National Commission on Farmers

Serving Farmers And Saving Farming

JAI KISAN: A DRAFT NATIONAL POLICY FOR FARMERS

FOURTH REPORT

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TERMS OF REFERENCE
FOR
NATIONAL COMMISSION ON FARMERS

- Work out a comprehensive medium-term strategy for food and nutrition security in the country in order to move towards the goal of universal food security over time.
- Propose methods of enhancing the productivity, profitability, stability and sustainability of the major farming systems of the country based on an agro-ecological and agro-climatic approach and the harnessing of frontier technologies.
- Bring about synergy between technology and public policy and recommend measures for enhancing income and employment potential in rural areas through diversification, application of appropriate technology including IT for information on market, weather, credit facilities and e-commerce, training and market reforms.
- Suggest measures to attract and retain educated youth in farming and recommend for this purpose; methods of technological upgrading of crop husbandry, horticulture, animal husbandry, fisheries (inland and marine), agro-forestry and agro-processing and associated marketing infrastructure.
- Suggest comprehensive policy reforms designed to enhance investment in agri-research, substantially increase flow of rural credit to farmers including small and marginal, triggering agricultural growth led economic progress, which can lead to opportunities for a healthy and productive life to rural families.
- Formulate special programmes for dryland farming for farmers in the arid and semi-arid regions, as well as for farmers in hilly and coastal areas in order to link the livelihood security of the farming communities living in such areas with the ecological security of such regions. Review in this context, all ongoing Technology Missions like those relating to pulses, oilseeds, maize, cotton, watershed etc. and recommend methods of promoting horizontal integration of

vertically structured programmes. Also suggest credit-linked insurance schemes which can protect resource poor farm families from unbearable risks. Further, suggest methods of strengthening and streamlining the National Horticulture Development Board.

- ❖ Suggest measures for enhancing the quality and cost competitiveness of farm commodities so as to make them globally competitive through providing necessary facilities and application of frontier science and promote quality literacy for codex alimentarius standard, sanitary and phyto-sanitary measures among farmers through reorienting and retooling extension machinery. Also suggest methods of providing adequate protection to farmers from imports when international prices fall sharply.
- ❖ Recommend measures for the credit, knowledge, skill, technological and marketing empowerment of women, taking into consideration the increasing feminization of agriculture and the proposed conferment of right to land ownership.
- ❖ Suggest methods of empowering male and female members of elected local bodies to discharge effectively their role in conserving and improving the ecological foundations for sustainable agriculture like land, water, agro-biodiversity and the atmosphere with priority attention to irrigation water.
- ❖ Consider any other issue, which is relevant to the above or is specially referred to the Commission by Government.

The Commission is to submit a medium term policy for food and nutrition security in the country in order to move towards the goal of universal food security over time within the next three months and to submit its recommendations on other Terms of Reference as soon as practicable and in any case on or before 13th October, 2006. The Commission, however is permitted to submit interim reports on any of the Terms of Reference it deemed fit or expected of it.

[Ministry of Agriculture Resolution No.8-2/2003-Policy(ES) dated 18th November, 2004]

COMPOSITION OF THE
NATIONAL COMMISSION ON FARMERS

The composition of the reconstituted National Commission on Farmers is as under:-

Chairman

Prof. M.S. Swaminathan

Full-time Members

Dr. Ram Badan Singh
Shri Y.C. Nanda

Part-time Members

Dr. R.L. Pitale
Shri Jagadish Pradhan
Ms. Chanda Nimbkar
Shri Atul Kumar Anjan

Member Secretary

Shri Atul Sinha

[Ministry of Agriculture Resolution No.8-2/2003-Policy (ES) dated 18th November, 2004]

CHAPTER 1

ENDING THE ERA OF FARMERS' SUICIDES AND LOW AGRICULTURAL GROWTH RATE: SYNOPTIC ACCOUNT OF NCF RECOMMENDATIONS

1.1 Introduction

1.1.1 NCF has so far submitted three Reports to the Union Agriculture Minister - on 29 December 2004, 11 August 2005 and 29 December 2005 respectively. The Fourth Report, *inter alia* containing a Draft National Policy on Farmers is being submitted to the Union Agriculture Minister on Vaisakhi Day i.e. 13 April 2006.

1.1.2 2005 was a difficult year both for the nation and for farm and fisher families. Beginning with the titanic tsunami of 26 December 2004, and ending with the disastrous earthquake in Kashmir and floods in Tamil Nadu, our farm and fisher families have been subjected to the fury of nature in the form of drought, unseasonal and heavy rains (like the one which caused damage to the onion crop in Maharashtra) and floods. Institutional support to small farmers is weak. The same is true of post-harvest infrastructure. For example, even now paddy is being spread on the roads for drying in many places. The spoilage losses can be as high as 30% in the case of vegetables and fruits. Institutions, which are supposed to help farmers, such as research, extension, credit and input supply agencies, are by and large not pro-poor and pro-women. Mechanisms for risk mitigation are poor or absent. Hardly 10% of farmers are covered by crop insurance. Farm families are also not covered by health insurance. There is no Agricultural Risk Fund. Both risk mitigation and price stabilization are receiving inadequate policy support. According to farmers, the cost of production is invariably higher than the Minimum Support Price, due to ever increasing prices of diesel and other inputs. Investment in agriculture has suffered a decline over the past two decades. Capital formation in agriculture and allied sectors in relation to GDP started declining in the 1980s and is only now being reversed. This has adversely affected irrigation and rural infrastructure development. Investment on

agriculture research has also suffered a decline. An unfortunate consequence of the constellation of hardships faced by small farm families is the growing number of suicides among farmers. The situation is particularly alarming in the Vidharbha region of Maharashtra and in Andhra Pradesh.

1.1.3 The cost-risk-return structure of farming is becoming adverse. Consequently, indebtedness is growing in rural areas. In Maharashtra over 55% of the State's farm households are in debt. Average household size of farmers is 5.5 at the all-India level. In the low-income groups, the average size goes up to 6.9. According to NSSO-59th round, the average monthly per capita consumption expenditure of farm households across India was Rs. 503 in 2003. The all India average monthly income per farmer household during the same period was Rs.2115. (The figure was Rs.1062 for Orissa and Rs.1633 for UP). Endemic hunger (i.e., chronic undernutrition), is high both in families without assets like land or livestock, as well as in families with small land holdings without access to irrigation. Policy reform in agriculture is thus overdue. Such policy reform should be pro-small farmer and pro-women and pro-landless agricultural labour. If we do not attend to the problems of small farm and landless agricultural labour families with a sense of urgency and commitment, the "Indian Enigma" of the co-existence of enormous technological capability and entrepreneurship on the one hand, and extensive under-nutrition, poverty and deprivation, on the other, will not only persist, but will lead to social disruption and violence and increasing human insecurity. Without peace and security, enduring economic progress will not be possible. NCF therefore recommends that the agricultural year 2006-07 be designated as the **Year of Agricultural Renewal.**

1.1.4 During this year an integrated package of measures should be introduced in every part of the country to increase farm productivity and profitability in perpetuity without associated ecological harm. The programmes should cover all our major agro-ecological regions-arid, semi-arid (i.e. dry-farming) hill, coastal and wet (i.e. irrigated or high rainfall) zones. The present agricultural crisis can then be converted into an opportunity for not only reversing the decline, but for taking the agricultural revolution forward by helping farm families to bridge the gap between potential and actual yields in all major

farming systems through mutually reinforcing packages of technology, services and public policies. The programmes initiated during the 2006-07: Year of Agricultural Renewal by Central and State Governments, Panchayati Raj institutions, Agricultural, Veterinary, Rural and Women's Universities and IITs, Private and Public Sector Industries, Civil Society Organisations and Mass Media should be designed to foster productivity, quality, sustainability, profitability and employment revolutions in the farm sector in all the over 600,000 villages in the country. It should help to promote job-led economic growth in our villages.

1.1.5 It is felt that declaration of the year 2006-07 as the "Year of Agricultural Renewal" would be a positive step towards an Evergreen Revolution in Agriculture. The recommendations of the NCF contained in its three Reports would help in achieving a growth rate of 4 percent in agriculture, which in turn would help to raise the overall growth rate in GDP to over 8 percent.

1.2 Synopsis of Recommendations:

1.2.1 The major recommendations in the first three Reports of the NCF are summarized below under the heads of Land, Water, Credit and Insurance, Technology and Markets – the five core areas needing urgent attention to make farming a viable activity for farmers.

1.2.2 Land

There is an urgent need for a **National Land Use Advisory Service, linked to State and Block Level Land Use Advisory Services** on a hub and spokes model. These can be virtual organizations with the capacity to link land use decisions with ecological, meteorological and marketing factors on a location and season specific basis. The National Land Use Advisory Service can be linked to a virtual body – the Indian Trade Organisation (ITO) (discussed in details in the Third Report). It should have continuous contact with IMD, ISRO, Agricultural Universities and Departments, Commodity Exchanges and Futures Markets, APEDA, Commodity Boards and all credible national and international sources of information on domestic and international markets. The Land Use Advisory Service should cover crop and animal husbandry, horticulture, inland

fisheries, forestry and agro-forestry, and have the capacity to proactively assess potential surpluses and shortages of essential commodities. Revitalize and strengthen National and State Land Use Boards on the pattern of hub and spokes model, to give proactive advice to farmers on crops.

i. Commemorate 2006-07 as the year of **Soil Health Enhancement.** Soil Health Enhancement holds the key to improving the return from investment in other inputs like seeds and water. Dry farming areas need particular attention from the point of view of overcoming micro-and macronutrient deficiencies. As stressed by the Prime Minister, the second green revolution has to begin in dry farming areas

ii. Retool and rejuvenate soil-testing laboratories to address the problems of micronutrients deficiency in soil. **Establish a national network of 1000 sophisticated soil testing laboratories.**

iii. Issue **Soil Health Passbook to every farm family** based on an integrated analysis of the physical, chemical and microbiological properties of the soil.

iv. Organize **Travelling seminars** for farm men and women to learn the factors responsible for "agricultural bright spots", with priority to horticulture. Another method of facilitating Farmer-to-Farmer learning is the establishment of **Farm Schools** in the fields of farmers-achievers.

1.2.3.1 Water

i. Have a **Policy of Water for Agriculture**. Converge all Technology Missions around a Watershed or Command Area

ii. Launch a Million Wells Recharge Programme, Rebuild water bodies and bring about greater integration between currently fragmented progrmames.

iii. Launch a Water Literacy Movement, training Water Masters in every Panchayat. **Increasing supply through rainwater harvesting and recharge of the aquifer should become mandatory**

iv. Set up National Rainfed Area Authority to help in converting scientific know-how into field level do-how through large-scale demonstrations. The Authority should also help to foster water conservation, Pani Panchayats, scientific land use planning and assured and remunerative marketing.

v. Promote seawater farming for coastal area prosperity – pilot projects covering about 50,000 ha in all coastal states to demonstrate conjunctive use of sea and fresh water and forestry and aquaculture.

vi. Establish a National Research Centre on Glacierology for collection, storage and dissemination of information on status of seasonal/perennial snow and ice

vii. Launch a National Challenge Programme for Coastal Systems Research (CSR), for concurrent attention to coastal agriculture, agro-forestry, culture and capture fisheries

1.2.3.2 Water – Fisheries

i. Set up National Agency and Protocol of Seed Certification for Fisheries

ii. Set up an interdisciplinary Task Force to address need for a comprehensive set of Aquarian Reforms in order to foster sustainable and equitable use of both coastal and inland waters for capture and culture fisheries.

iii. Organize centralized support services to support decentralized small scale production (e.g. Mother Ships based in Andaman & Nicobar and Lakshadweep Group of Islands), upgradation and construction of new minor fish harbours and fish landing centers, large wholesale markets for larger and more hygienic handling of catch and greater employment generation.

iv. Set up a Central Fishery Harbour Development Authority.

v. Set up a **National Fisheries Development Board** to provide technical and infrastructural support to fisher communities, particularly in the areas of fish processing and marketing as well as in fish seed and feed production and distribution.

vi. Hike subsistence allowance per fisher family from Rs. 300 to Rs. 1500 per month for better enforcement of close season. There should be a Contributory Provident Fund and Pension Scheme for fishers above 60 years of age.

vii. Establish '**Fish for All Training Centres**', which will enhance the capacity of fisher women and men in all aspects of the capture to consumption chain.

1.2.4 Credit and Insurance

i. Introduce an integrated **Parivar Bima Policy** for the rural poor for providing hospitalization expenses, life cover for deaths/disabilities and cover for dwelling units. This should be linked to self-help groups and largely funded by the contribution of Members.

ii. Launch a drive for credit and insurance literacy amongst farmers. Set up a **Rural Insurance Development Fund** for promoting insurance coverage

iii. **Keeping in view the decline in the profitability of agriculture, and increasing farmers' distress and indebtedness, the government may consider providing support to the banking system for reducing the rate of interest for crop loans to 4% during the Year of Agricultural Renewal.**

iv. The outreach of the formal credit system has to expand to reach the really poor and needy

v. There is an urgent need for a **paradigm shift from micro-finance to livelihood finance**, comprising a comprehensive package of support services including financial services, [including insurance for life, health, crops and livestock: infrastructure finance for roads, power, market, telecom etc and investment in human development], agriculture and business development services [including productivity enhancement, local value addition, alternate market linkages etc] and institutional development services [forming and strengthening various producers' organisations, such as SHGs, water user associations, forest protection committees, credit & commodity cooperatives, empowering Panchayats through capacity building and knowledge centres etc.].

vi. **Need for an Agri-risk Fund:** There are areas in our country, which have recurrent and frequent drought/floods etc, which cripple the incomes of the farmers. These farmers become defaulters to the banks and thereby become "push-outs" of the credit system. Rescheduling and restructuring of their loans are not enough in the event of successive natural calamities. The Government of India may step in to create an Agriculture-Risk Fund to provide relief [waiver in full/ part of loan and interest] to the farmers in the case of successive droughts, etc.

and also waiver of interest on loans in areas hit by droughts, floods, heavy pest infestation etc. This Fund should have contributions from the Central Government, State Governments and Banks in a predetermined fashion.

vii. **Distress 'hot spots' – moratorium on debt recovery:** There is a need for moratorium on debt recovery including loans from non-institutional sources in distress hotspots, till reasonable profit margins in agriculture operations are restored. The debt recovery may be staggered in easy installments. For this purpose, liquidity support may have to be provided to the localised banks like the RRBs/Cooperative Banks etc.

viii. **Issue of Kisan Credit Card (KCC) to women farmers:** Inspite of nearly 4.5 crore KCCs issued by the banks, very few cards have been issued to women farmers and no separate data are available in this regard. Keeping in view the fact that there are a very large number of women-headed farming families, particularly in the hills and NE Region, special effort is needed to issue KCC to these farmers. The banks may develop proper documentation systems to issue KCCs to women where the land is in the name of the menfolk who do not reside in the rural area [jobs in the cities/army etc] or face similar other situation and the land is cultivated by the wife.

ix. **Distress sale - need for pledge loans:** Distress sale by small/marginal farmers to square off their debts or for immediate consumption purposes soon after harvest is quite common. It is normal for a farmer to get 10-15% discounted price for spot payment for his produce. Pledge loans to farmers need to be liberalised and encouraged to help the farmers to overcome this problem. **The constraints in improving the negotiability of warehouse receipts also need to be removed.**

x. **Crop insurance** is covering only about 14% of the farmers. The need is to expand the cover to all farmers and all crops in a time bound manner. The scheme needs to be made more farmer-friendly and the premium reduced.

xi. Establish **Credit Counseling Centres** where severely indebted farmers can be provided with **a debt rescue package** of information in order to get them out of the debt trap, and thereby save them from committing suicide.

1.2.5 Technology

i. All ICAR institutions and Agricultural Universities may commemorate 2006–07 as the **Agricultural Technology Year**. The major aim of this year should be to strengthen participatory research and knowledge management with farming families and the organisation of about 60,000 **Lab to Land programmes** in the area of post-harvest technology, value addition to primary products and biomass utilization.

ii. A post-harvest technology wing should be added to every Krishi Vigyan Kendra and the help of other institutes like CFTRI and CSIR taken in designing the Lab to Land Programmes.

iii. Agricultural scientists should state the performance of new varieties and technologies in terms of **net income per hectare**, and not just in terms of yield per hectare.

iv. All programmes designed to foster access to technologies must be gender sensitive.

v. A cadre of Rural **Farm Science Managers** should be developed by training a couple of women and men members of every Panchayat/ local body in the management of new technologies, such as Biotechnology and information and Communication Technology. Under the 73rd Constitution Amendment, the responsibility of Panchayats includes agriculture and agriculture extension. **Therefore, a Scientist – Panchayat linkage is the need of the hour. Genome Clubs** may be organized in village schools and KVKs to spread genetic literacy.

vi. Develop Computerized Farm Advisory System; ICT should be effectively harnessed to empower rural men and women through the **Every Village a Knowledge Centre Movement** with farming system and season specific information as well as market and price information.

vii. Organize a **National Federation of Farm Technology Missions** headed by a farmer-achiever, which can help to bring to the watershed community the benefits of all other relevant Technology Missions like pulses, oilseeds, cotton, horticulture, dairy etc. Organize a **Technology Mission on Sugarcane** jointly

with sugarcane growers' organizations and cooperatives and sugar factories on the basis of a seed-to-sugar approach. Set up **National Mission on Medicinal and Aromatic Plants**. The National Medicinal Plants Boards needs to be restructured and re-tooled, to enable it to function like NDDB.

viii. **Put in place a National Agricultural Biosecurity System** on a hub and spokes model - to help in preventing pandemics like Avian Flu (H5N 1 viral strain)

ix. Provide greater research support for Organic farming. Research on soil fertility enhancement and plant health management has also to be strengthened.

x. Facilitate setting up of **Agriculture and Aquaculture Service Centres,** equipped with a laboratory, storage facilities for inputs and with communication facilities and run by trained managers who are available to the farmers to provide reliable technical advice, arrange for procurement of quality seed, feed, probiotics, provide information on the market and price fluctuations, should be set up with the active involvement of the farmers in different production areas.

1.2.6 Markets

i. **Amendment to Acts/legal instruments:** The Essential Commodities Act and other legal instruments including the State Agriculture Produce Marketing Committee Acts [APMC Acts] relating to marketing, storage and processing of agriculture produce need to be reviewed in order to meet the requirements of modern agriculture and attracting private capital in this sector.

ii. There is a need for focused attention for improving the **rural periodic markets**, which are the first contact point for the farmers and also for improving the infrastructure facilities at the regulated markets.

iii. The **role of the APMCs/ State Agriculture Marketing Boards** need to change from regulatory focus to promotion of grading, branding, packaging and development of distant and international markets for the local produce.

iv. **Commodity-based farmers' organisations** like Small Cotton Farmers' Estates, Small Farmers' Horticulture Estates, Small Farmers' Poultry Estates

and Small Farmers' Medicinal Plants estates should be promoted to combine the advantages of decentralized production and centralized services, post harvest management, value addition and marketing, for leveraging institutional support and facilitate direct farmer-consumer linkage.

v. **Implementation of MSP** across the regions needs considerable improvement. Arrangements to protect the Minimum Support Price (MSP) needs to be put in place for crops other than paddy and wheat. These include coarse cereals like millets. Without MSP support or other effective need-based market intervention by the government, advice to farmers on crop diversification could lead to disastrous results. MSP should be adjusted according to the wholesale price index.

vi. The price behaviour of sensitive commodities needs to be closely watched particularly during the glut periods for need-based intervention under the **'Market Intervention Scheme' [MIS]** of the Government of India.

vii. **Import tariffs** on farm products produced in resource poor regions deserve to be carefully monitored and maintained at such levels as to provide sufficient incentives to dryland farmers.

viii. **Pre–production Agreements to sell:** Pre-production agreements for sale (loosely referred to as 'contract farming'), between the farmers and corporate houses/processing companies/others are being increasingly used in the case of certain vegetables/fruits/ medicinal plants etc. The need is to develop a comprehensive, clean, equitable and farmer centric model agreement with special attention to clauses dealing with quality standards, withdrawal conditions, pricing standards, paying arrangements, acts of God clauses and arbitration mechanism, so that the farmers do not get a raw deal. Till such a code of conduct is introduced and the farmers are empowered by formation of groups/cooperatives to deal with the agribusiness unit on their behalf, one has to be rather cautious about these arrangements.

ix. Set up a **Livestock Feed Corporation of India** jointly with NDDB, SFAC and NABARD to provide support to local level SHGs engaged in the production of fodder and feed and in organizing Fodder and Feed Banks.

x. Identify **Organic farming zones**, to facilitate certification. In such zones, promote the formation of Small Farmers' Organic Agriculture Estates: Develop Andaman & Nicobar Islands into Organic Farming Islands.

xi. Develop **an Indian Single Market** for agricultural produce for strengthening producer oriented marketing to give power of scale to small producers.

xii. Promote trade, patent, quality and genetic literacy

1.3 Other Key Recommendations

1.3.1 Medium term strategy for Food and Nutrition Security – Six Point Action Plan for Hunger Free India

a. Reform of the Delivery System based on a life cycle approach to food and nutrition security.

b. Community Food Security Systems – Community managed Gene-Seed-Grain-Water bank Continuum

c. Eradication of Hidden Hunger based on natural cum food fortification approaches

d. New Deal for the Self-Employed (Establish SHG Capacity Building and Mentoring Centres, Paradigm shift from Microfinance to Livelihood Finance)

e. Enhance the Productivity and Profitability of Small Holdings to increase marketable surplus

f. Introduce a National Food Guarantee Act combining the features of the National Rural Employment Guarantee Act and Food for Work Programme.

1.3.2 Introduce a **Farmers' Livelihood Security Compact** comprising of the following integrated package of measures to step up credit and generate employment in suicide hotspots:

a) **Set up State level Farmers' Commission** as has already been done by the Punjab Government for ensuring dynamic government response to farmers' problems. Farm men and women should be represented in the Commission.

b) **Undertake a Census of Suicides** to have a proper understanding, assessment of reasons and count of suicides.

c) **Micro-finance policies should be restructured to serve as Livelihood Finance**

d) Initiate a **Debt survey to** take into account newer forms of credit and indebtedness and newer forms of bondage.

e) **Debt waiver -** The amount that is to be the cut-off point could be worked out in consultation with Panchayats and farmers' representatives in the distress hotspot areas.

f) **Insurance revival:** There are provisions in the insurance laws that allow LIC to revive lapsed policies.

g) **Parivar Bima Policy:** The integrated family insurance policy recommended by NCF in its first report deserves to be examined and introduced to begin with, in dry farming areas.

h) **Policies for Irrigation Water:** Water conservation, equity and fairness and public good will have to be the basis of water policies. Irrigation policies need to be viewed in a holistic manner and made pro-poor.

i) **Revising import policies:** Some swift action on import duties of cotton for instance is a must in the light of large number of suicides by Vidharbha's poor cotton farmers. Other crops need to be similarly protected.

j) **Access to affordable inputs is crucial:** The government must urgently intervene to ensure that quality seed and other inputs reach farmers at affordable costs and at the right time and place. Resource poor farm families should not be left to the mercy of input dealers who have emerged as the new moneylenders of the countryside. The maximum punishment for selling fake seed (except where new laws have been passed) is a meagre Rs. 500.

k) **Overhauling farmers' markets:** Swift action is required to overhaul the **ryuthu bazars** or farmers' markets. **Most of these are presently controlled not by farmers but by traders, from whose control they must be released**. Amendments to APMA, as suggested by the Union Agriculture Ministry, need to be carried out by State Governments as soon as possible. There is also need for introducing focused **Market Intervention Schemes** (MIS) in the case of life-saving crops such as cumin in arid areas.

a. **Extension work:** The vital role of the Agriculture Extension Officer must be recognised and the system revived and strengthened. **Agricultural and Animal Sciences Universities could form Hope Generation Teams (like NSS) of young male and female students who could stay in the distress villages during vacations and extend both technical and psychological support. The universities must be accountable to the farming community and not to private interests**.

b. **Basic services:** The distress sweeping rural India flows from the gradual collapse of public services. For instance, almost all the suicide and otherwise crisis-hit households record high health expenditures. There is urgent need for both affordable health insurance, and the revitalization of primary healthcare centres.

c. **Knowledge Empowerment:** In addition to the above steps, there is need for establishing Village Knowledge Centres (VKCs) or *Gyan Chaupals* in the farmers' distress hotspots. These VKCs could be linked to a Block level Village Resource Centre (VRC) with the help of the Indian Space Research Organisation (ISRO). This will enable tele-conferencing and thereby facilitate immediate attention to distress calls. The VRC-VKC grid could provide dynamic and demand driven information on all aspects of agricultural and non-farm livelihoods. These centres of hope in areas where rural families had lost hope, should be operated to the extent feasible by the wives or children of the farmers who had unfortunately taken their lives.

1.3.3 Policy for Women in Agriculture

a. Issue joint pattas to ensure land ownership rights to women
b. Set targets State-wise for at least 40% of government land distributed to SC/ST to go to the women of these communities.
c. Allocate land in State Farms (both Central and State) to women SHGs engaged in the production of seeds and planting material for horticultural crops including medicinal plants.

d. **A Gram Panchayat Mahila Fund** should be established to enable SHGs and other women's groups to undertake community activities that help to meet essential gender specific needs.

1.3.4 **Set up a Heritage Gene Banks** to protect livestock heritage

1.3.5 Organize a separate **Department of Fisheries** in the Ministry of Agriculture.

1.3.6 **Rename Ministry of Agriculture as Ministry of Agriculture and Farmers' Welfare**

1.4 Thus, the National Agricultural Renewal Year Programme of 2006-07, should deal concurrently with proactive advice to farmers on land use, soil health enhancement, augmentation of the area under irrigation coupled with efficiency and equity in water use, credit and insurance reform, technology up-gradation and dissemination, and farmer-centred marketing coupled with necessary policy and infrastructure support to address and redress the problems. Only such a human-centred approach to agricultural policies based on the strong foundations of the health and livelihood security of the majority of our farm population, which is also the largest consumer population in the country, will enable us to achieve an annual growth rate of 4% in agriculture on a long-term basis.

CHAPTER 2

JAI KISAN: DRAFT NATIONAL POLICY FOR FARMERS

(Draft for Comments, Public Debate and Consensus Building)

2.1 Why a National Policy for Farmers

2.1.1 At the time of our Independence, Jawaharlal Nehru said, "Everything else can wait, but not agriculture". Unfortunately this profound truth is yet to be converted into concrete policies and action on an adequate scale. There have been several policy statements for agriculture during the last 59 years, including the comprehensive reports of the National Commission on Agriculture (1976). The last National Agricultural Policy was formulated in 2002. However, we are yet to place faces before figures and the problems of farm families as human beings and citizens of the country are yet to receive the attention they need and deserve. Agricultural growth has decelerated during the last decade. This has led to a decline in real per capita incomes in rural India, in comparison to the rapid growth in urban incomes. **The present Draft Policy for Farmers is designed to fill this gap and to get the focus of our agricultural policies shifted to the women and men feeding the nation, thus moving away from an attitude which measures progress only in millions of tonnes of foodgrains and other farm commodities.** Its main aim is to bring about a mindset change and a shift from an approach of patronage to partnership with farm and fisher families based on mutual respect. Progress in agriculture should be measured by the growth rate in the net income of farm families, if the human dimension is to be added to agricultural policies.

2.1.2 Farming is both a way of life and the principal means of livelihood for 65 per cent of India's population of 110 crores. Our farm population is increasing annually by 1.84 per cent. The average farm size is becoming smaller each year and the cost-risk-return structure of farming is becoming adverse, with the result that farmers are getting increasingly indebted. Marketing infrastructure is generally poor, particularly in perishable commodities. No wonder, a recent NSSO survey revealed that nearly 40 per

cent of farmers would like to quit farming, if they have the option to do so. Unfortunately, there is little option for them except moving into urban slums.

2.1.3 The livelihoods of pastoralists and smallholder farmers are threatened by the progressive loss of grazing land for their animals, limitations to mobility, inadequate or inappropriate government policies, and lack of animal health and other services. These developments are also causing the progressive loss of the livestock breeds and species that provide rural livelihoods and life-style options.

2.1.4 The support systems needed by farmers, like research, extension, input supply and opportunities for assured and remunerative marketing are in need of review and reform. Small farmers are forced to borrow from moneylenders at high rates of interest, since only 51 per cent of the credit requirements of farmers are met by institutional sources. Only 27 per cent of all cultivator households receive institutional credit.

2.1.5 Farmers' suicides are not only persisting but are tending to increase, particularly in the Vidharbha region of Maharashtra. The suicides are driven by several factors that include debt from private moneylenders at high rates of interest, soaring input costs, low output prices, need for funds for non-farm expenditure, particularly for healthcare and a complete loss of hope. The farmers of such regions need to be rescued from the pall of despair and doom. Unfortunately, the economic, ecological, technological and social problems facing small farmers are yet to receive the integrated attention they need, although the NCF had recommended in its Second Report submitted in August 2005, a life saving package, including the formation of "**Hope Generation Teams**" of students by Agricultural Universities, to visit suicide hotspots.

2.1.6 The social prestige and status accorded to farmers are also low. **Farmers seldom receive recognition through Padma Awards on Republic Day - an index of the low recognition given to the contributions of 650 million farm women and men not only to food and livelihood security, but also to national sovereignty**. Lal Bahadur

Shastri's slogan "Jai Kisan" is yet to be converted into public policies which recognise the pivotal role of farming communities in national well-being and security.

2.1.7 Policies are needed for making the farming operators sub-marginal, marginal and small farmers economically viable and environmentally sustainable. Well-defined guidelines are needed for assisting such families with assured and remunerative marketing opportunities, particularly in the case of perishable commodities, and 'orphan'" crops like a wide range of millets, tubers, pulses and oilseeds.

2.1.8 Technology has been a major factor in the rich-poor divide until now. We should now enlist technology as an ally in the movement for gender and social equity. This will call for a pro-poor, pro-women and pro-nature orientation to technology development and dissemination. Also, Intellectual Property Rights (IPR) policies should be such that **there is social inclusion in access to technologies**. This will call for a considerable stepping up of investment in **public good research** and an **antyodaya** approach to technology development and dissemination. There is no option except to produce more food and other commodities under conditions of diminishing per capita arable land and irrigation water resources. Hence, we must harness the best in frontier technologies and integrate them with traditional wisdom and thereby launch an ecotechnology movement.

2.1.9 Research should be tailored to the need for developing technologies which can help to add economic value to the time and labour of the poor, particularly women. Also, the advantage of the National Rural Employment Guarantee Programme (NREGP) should be taken for launching a massive adult and functional literacy programme using modern computer-aided joyful learning techniques. The poor are poor because they have no assets, neither land nor livestock nor fishpond. They are often illiterate also. Modern technologies can help to achieve a quantum jump in imparting literacy and market-driven skills. They should therefore be harnessed for the benefit of resource poor farm and

landless labour families living below the poverty line. Further, the NREGP should be used to create productive assets in rural areas.

2.1.10 Within a week after the launch of NREGP, 2.7 million applicants reportedly registered themselves for employment under this programme in 13 districts of Andhra Pradesh and a million registered in 12 districts of Maharashtra. The average wage under this programme is about Rs. 60 per day. While this will help them to get their daily bread, the programme cannot solve the challenge of pervasive poverty. Since NREGP represents employment of the last resort and caters only to unskilled work, the extent of despair and deprivation in rural India is obvious from the demand for placement in this programme.

2.1.11 Addressing the nutrition, healthcare and education needs of the poor, and particularly of agricultural labour, tribal women and men and fisher families should be given top priority. Nearly 75 per cent of children in the country are under-weight due to inadequate nutrition. India has the largest number of under-weight and low birth weight children and their prevalence is almost double that of Sub-Saharan Africa. Micronutrient deficiencies are widespread. More than 75 per cent of preschool children suffer from iron deficiency anaemia. About 57 per cent of preschool children have sub-clinical vitamin A deficiency. Many traditional food habits in rural and tribal areas included a wide range of millets, tubers and grain legumes. **The revitalization of nutrition-centred farming systems is an urgent task. Both dying crops and dying wisdom should be saved and harnessed for local level community managed food security systems, like Community Food Banks.**

2.1.12 While farm families are crying for additional investment in infrastructure and farm innovation, there has been a drop in government investment in the agriculture sector. The drop in government as well as private investment has significantly slowed down momentum in the entire rural economy. Public policies in the area of farm subsidies have led to distortions in land use and fertiliser consumption and have promoted the unsustainable exploitation of groundwater. The intensive wheat-rice

rotation in the Punjab-Haryana region has led to the depletion of groundwater and to soil salinisation in some areas. Balanced fertilisation has been affected by the heavy subsidy given to urea-based fertilisers, particularly in the context of a sharp rise in the prices of all chemical fertilisers. Soil micronutrient deficiencies are not being addressed. **Consequently, factor productivity is going down, with a consequent adverse impact on the cost of production.**

2.2 Silver Lining in the Dark Cloud

2.2.1 Fortunately, several significant initiatives have been taken during the last 2 years to reverse the downward trend in agricultural production and to find permanent solutions to the agrarian crisis. Some of the important new initiatives are:

- Bharat Nirman or a New Deal for Rural India.
- National Rural Employment Guarantee Programme.
- National Horticulture Mission.
- Expansion of agricultural credit and lowering of interest rates.
- National Rainfed Area Authority.
- National Fisheries Development Board.
- Changes in the Agriculture Produce Marketing Committee Act (APMC), to make them farmer-friendly.
- Integrated Food Law (currently the food processing industry is governed by 16 different laws).
- Warehouse Receipt Act, making warehouse receipts a negotiable instrument, thereby helping to prevent distress sales.
- Knowledge connectivity through the e-governance and Every Village a Knowledge Centre.

2.2.2 The time is therefore opportune for revitalising our agricultural progress by making agrarian prosperity the bottom line of government investment and agricultural and rural development policies.

2.2.3 Data and analysis relevant to the preparation of a **Draft National Policy for Farmers** are included in this chapter in order to provide the rationale underlying the recommendations. The conclusions of the Mid-term Appraisal of the Tenth Plan conducted by the Union Planning Commission are also included among the background documents (Annexure 1, Chapter 3.1), in order to emphasise the need to prevent a further fall in the productivity and economic viability of farming.

2.3 Next Steps

2.3.1 NCF is of the view that the process of preparation of a National Policy Statement is as important as the product. The present draft is the result of widespread consultations and field visits during the last 15 months. NCF proposes to provide a second draft in its fifth and final Report to be submitted to the Ministry of Agriculture on October 13, 2006, when the term of NCF ends. The second draft will be based on the views/comments on the present draft by Farmers' and Fisher People's Associations, as well as women's organisations, State Governments, financial institutions, Self-help Groups (SHGs), Cooperative Federations, private and public sector companies, mass media and all other stakeholders. State Governments have a special responsibility, since agriculture is a State subject under our Constitution. NCF hopes that the Ministry of Agriculture will get the draft policy finalised by early 2007, so that the policy can be adopted by Parliament and the National Development Council on the occasion of the 60th Anniversary of our Independence.

2.4 Draft National Policy for Farmers

Box I

Mission Statement

- To mainstream the human dimension in all farm policies and programmes and to give explicit attention to issues relating to women in agriculture.
- To end the era of farmers' suicides and to restore pride and confidence in India's agricultural capability.
- To complete the unfinished agenda in land reforms and to initiate comprehensive asset and aquarian reforms in rural India.
- To enhance the income, livelihood, nutrition and health security of farm, fisher, tribal, pastoral and agricultural labour families through mutually reinforcing packages of technology, techno-infrastructure, services and public policies.
- To protect and improve the land, water, biodiversity and climate resources essential for sustained advances in the productivity, profitability and stability of major farming systems, and thereby the livelihood security of nearly two-thirds of our population.
- To introduce measures which can help to attract and retain youth in farming and which can confer the power of scale to small and marginal farmers both in the production and post-harvest phases of farming, thereby enhancing their income and competitiveness.
- To strengthen the biosecurity of crops, farm animals, fishes and forest trees for safeguarding both the work and income security of farm and fisher families, and the health and trade security of the nation.

2.4.1 Definition

For the purpose of this Policy, the term "farmers" will include landless agricultural labourers, sharecroppers, tenants, small, marginal and sub-marginal cultivators, farmers with larger holdings, fishers, dairy, sheep, poultry and other farmers involved in animal husbandry, pastoralists, plantation workers, as well as those rural and tribal families engaged in a wide variety of farming related occupations such as sericulture and vermiculture. The term will include tribal families sometimes engaged in shifting cultivation and in the collection and use of non-timber forest products. In all cases, both men and women will receive equal attention. This Draft Policy aims to suggest methods of improving the income and work security of such citizens of the country who not only constitute the genuine majority of our population, but also represent the largest private sector enterprise of the country.

2.4.2 Ending the Era of Farmers' Suicides

2.4.2.1 We live on this earth as guests of the green plants which convert sunlight into food, and of the farm women and men who toil in sun and rain to cultivate them. It is

therefore sad and shameful that the very farmers making life possible for others are forced to take their own lives. **Ending this chapter in our national history must be the first and foremost task of Government**. From its first Report, NCF has been giving both generic and location specific recommendations to end this sad chapter of our agricultural history. A 'Livelihood Security Compact', programme for instilling hope in the minds of those farmers who have lost all hope, and specific steps for solving the Vidharbha agrarian crisis have been proposed in the earlier Reports of NCF. The establishment of Village Knowledge Centres managed by the widows and/or sons and daughters of the farmers who have taken their lives will help to spread the right information, at the right time and to the right people, particularly in the areas of credit, insurance and trade literacy. Such a programme is being launched on May 1, 2006 (Maharashtra Day) at Nagpur. Also, the 'Hope Generation Teams' to be set up by Agricultural Universities should start functioning immediately, since the summer vacation will afford an opportunity to scholars and staff to stay in the 'Suicide Hot Spots'and spread a message of confidence in our agricultural future.

2.4.2.2 Ours is a nation of subsistence farmers, who constitute one fourth of the global farm population. There is little or no evidence that policy is being shaped by that reality. Farming is the largest people's private sector and not a corporate domain. The immediate step Government must take is to implement the NCF recommendation for a Price Stabilisation Fund. While a multiplicity of factors is driving the farm suicides, the greatest worry of the farmers relates to the price he is likely to get for his produce at harvest time. This has proved true regardless whether the produce is cotton, onions, groundnut, sugarcane or pulses. **Assured and remunerative price for farm produce is the core issue. Farmers should be assured that there will be strong Government intervention to prevent distress sales.**

2.4.2.3 There are no conclusive figures on the number of farmers' suicides. According to media reports, it appears that this number may be about 30,000 across six States. There is need for a proper "Suicides Census". Gram Sabhas may be involved in this process. The review and overhaul of credit operations ought to be far more transparent and rigorous. The Indian Trade Organisation (ITO) should come into

existence soon as a watchdog body to safeguard farmers' interests. The ITO could be supported by a Trade Advisory Body for Small Farmers. The objective would be to allow farmers to engage with decision makers in the formulation of appropriate policy responses to developments in agricultural markets.

2.4.2.4 Another area where the Central and State Governments can help is input costs. High quality inputs should be made available at affordable prices at the right time and place, along with credible extension advice. Today, the farmer depends on the input dealer who sells seeds, pesticides and fertilisers for technical advice. In many "Suicide Hot Spot" areas, the input dealer is also the moneylender, the scientist, agricultural expert, counselor and buyer all rolled into one.

2.4.2.5 NCF urges State Governments and all concerned not to place the underlying causes for the increasing number of farmers' suicides under the carpet and delay action on its recommendations. Some immediate financial support to the bereaved families is important, but not adequate. Until such time we do not recognise the root causes of this sad chapter of our agricultural history, remedial actions will largely be cosmetic.

2.4.3 Asset Reform

2.4.3.1 The purpose of asset reform is to ensure that every man and woman in villages either possess or has access to a productive asset like land, livestock, fishpond, homestead farm or income through an enterprise, or a market driven skill, so that household nutrition security is safeguarded, and children are able to go to school. Child labour has to be rendered unnecessary by improving the economic wellbeing of the adults.

2.4.3.2 Land

2.4.3.2.1 The major assets available to farm families are land, water, livestock, biodiversity, fisheries and forestry. The ownership of land is highly skewed with over 60 per cent of the rural households owning less than one hectare. Farmers owning over one hectare comprise nearly 28 per cent of rural families. The landless population amounts to

11.24 per cent of rural households. These data relate to 1991-92 and it is obvious that by now there would have been further fragmentation of holdings leading to a much larger incidence of very small operational holdings. The slow growth of opportunities in the non-farm employment sector has led to the proliferation of tiny and economically non-viable holdings. **Increase in small farm productivity and creating multiple livelihood opportunities through crop-livestock integrated farming systems as well as agro-processing have become urgent tasks.** The first and foremost task of the National Policy for Farmers should be in the area of land reform with particular reference to tenancy laws, distribution of ceiling surplus land, attention to common property and wasteland resources and the consolidation of holdings. Following the conferment of land rights to women under the Hindu Succession Amendment Act (2005), the provision of appropriate support services to women farmers has become urgent. Joint Pattas are essential for women to get access to credit. Also, there should be stringent restrictions on the diversion of prime farmland for non-farm purposes.

2.4.3.2.2 Methods of providing the power of scale to small farmers will have to be developed and popularised on a win-win basis for all concerned. Such methods should include the following:

i. Cooperative Farming – This has by and large not been successful except in the case of the dairy industry. Marketing cooperatives are successful since members cooperate on the basis of enlightened self-interest. Other forms of service cooperatives are yet to emerge on a significant scale. For example there is scope for Irrigation Water Cooperatives which can operate community tubewells, lift irrigation etc. Cooperative farming will be ideal for small and marginal farmers since the cooperative can provide centralised services like tractors and other farm equipment as well as threshing and drying machines, to support small scale decentralised production. This will bring down the cost of production and enhance the quality of produce and thereby of income. Instead of denying small farmers the many opportunities provided by cooperatives, the emphasis should be on the introduction of appropriate reforms to make them small farmer-friendly and efficient. Cooperative credit institutions also need revamping and revitalisation.

ii. Group Farming by Self-Help Groups – So far, Self-Help Groups (SHGs) have been mainly organised for supporting micro-enterprises operated by women with the help of micro-credit. With the growing diminution in the size of operational holdings, it will be useful to promote SHGs at the production end of the farming enterprise involving men. This will be particularly helpful in the case of integrated pest management, integrated nutrient supply, scientific water management and improved post-harvest technology. SHGs will however become sustainable, only if they have backward linkages with technology and credit and forward linkages with processing and marketing organisations. Steps will have to be taken to convert micro-finance into livelihood finance through appropriate support systems. There is also need for establishing **SHG Capacity Building and Mentoring Centres**.

iii. Small Holders' Estates – In its earlier reports, NCF has recommended the formation of Small Holders' Cotton, Horticulture, Herbal, Poultry and Aquaculture Estates. The aim is to promote group cooperation among farmers living in a village or watershed or the command area of an irrigation project in improving productivity, reducing the cost of production and entering into marketing contracts with textile mills, food processing industries, pharmaceutical companies, fish marketing agencies etc. Such Small Farmers' Estates can also manufacture products under brand names and enhance income security. Group insurance will then become feasible. Agri-clinics and Agribusiness Centres could be linked to such Estates.

iv. Contract Farming – Symbiotic contracts which confer benefits to both producers and purchasers will be ideal for ensuring assured and remunerative marketing opportunities. At the moment, the Central and State Governments through organisations like Food Corporation of India (FCI), NAFED, etc., ensure the operation of the Minimum Support Price (MSP) announced by Government. Contract cultivation based on a well-defined Code of Conduct will be helpful to small producers in getting good quality input, a fair price as well as prompt payment for their produce. A **Code of Conduct for Contract Farming** will have to be developed for major groups of farm commodities like vegetables, fruits, flowers, medicinal

plants, tuber crops, pulses, oilseeds, sugarcane, cereals, cotton etc. Both production and marketing contracts are growing. **Available evidence indicates that direct contract between the producer and purchaser is more advantageous to small farmers than indirect contract through intermediary agencies**. A National Federation of Farmers entering into contract cultivation will be useful to identify the best pro-farmer practices that will ensure a win-win situation for both producers and purchasers.

v. Corporate Farming – The scope for corporate farming is rather limited except in cases relating to the restoration of degraded lands and cultivation of raw material for industries like paper, rayon, furniture, building materials, etc. The corporate sector could bring the best available technology for upgrading degraded lands and for getting high yields through improved technology. The cultivation of crops for biofuels also presents opportunities for corporate farming. However, care has to be taken to ensure that common property resources or grazing lands are not allotted to corporations, thereby leading to a shortage of vital grazing areas for sustainable livestock production.

vi. Company Farming – Private limited companies, registered under the Companies (Amendment) Act, 2002 are now coming into existence in the area of seed production and the production of biofertilisers, biopesticides and other forms of biological software essential for sustainable agriculture. Small farmers can then become shareholders in companies managed by them.

vii. Government State Farms – In the fifties, there was considerable emphasis on the development of large State farms on the model of the farms promoted by the former Soviet Union. Most such farms are now being used for purposes other than the production of food crops. The land available with State Farms could be made available to women self-help groups for the production of hybrid and improved seeds of crop plants, vegetables, fruits and flowers, as recommended by NCF in its First Report. Also, State Farms could be used for developing **Living Heritage Gene Banks** of the Germplasm of local breeds of cattle, sheep, poultry, etc. This will be

very helpful to preserve our animal genetic wealth. Where possible, they should be handed over to farmers' organisations or NGOs for management. Such farms should be given the responsibility of assisting and encouraging community-based conservation of livestock breeds and species in the surrounding areas. They should be run on scientific lines and monitored by a committee consisting of local farmers' representatives, scientists and NGOs.

2.4.3.2.3 To sum up, even the ownership of a small plot of land will help the family to improve household income and nutrition security. Wherever feasible, landless labour households should be provided with at least 10 cents per household which will give them space for kitchen gardens and animal rearing.

2.4.3.3 Livestock

2.4.3.3.1 According to the 17th Livestock Census released in January 2005, India has 57 per cent of the world's buffalo population and 16 per cent of the cattle population. Also, we rank third in sheep wealth and second in goat population. The contribution of the livestock sector to agricultural GDP has increased from 18 per cent in 1981 to 26 per cent in 2004-05. **It is clear that livestock and livelihoods are very intimately related in our country and that crop-livestock integrated farming is the pathway for farmers' well being**.

2.4.3.3.2 The ownership of livestock is much more egalitarian since resource poor farming families own a majority of cattle, buffalo, sheep and goats. The major constraints experienced by such families relate to fodder, feed and healthcare. There is an urgent need for establishing **Livestock Feed and Fodder Corporations** to assist SHGs to produce good quality animal feeds. Such a Corporation should be a facilitating body for providing seeds and planting material of improved varieties to SHGs for local level production. The productivity of our livestock is low and can be easily improved through better nutrition and healthcare. Agri-clinics operated by veterinary and farm science graduates will be very helpful to enhance the income of livestock owners through higher productivity. At the same time, crop-livestock mixed farming systems should be promoted since this will help to improve both income and household nutritional security.

It should be noted that suicides by farmers are rare in areas where there are multiple livelihood opportunities. India's achievement in becoming the largest producer of milk in the world has an important message, namely concurrent attention to all links in the production, processing and marketing chain through cooperatives and group endeavour will lead to striking results.

2.4.3.3.3 The Union Finance Minister in the recent budget has announced that banks are being asked to provide a separate window for SHGs as well as for joint liability groups of tenant farmers. This window will provide an opportunity for achieving a fodder and feed revolution for enhancing the health and productivity of our unique livestock wealth. Livestock insurance also needs revamping and be made accessible to small livestock owners. Livestock rearing can be linked to organic farming, so that there is value addition to the produce from small farms.

2.4.3.4 Fisheries

2.4.3.4.1 Both coastal and inland fisheries provide employment and livelihoods to millions of families. There is considerable scope for improving the income of fisher families on an environmentally sustainable basis by introducing Integrated Coastal Zone Management and scientific fish rearing, harvesting and processing. In the area of public policy, there is need for well-planned **Aquarian Reforms** addressing the following issues:

- Conflicts between mechanised and artesenal fishing enterprises.
- Conflicts between aquaculturists and agriculturists as well as local population because of salt water entering into the aquifer, and pollution caused by intensive systems of aquaculture.
- Lack of well-defined policies for the allocation of ponds and reservoirs to landless labour and dalit families for practicing modern aquaculture based on composite fish farming.
- Concerns of environmentalists in the areas of seaweed farming and introduction of exotic carps and other alien invasive species.

2.4.3.4.2 Therefore, aquarian reforms should address issues in the areas of ecology and equity and should enable resource poor fisher and landless labour families to earn their livelihood from capture and culture fisheries in a sustainable manner. The other aspects of policy which need attention are fish seed and feed production, post-harvest technology and subsistence allowance for fisher families during the 'close season' period. The subsistence allowance per fisher family should be atleast Rs.1500 per month during the 'close season'. The establishment of a **National Fisheries Development Board** (NFDB) on the lines of the National Dairy Development Board is a welcome step. The guiding principles for NFDB should be ecology, economics, gender equity and employment generation. Such a Board should have representatives of fisher communities representing both the capture and culture aspects of fish farming. Also, the Board should establish "**Fish for All Training and Capacity Building Centres**" which can impart training to fisher families in all aspects of the capture/culture–consumption chain. Quality literacy is important to safeguard the harvested fish from salmonella and other infections capable of producing mycotoxins. Another area requiring attention is the standardisation of Low External Input Sustainable Aquaculture Techniques (LEISA) which will be environment friendly. The National Fisheries Development Board should also help those engaged in small scale ocean fisheries by providing Mother Ships which can ensure hygienic handling of catch in the mid-ocean. Other forms of centralised services to support the decentralised capture and culture fisheries sectors are also important. Special attention needs to be given to the training needs of fisher women who handle the harvested catch. The National Aquaculture Authority and the National Fisheries Development Board should work together, so that capture fisheries and aquaculture become mutually reinforcing in improving the economic well being of fisher families and the nutritional well-being of consumers.

2.4.3.4.3 Inland aquaculture including ornamental fish culture and air breathing fishes can provide additional income to resource poor families. This is why well-defined aquarian reforms are essential to provide fisher families, particularly women, with the necessary space in ponds and reservoirs. There are also opportunities for establishing artificial coral reefs to compensate for the loss of natural coral reefs. This will help to

revive the fish catch. The new Integrated Coastal Zone Management Policy should pay concurrent attention to the management of about 10 km of land surface and 10 km of sea surface from the shoreline. This will ensure that land-based occupations do not cause damage to ocean fisheries as a result of release of effluents and other pollutants. The coastal communities can also be enabled to raise bioshields comprising mangroves, casuarina, salicornia, atriplex and other halophytic plants. This will help to safeguard the lives and livelihoods of coastal fisher and farm families in the event of cyclonic storms and seawater inundation, as for example like the one caused by **tsunami**. Coastal Bioshields, Biovillages and Village Knowledge Centres would help all families living in coastal areas to earn sustainable and secure incomes.

2.4.3.4.4 There is also need for a dynamic policy for the management and economic use of the Exclusive Economics Zone (EEZ) extending to nearly 2 million km^2 of sea surface, which amounts to two-thirds of the land surface available to India. This can be a priority task of the National Fisheries Development Board since it can help to generate both new income and employment opportunities for coastal communities.

2.4.3.5 Water

2.4.3.5.1 Irrigation water at the right time and in adequate quantities is now becoming a serious constraint in achieving both higher productivity and stability of farming in many parts of the country. Jal Swaraj or self-sufficiency in irrigation water availability is the need of the hour. Though the total rainfall in our country is satisfactory, its distribution is highly skewed, with most of the rainfall occurring in 100 hours in a year. Therefore, rainwater harvesting and aquifer recharge have become essential for ensuring the stability of supply. They must be made mandatory. Water quality also needs attention since water often gets polluted at source with pesticide residues and toxic chemicals. There is also the problem of arsenic poisoning in groundwater. The problem of arsenic poisoning abounds because people residing in regions blessed with abundant surface water such as West Bengal increasingly depend on the groundwater for drinking and irrigation purposes. There is an urgent need to remove this dependency by making available other safe drinking water options–for instance, surface water, which is arsenic free. West

Bengal has 7000 cubic meter of available surface water per capita. Effective management of surface water including rivers, canals, water bodies, lakes, ponds and rainwater can reduce groundwater dependency in irrigation.

2.4.3.5.2 Besides problems relating to adequacy and quality, there are serious issues concerning equity in water distribution. Water is a public good and a social resource and not private property. The privatisation of water supply distribution is fraught with dangers and could lead to water wars in local communities. **A nationally debated and accepted strategy for bringing 10 million hectares of new area under irrigation under the Bharat Nirman programme should be developed**. The Polavaram Project to be built across the Godavari in Andhra Pradesh is a case in point. Different viewpoints can be reconciled only by dialogue and consensus building; Taking **Prior Informed Consent** of the community that will be affected by a project should be a precondition for approval of a project.

2.4.3.5.3 **Further, increasing supply through rainwater harvesting and recharge of the aquifer should become mandatory**. All existing wells and ponds should be renovated. Demand management through improved irrigation practices, including sprinkler and drip irrigation, should receive priority attention. A Water Literacy movement should be launched and regulations should be developed for the sustainable use of groundwater. Seawater farming should be promoted in coastal areas through the cultivation of mangroves, salicornia, casuarina and appropriate halophytic plants. The conjunctive use of rain, river, ground, sea, and treated sewage water should become the principal method for the effective use of available water resources. In water scarce areas, the land use system should place emphasis on the cultivation of high value–low water requiring crops, such as pulses and oilseeds. Pulses and oilseed villages can be promoted where all farmers work together in harvesting rainwater and sharing the water equitably for growing pulses and oilseeds. There is need for a **Pani Panchayat** in every village consisting of the Members of the Gram Sabha who could help in getting the available water distributed on an equitable basis. **Where large scale dislocation of families living in the areas which will be submerged as a result of the construction of large dams or linking of rivers is likely, the Gram Sabhas of the affected villages should be**

involved in the preparation of the rehabilitation plans. This should be done at the time the large dam or other steps like the interlinking of rivers are in the drawing board. Proactive consultations and consensus building will help to save both avoidable human hardship and suffering and protracted litigation. Appropriate legislation should also be in place to prevent further exploitation of groundwater in Dark Blocks by individual farmers. Farmers also need technical advice in the selection of sites for borewells. A farmer-friendly insurance cover should be in place for failed wells.

2.4.3.5.4 Land use decisions are also water use decisions. Hence, in areas characterised by water scarcity, the cropping pattern should be designed in such a manner that low water requiring, but high value crops like pulses are grown. Water Users' Associations are now being encouraged for maximising the benefits of the available water. The National Rainfed Area Authority could help in promoting scientific water harvesting, sustainable and equitable use and the introduction of efficient methods of water use like drip irrigation. There should be symbiotic interaction between the National Rainfed Area Authority, the National Horticulture Mission, the Technology Missions and the National Rural Employment Guarantee Programme.

2.4.3.5.5 There are many schemes currently in progress with support from the Central and State Governments to harness the following sources of water for agricultural, industrial and domestic purposes.

- groundwater;
- rainwater;
- surface water including rivers and reservoirs;
- recycled water by treating effluents and sewage water; and
- sea water.

2.4.3.5.6 All the above sources of water can be utilised both in a conjunctive manner and separately using the most efficient technologies available. For example, all along the coast as well as in the Andaman and Nicobar Islands and Lakshadweep Group of Islands, seawater farming could be promoted for coastal area prosperity. This will involve the

introduction of agro-forestry systems which combine the cultivation of mangroves, salicornia, casuarinas, coconut, cashewnut etc. along with prawn culture. Such agro-aqua farming systems will open up great opportunities for income and employment generation in coastal areas on a sustainable basis, provided they are based on sound ecological principles.

2.4.4 Biodiversity

2.4.4.1 The Government of India has already enacted a Plant Variety Protection and Farmers' Rights Act (PVPFR), 2001 and Biodiversity Act, 2002. The implementation of both these Acts has also begun. The PVPFR Act recognises the multiple roles of farmers as cultivators, conservers and breeders. Detailed guidelines should be developed for ensuring that the rights of farmers in their various roles are protected. For example, most farmers who are cultivators are entitled to **Plant Back Rights**. This implies that they can keep their own seeds and also enter into limited exchange in their vicinity. Farmers as breeders have the same rights as professional breeders and they can enter their varieties for registration and protection. Farmers as conservers are entitled to recognition and reward from both the National Gene Fund and the National Biodiversity Fund. Quite often, the conserved material of great value could have been the contribution of a community and not an individual. Therefore, the procedures adopted should be such that community contributions can be recognised and suitably rewarded. Breeders should be required to indicate in the pedigree of the variety for which they are seeking protection, the names of the landraces and the areas from where they were collected, while submitting their application for registration. For example, Oryza nivara from Eastern UP was the major donor of tungro virus resistance in improved rice varieties like IR 36 which occupied over 10 million hectares in South and South East Asian countries.

2.4.4.2 The provisions in the Biodiversity Act, for prior informed consent and benefit sharing, are equally important for tribal and rural women and men. Invariably much of the conservation work has been done by women. Therefore, the recognition procedures should take into account gender roles in the conservation and enhancement of bioresources.

2.4.4.3 There is also need for assisting tribal and rural women and men in revitalising their in situ on-farm conservation traditions. Participatory breeding procedures, involving scientists and local conservers, would be particularly helpful in improving the productivity of landraces. Genetic engineers, working in public-good institutions should perform the role of pre-breeding, i.e., development of novel genetic combinations for important economic traits, such as resistance to biotic and abiotic stresses. They should then work with farmers in participatory breeding programmes, so that genetic efficiency and genetic diversity can be integrated in an effective manner. Genetic homogeneity enhances genetic vulnerability to pests and diseases. This is why the integration of pre-breeding and participatory breeding would help to insulate small farmers from the risks of pest epidemic.

2.4.4.4 There is also need for launching **genetic and legal literacy** movements in areas rich in agro biodiversity, such as the North East Region, Western and Eastern Ghats and the arid zone. **Genome Clubs** can be organised in rural schools for imparting an understanding of the importance of genetic resources conservation. Legal literacy would help tribal and rural families to understand the provisions in PVPFR and Biodiversity Acts with reference to their entitlements. If such steps are taken, we can prevent some of our genetic paradises becoming 'hotspots' from the point of view of threat to biodiversity. Farm and tribal families should be trained in methods of preventing gene erosion. Coastal biodiversity, including coral reefs and sea grass beds, are also in urgent need of conservation. Tribal, farm and fisher families can play a major role in this area provided they are involved as partners in the genetic conservation movement. Traditional methods of conservation like Sacred Groves need to be supported and encouraged.

2.4.4.5 Animal Genetic Resources

2.4.4.5.1 Apart from conserving genetic diversity and acknowledging the vital role of livestock keepers, there is need to document the indigenous knowledge of pastoral communities about animal maintenance and breeding. Community-based conservation and development of indigenous livestock breeds and species should be encouraged. There should be a special focus on both hot and cold arid and semi-arid areas where the genetic

diversity and associated indigenous knowledge are particularly well developed. Wastelands could be used to promote in situ conservation of animal breeds, even those that are amenable to ex situ conservation. A policy focus will need to be created, to conserve grazing lands, to enable the conservation of animal genetic resources. Documentation of special traits should be done in the context of the new biology and new nutritional needs or for other economic traits like hide/ leather quality. There is need for offshore Genetic Resource Centres for screening germplasm for resistance to serious diseases like the H5N1 strain of avian influenza virus.

2.4.4.5.2 The burden of conservation cannot be allowed to fall on the largely impoverished communities that maintain animal genetic diversity. A system of rewards and incentives must be developed to enable and motivate people to conserve their breeds under the Biodiversity Act. The Biodiversity Fund should be used for such purposes. Livestock keepers' inherent rights to continue to use and develop their own breeding stock and breeding practices should be acknowledged. The government must recognise these rights, acknowledge livestock keepers' contribution to the national economy, and adapt its policies and legal frameworks accordingly. This is particularly important to pre-empt attempts to use the intellectual property system to obtain control over animal resources that are an important component of the country's food and livelihood security systems.

2.4.4.6 Plant Genetic Resources

2.4.4.6.1 A nationwide programme needs to be launched for the ex situ and in situ conservation of plant genetic resources at the field/farmer level. Farmer level gene/seed banks need to be put up in areas where traditional varieties are saved. Some State governments, as for example Jharkhand is promoting a 'Seed Exchange Programme' under which farmers are given hybrid rice in exchange for their traditional rice varieties. There is need to ensure that in this process, the traditional rice gene pool is not lost. Participatory management of National Parks, Biosphere Reserves and Gene Sanctuaries should be promoted.

2.4.5 Climate Change

2.4.5.1 Climate change leading to adverse changes in temperature, precipitation and sea level is no longer just a theoretical possibility. Most experts agree that we are already beginning to experience the impact of global warming as evident from the melting of glaciers and Antarctic and Arctic ice caps. Coastal storms and cyclones are also increasing in frequency and intensity. Droughts and floods are likely to be more frequent. Although climate change is a product of the unsustainable consumption of non-renewable forms of energy by industrialised countries, the harmful impact of climate change will be felt more by poor nations and the poor in all nations due to their limited coping capacity. Steps will have to be taken to standardise proactive measures that can reduce the vulnerability to climate change. Based on computer simulation models, contingency plans and alternative land and water use strategies will have to be developed for each major agro-climatic zone. Protecting the livelihood security of farm and fisher women and men from adverse climatic changes has to become a priority task. In drought and flood prone areas, experienced farm women and men can be trained as 'Climate Managers'.

2.4.6 Science and Technology

2.4.6.1 Science and Technology are the drivers of change in farm operations and output. New technologies which can help to enhance productivity per units of land and water are needed for overcoming the prevailing technology fatigue. Frontier technologies like biotechnology, information and communication technology, renewable energy technologies, space applications and nanotechnology provide uncommon opportunities for launching an ever-green revolution, capable of improving productivity in perpetuity without ecological harm. In order to ensure social inclusion in access to new technologies, public investment in socially relevant agricultural research should be stepped up under the umbrella of the National Agricultural Research System (NARS) which comprises large numbers of ICAR institutions, State Agricultural Universities, All India Coordinated Research Projects and National Bureaus. NGOs carrying out research should also be encompassed under the NARS umbrella.

2.4.6.2 The research strategy should be pro-nature and pro-small farmer oriented. For example, in the case of Bt Cotton, public good institutions should concentrate on developing varieties rather than hybrids, so that farmers can keep their own seeds. Even now 80 per cent of the seeds used in agriculture come from farmer-seed systems. These will have to be strengthened and supported through infrastructure for community managed Seed Villages and Seed Technology Training Centres. In order to spread scientific literacy and to remove inadequately informed apprehensions about the risks and benefits associated with biotechnology and other new technologies, atleast one woman and one male member of every Panchayat should be trained as **Farm Science Managers**.

2.4.6.3 Among the other steps, which need urgent implementation are the addition of post-harvest technology wings to Krishi Vigyan Kendras, and the organisation of lab-to-land demonstrations in the area of post-harvest technology, agro-processing and value addition to primary products. This will be important for providing skilled jobs in villages to landless labour families. Also, there is need for establishing **Farm Schools in the fields of outstanding farmers** like Krishi and Udyan Pandits and awardees of nationally recognised awards for farmers like the Karshakhashree of Malayala Manorama and ASPEE Awards. Farmer-to-farmer learning can speed up the process of technological upgrading of crop and animal husbandry, fisheries and agro-forestry. Priority could also be given for the establishment of Farm Schools in the fields of eminent horticulturists including those, who are raising organic vegetables and fruits and tissue culture propagated planting material. Human resource development holds the key to breaking the stagnation in agricultural growth and productivity.

2.4.6.4 Organic farming requires greater scientific inputs than chemical farming. This area of research hence needs high level multidisciplinary attention. Certification procedures which are internationally recognised are also needed. Organic farming zones could be created in medicinal plants and other crops which are likely to be in demand in national and international markets. Science for the small farmers should be the motto since whatever new technologies are adopted by resource poor farmers will easily spread among large farmers. The reverse may not happen.

2.4.6.5 In intensive agriculture areas like the Punjab and Haryana, crop diversification may be beneficial from the point of view of ecology, economics and employment generation. **However, any advice on crop diversification must be accompanied by steps to ensure effective market support for the alternative crops.**

2.4.6.6 Agriculture is becoming knowledge intensive. Knowledge is often a substitute for land and water, since it helps farmers to produce more from the same plot of land and same quantity of water. This is why computer-aided and internet connected Village Knowledge Centres assume great importance in the movement for a technological upgradation of both farm operations and farming efficiency.

2.4.6.7 IPR policies should make provision for compulsory licensing of rights in the cases of research products and processes of value to resource poor farming families. In all cases of health and food security, social inclusion should be the guiding factor in the development of IPR.

2.4.6.8 Agro-meteorology

2.4.6.8.1 The national capacity in short-, medium- and long-term weather forecasting is quite considerable. What is now important is to convert generic information into location-specific land use advice, based on cropping patterns and water availability. The Agro-meteorological Advisories issued by Indian Agromet Advisory Service Centre, Pune, can be used by **Panchayat Level Farm Science Managers,** trained to give appropriate land use suggestions. Also, the **National Land Use Advisory Service,** recommended by NCF in its Third Report, would help to make the information relevant to both farm and fisher families. In the case of marine fisheries, data on wave heights and location of fish shoals are now available. These will have to be transmitted to the fishermen before they move into the sea. An integrated internet – FM or HAM radio service would be very helpful to fishermen on the high seas.

2.4.6.8.2 Timely and dependable advice on weather conditions will be very helpful to farm families to plan their sowing and the other operations. The National Land Use Advisory Service in collaboration with Panchayat Level Farm Science Managers can help

to bring the benefits of the advances in agricultural meteorology to farm and fisher populations.

2.4.6.9 Agricultural Biosecurity

2.4.6.9.1 Agricultural Biosecurity covering crops, trees and farm and aquatic animals is of great importance since it relates to the work and income security of 70 per cent of the population, and food and trade security of the nation. There is need to develop a **National Agricultural Biosecurity System (NABS)** with the following aims:

- Safeguard the income and livelihood security of farm and fisher families as well as the food, health and trade security of the nation through effective and integrated surveillance, vigilance, prevention and control mechanisms designed to protect the productivity and safety of crops, farm animals, fishes and forest trees.

- Enhance national and local level capacity in initiating proactive measures in the areas of monitoring, early warning, education, research, control and international cooperation, and introduce an integrated biosecurity package comprising regulatory measures, education and social mobilisation.

- Organise a coordinated **National Agricultural Biosecurity Programme** on a hub and spokes model with effective home and regional quarantine facilities capable of insulating the major agro-ecological and farming systems zones of the country from invasive alien species of pests, pathogens and weeds.

2.4.6.9.2 The NABS should have the following three mutually reinforcing components:

i. **National Agricultural Biosecurity Council (NABC)** chaired by the Union Minister for Agriculture to serve as an apex policymaking and coordinating body.
ii. **National Centre for Agricultural Biosecurity (NCAB)** having four wings dealing with crops, farm animals, living aquatic resources and agriculturally important micro-organisms and dealing with the analysis, aversion and management of risks, as well as the operation of an early warning system. NCAB will provide the Secretariat for the National Agricultural Biosecurity Council.

iii. **National Agricultural Biosecurity Network (NABN):** NCAB will serve as the coordinating and facilitating centre for a National Agricultural Biosecurity Network designed to facilitate scientific partnerships among the many existing institutions in the public, private, academic and civil society sectors, engaged in biomonitoring, biosafety, quarantine, and other biosecurity programmes to help maximise the benefits from the already existing scientific expertise and institutional strengths.

2.4.6.9.3 The establishment of a National Biosecurity Council, National Centre for Agricultural Biosecurity and a National Agricultural Biosecurity Network will help us to strengthen considerably our ability to undertake pro-active measures to prevent the outbreak of pandemics and the introduction of invasive alien species. Such an **Agricultural Biosecurity Compact** is an urgent national need since prevention is always better than cure. The details on the structure and organization appear in chapter IV of this Report.

2.4.7 Inputs

i. Seeds: Good quality seeds and disease free planting material are essential for crop productivity and security. Hybrids are now becoming available in many crops. Seeds of such hybrids can be produced by women SHGs on contract with seed companies. Mutually beneficial farmer-seed company partnership can be fostered. In the case of new varieties, foundation seeds could be provided to SHGs. Proper technical guidance and training in seed technology will be necessary for SHGs to produce high quality seeds. This will be an ideal area for private sector–farmers' association partnership.

ii. Soil Health: Pricing policies should be such that balanced fertilisation is promoted. As recommended in the First Report of NCF, every farm family should be issued with a Soil Health Passbook, which contains integrated information on the physics, chemistry and microbiology of the soils. In particular, more laboratories to detect micronutrient deficiencies are urgently needed. **Soil Health Enhancement holds**

the key to raising small farm productivity. There is also need for proper technical advice on the reclamation of wastelands and on improving their biological potential.

iii. Implements: Small farmers need implements which can enable them to sow the crop at the right time and manage weeds and adopt improved post-harvest technology. Women need implements which can reduce drudgery and enhance output.

iv. Vaccines and Sero-diagnostics: Major gaps in the facilities presently available will have to be filled in the case of important animal diseases. Biotechnology research in the area of vaccine development needs to be stepped up. Public-private partnerships should be encouraged in this area.

v. Fish Seed and Feed: Good quality and disease free fish seed holds the key to successful inland aquaculture. Suitable SHGs could be trained in induced breeding and fish seed production. Similarly, feed at affordable prices is another requirement. Fish farmers' cooperatives could organise the production of feed and seed with technical assistance from the National Fisheries Development Board.

vi. Animal Feed: Inadequate nutrition is the primary cause of low milk yield in dairy animals. There is both under nutrition and malnutrition. Annual milk production can reach over hundred million tonnes if the nutritional requirements of cows and buffaloes can be met. Here, both conventional and non-conventional approaches are needed. Many of the celluleosic wastes can be converted into good animal feed through appropriate treatment and enrichment. Breeding of nutrition rich fodder plants should receive high priority. Established technologies such as baling and ensiling, need to be disseminated widely.

vii. Support Services: A few other essential support services needed for higher farm animal productivity are-establishing genetic evaluation systems for indigenous breeds as well as crosses so that selection can lead to genetic improvement of

production characteristics upgrading of breed through artificial insemination, cross breeding suited to the farmers' resources and improved processing and marketing.

viii. There are other areas of input supply also which merit intensive attention. Some examples: bio-fertilisers and bio-pesticides, irrigation equipment, assured power supply, postharvest technology and infrastructure and rural godowns and warehouses.

2.4.8 Farmer Categories needing Special Attention

2.4.8.1 Landless Agricultural Labour

2.4.8.1.1 Agriculture accounted for 21 per cent of GDP in 2004-05. Employment in the farm sector however amounted to as much as 60 per cent in 1999-2000. This represents a decline of just 16 per centage points since 1950-55. Parts of the non-agricultural economy are on a roll, while the agricultural economy is in a state of distress. Those most affected by the agrarian crisis are the ones without assets, particularly women. Men often migrate to towns and cities in search of jobs. The National Rural Employment Guarantee Programme should help to save the assetless poor from starvation. However, it cannot lift them out of poverty.

2.4.8.1.2 China has addressed the need for creating opportunities for skilled non-farm employment through a massive Township and Village Enterprises (TVE) movement. There were 21.15 million TVEs in China at the end of 2001, employing a total of 130 million workers. Their added value of 29356 billion Yuan (3669.5 billion US $) accounting for 31.1 per cent of the national total (He Kang, 2006, China's Township and Village Enterprises, Foreign Language Press, Beijing)

2.4.8.1.3 Several programmes have been initiated by KVIC and NGOs for generating off- and non-farm employment. The SHG movement is helping women, particularly in South India to come out of the poverty trap. There is need for a counterpart to NREGP in the skilled employment sector. Initiatives like Small Farmers' Agribusiness Consortium (SFAC), Agri-clinics and Agribusiness Centres, Food Parks etc., which could have provided substantial additional livelihood opportunities to the rural poor are yet to take

off. **It would be useful to integrate all of them into one initiative like China's TVEs and launch a Rural Non-farm Livelihood Initiative** for families without land or other productive assets. The joyful learning programme through computer aided adult/functional literacy procedures should help to accelerate the progress of eradication of illiteracy. **The Rural Non-farm Livelihood Initiative** could have as its core the KVIC and restructured SFAC and bring all rural non-farm employment programmes together, in order to generate convergence and synergy among them. A Consortium approach could be adopted involving Central and State Governments, Academia, NGOs, public and private sector industry and financial institutions. The sooner we initiate a massive and market-driven rural non-farm livelihood programme, the greater will be the prospect for peace and security in rural India. Also, food security in India is best expressed in terms of million person years of jobs, rather than in million tonnes of foodgrains. Where there is work, there is money. Where there is money, there is food. There is therefore need for a restructuring and revamping of organisations like SFAC, KVIC, Agri-clinics and Agribusiness Centres.

2.4.8.2 Women Farmers and Farm Labour

2.4.8.2.1 Public policies in the field of agriculture are yet to be engendered. Women-headed farm households suffer many handicaps in the areas of access to technologies, inputs and extension advice. Absence of titles to land prevents many de-facto women farmers from eligibility to institutional credit. Kisan Credit Cards have been issued mostly to men. Small farm productivity will not go up unless there are serious efforts in the areas of knowledge and skill empowerment of women in all aspects of the farming system. Considering the critical role played by women in post-harvest handling, processing, storage and marketing, women farmers and farm labour should be actively involved in the 60,000 Lab-to-Land post-harvest technology and agro-processing demonstrations recommended by NCF in its Third Report.

2.4.8.2.2 Joint Pattas should be issued speedily, particularly in the areas where there is outmigration of men. Also, women farm workers require support services like crèches, healthcare and functional literacy courses. Nutritional requirements of pregnant and

nursing women need to be met. Women SHGs need Capacity Building and Mentoring Centres. They should also be given land in State Farms for seed production, animal genetic resources conservation, etc. Women perform multiple functions. The aim of agricultural research and extension should be bringing about a reduction in the number of hours of work and an increase in the income per each hour of work, i.e. value-addition to the time and labour of women in agriculture. Training in food safety and quality management is essential, since women handle many of the post-harvest operations. Legal literacy with reference to their entitlements is equally important.

2.4.8.2.3 Credit continues to be a big problem for women farmers and even more so for women tribal farmers. Even though the criteria have been made flexible to include tenant farmers, ownership of land pattas is still the norm for extending credit. This implies a problem for women farmers (who are generally not title-holders), and also small and marginal farmers, who may be cultivating more land than that for which they have pattas. **Institutional credit for agriculture needs to be delinked from land titles.**

2.4.8.2.4 Women are not allowed to participate in the traditional decision-making bodies. This is a major constraint and leaves them out of decision-making and planning processes, as say in the case of NREGP. The majority of representatives of the farmers' union at the district level are men. The voices of women are not heard in such consultation bodies.

2.4.8.2.5 Without conscious effort to change this state of affairs and promotion of womens' skill and technological empowerment, the productivity of small farms will remain low and post harvest losses will remain high.

2.4.8.3 Tribal Farmers

2.4.8.3.1 Scheduled Tribes account for 8.6 per cent of the total population of the country. A majority of tribal communities across the country are dependent on forests for their livelihoods. These include cultivation (shifting cultivation in many parts of East and North East India), collection of fuel, fodder and a range of non-timber forest produce.

Tribal farmers are among the poorest within the category of farmers. These communities have customary norms for ownership of the forest areas, and also have community based mechanisms for protection and rejuvenation. Since the colonial period and even in the subsequent years of independence, several policies have been enacted related to forests and rights of forest dwelling communities (mostly tribals).

2.4.8.3.2 At the same time, protection and conservation of forests areas, has been under the control and administration of the State Forest Departments. There has been no systematic effort to demarcate areas that are used and managed by forest dwelling communities, or to provide legal rights and titles to these communities. The relation between the Forest Department and forest dwelling communities has largely been one of conflict and confrontation, with forest dependant communities being labeled 'encroachers'. Forest communities are often forced to eke out their livelihoods through a pattern of bribes and fines. Attempts towards Joint Forest Management have been successful in some States. These however are dispersed and have also not been gender sensitive.

2.4.8.3.3 Historically, large development projects including dams and mines have also encroached upon large tracts of forest areas, and displaced several thousand forest dwelling communities, who are still struggling to survive in the absence of human-centred rehabilitation efforts. In most instances, in the absence of land titles, their very existence is not acknowledged. According to the Ministry of Environment and Forests, close to 10 lakh hectares of forestland have been released for various projects such as mining and industrial development. This area is almost as large as the same Ministry's estimate of the total forestland area under 'encroachment' (13.4 lakh hectares).

2.4.8.3.4 Efforts to manage forest areas in the country will have to balance the demands for ecological conservation as well as protecting the livelihoods of forest dwelling communities. The following steps will be helpful in this respect:

i. A clear statement of rights relating to what has traditionally been the domain of forest dwellers (both tribal and non-tribal) including lands traditionally occupied and resources traditionally used.

ii. A clear process by which legitimate right-holders can be identified and recorded, and conversely, by which recent encroachers, and others who have been taking advantage of forest dwellers for vested interest, can be identified and alienated.

iii. Explicit provisions to ensure conservation, including priority to provisions of wildlife/biodiversity/forest laws that are meant to ensure conservation, and special focus on protected areas and threatened species.

iv. Strengthening of or changes in institutional structures that would enable more participatory processes of decision-making, including in the management of protected areas.

v. Explicit provisions that enable forest-dwelling communities to say 'no' to, or seek changes in, 'development' projects that are impinging on their lands and resources.

vi. Provisions for regular and open processes of dialogue, consultation, sharing of information, etc, involving communities, NGOs, officials, and others.

vii. Clear monitoring provisions that enable a constant check on whether the rights are being honoured or not, as also whether the exercise of rights is respecting conservation parameters.

2.4.8.3.5 An important area of conflict between people and protected areas is the problem of compensation for damage caused to livestock, crop or life by animals. States must review the provisions and procedures for compensation for human life, livestock and crop damage. Compensation must be paid to families who continue to live within the reserves also. The joint forest management programme in the vicinity of the reserves must be revamped so that people living in the fringes can be given management decisions

and rights over the produce of forests; this will help to enhance the productivity of the resources as well.

2.4.8.3.6 Some of the generic problems of tribal farm families, also applicable in general terms for small and marginal farmers and women farmers across the board are the following:

i. Lack of inputs especially quality seeds and fertilisers.
ii. No mechanism for State purchase of output at Minimum Support Price.
iii. Lack of attention to soil and water conservation that could facilitate double cropping.
iv. Total lack of attention to livestock management especially fodder production. Free grazing of cattle during the rabi season is a major bottleneck for the taking of a second crop.
v. Vesting of land in the community, absence of alienable rights with the farmers and the problems in creation of charge/mortgage on land in certain tribal areas constrain flow of institutional credit. The need is to develop innovative methods of collateral substitution and documentation procedures to overcome the difficulties.
vi. Integrated farming projects based on plantations and inter-cropping (as granted under the Meso-area development programmes, or ITDP) again need to be delinked from land titles. At present, to gain sanction, a scheme of this nature requires the farmers to agree to provide at least 5 acres of land. In a hilly terrain and with continuous subdivision of plots over generations, this not only becomes difficult even for male farmers, but more so for women who lack titles. Yet, trees in particular are seen as women's resource, with the output used both for family nutrition and sale.
vii. While KVKs and ATMA are now providing more of agriculture and resource-related training, the old home science model continues for women. Training for tribal women SHG group members is provided in candle-making, tomato sauce making and making bead necklaces–obviously a total waste of time and resources, unless market tie-ups for such products exist.

2.4.8.4 Pastoralists

The Draft Scheduled Tribes (Recognition of Forest Rights) Bill, 2005 envisages, "rights of uses or entitlements such as grazing in forests and traditional seasonal resource access of nomadic or pastoralist communities". This Act is yet to be passed by Parliament. Many of the Joint Forest Management Committees are designed to provide opportunities to tribal families and pastoralists for access to non-timber forest products. The following steps are needed to ensure the right to livelihood of pastoralists:

i. Restoration of traditional grazing rights and camping rights in forest areas including wildlife sanctuaries and national parks, and also those areas earmarked for grazing purpose in village common lands.

ii. Formalising entitlements (including issue of permanent grazing cards) for the traditional pastoralists/herders maintaining native animal breeds and who depend upon them for their livelihood for enabling their free access to notified or demarcated grazing sites and migration routes.

iii. Whenever a tree planting programme is to be implemented, alternative grazing land and drinking water resources for animals should be allotted by the concerned authorities. It should be made mandatory for the implementing agency before initiating afforestation, to seek prior consent from forest dependent communities including pastoralists. Rotational system of grazing should be encouraged instead of complete closing of forest zone for tree plantation purpose.

iv. In-depth documentation, characterisation of indigenous livestock breeds should be carried out to recognise and protect intellectual property rights of the local communities / individuals, conserving these livestock breeds.

v. Pastoralists should be involved in all local natural resource management programmes, including village forest committees.

vi. Common land assigned to forest departments and unutilised or encroached land should be retrieved and brought under the control of village level committees or grassroots institutions for pasture development.

2.4.8.5 Plantation Labour

2.4.8.5.1 A large number of small farmers are engaged in the cultivation of plantation crops like tea, coffee, rubber, cardamom, pepper and vanilla. Price fluctuation and competition from products imported from abroad are among the major problems facing them. A Price Stabilisation Fund is essential to insulate them from the vagaries of the market. Similarly, plantation labour, many of whom are women, require support services like crèches and health and life insurance. The problems of plantation labour therefore need special attention.

2.4.8.6 Island Farmers

2.4.8.6.1 The farming and fisher families in Andaman and Nicobar Islands and the Lakshadweep group of Islands need special attention. Their needs cover the areas of technology, training, techno-infrastructure and trade. Island agriculture also has the problem of transport costs, particularly for commodities like fish which may have to be sold in the main land. There are several ancient tribes in the Andaman and Nicobar Islands who have rich traditional knowledge and wisdom. Steps should be taken to recognise and reward their indigenous knowledge in the areas of biodiversity conservation and traditional healthcare. The islands are also ideal for horticulture including coconut plantation. There are also special health problems. Therefore both the National Horticulture Mission and National Rural Health Mission should pay particular attention to the needs of Island farmers and fishermen. Proactive measures like the erection of mangrove and non-mangrove based bioshields should be initiated in order to safeguard the lives and livelihoods of island populations in the event of sea level rise due to global warming.

2.4.8.7 Urban Farmers

2.4.8.7.1 Urban home gardens could make a substantial contribution to improving nutrition security through the cultivation and consumption of vegetables and fruits. Home nutrition gardens could be designed in the case of low-income groups in such a manner that they can provide horticultural remedies to major nutritional maladies like deficiency of micronutrients in the diet. Urban backyard farming will require support services in the form of good seeds and planting material and safe plant protection techniques. Urban slums need particular attention from the point of view of combating malnutrition through nutrition gardens. The National Horticulture Mission could pay particular attention to enhancing the nutrition security of urban slum dwellers and low income groups through promoting the cultivation and consumption of appropriate vegetables and fruits.

2.4.8.8 Organic Farmers

2.4.8.8.1 The challenge to organic farmers lies in raising the organic carbon content in the soil to 1 per cent and total organic matter to about 10 per cent. The approximate cost of converting one hectare of wasteland to organic farming will be about Rs.30,000 per annum. Such expenditure will be needed for about three years, so that the soil fertility can be enhanced to sustain good yield. The organic farming movement in India suffers from a lack of institutional support in the areas of research, extension and marketing. Farmers feel the need for technological guidance, but research work based on careful field experiments is currently inadequate. Organic farming requires more scientific support than chemical farming. The Krishi Vigyan Kendras should be equipped to provide training in organic agriculture. Assured and remunerative marketing opportunities are yet to develop. Internationally accepted certification procedures also need strengthening. Organic farming zones could be identified, like some of the hill areas and islands where currently chemical fertiliser use is very low. **A National Federation of Organic Farmers' Association** could be formed to develop common brand names both for the home and external markets. Food safety and quality specifications should conform to the codex alimentarius standards, since there are

occasional reports of heavy metals being present in organic foods. Certification procedures should be made farmer-friendly and affordable. When subsidies or loans are given to farmers to buy fertilisers, there should be no insistence on the purchase of only chemical fertilisers. Farmers should be able to spend the money on organic fertilisers and bio-pesticides.

2.4.8.8.2 Farm men and women thus belong to different categories and require differential support. However, there are many generic problems affecting the farming community as a whole. Therefore, the Central and State Governments should assist the growth of Farmers' Associations which can empower the voiceless. Voicing the voiceless and reaching the unreached should be major goals of public policies relating to the agrarian population.

2.4.9 Credit and Insurance

2.4.9.1 The need is to improve the outreach and efficiency of the rural banking system. The financial services must reach all its users effectively; the credit must be in time, in required quantities and at appropriate interest rate. NCF had recommended an interest rate of 4 per cent per annum and the Government of India had met this recommendation partly, by announcing credit availability to farmers at 7 per cent up to Rs. 1 lakh. It should be possible to bring about a considerable reduction in transaction cost by eliminating all forms of ostentation in the operation of the banking system. The inefficiencies of delivery system should not be loaded on borrowers. The delivery system has to be proactive and should respond to the needs of the financial services in the rural areas in an efficient manner. The banking system needs to explore the large unmet credit potential for raising agriculture to higher thresholds, growth of rural and agri-business enterprises and employment. There is also need for considering a credit cycle of 4 to 5 years in chronically drought prone areas, so that farmers will be able to repay the loans when there is a good monsoon leading to a good crop.

2.4.9.2 The State has a responsibility in improving the credit absorptive capacity of the farmers and to support the banking system by creating favourable environment for expanding and deepening of financial services by the banks.

2.4.9.3 NABARD as the leader of agriculture and rural credit should ensure convergence among credit availability, credit absorptive capacity of the farmers and other rural borrowers and an efficient credit delivery system, by providing financial and technical assistance to the banking system and necessary inputs to the State. As a development bank, NABARD should actively involve in institution building and provide back up support through research and development initiatives.

2.4.9.4 The Reserve Bank and Government of India have to broadly assign the role and responsibilities to different agencies in the multi agency system and ensure implementation of their policies and programmes.

2.4.9.5 Agriculture is a high risk economic activity. The farmers need user friendly insurance instruments covering production right from sowing to post harvest operations and also the market risks for all crops throughout the country for insulating them from financial distress and in the process making agriculture financially viable. There is need for both credit and insurance literacy in villages.

2.4.9.6 Since part of the debt incurred by small and marginal farmers and landless labour is for healthcare, priority should be given in extending the benefits of the National Rural Health Mission to areas affected by agrarian distress.

2.4.10 Cooperatives

2.4.10.1 The cooperatives have an important role to play particularly in banking, marketing, agro-processing and other agri-businesses to protect the farmers from the vagaries of existing imperfections in the supply of inputs, production, value addition and marketing etc. and also in the process improve their welfare. The cooperatives are basically economic enterprises (not an extended arm of the State) and require entrepreneurial approach. They should not only gather competitive edge through suitable

enterprise focus on the traditional primary value creating activities, but also in secondary value creation activities through suitable strategic alliances with private and public sector units. The need is to identify means and measures by which the farmers could gain power of scale and economies, which they otherwise do not have, obtain greater control of the market channels and improve their chances of being profitable.

2.4.10.2 For achieving the above objectives, the policy and legal framework under which the cooperatives are functioning would require to be reviewed, so as to create enabling environment for them, to attain autonomy to run their operations in business like fashion, without rigid controls and regulations imposed by the State laws. To succeed and serve the farmers to their full potential, the cooperatives need to function as voluntary, member driven, autonomous and largely self-regulating organisations, working on the principles of self-help. The management of the cooperatives needs to be professionalised with clear demarcation of functions of the elected members and the professional managers. The audit and accounting systems also has to be improved, so as to give greater confidence to all those who are associated with them.

2.4.10.3 With economic liberalisation and market competitiveness, the cooperatives would require much larger capital and other financial resources to be successful. However, the changes in legal framework, regulatory system and constraints in liberal State support would necessitate identification of new ways and means, as also instruments to gain greater access for the cooperatives to capital/financial resources and removal of impediments due to law and regulations in capital formation, which prevent the members from obtaining the benefits of surplus retention in the business. Opportunities to increase non-members financing, consistent with the objectives of cooperation will also have to be explored.

2.4.11 Assured and Remunerative Marketing Opportunities

2.4.11.1 Assured and remunerative marketing opportunities hold the key to continued progress in enhancing farm productivity and profitability. Already, several significant market reforms have been initiated by the Union Ministry of Agriculture. The State

Governments will have to undertake such reforms speedily in order to provide more options to the farmers for selling their produce, allowing the private sector including the cooperatives to develop markets, promote direct sale to the consumers and removing bottlenecks and scope for corruption and harassment. What farmers seek is greater protection from market fluctuations. The Minimum Support Price (MSP) has to be protected more effectively across the country. Of late, the farmers have been feeling that the MSP of crops have not kept pace with the rising input costs. Likewise, the Market Intervention Scheme (MIS) should respond speedily to exigencies, especially in the case of sensitive crops in the rainfed areas. Similarly, the establishment of **Community Foodgrain Banks would help in the marketing of underutilised crops** and thereby generate an economic stake in the conservation of agro-biodiversity. Indian farmers can produce a wide range of health foods and herbal medicines and market them under strict quality control and certification procedures. The Public Distribution System (PDS) can also be encouraged to store and sell nutritious millets with appropriate price support to farmers.

2.4.11.2 Farmers require authentic advice based on meteorological, marketing and management information for land use decisions/investments etc. Restructured Land Use Boards supported by a team of technical experts/agencies could render this service. Infrastructure support has to be put in place to minimise post harvest losses and enable agro-processing and value addition at the village level itself to promote livelihoods. The collective strength of farmers has to be built up by encouraging farmers' organisations and other entities like cooperatives and small farmers' estates, so that they can get a fair deal and enjoy the economies and power of scale. The farmers, particularly the small and marginal farmers need pledge loans to be able to avoid distress sale and sell their produce when the price is favourable. Constraints in improving the negotiability of warehouse receipts also need to be removed.

2.4.11.3 NCF had recommended in its Third Report the establishment of an Indian Trade Organisation (ITO), which will safeguard the interests of farm and fisher families by providing a Livelihood Security Box to ensure fair trade. The Livelihood Security

Box should have provision to impose quantitative restrictions on imports and or/increases in import tariffs, under conditions where imports of certain commodities will be detrimental to the work and income security of large numbers of farming families. It should be emphasised that **there is no level playing field between the capital, subsidy and technology driven mass production agriculture** of the industrialised countries, and the '**production by masses'** agriculture of India characterised by weak support services, heavy debt and 'resource and technology poverty'. The steps recommended by NCF for promoting an **Indian Single Market** need to be examined and implemented. The bottom line of our trade policies in agriculture should be the economic well being and livelihood security of agricultural families. Nothing should be done which will destroy job opportunities in rural India.

2.4.11.4 Quality and trade literacy programmes have to be launched across the country. In relation to commodities which are exported, it will be essential to conform to WTO regulations. At present, such commodities constitute about 7 per cent of total agricultural production in the country. Farmers' Associations and SHGs should be helped to export on competitive terms by spreading awareness of the opportunities available for external agricultural trade. In such cases, cost, quality and reliability of supply will determine long-term trade relationships. The agri-export zones should be further strengthened and should become places where farmers will get the best possible price for their produce.

2.4.11.5 The consumption capacity has to be increased within the country through the infusion of more purchasing power in the hands of families currently caught in the poverty trap. Farmers, who are also the largest consumer group, will produce more, if there is greater consumption and consequently greater demand for farm produce and products. **The Food Guarantee Act** recommended in the Second Report of NCF would help to make food serve the role of currency. Such a procedure will help to improve household nutrition security as well as farmers' income. The future of Indian agriculture will depend upon the efficiency and seriousness with which pro-farmer marketing systems are put in place.

2.4.12 Public Policies for Sustainable Livelihoods

2.4.12.1 The cost-risk-return structure of farming is getting adverse, leading to increasing rural indebtedness. In addition to those already mentioned, the following steps will help to ensure that the well-being and livelihood security of all included under the category of "farmers" in this policy statement become the bottom line of public policies.

i. The scope of the Minimum Support Price (MSP) programme should be expanded to cover all crops of importance to food and income security for small farmers. Arrangements should be made to ensure MSP at the right time and at the right place, particularly in the areas coming within the scope of the National Rainfed Area Authority. **Also, advice to farmers on crop diversification should be linked to the assurance of MSP. Small farm families should not be exposed to administrative and academic experiments and gambles in the market.**

ii. A Market **Risk Stabilization Fund** should be established jointly by Central and State Governments and financial institutions to protect farmers during periods of violent fluctuations in prices, as for example, in the case of perishable commodities like onion, potato, tomato, etc.

iii. There is also need for an **Agriculture Risk Fund** to insulate farmers from risks arising due to recurrent droughts and other weather aberrations.

iv. The scope of Agricultural Insurance Policies should become wider and there should also be coverage for health insurance, as envisaged under the **Parivar Bima Policy** recommended by NCF in its First Report. There should also be insurance provided by Seed Companies in the case of GM crops, so that farmers who pay high prices for the seeds for such crops do not suffer in case of crop failure.

v. Nutrition support to rural families affected by HIV/AIDS, tuberculosis, malaria and leprosy is needed to assist in recovery and restoration to a productive life. There is evidence to suggest that a pure drug based approach alone, is not

adequate to help economically underprivileged rural women and men recover from diseases involving prolonged treatment. In addition to health insurance, about 2 million tonnes of foodgrains may be earmarked for launching a Nutrition-cum-Drug Based Approach to getting farm families restored to normal health. A basic requisite for enhancing small farm productivity is the health of the farm worker. This is particularly true in the case of women suffering from a multiple burden on their time. The food grains allotted to such a programme can be distributed through the normal channels on the production of a Food Coupon issued by the appropriate government agencies. For example in the case of HIV/AIDS, the National AIDS Control Organisation (NACO) would be the appropriate agency for the issue of food coupon to the children, women and men affected by this debilitating and killing disease. The Food-cum-Drug based approach to healthcare should become an integral part of the National Rural Health Mission.

vi. An **Indian Trade Organisation** (ITO) and an **Agro-ecological Land Use Advisory Service** should be established on the lines recommended by NCF in its Third Report. The ITO should help Government to operate a Livelihood Security Box.

vii. Since agriculture is a State subject, every State Government should set up a **State Farmers' Commission** with an eminent farmer as Chairperson. The Membership of the Commission should include all the principal stakeholders in the farming enterprise. Such Commissions should submit an Annual Report for being placed before the respective State Legislature for discussion and decision.

viii. Agricultural progress should be measured by the growth in the net income of farm families. Along with production growth rates, income growth rates should also be measured and published by the Economics and Statistics Directorate of the Union Ministry of Agriculture.

ix. Article 243 G of the 11th Schedule of the Constitution (73rd Amendment) Act, 1992 entrusts Panchayats **with responsibility for agriculture including agricultural extension**. In addition, Panchayats will also have to attend to:

- Land improvement, implementation of land reforms, land consolidation and conservation.
- Minor irrigation, water management and watershed development.
- Animal husbandry, dairying and poultry.
- Fisheries.
- Social forestry and farm forestry.
- Minor forest produce.
- Small scale industries, including food processing industries.

2.4.12.2 At the moment there are about 2,25,000 panchayats in the country. The problems facing Indian Farmers are generally dealt with in an aggregated manner – i.e., taking into consideration the problems of over 100 million farming families as a whole. They then appear formidable. **However, if such problems are disaggregated and dealt with by Gram Sabhas and Panchayats, location-specific problems can be attended to speedily and effectively.** The extreme distress faced by farmers in certain regions of the country can then be dealt with promptly. Therefore, it is time that the provisions of Article 243 G are implemented, both in letter and spirit. NCF in its earlier reports had recommended that Panchayats should be involved in water conservation and management as well as in the resettlement of those who will be displaced by big dams through Gram Sabhas serving as Pani Panchayats. Also, one woman and one male member of the panchayat should be trained to serve as Farm Science Managers. In the areas prone to drought, floods and cyclones, one male and one female member could also be trained to serve as Climate Managers. Panchayats could also be the location for the Village Knowledge Centres. They can then play a very important role in agricultural renewal and renaissance.

2.4.12.3 In addition to the resources being made available by the Government of India, State Governments should show their commitments to farmers' livelihood through greater allocation of resources in the State budgets.

2.4.12.4 Finally, the name of the Ministry of Agriculture both in the Centre and States should be changed to **Ministry of Agriculture and Farmers' Welfare** in order to highlight the critical role of these Government Departments in ensuring the income and work security of over 600 million members of India's population.

2.4.13 No Time to Relax

2.4.13.1 The consequences of inaction in addressing the prevailing agrarian distress will be disastrous. Mentioning three of them would be adequate to highlight the serious implications of neglecting the "Jai Kisan" commitment.

- Expansion of threats to internal peace and security (e.g. spread of Naxalite Movement)
- Reverting to a ship-to-mouth existence, thereby diluting national sovereignty and enlarging the rural-urban divide in economic growth
- Jobless or even job-loss economic growth resulting in joyless growth for nearly half of our population.

If agriculture goes wrong, nothing else will have a chance to go right. If conversely agriculture goes right, the vision of a hunger and poverty free India can become a reality sooner than the timeframe set under the UN Millennium Development Goals.

2.4.14 Avoiding a Mismatch between National Policy and Agro-climatic, Socio-economic and Socio-cultural Diversity

2.4.14.1 Indian agriculture is rich in diversity of soils, climate, farming communities and systems, and resource endowments. Hence, a broad national policy will have to be tailored to suit different agro-climatic, socio-economic and socio-cultural factors, by the local stakeholders. The framework for a **National Policy for Farmers** presented in this Report will have to be suitably adapted and elaborated to suit local realities in different parts of the country, particularly with reference to priorities in action points.

2.4.15 Way Forward

2.4.15.1 NCF will hold regional consultations with State Governments, Farmers' organisations including Women's organisations, all other stakeholders and mass media between May - August, 2006. On the basis of the inputs and advice received, the draft National Policy for Farmers will be revised and a second draft will be included in the final Report to be presented on October 13, 2006, when the term of NCF ends.

2.4.15.2 NCF requests the Ministry of Agriculture to get this draft policy considered by the NDC Committee on Agriculture, the Agriculture Coordination Committee chaired by the Prime Minister, Consultative Committee of Parliament and other appropriate bodies.

2.4.15.3 The Final draft could be put up by the Ministry to Cabinet, NDC and Parliament early in 2007 so that a **National Policy for Farmers** can be launched for the first time in 10,000 years of India's agricultural history on 15th August, 2007. Suitable financial provision may be made in the budget for 2007-08 for making the Policy operational.

CHAPTER 3.1

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

BACKGROUND

3.1.1 Agriculture plays an important role in the overall economic and social well being in the country. Though the share of the agriculture sector in the GDP is declining, it still accounts for nearly 21% and remains the biggest sector after services. The contribution of manufacturing sector in GDP is nearly 38% lower than that of agriculture. Incidentally, the farm production sector is the most privatized sector in India, decision on what, how much, when, how to produce and sell are taken by individual farmers. More than half of the work force in India is engaged in agriculture or activities allied to agriculture. It is the agriculture, which provides food and nutrition to the population and raw material to a large number of industries. Nearly one-sixth of the total export earnings are from agriculture.

3.1.2 There is no doubt that Indian agriculture has made significant progress in the post independence period particularly in the wake of the Green Revolution. The foodgrain production increased to a level of 212.1 million ton in 2003-04 [Mid-Term Appraisal of the Tenth Five Year Plan] as against only 89.36 million ton in 1964-65. The production of oil seeds, sugarcane, cotton, fruits/vegetables, milk and poultry meat/eggs also increased appreciably. The main factors for growth of agriculture have been increase in net area sown, expansion in irrigational facilities particularly tubewells, land reforms especially consolidation of holdings, introduction of the high yielding seeds, increased use of fertilisers, expansion of institutional credit in the rural area after the nationalization of private sector banks, farm mechanisation, price policy based on MSP and the procurement operations and improvement in rural infrastructure particularly roads/ rural electrification etc. With the result, over the years, India has moved from food shortages to self-sufficiency, at least in terms of physical quantities of grains and now exports a

variety of food items. The sector has enabled the country to reach food security at the national level and in the process maintain national security.

3.1.3 However, the absolute numbers of agriculture production, cover up many harsh realities in regard to our agriculture development and the economic welfare of the farmers. For a developing country like ours striving to achieve a higher growth path, it is important to look at agriculture as just not a means of providing food to the population but as sustaining incomes of those producing it and linked to it. Livelihood of nearly two-third of India's population is dependent on agriculture and the objectives of a welfare state cannot be met unless their incomes are adequate and growing in a sustainable manner. This would require a relook at our policies and planning for this sector with farmer at the centre stage. In any case, farming ultimately is a business activity and like any other business, the bottom line is crucial. The current agricultural scenario based on the assessment of the Planning Commission, Government of India is given at Annexure I. The assessment is disturbing to say the least. Not giving sufficient importance either to the man behind the business or the bottom line could only be disastrous. Some of the issues impacting the farmers are discussed in the following paragraphs:

3.1.4 The low average yield is a major issue. According to the Government of India data, the average yield of foodgrains [covering over 65% of the gross cropped area] was 1.74 ton per hectare in 2001-02. However, in 57% of the area, the average yield was less than 1.5 ton per hectare and only in 8.54% area; the yield was above 2.5 ton per hectare. Another worrisome issue is that even in Punjab and Haryana [the only States with average yield was above 2.5 ton per hectare] the yields of wheat and rice are plateuing in absence of newer technological advances. The yield growth of these crops [covering 58% of the area under foodgrains] decelerated throughout the 1990s to about 1% per annum from 3% during the 1980s indicating a potentially serious exhaustion of technological progress[1].

[1] *Mid Term Evaluation of the Tenth Five Year Plan.*

3.1.5 Together with low yields, the other serious handicap faced by our farmers is the small and scattered operational holdings. The average holding size has come down from, 2.67 hectare in 1960-61 to 1.34 hectare in 1990-91. The number of operational holdings has increased by above 82% [from 51 million in 1960-61 to 93 million in 1991-92] in three decades. The land distribution in India is very skewed as shown below:

Table 1: Distribution of Ownership Holdings in Rural India -1991-92

Land Holding	Percentage of Rural Households	Percentage of Land Held
Land Less	11.24	-
0.01 to 0.99 Acre	40.11	3.80
1.00 to 2.49 Acre	20.52	13.13
2.50 to 4.99 Acre	13.42	18.59
5.00 to 14.99 Acre	12.09	37.81
15.00 and Above	2.62	26.67
	100.00	100.00

Source: ***Report on Some Aspects of Household Ownership Landholdings-1991-92. NSS Report – 399***

3.1.6 The landless, sub-marginal [upto one acre] and marginal [1 acre to 2.49 acre] farmers formed 71.87% of the rural households and held only 16.93% of the land. The small farmers [2.50 acre to 4.99 acre] formed another 13.42% of the rural households and owned 18.59% of the land. The landless, marginal and small farmers formed 85.29% of the total rural households in 1991-92 which increased to 88.9% in 1999-2000[2]. The pressure on land and lack of alternative employment opportunities has led to proliferation of small and economically non-viable holdings. The percentage of holdings of less than 5 acre has increased from 61.69% in 1960-61 to 78.2% in 1990-91 and to 80.3% in 1995-96 [Agriculture Statistics at a Glance – 2005, Ministry of Agriculture, Government of India]. An average size of operational holding declined from 1.57 hectare in 1990-91 to 1.41 hectare in 1995-96. The average holding was divided into 2.7 parcels. As land continues to be the most prized possession and single most important determinant of the socio economic status of the people in rural India[3] [also provides collateral for credit and

[2] NSS Report No. 458 – Report on Employment and Unemployment Situation in India

[3] According to the NSSO Report No 500- Household Assets and liabilities in India [as on 30th June, 2002], as much as 63.2% of the total assets of rural households were in the form of land & 23.5% in the form of building.

security in the event of natural hazard or life contingencies] and tenancy laws prohibiting/strongly discouraging leasing of land, the fast growth of the rural population, the succession laws and absence of alternative employment opportunities means that the average ownership/operational holding sizes would continue to decline even further. Increasing small farm productivity and improving small crop-livestock integrated production systems and multiple livelihood opportunities through agro processing and bio mass utilization, are essential both to meet food production targets and also reducing hunger, poverty and rural unemployment. Development of animal husbandry could play an important role in augmenting income of the small/marginal farmers. The share of these farmers in dairy farming is quite substantial. They form the core of the milk production sector. Taken together [small and marginal farmers] accounted for 71% of the in –milk bovine stock in 2002-03. The marginal farmers, who had only 20% of the in-milk bovine stock in 1970-71, increased it to 31% in 1981-82, to44% in 1990-91 and to 52% in 2002-03.

3.1.7 The tenancy laws are an important issue. These laws, which aimed at ensuring security to tenants and firming fair land rents were enacted against the background of exploitation of tenants. Kerala and J&K have completely banned leasing out of agricultural land, while in Telangana in A. P., Karnataka, H. P., M. P. and U. P. leasing out agricultural land is allowed only in case of certain disabled persons like widows, minors, personnel of armed forces etc. Punjab, Gujarat, Haryana, Maharashtra and Assam have not banned leasing out agricultural land but the tenant acquires a right to purchase the leased in land within a specified period of tenancy. In A. P. [other than Telangana], Orissa, Rajasthan, Tamilnadu, and West Bengal there are no restrictions on land leasing excepting that in West Bengal only sharecropper leases are allowed. In the tribal areas of A. P., Bihar, Orissa, M. P. and Maharashtra, only competent authority can permit the transfer of tribal land to non-tribal. **However, the various loopholes and difficulties in actual implementation has meant that leasing of agricultural land continues to be done [around 10.36 million hectare was leased during 1991-92 which formed 8.2% of the total cultivated area] but in many places in a concealed manner with all its attendant evils, [including formal credit exclusion] which could be more**

exploitative to the leases particularly the land less, marginal or small farmers. Incidentally, the small/marginal farmers are major players in the land lease market. Increasing cost of cultivation, falling returns, non-availability of irrigation and problems in accessing institutional credit are some of the factors leading to leasing out land by small/marginal farmers. In certain States the fall out of existing tenancy laws is that some of the farmers opt to keep land follow in the event of their moving to the town/ cities for employment. This not only adversely affects production but also leads to deterioration in the quality of land. This phenomenon is more widespread in UP, Karnataka, Kerala, H.P., Jammu and Kashmir and A. P. where leasing out agricultural land is either completely banned or is allowed only in the case of certain disabled categories like widows, minors, armed forces personnel etc.

3.1.8 The tenancy laws have to be such as to encourage all sections of rural population to participate in the land lease market depending upon their resources, availability of off farm/ non farm employment opportunities, the wage rate, cropping pattern and income possibilities from use of land in agricultural and activities allied to agriculture. However, there should be no fear of loss of land leased out to others. In areas where agriculture is well developed, wages are high and non-farm employment opportunities broad based, it may be an attractive alternative for small/marginal farmers to lease out their land and take up wage employment/start-an independent tiny/ micro enterprise if the law assures that they would not be deprived of their land. The medium/big farmers could improve scale economies by leasing in land. On the other hand, in States where agriculture is relatively backward, wages low and alternative employment opportunities limited, the small/ marginal farmers could lease in land from medium to big farmers who may like to migrate to urban areas for non-land based employment/ business opportunities. Some of the safeguards in developing land lease markets could be (a) The lessees should be able to resume the land for self cultivation after expiring of lease term. (b) In case of land leased out by small/marginal farmers, the ownership rights should not be conferred on the tenants. (c) The medium and larger farmers should not be allowed to purchase leased in land from small/ marginal farmers.

3.1.9 Low intensity of cultivation is another issue. Due to concentration of rains in a few months in one season [that too in few days] and limitations in development of irrigation, the cropping intensity has not gone beyond 1.37 for the country as a whole, though theoretically it is possible to grow three corps in a year in a large part of our country. The average decadal growth in cropping intensity has been around 1.25% per annum. Large part of our country had cropping intensity of less than 1.30. The cropping intensity across States during 1996-97 is shown in **Table 2.**

Table 2: Cropping Intensity across the States - 1996 - 97

Cropping intensity below 1.15	Mizoram, Meghalaya, Nagaland, Gujarat
Cropping intensity between 1.15 to 1.30	Karnataka, Tamil Nadu, Maharashtra, AP, MP, Arunachal Pradesh, Rajasthan
Cropping intensity between 1.30 to 1.45	Kerala, Orissa, Bihar
Cropping intensity between 1.45 to 1.60	Manipur, Assam, J&K, U.P.
Cropping intensity above 1.6	Punjab, Haryana, Tripura, West Bengal & Himachal Pradesh

Source: ***State of the Indian Farmer: A Millennium Study – Land Resources***

3.1.10 While other than China, the irrigation system in no other country is as extensive as in India; still only 35.9% of the operated area in 1991-92 was irrigated. However, it is this irrigation system, which has fuelled India's growth in agriculture production. Irrigation has acquired additional importance since the Green Revolution, which is characterized by the use of high-yielding seed varieties, intensive use of fertilizers and other inputs. These inputs are more effective if used alongwith regular and adequate supply of water. This system of agriculture is often seen as the face of Indian agriculture attracting most of the attention of the policy makers and the input delivery system. The risk factor in rainfed agriculture, constraints the farmer from intensive usage of inputs and this farming is generally associated with low yield, low income farming carried on by those who are staying on in agriculture for want of other alternatives.

3.1.11 There are large inter State variation in the extent of irrigation. In Punjab and Haryana nearly 73% area was irrigated followed by U. P. [67.06%], Tamil Nadu [47.46%], West Bengal [44.87%] and Bihar [41.09%]. While the Gangetic plains and the Eastern coast has achieved a relatively enhanced stage of irrigation development the arid

region and the high rainfall receiving areas have a low level of achievement. The results of excessive irrigation are also becoming evident in some developed areas in the form of rapid depletion of ground water, deterioration in ground water quality and the problem of water logging. The tubewells were the major source of irrigation accounting for 36.37% of the irrigated area, followed by canals [26.04%], wells [18.11%], tanks [3.84%], other sources [7.2%] and for the balance 8.44 % the source of irrigation was not reported. In Punjab 83.66%, Uttar Pradesh 66.94%, Bihar 51% and Haryana 42.22% of the irrigated area was irrigated by tubewells. Canals were the major source of irrigation in Orissa [54.17%], Haryana [49.75%] and Rajasthan [34.17%]. Tanks were largely used in A. P. Tamil Nadu, Karnataka and Orissa. Wells were the primary source of irrigation in Maharashtra [54.85%], Tamil Nadu [41.49%], Gujarat [44.9%], Madhya Pradesh [33.10%] and Kerala [32.33%]. The major problems concerning irrigation are the falling investments in development of irrigation in public sector, poor maintenance of canals/other water bodies, the issue of water charges, the actual irrigation developed being much below the potential created, depletion of ground water in many areas [large number of blocks coming in the 'dark' category where further ground water development is not supported by institutional finance], falling water table, energisation of tubewells, poor quality of power supply and need for much greater use of water saving devices/ practices, micro irrigation systems etc.

3.1.12 The trends of changes in the net irrigated area to the net sown area across various classes of farmers show that the percentage of net irrigated area to net sown area was consistently much higher in the case of farmers upto 5 acre holdings [throughout 1970-71 to 1990-91] than the medium and large farmers. In 1990-91, 43.6% and 35.7% of the net area sown by marginal and small farmers respectively was irrigated whereas the percentage in respect of the medium and large farmers was only 29.7 and 22.5 respectively. However, the annual compound rate of growth of irrigation between 1970-71 & 1990-91 was highest in the case of big farmers [2.78%] followed by medium farmers [1.90%] and was lower in the case of Semi-Medium farmers [1.33%], small farmers [1.24%] and marginal farmers [1.28%]. With declining public sector investment,

the small/marginal farmers and areas with lower irrigation development need special focus and dispensation for irrigation development.

3.1.13 Another important aspect is that the Indian farm economy is largely crop based. Nearly 79.2% of the holdings in 1991-92 were used mainly for raising crops, 8.2% for livestock, 1.5% for poultry, 3.9% for plantation/horticulture and the balance of 7.1% for other purposes. Food grains are the main crops. However, some changes are taking place in the cropping pattern. In 1980-81 nearly 80.35% area was under foodgrains, which came down to 75.38% in 1990-91. The decline has been across all the size classes i.e. marginal/small, medium and big farmers. However, the decline is slightly sharper in the case of medium and big farmers. Among the cereal, the decline in so called 'coarse cereals' is heavy. The area under coarse cereals came down from a high of 45.95 million hectare in 1970-71 to only 30.80 million hectare in 1999-2000, though the production level marginally increased from 30.55 million ton to 32 million ton during the above period. The area under pulses has also declined during 1970-71 to 1990-91 across all size classes of farmers. [From 13.36% to 11.35%]. The area under oilseeds increased continuously from 1950-51 to 1990-91 [from 10.73 million hectare to 24.10 hectare] but remained more or less constant by 1999-2000 at around 24 million hectare. The percentage area under sugarcane, fruits/vegetables & spices has shown increases between 1980-81 and 1990-91. The area under jute/mesta and cotton together has remained more or less constant during 1980-81 and 1990-91.

3.1.14 The cropping pattern changes also show some movement towards international trade oriented crops and improvement in farmers' price response and net income. It would also appear that cropping pattern changes are first led by medium farmers and followed by the large and small/marginal farmers.

3.1.15 Marketing is becoming a major issue with the farmers all over the country as they are shifting from the subsistence farming. The Karnataka study referred to in Second Report of the National Commission on Farmers [Serving Farmers and Saving Farming-Crises to Confidence] indicated that 71% of the sample farmers [sample size of 3408 farmers] in Karnataka chose not to sell their produce at the Regulated Markets. The

institutional rigidities have made the Regulated Markets imperfect and less responsive to market fundamentals and reduce the economic benefit to the farmers bringing their produce for sale. Farmers using the Regulated Markets complain of under weighing, unauthorized deductions, harassment by Collies/Hamals etc, inadequate infrastructure, long distance and lack of transparency in auctions etc. Further, very little efforts have so far been made in developing village periodic markets [Haats etc], which are the first contact point for the small farmers. In absence of comprehensive price and market support, small/ marginal farmers resort to distress sale of their produce where the buyer may pay 10-15% discounted price for spot payment and also cheat on them by under weighment and other deductions etc.

3.1.16 The existing minimum support price [MSP] policy coupled with procurement operations has benefited mainly the farmers growing rice and wheat and that too in a few States only. Though the MSP is announced for 25 commodities accounting for nearly 75% of the value of output and nearly 80% of the gross cropped area, the prices often remain lower than MSP in most of the markets in the country. Further, there are huge variations in the prices received by farmers in the same district or town leave alone the State. The farmers believe that of late the MSP have not kept pace with the increase in prices of inputs. **Further, the need for a much stronger protection of MSP in different regions of the country for all commodities cannot be over emphasized.** Exploitation by traders/middlemen, less than satisfactory performance of the Agriculture Produce Marketing Committees, large supply chain, absence of grading, post harvest losses and lack of value addition means that the farmer gets much less than what he could get for his produce. Coupled with uncertainty of prices, the distress sales add to the farmers' problems. As pointed out in the Second Report of the National Commission on Farmers referred to in the previous paragraph, micro level studies show that 50% of the small farmers' produce is sold in distress. The need is for several policy level changes, increased investments and creation of more effective instruments, systems and structures to remedy the situation, including mitigation of market risks. Development of a farmer centric contract farming system deserves a high priority in this regard.

3.1.17 The terms of trade between the agriculture and non-agriculture is another issue. The latest series of index of term of trade [ITT] between agriculture and non-agriculture sectors with triennium ending 1990-91 as base shows that while the ITT moved continuously in favour of agriculture during 1981-82 and 1991-92, when index moved from 88.7 to 106.6 during 1992-93 to 1997-98 it fluctuated with peak reached in 1994-95 at 106.6**. Thereafter, the ITT has been moving downward with some fluctuations in between. The ITT was as low as 102.7 during 1999-2000 and only 101.2 during 2000-01.** The mid –term review of the Tenth Five Year Plan has observed under paragraph 5.9 that during 1997-2002, agricultural prices declined relative to prices not only of inputs but also non-food consumer goods. As a result, the purchasing power of agricultural incomes [current price GDP divided by consumer expenditure deflator] decelerated more than GDP at constant prices. Real farm incomes defined in this way not only show no per capita growth after 1997, but also exhibit increased variability.

3.1.18 The total factor productivity and the profitability in agriculture has declined in real terms in recent years. With the yields stagnating or growing very slowly, the prices of agricultural commodities remaining depressed in both national and international markets, the farmers have very little incentive for making investments in agriculture. The yields of crops like cotton, sugarcane, tobacco, soybean among important crops have shown negative growth during the last few years. As a matter of fact, low profitability and high risk are threatening the viability and sustainability of agriculture. The NSS data reveals that given the choice, about 40% of the farmers may like to quit agriculture. Farming no longer is able to attract or retain youth. Dr. Y.K. Alagh in the 'State of Indian Farmer: A Millennium Study-An Overview' has observed that the agriculture profitability has fallen by 14.2% during 1990-91 and 2000- 2001. The margins deteriorated for cotton and for almost all coarse cereals and oil seeds. There has also been a deceleration in input use mainly because of inadequate expansion of public infrastructure and less favourable input prices during the 1990s. However, it needs to be remembered that for modernization of Indian agriculture the non-land based inputs would increasingly become more important and the farmers would have to rely more on purchased inputs. The deceleration in the growth of input use after 1996-97, to about 2%

per annum from over 2.5% per annum during 1980-97 is a matter of concern. This occurred mainly because the out put prices had begun to fall relative to input prices from 1997-98 [Mid – Term Appraisal of X^{th} Plan – Paragraph 5.9]

3.1.19 'Improving farmers' access to new technologies and coverage of more crops in research and development efforts rather than concentrating on few crops is important for productivity growth, cost effectiveness and profitability and income of the farmers at large. The crucial issue is to decide the role that needs to be assigned to agriculture research and extension and the direction in which it should proceed in future. There is a need for paradigm shift in research methodology and allocation of research efforts towards crops and condition of resource poor and rainfed agriculture.

Farmers Income - Crucial Issue

3.1.20 The welfare of the farmers is primarily linked to the level and trends in farm incomes. The income of the farming household depends not only on price-cost ratios, crop yields, cropping patterns and relative movement of farm prices to cost of living but also on farm size and cropping intensity. A very small average operational holding and low cropping intensity means that an average Indian farmer operates on very low-income levels. With continuous decline in average farm size as a result of faster growth of farm population than the cropped area, the outcomes per cultivator – are less favourable than the outcomes per hectare. This is a serious matter and often in the midst of overall agricultural growth figures [the aggregates], the fact that the average farming household does not gain as much escapes attention.

3.1.21 According to census data, the number of cultivators grew at 1.83% per annum during the Eighties and at 1.44% per annum during the Nineties. However, the land use statistics reveal that the growth of cropped area during the Eighties and the Nineties was only 0.40% per annum and 0.45% per annum respectively meaning thereby the constant reduction of cropped area per farming household. With productivity growth slowing down in the Nineties at 1.3% per annum as against 2.56 % per annum in the Eighties, the farm business income per farmer declined in some areas. The data suggests

that the real business income from farming per household declined in Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Orissa and Rajasthan during the nineties.

3.1.22 The total farm income from average farm size in Andhra Pradesh, Gujarat, Haryana, Punjab, Madhya Pradesh, Rajasthan and West Bengal during the late Nineties was not adequate to keep the family above the poverty line.

3.1.23 Prof. Abhijit Sen [presently Member, Planning Commission] has estimated that the average farm business income per hectare [return over cost i.e., all actual expenses in cash and kind incurred in production by owner operator plus rent paid for leased in land] for all states/crops during 1999-2000 was Rs 9252 which along with contribution of livestock was estimated at Rs 12, 027 per hectare of cropped area.[4] With average size of holding at about 1.42 hectare and all India cropping intensity at 135 per cent, the cropped area per farm works out be 1.92 hectare which could yield an income of Rs 23092 per annum. With average family size of 5.6, the per capita income worked out to only Rs 4124, which is hardly sufficient to provide the essentials of life with per day amount of only Rs 11.30. With productivity and income levels much lower than the All India average in States like Assam, Bihar, Madhya Pradesh, Karnataka, Maharashtra and Orissa the income would be much lower particularly where the average size of holding and cropping intensity is lower. Ensuring viability and sustainability of this vast rural population is a major challenge to our planners and policy makers. The problem is deep rooted and cancerous, which could destroy our entire social system if major shifts, and changes in policy, planning and resource allocation are not brought about quickly.

Farmers' Suicides

3.1.24 Farmers' suicides are not only persisting but are tending to increase and spread over wider area. The fundamental cause of the deterioration in rural economy is less than satisfactory performance of the agriculture sector. The low growth in agriculture per capita income and increasing disparity between per capita farm and non

[4] Share of livestock in the gross value of agriculture has increased from 16% in 1970-71 to 26% in 1995-96.

farm income has been caused by both fast growth of rural population and relatively slow growth of agricultural and rural output as compared to other sectors of the economy. The disparity would further worsen unless there is a major shift in our policies and the farmer is brought to the centre stage of all our planning exercises.

3.1.25 In the wake of commercialisation of Indian agriculture, many small/ marginal farmers enter the high-risk commercial farming from a position of extreme vulnerability due to meagre asset base and lack of knowledge of technology and familiarity/ support for handling the market forces. The cyclical nature of farming with occasional blessings encourages them to take risks much beyond their capacity. When these expectations are not met due to natural factors or human greed [supply of spurious seeds, pesticides and credit from money lenders at exorbitant rates etc.], these farmers suffer a great deal. The farmers are generally in a position to manage one cycle of drought or other distress but are most likely to succumb to it if the cycle was repeated. It is the successive droughts, loss of crops, illness, high expenses on social events/ obligations, collapse of market, a major loss of asset or earning system/ capacity, which causes severe unbearable distress among the rural people. The crumbling of kin-social net working, support systems and institutional system has compounded the problem causing great distress sometime leading to the greatest disaster to the family in the form of suicide by the breadwinner. Effective and farm reaching efforts are required to eliminate these distress factors and convert the hot spots of agriculture into bright spots.

3.1.26 It is important that public investment in agriculture and rural development is stepped up and there is greater focus on improving grading, storage, marketing and processing of agricultural produce to improve farmer's incomes from per unit of output.[5] Infrastructure investments for better rural road connectivity, availability of quality power

[5] Public sector investment plays an important role in the development of infrastructure like irrigation, electricity, agriculture research, markets, roads etc. The decline in public sector investments is particularly harsh on underdeveloped areas, which attract less private sector investments. [The private sector investment is influenced by availability of enabling infrastructure and expected returns from investments. In absence of public sector investments in infrastructure, which increase the returns from investments, private sector is also likely to ignore such areas]. The share of public sector in gross capital formation in agriculture declined from 33% in 1993-94 to 24.2% in 2000-01. The gross capital formation in agriculture as a proportion of the total gross capital formation in India has also continuously declined. [from 14.3% in 1970-71 to 7.1% in 2001-02].

supply, building human capital through education, training, quality assurance, timely input supply and sound advice based on market/weather forecasts etc. and greater focus or providing support for development of animal husbandry activities [backward and forward linkages] could help in improving the welfare of small / marginal farmers in India. An important aspect is to provide power of scale to farmers by encouraging formation of small farmer's estates/ cooperative farmers'/ the self-help groups/ or corporate faming units etc. The Cooperatives could play an important role in various marketing related functions like collecting farmer's produce, grading, transporting, initial processing, marketing and supplying of inputs etc. The need is for policy bias in favour of group approach for delivery of services, marketing, avoiding over capitalization and greater use of labour intensive technologies.

Agricultural Credit- Access and Other Issues

3.1.27 Access to institutional finance is important particularly in diversification and switching over to commercial and high value agriculture. Further, the small farmers whose operations and surpluses are small could ill afford high cost loans from non-institutional agencies. However, the World Bank, National Council of Applied Economic Research [NCAER], Rural Finance Access Survey [RFAS-2003] conducted in U. P. and A.P. indicated that the banks served primarily the needs of the richer rural borrowers: 44% of the large farmers were borrowers whereas 87% of the marginal farmers did not have access to credit. Access to formal credit was particularly a problem for meeting unforeseen expenditure and resulted in heavy reliance among poorer households on informal sources, mostly moneylenders, traders and sometimes friends and relatives. The interest rate charged by informal sources was invariably quite high [around 48% per annum]. As per available data[6], as much as 55.2 per cent of the loans outstanding at the farmer household level were from the formal institutions (35.6 per cent from banks and 19.6 per cent from the cooperatives) 25.7 per cent from the professional money lenders, 8.5 per cent from relatives/ friends, 5.2 per cent from traders and the balance of 5.4 per cent from others including government (2.5 per cent). However, in Andhra Pradesh,

[6] ***Situation Assessment Survey of Farmer s- Indebtedness of Farmer Households-NSS 59th Round – NSS Report No. 498-May, 2005. Source: NSS Report 498 – May 2005***

Rajasthan, Manipur, Meghalaya the loan outstanding from professional moneylenders exceeded that from the banks and the cooperatives put together. As regards the outreach, the professional moneylenders had the largest percentage of farmer household indebted to them. The position was as under:

Table 3: Indebtedness of Farmer Households [Percentage]

S. No.	Source	Percentage of farmer households indebted
1.	Government	2.5
2.	Cooperative Societies	21.7
3.	Banks	22.5
4.	Professional Money Lenders	24.1
5.	Traders	10.0
6.	Relatives and Friends	15.0
7.	Others	4.2
	Total	**100.0**

It is rather disturbing that after nearly 37 years of the nationalization of private sector banks and over fifteen years of credit targeting for agriculture, on all India basis the banks had a smaller outreach of the Indian farmers as compared to the professional moneylenders. In Andhra Pradesh, Bihar, Manipur, Meghalaya and Rajasthan the combined out reach of the Government, banks and cooperatives [the formal sector] was less than that of the moneylenders. More than 50% of the farmers' households in Andhra Pradesh and Tamilnadu were indebted to moneylenders. The cooperative societies had the best out reach among all agencies [institutional as well as non-institutional] in Maharashtra [61%], Haryana [44%], Kerala [46%], Gujarat [40%], Punjab [38%], Chhattisgarh [37%] and Madhya Pradesh [37%].

3.1.28 In Eastern India where large growth potential has largely remained unexploited due to various reasons including credit constraints the outreach of the formal credit system needs considerable improvement. Excepting Orissa, Jharkhand and Tripura, friends and relatives [Meghalaya, Arunachal Pradesh, Manipur, Assam, Bihar, Mizoram] and Traders [West Bengal, Sikkim, Nagaland] were having the largest outreach.

3.1.29 Besides the question of restricted outreach of the banks, the other issues, which are resented by the rural borrowers, are the cumbersome lending procedures, documentation delays and difficulties, time taken in appraisal/sanction of loans, rigidities in lending, lack of appropriate products and insistence on collaterals by the banks. The adequacy and timely availability of credit is crucial for the farmers which does not get the required attention from the banks. The small borrowers are almost alienated from the commercial banks, which are often viewed by them as institutions for the rural elite. There is a need for streamlining the institutional lending procedures, improve the outreach and increase the supply of credit to farmers on a priority basis. There is very large regional imbalance in flow of institutional credit which needs to be corrected. The per capita credit in 1996-2001 in North Eastern Region [Rs. 17], Eastern Region [Rs. 42], Central Region [Rs. 86] was much lower than Northern Region [Rs. 153] and Southern Region [Rs. 280] and all India average of Rs. 128. Investment credit which adds to the total assets in the farming section, adds to the productivity of farms and helps in value addition is important. However, the proportion of investment credit in total credit has been declining. Since most of the investment credit is supported by mortgage/charge of land, there is a need to improve the land record system, streamlining the system of creating charge/mortgage, improve availability of land records, reduction in stamp duty/registration charges etc. to facilitate flow of more term credit. The State Governments may also look at the infrastructure/other backward and forward linkages etc. which could add to absorptive capacity of the farmers for increased credit. North Eastern Region where land vests with the Government/Community or oral lease holders, who can not mortgage land, would require special documentation from banks which in turn would require to the assured of assistance from State Government/Revenue Authorities etc. to recover their dues from such borrowers in case of default. Strengthening and supporting the more friendly and pro small clients localised banking institutions [the cooperatives, cooperative banks and the Regional Rural Banks] and providing separate dispensation to them to overcome their handicaps [higher risk profile and small geographical operational area, higher cost of funds etc.] are needed on a priority basis. The commercial banks need to relook their recruitment and personnel policies to have technically competent and willing staff to man the rural branches. The

rural branch managers need to be innovative and should be able to respond to the local situations and credit needs. The requirement of credit are likely to go up considerably with increase in purchased inputs, commercialization of agriculture, growth of agric-business opportunities [with improved connectivity] etc. and the rural branch managers can not continue to work in a routined manner responding only to traditional cropping pattern and extending investment credit for well known schemes of milch animals/tubewells and tractors etc.

3.1.30 Another issue is the risks, which the farmers face due to natural calamities, sudden pest attacks, diseases, market failure etc., which seriously impact their incomes and livelihood security. The risk profile is very high in rainfed farming which makes it nearly impossible for these farmers to switch over to commercial/high value crops to any significant extent. They are reluctant to use purchased inputs due to the uncertainty of production. Though the crop insurance scheme is being implemented since 1985 [which was widened in scope and content and introduced as National Agriculture Insurance Scheme' in 1999] it has generally failed to attract and satisfy farmers mainly because of a large insurance unit [taluka/block to assess the loss instead of the farmer], the guaranteed yield fixed at 3 or 5 years average, low indemnity level [60% in most of the crops], inordinate delay in settlement of claims [as much as 12 months in many cases], non-coverage of crops like fruits/ vegetables etc. **The need is to thoroughly revise the crop insurance scheme and make it farmer friendly.** An insurance scheme which does not promptly provide relief if the event for which insurance was taken happens, but looks at the average yield data for a tehsil/block and takes a long time in settlement of claim is not appreciated by the farmers. The Situation Assessment Survey of Farmers done by the NSSO [NSS Report No 496: Some Aspects of Farming 2003] reveals that at the all India level, only 4% of farmer households reported ever having insured their crops. Among those who had never insured their crops, a very large proportion-57% were unaware of the practice of crop insurance. While 16% were aware but not interested, 24% said that the facility was not available to them and 3% felt that they could not afford to pay the premium. Lack of awareness and interest in a scheme, which is in operation for nearly 20

years, is a sad commentary on the development/promotional efforts and nature of the scheme.

3.1.31 In absence of an effective crop insurance system, the successive droughts/natural calamities etc seriously erode the repaying capacity of small farmer/rainfed farmer who becomes a defaulter if he/she is unable to service institutional credit. The normal policy of reschedulement/conversion of short-term loans into medium term loan in such situation is not really enough. The farmers in the event of successive droughts/natural calamities require 'relief' and not mere shifting of repayment obligation to future dates. The need is to constitute a Agriculture Credit Risk Fund to support the banks particularly the small localised banks to provide relief to the farmers in these conditions.

The WTO

3.1.32 At the time of signing the Agreement on Agriculture [AOA], it was hoped that the Indian farmers would gain from trade liberalisation and access to international markets for their products. The reduction in domestic support as well as export subsidies by other countries, particularly the Western countries and Japan etc. was expected to enhance competitiveness of our agriculture and result in gain to our farmers through exports. However, this has not happened. On the other hand, due to low tariffs, import of edible oils [palm oil in particular] has increased which has adversely affected the interest of our rain fed farmers diversifying into oil seeds. It would appear that the postponement of agreement in agricultural negotiations, inspite of our concerted efforts at Hong Kong [2005], would prolong the unequal trade bargain entered into in Marrakesh [1994].

3.1.33 There is a need for early consideration of the proposal made in the Third Report of the National Commission on Farmers [Serving Farmers and Saving Farming - 2006: Year of Agricultural Revival] for establishing an Indian Trade Organisation [ITO] and our own boxes for domestic agricultural support on the models of the WTO's Blue, Green and Amber boxes. We need to segregate the support extended to farmers into two groups - those which are of the nature of life and livelihood support to small farm

families and those which could be considered as trade distorting in the international market. The first group of support measures needs to be strengthened for protecting the food and livelihood security of our farmers.

3.1.34 Incidentally, the Situation Assessment Report No. 496. Some Aspects of Farming, 2003 published by the NSSO Reveals that only 8% of the farmers at the all-India level had heard of the WTO and had some idea of its objectives and activities. Higher awareness about WTO was among farmers in Kerala [44%], Punjab [23%], Haryana, Tamil Nadu and West Bengal [12% each].

3.1.35 Another aspect, which impacts the well being and future prospects of the farmers and their families, is the availability of essential facilities in the villages. The NSS Report No.487 on Village Facilities, July-December, 2002 based on a sample of 4646 villages revealed in **Table 4**.

Table 4: Facilities in Villages [Percentage]

Nature of facility	Percentage of villages having the facility
Primary school	72
Pre-Primary School	66
Medicine shop	10
Private clinic/Doctor	20
Primary Health Centre with in kms.	46
Post office	22
Tap water	18
Access to electricity	75
Any type of drainage system	30

Source: ***NSS – Report No. 487 - 2005***

3.1.36 The above data reveals that a substantial number of villages did not have the basic facility of tap water, electricity, medical attention/availability of medicines, primary school, drainage and postal facilities. Availability of improved seeds, pesticides etc. also posed problems. Almost 24% of the farmers had to travel more than 10km for improved seeds and 21% of the farmers had to travel more than 10km for pesticides. Even for veterinary services about 15% farmers had to travel more than 15km. On all India basis

only 18%, 19% and 24% farmers respectively reported availability of improved seeds, pesticides and veterinary services in their villages. Absence of these facilities, a famine of jobs/livehood opportunities in the rural areas, declining profitability of agriculture, small holdings generating low surplus and increasing disparity between per capita farm and non-farm income is making farming rather unattractive particularly for the youth. Retaining educated and trained youth in the rural areas is a serious problem.

The National Agriculture Policy

3.1.37 The National Agriculture Policy formulated by the Government of India had observed **"Agriculture has also become a relatively under rewarding profession due to generally unfavourable price regime and low value addition, causing abandoning of farming and increasing migration from rural areas. The situation is likely to be exacerbated further in the wake of integration of agriculture trade in global system, unless immediate corrective measures are taken."** The above statement rings the alarm bells as far as the state of the Indian farmer is concerned. The National Agriculture Policy therefore, sought to secure a fair standard of living for the farmers and agriculture workers and their families, discourage migration to the urban areas and face the challenges arising out of economic liberalisation and globalisation. It aimed to attain, over the next two decades:

- A growth rate in excess of 4 per cent per annum in the agriculture sector
- Growth that is based on efficient use of resources and conserve our soil, water and bio-diversity
- Growth with equity, i.e., growth which is widespread across regions and farmers
- Growth that is demand driven and caters to domestic markets and maximizes benefits from exports of agricultural products in the face of challenges arising from economic liberalisation and globalisation
- Growth that is sustainable technologically, environmentally and economically

3.1.38 It is essential to achieve the above aims without loosing sight of the farmer. It is therefore important that a National Policy for Farmers is formulated to guide the planners and policy makers so that the interests of the farmers are kept at centre stage

while achieving the objectives of sustainable high growth rate across regions and farmers and deriving benefits from economic liberalisation and globalisation under the National Agriculture Policy.

3.1.39 The National Policy on Agriculture has expressed concern about the agricultural workers and their families. The landless constitute about 11.24% of the rural households in India and their livehood is primarily related to agriculture. A substantial percentage of these fall in the category of poor[7]. The urgency to improve their economic well being cannot be overemphasized. Exclusion of rural landless or coastal fisherman/fisher women from the coverage of the policy for farmers would make it rather restrictive. The National Policy for Farmers needs therefore to cover all farmers, landless agricultural labourers, sharecroppers, tenants, fishermen/fisherwomen, poultry/other animal husbandry farmers, bee keepers, others doing vermiculture, sericulture etc. Certain aspects of the definition of 'farmers' to clarify the coverage are discussed at Annexure II.

Annexure - I

Current Agricultural Scenario:
Assessment by Union Planning Commission

1. Growth Rate

- GDP growth in agriculture and allied sectors during the **first three years of the Tenth Plan averages only 1 percent per annum, in contrast to the Tenth Plan target of 4 percent.**

- The share of agriculture and allied sectors was 3.9% of the total Tenth Plan outlay, as against 4.9% in the Ninth Plan. The total share of agriculture, irrigation and rural development stood reduced from 20.1% in the Ninth Plan to 18.7% in the Tenth Plan.

- Tenth Plan expenditure of the Ministry of Agriculture during 2002-03 and 2003-04 was 27% of the total Tenth Plan outplay.

2. National Accounts

- Growth rates of livestock and crop output have averaged about 3.6% and 1.1% per annum, respectively **after 1996-97,** down from 4.5% to 3.1% during 1980-97.

- Within the crop sector, only fruits and vegetables grew at over 2.5% per annum. **The output of remaining crops fell below 0.5% per annum after 1996-97** as compared to over 3% earlier.

- Growth of input use in agriculture **decelerated after 1996-97**, to about 2% per annum from over 2.5% during 1980-97.

- **After 1997-98, output prices began to fall relative to input prices.**

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[7] IARI-FAO/RAP study [2001] based of 50th NSS round (1993-94) quoted in India 2020 Report of the Planning Commission shows that 54% of the landless were poor.

- Part of the deceleration in agricultural growth can, therefore be attributed to lower profitability leading to a slow increase in input use. **Growth of input productivity became negligible after 1996-97.**

- During 1997-2002, agricultural prices declined **relative to prices not only of inputs** but also non-food consumer goods. Purchasing power of agriculture incomes decelerated more than GDP at constant prices. **Real farm incomes showed no per capita growth after 1996-97.**

- Real per capita food consumption declined after 1998-99, despite fall in relative food prices. **Per capita consumption declined absolutely in case of cereals, pulses and edible oils.** The growth rate in the consumption of fruits, vegetables and milk also declined.

- Input use and productivity growth decelerated from the 9th Plan onwards. **This was accompanied by low demand growth and higher farm income variability.**

3. Crop Production

- The Tenth Plan foodgrains target is 230 million tones in 2006-07. **The production was 212.9 million tones in 2001-02 and since then it has been declining.**

- Trend of rice and wheat production was less than population growth by the end of the 9th Plan. **Yield growth throughout the 1990s was about 1% per annum, as against 3% during the 1980s.** Large exports at below domestic prices and subsequent poor monsoons have now reduced the stocks to a low level.

- Yield growth in coarse cereals was about 2% per annum throughout the 1990s, mainly **because of maize**

- A Technology Mission in Pulses has been in existence since the early 1990s. Pulses yields have stagnated and the area under cultivation has also shrunk. **A sharp increase in imports of pulses has further reduced incentives for home production.**

- Oil Seeds Technology Mission started in 1986. There was a substantial expansion of area, yield and production till the mid 1990s. The production went up to 24.4 million tones in 1996-97. The production was 25.1 million tones in 2003-04, but growth continues to be negligible.

- Imports of edible oils, was less than 10% of domestic production till 1994-95. **Now the volume of imports equals domestic production**.

- There is an urgent need to **review the work of the Technology Mission on Oilseeds and Pulses, since the mission mode approach to project formulation and implementation should yield the anticipated outputs.**

- **Cotton Production** has been good during 2004-05, but yield and quality are still poor. The Technology Mission on Cotton needs to promote a symphony approach, linking the cotton producers and the textile industry in a symbiotic manner.

- **Sugarcane** yield has been either stagnating or declining – recovery of sugar from cane has not increased.

- **In fruits and vegetables, there has been no increase in yield**. Vegetable yields are declining. **Output increase is entirely through area expansion. The National Horticulture Mission will have to concentrate on increasing yield and quality**. Post-harvest processing and management need urgent attention. The National Horticulture Board needs careful restructuring and revitalization.

4. **Livestock and Fish Production**

- Milk and egg production has decelerated. There is, however, an increase in the number of crossbred cattle and poultry since 1997. Feed, Fodder and marketing need attention.

- Fish production is growing at a rate of 4% p.a. and the production was 6.4 million tones in 2003-04.

5. **Overall Trends**

- Almost every sector experienced lower growth after 1996-97. Even in **the excellent monsoon year of 2003-04, per capita output was less, except in horticulture.**

- Food consumption has stagnated since the beginning of the 9th Plan. National Accounts data show that real per capita consumption of cereals, pulses, edible oils, sugar, milk, fruits and vegetables was lower in 2003-04 than in 1998-99.

- Overall employment growth has been very slow. Real agricultural incomes have been stagnating or declining.

- Agriculture will progress only if demand (both home consumption and export) increases. **Consumption should be increased through both nutrition intervention programmes and through accelerated non-farm employment.**

- Cost of production should be reduced through enhanced factor productivity. The average fertilizer response of food grain output to NPK fertilization works out to 7.8 kg grain per kg NPK. This is a very low return. How can we become globally competitive if our factor productivity is both low and declining?

- Imports of pulses and oilseeds are growing. Import of pulses, which used to vary in the range of 3 to 6 lakh tonnes in the 1990s surged to over 2 million tones in 2001-02 and has remained at that level since then. Imports of edible oils increased from 1 million tonne in 1995-96 to over 4 million tonnes in 1999-2000. It is now ranging in the order of 4.2 to 5.3 million tones per year accounting for about half of domestic consumption.

- Sustainability of food production is threatened by depletion and pollution of the aquifer, soil health degradation, failure of research, extension and input supply systems and declining investment in the farm sector. In addition to being a gamble in the monsoon, farming is becoming increasingly a gamble in the market. "The fatigue of the green revolution" is due to both ecological damage and technology fatigue.

- India today has the largest number of under-nourished children, women and men in the world. Maternal and foetal under-nutrition is resulting in low birth weight babies. Such LBW children are handicapped at birth in brain development, the cruelest form of inequity. Yet, we often hear glib talks about India becoming a Knowledge Superpower. Unless there is widespread realization among political leaders and policy makers that we are on the threshold of an unprecedented human tragedy, we will have to revert once again to the "begging bowl" phase of our agricultural evolution. Also, where hunger rules, peace will not prevail.

Professor M S Swaminathan, 2005, "Science and Technology for Bharat Nirman", Extract from Presidential Address at 12th General Body Meeting of National Academy of Agricultural Sciences, New Delhi, June 5, 2005

Annexure II

FARMER - SOME DEFINITIONAL ISSUES

Farmers in local languages in India are referred as Kisans. Krishaks, Roytus, Chasis etc. The term farmer includes those who cultivate land and also the sharecroppers/tenants and the agricultural labourers whose incomes come from agricultural operations and activities related/ allied to agriculture. However, the National Sample Survey Organisation [NSSO] defines a farmer as a person who operates some land [owned or taken on lease or otherwise possessed] and is engaged in the agricultural activities during the last 365 days. If either of the above requirements of the definition are not satisfied, the person is not treated as a farmer. Thus the person engaged in agricultural and /or allied activities but not operating a piece of land is not considered as farmers. In other words the agricultural labourers, coastal fishermen, rural artisans and other persons providing agricultural services are not classified as farmers.

2. A plot of land is considered to be owned by a person if the right of permanent heritable possession with or without the right of transfer of title, is vested in him/her. Land held in owner-like possession under long-term lease or assignment is also considered as land owned. The land held as Pattadars, Bhumidars, Bhumiswami, Rayat Sithibans is also considered as land owned as is land taken on lease. Land held under special conditions such that the holder does not possess the title of ownership but the right for long term possession of land [for example land possessed under perpetual lease, hereditary tenure, long-term lease for 30 years or more] is considered as being held under owner like possession. In the States where land reform legislations have provided for full proprietorship to rest with tenants, they are considered as having owner like possession, even if they have not paid the full compensation. Similarly, plot of land possessed by a tribal in accordance with the traditional tribal rights from local chieftains or village /district council or land occupied by a tenant for which the right of ownership vests with the community is considered under owner like possession.

3. The NSSO definition emphasises on two aspects i.e., operation on some land owned, leased or otherwise possessed and secondly engagement in agricultural activities. The agricultural activities are understood to mean cultivation of field and horticultural crops, growing of trees/plants such as rubber, coffee, cashew, coconut, pepper, tea, etc. animal husbandry, fisheries, bee keeping, vermiculture, sericulture etc. However as we are aiming to prepare a draft Kisan Policy, it would be necessary to give a broader coverage to the term farmer. It may therefore be appropriate to cover all those who are engaged in agricultural activities as defined above irrespective whether they own, have leased in or possess some land. This would enable us to include the farmers as defined by NSSO as also the agricultural labourers and coastal fisherman etc. Excluding the landless agricultural labourers who form 11.24 of the rural households and primarily earn their livehood from agricultural operations would be rather restrictive. Similarly excluding coastal fishermen but including other fisherman who carry out fisheries on their own pond/fields etc. will also not be appropriate for the purpose of preparation of Kisan Policy.

4. Farmers so defined would represent landless agricultural labourers, sharecroppers, tenants, small and marginal cultivators, other farmers, tribal farmers, fishermen/ fisherwomen, poultry/other animal husbandry and pastoral farmers, bee keepers, others doing vermiculture, sericulture etc.

CHAPTER 3.2

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

LAND POLICY

3.2.1.0 Introduction

3.2.1.1 Land is the most fundamental requirement for the very survival of the humankind. This finite resource is the most dynamically used agricultural resource for livelihood security. Its quality, quantity and availability in the market-driven setting are hence the most important elements of agro-ecological, socio-economic and environmental security of the nation. Land is not only an economic asset but also has enormous social, psychological and emotional relevance. Rights and access to land are thus fundamental to help empower the poor to adjust to the challenges posed from time to time, such as technology revolution and globalisation in recent years.

3.2.1.2 Secure rights to land are also a basis for shelter, for access to services and for civic and political participation. They are also a source of financial security, as collateral to raise credit or as a transferable asset that can be sold, rented out, mortgaged, loaned or bequeathed. Moreover, secure access to land creates incentives for the user to invest labour and other resources in it, so as to maintain or enhance its value and sustain its productivity, and to access social and economic development opportunities. Several studies have documented a positive relationship between equitably distributed land and economic growth as well as social cohesion. Facilitating land access for poorer groups and protecting their land rights, within the context of the rule of law, enables people to enjoy shelter, food and security in an increasingly competitive environment. This is particularly so where off-farm employment opportunities are limited.

3.2.1.3 Increasing demand for the fixed supply of land typically translates into higher prices. Control over this resource is often central to national and local political

power. As competition for land increases, those with weak rights tend to be cast aside, as they are unable effectively to assert their claims. Land rights once lost are difficult to re-establish. Tribal people may find that the lands on which their livelihoods depend have been sold off for mining developments, ostensibly bringing jobs and development to the local area (and the poor gets still poorer). Land policy must have explicit proactive rehabilitation provisions and measures.

3.2.1.4 Land policy in India has evolved over hundreds of years in line with the evolving agrarian and urban societies and political and governance patterns and occupied centre stage in India's policy debate. In Independent India, the very First Five-Year Plan had spelt out country's' land policy, which aimed to reduce disparities in income and wealth, to eliminate exploitation and to provide security to tenants, as well as to achieve social transformation through equality of status and an opportunity for different sections of the population to participate in development initiatives. The policy has undergone broadly four phases. The first phase (1950-1972) consisted of land reforms, including abolition of the intermediaries, tenancy reform which has provision also for enabling tenants to acquire ownership rights and the distribution of land using land ceiling. The second phase (1972-85) shifted attention to bringing uncultivated land under cultivation. The third phase (1985-95) increased attention to watershed management and a Waste Land Development Agency was established. The fourth and current phase (beyond 1995) is giving greater attention to land administration, rental markets, land records and land titles. All the Five Year Plans since 1951 have addressed land policy and reforms (**Annexure I**), serving as a process of overall development.

3.2.1.5 Following the Land Ceiling Act, the surplus land was distributed to landless and near- landless poor farmers and tenurial rights to almost 10 million ha of land were transferred during the 1970s and 1980s - more than three times what was involved in the well-known land reforms of Japan, Korea and other East Asian countries. **Box I** gives details of the major achievements steered by the Ministry of Rural Development, Government of India as well as the States in the field of land reforms from the beginning of the First Five Year Plan till the Tenth Five Year Plan.

Box I. Land Reform Achievements

- Intermediaries have been abolished over 6.0 million hectares of land and ownership rights have been granted to 20 million tillers.
- 12.42 million tenants have got their rights protected over an area of 6.25 million hectares of land;
- An area of 2.12 million hectares of ceiling surplus land has been distributed to 5.67 million rural poor, 51% of which constitute Scheduled Castes/Scheduled Tribes.
- An area of 5.90 million hectares of Government wastelands and 0.87 million hectares of Bhoodan land have also been distributed among the eligible rural poor;
- 0.17 million hectares of alienated land has been restored to Scheduled Tribes land owners;
- An area of 65.34 million hectares has been consolidated in the country;
- 582 districts, 201 Sub-Divisions and 3142 tehsils / taluks have been covered under the Computerization of Land Records (CLR) programme, out of which 1553 tehsils wherein computerized copies of RoR are being issued to land owners. For this purpose a financial assistance of Rs. 3005.15 million has been released to States/UTs.
- Under the Scheme of Strengthening of Revenue Administration and Updating of Land Records, an amount of Rs. 2659.74 million as Central share has been provided to States/UTs for undertaking survey operations and updating of land records and creating infrastructure facilities or revenue administration.

Source: Annual Report, Ministry of Rural Development, Government of India, 2004-05

3.2.1.6 The above achievements notwithstanding and sporadic marginal impact on poverty and inequity reduction, the objectives of the land reforms, as described in the following Section, have only partially been met and in most cases the beneficiaries did not receive full ownership. In the meantime, the land reform activities have tapered off and the task remains eminently unfinished. On the other hand, despite the restrictions and high cost of transactions in the land rental markets, more than 15 million households are participating in rental markets, and concealed tenancy is not uncommon. Moreover, the area-development programmes such as watershed programmes and management of degraded lands have not proceeded satisfactorily. Land policy must address structural issues that, in the longer term, need to be addressed in order to ensure that the economic opportunities opened by other policy changes will benefit the broad majority of the poor.

3.2.1.7 Obviously, the old and ongoing land reform and land development programmes should be revisited and revitalised in context of the ground realities and

the various new developments such as globalisation, liberalisation and the accent on diversification, off-farm employment, public-private partnership, revival of rural cooperatives, group farming for enhanced scale of economy and on competitiveness. In doing so, the farmer must be kept in the centre of the development process and the interest of the small and marginal farmers and the landless poor should be actively promoted. Land affairs and agriculture being State subjects and matters of great socio-economic and political importance (and sensitivity), the Central and State Governments should synergise their efforts to empower the landless and near-landless. The States should be given due financial, legal and technical supports to develop necessary Acts and Laws, legal instruments, trained human resources and institutional mechanisms to implement the policy and reforms and to monitor their impact on poverty reduction, economic development and agro-ecological security.

3.2.2.0 Ground Realities

3.2.2.1 Summarised below are the major outcomes and trends of the land reforms in the past, specifically in terms of land distribution, holding size, rental market and land development.

- In the early years of the post- Independence era, four important components of land reform comprised: (i) the abolition of intermediaries, (ii) tenancy reforms, (iii) fixing ceiling on land holdings and (iv) consolidation of land holdings. By 1960, the whole process of legal enactment of the abolition of intermediaries was completed. The other land reforms, namely, consolidation of holdings and implementation of land ceilings, had mixed outcomes; the latter, however, has halted increase in the concentration of land in fewer hands. Further, the phenomenon of absentee landlords was weakened and there was greater convergence of ownership and management. A strong middle peasantry emerged which had largely anchored the Green Revolution.
- Land base of marginal and near-landless households has not improved much over time; at best, the percolation of gains from land redistribution has stopped at the middle level of peasantry. Only 40% of the land out of the

totally distributed has been given to the Scheduled Castes (SCs) and Scheduled Tribes (STs). Dispossession of the land allotted to *Dalits* is not uncommon. Lakhs of acres of land are still with the court for dispute settlement since the landowners or *ryots* have refused to hand over the land to the *Dalits*. In addition, the government has abolished the settlement courts.

- The politics of land distribution has been changing which is reflected in the changed power structure. In the earlier times, the SCs and STs occupied the primacy in terms of land distribution. On paper it is still continuing but ever since the backward classes have gained enhanced political economic concessions available land is mostly going to the OBCs than to the SCs and STs.
- The huge proliferation of extremely small and economically non-viable holdings is emerging as a major agrarian handicap for livelihood improvement of majority poor smallholders. Nearly 66 percent of the farming households own small holdings of less than 1 ha. Simultaneous occurrence of diversion of agricultural land to non-agricultural uses (net outflow) and under-utilization of available agricultural land (current fallows) has diminished availability of land for cultivation and has shrunk common property resources (CPRs).
- The quality of land has deteriorated over years, often linked with poverty and compulsive "mining" of the land. But, often the damage caused by rich farmers is much more widespread as compared to that by smallholders. Small farmers utilise their lands more fully compared to large ones. SCs and STs have greater underutilization of land because of their poor access to technology, irrigation, inputs and credit.
- Despite multi ministerial institutional interventions to strengthen integrated watershed management, involving also the landless and land poor to manage the watersheds, alongwith the encouragement of the role of NGOs and higher levels of peoples' participation, the performance of majority of the watersheds is unsatisfactory and the efforts are often fragmented, nonparticipatory and duplicative.

- Despite ban on leasing in and leasing out, the amount of land actually leased in is high. Agricultural technology, encompassing seed, fertilizer, irrigation and mechanization has impacted extent of tenancy and the lease market. The extent of sharecropping has greatly declined, whereas fixed rent tenancy, including fixed share of produce, has increased. Reverse tenancy exists but is not of much consequence in most States; often holders of not very different farm-size categories dominate the lease market. Concealed tenancy is also prevalent. The land lease market is mostly functioning on the principle of demand supply balance.
- Although a good beginning has been made in some of the States, through projects such as "Bhoomi" in Karnataka, "Dharni" in Goa, "Tamil Niloin" in Tamil Nadu and "e-Dhara" in Gujarat, but in majority of the States, land record and clear status of land titles and rights are generally missing and nonexistent. Computerisation of such records, a prerequisite for implementation of reforms, has thus yet to show its impact on a wide scale and "the revenue administration in the country lacks vision, dynamism, a holistic view of land management by the State and hardly it takes any intrinsic momentum."

3.2.3.0 Impact of Land Policy

3.2.3.1 India's land policy interventions during the last five decades can be assessed based on their impact on various parameters, including alleviation of poverty, conflict management and equity, sustainable economic development, environmental impact, and production efficiency. Despite the various shortcomings as described in the above Section II, the land policy interventions have had varying positive impacts across the States, depending in large part on the agrarian situation and the extent to which a given policy was implemented (**Annexure III**). Poverty alleviation could be considerably impacted by the first three phases of land reform, but the Drought Prone Area Development (DPAP) and Desert Area Development Programme (DADP) have made little inroad. Similar results are seen in respect of conflict management and equity, but a significant change was recorded in this area

because of the computerization of land records. DADP, DPAP and Wasteland Development Programmes could impact environmental management significantly. Similarly, these could influence sustainable growth in some pockets. The major contribution to sustainable growth came, however, from the abolition of intermediaries and from the ceiling on land holdings, which together have put a pressure on economic use of resources. While production efficiency is not a direct derivative of land policy, its components can help. The abolition of intermediaries, land ceilings and the consolidation of holdings (wherever it could be done) have certainly contributed. But, the boost was not large enough to create significant spill over impact in non–farm sector and overall rural income. The Watershed Development Programme has been one of the important land policy interventions in the recent past but its impact on poverty alleviation, production efficiency, conflict management and environmental management could have been better.

3.2.4.0 Major Issues

- Ever shrinking land availability and sub-division of holdings due to: (i) conversion of agricultural land to non-agricultural uses and diminution of Common Property Resources, (ii) rising pace of urbanisation, (iii) increasing demographic pressure and (iv) lack of non-farm employment.
- Unequal and inadequate access to land adversely impacting the production base of cultivating households at the bottom of the farm size hierarchy, especially when over 80 percent of the Indian farmers are small and marginal; alienation of land allotted to poor and *Dalits* has also not been uncommon.
- Unplanned land utilization – underutilization, excessive mining, faulty exploitation causing low productivity and production and exacerbating unsustainability and inequity (defunct Land Use Boards); outflow of land and increased current fallows have hampered availability of land for cultivation.
- Restrictive land markets, anomalies and loopholes in land tenancy laws, concealed tenancy, extremely poor land records and their inaccessibility, lack of congruence among Common Property Rights, Women's Land Rights, Customary Rights of Adivasis / Tribals and Dalit Land Rights, etc; Limited

role of PRIs and Gramsabhas; lack of structural change in agrarian system to operationalise land reforms.

- Changes have taken place in the basis of land reform policy from equity orientation to market orientation in a systematic manner in recent years. The market forces and speculations have further distorted land entitlement of the poor. Policy dialogues have been inconsistent in providing concrete approaches and actions to ensure inclusive economic development and access to production resources.
- Lack of sustained commitment from government and development agencies and disconnect among the concerned Ministries generally adopting short-term project based land use decisions are not only hurting the resources, but are often anti-poor. For instance, new Industrial Policies in some States are proving draconian for land rights of poor and should be harmonised with agriculture and land policies.

3.2.5.0 Policy Implications and Actions

Access to Land, Poverty Reduction and Agricultural Development

3.2.5.1 Rural poverty is strongly associated with poor access to land, either in the form of landlessness or because of insecure and contested land rights. Economic analyses have long recognized the importance of secure property rights for growth, and therefore for the poverty reduction which growth can bring. Increased land access for the poor can also bring direct benefits of poverty alleviation, not least by contributing directly to increased household food security. In an agriculturally important country like India, where alternative employment opportunities are limited, access to land is a fundamental means whereby the poor can ensure household food supplies and generate income. This applies both to societies in which subsistence agriculture is prevalent, where access to land is the *sine qua non* of household food security, and to societies where agriculture is more market-oriented, in which family farming provides a principal source of employment generating the income with which to buy food and to ensure livelihood security

3.2.5.2 The relationship between access to land and poverty reduction cannot be seen in isolation from broader agricultural and economic policy. Equally, these issues are intimately connected with rural development policies and environmental outcomes. The distribution of land rights and opportunities for access to land will have implications for the distribution of wealth, rates of economic growth and the incidence of poverty, and the shape and direction of agricultural development will affect the incomes and returns from different types of farming activity, the value of land and demands for owning or for accessing land resources. The incentives and tenure structures that largely determine how land is used will profoundly affect environmental impacts and sustainability.

3.2.5.3 Despite past and ongoing efforts of reducing the pressure on agricultural lands and lessening of the crowding in and overdependence on agriculture, in the absence of viable alternative employment opportunities, nearly 70 % of the Indian population, a huge number of nearly 700 million people comprising nearly 125 million families, continue to be engaged in agriculture and dependent on agricultural land for their livelihood. Therefore, land policy which must promote inclusiveness and enhanced and sustained agricultural productivity and income should be transparently and effectively pursued. In the meantime, creation of off-farm and non-farm employment should be vigorously promoted. Provision should also be made to exit farming in a phased and confident manner, if desired and warranted.

3.2.5.4 Small farm family farming remains the backbone of rural livelihood, and has been shown to be dynamic, responsive to change, and an important source of investment in agriculture. However, given the context of increasingly globalised markets, sustaining rural livelihoods for smallholder farmers will depend on their continued modernization, with support from policy and resources to strengthen capacity and access to markets. Smallholders must have their property rights secured and protected. This would provide collateral to obtain seasonal or longer-term credit for investment in productivity-enhancing changes or selection of an optimal time to sell the produce; enable them to safely rent out part of the land or rent in other land;

or in the last resort provide the option to sell their land and harness the proceeds to develop new livelihood opportunities.

3.2.5.5 Some critics argue that smallholder farming is inefficient and that the rural poor would be better off leaving the land and finding employment in the modern economy whether in commercial farms or in the non-farm sector (**Box II**). But, considering the ground socio-political realities and continued high dependence on agriculture, lack of alternative employment, and the untapped potential of small farms, "corporatisation" of agriculture is not desirable from any angle. Farmer-friendly contract farming, Small Farmers Estates and other such group mechanisms like National Dairy Development Board (NDDB) milk cooperatives and sugarcane cooperatives in Maharashtra are the viable alternatives to provide desired economies of scale as well as end-to-end linkages. Felda Scheme in Malaysia and Rubber Board in Thailand are success stories of promotion of oil palm and rubber on small holdings and processing in centralized high – tech processing plants in a Nucleus - Estate system, which could be adapted in India.

3.2.5.6 The latest (59th) Round of NSSO released in 2005 revealed that, given a viable alternative, 40 percent of the farmers would like to quit farming. This is not to be considered something highly unusual as most socio-economic transformations have witnessed the declining contribution of and dependence on agriculture and rising contribution of manufacturing (industries) and services sectors to national economies. However, in India the trend is "unusual" in the sense that while the contribution of agricultural GDP to total GDP is now only around 20 percent, the dependence on agriculture for employment and livelihood security continues to be extremely high, around 60 percent, thus adversely affecting the per caput income of agricultural population and further exacerbating the rural-urban income and livelihood gaps (the Bharat-India divide). The only way out of this worsening agrarian economy is to enhance productivity and income of small farms and farmers and diversify employment (rural) opportunities by strengthening production-processing-value addition-marketing-consumer chain under the leadership and control of the farmer and the farming community. The Amul Model of cooperative of the National Dairy

Development Board should be widely adopted in other agricultural subsectors (**Box III**) as well.

Box II. Smallholders Versus Large Farms

There has been long-standing debate about farm size and productivity. Some argue that the era of the smallholder farmer is over, and that for reasons of efficiency, small farms should be consolidated into fewer large holdings, allowing for economies of scale and increased mechanization. They point on the one hand to impoverished peasant farmers on the margins of existence with little ability to generate a surplus for investment in the farm enterprise and limited capacity to adopt new technology, and on the other to profitable large farms, accessing world markets, and providing employment and good wages to the local rural workforce. Others refute such arguments and note that for many crops there are few if any economies of scale in agricultural production. They point on the one hand to dynamic smallholder production, in which innovation and investment are very evident, as people adapt to new market opportunities and changing environmental conditions, and on the other hand to inefficient, extensive large farms with few workers, low wages and poor productivity.

There is ample evidence to support either case, depending on the type of crop, the policy context, and forms of support available to different kinds of farmer. Small farms are generally family-run, may be subsistence-based or market-oriented, using few or many external inputs, working manually or with machinery, and use the land extensively or intensively. Large farms are generally market-oriented, may be family-run like small farms or corporate, and use few if any or many labourers. Both small and large farms may be resource-poor or rich, use largely manual methods or machinery, and use the land extensively or intensively. Because of this great variation in farm types any statements on the relative merits of small versus large farms can only be relevant within specific social, economic and biophysical environments.

Scale economies may be achieved by mechanization in crops such as sugarcane, some cereals and soya, for example, while perennial crops such as rubber, fruit and vegetables tend to do better under intensive production with a significant proportion of manual input. In the absence of economies of scale, small farms may be more efficient than large ones because of the favourable incentive structure in selfemployed farming and the significant transaction and monitoring costs associated with hired labour. In Indonesia, for example, some 80 percent of rubber and resin production and 95 percent of fruits are produced in smallholders tree gardens. But both smallholder and plantation rubber may be tapped by experts, owners or labourers with a direct interest in the sustained latex quality and productivity of the trees in their care, and limited need of supervision.

Even where there may be few economies of scale in production itself, there are increasing upstream and downstream economies of scale related to access to inputs and markets. Purchasers of commodities prefer dealing with a few larger suppliers because of the transaction costs associated with handling produce from a large number of individual smallholders, relegating these to less profitable local market outlets. Such local markets are also under threat where local produce is in competition with food grains, often subsidized, from countries with surplus stocks. However, groups of smallholders may also organize themselves to jointly store, grade and sell their produce to gain access to large buyers.

Source: Lorenzo Cotula, Camilla Toulmin and Julian Quam, January 2006, Policies and Practices for Securing and Improving Access to land

Box III. Empower the Farmer

India's heart and soul resides in her villages. Unless rural India becomes socially and economically free, there will be no true progress. The success of our democracy rests with the rural poor and if we want the rural economy to be liberalised, we must empower our farmers. One of the best ways of achieving this is through co-operatives. Co-operatives comprise a special category of business organisations because their *raison d'etre* is not profits for distant shareholders, but returns to farmers who invest in land and animals.

The merit of the co-operative ideology is the co-ordination and balancing of fundamental principles of equality, democratic control and equality in institutions, and practices to maximise social welfare. It is my firm and unshakeable belief that the entire value chain from procurement to marketing is the sole and exclusive domain of the farmer. The moment the farmer loses or dilutes his right over it, being a small producer, he becomes nothing better than a contract labourer. Value addition in the procurement and processing functions is realised only at the time of marketing. If marketing is not in the hands of farmers' organisations, they will not get a good realisation for their efforts as marketing is the only revenue earning part of the value chain. There is no better way of helping our nation's producers to become productive members of our society.

A case in point is co-operative dairying, based on the Amul model where procurement, processing and marketing is in the hands of the farmers. A massive network, it involves collecting milk from more than 12 million farmers, testing, grading and transporting twice a day from 1,00,000 villages over 10,000 routes to about 180 dairy plants. It is later followed by processing, packing, and sending the milk to the market in almost 800 big and small towns every single day of the year — definitely no mean task in marketing. Delivering wholesome nutrition to the consumers at the most reasonable prices seen anywhere in the world, while transferring the bulk of the value realised back to the farmer is a feat both in marketing as well as in social development.

Co-operatives must be headed by professionals armed with tenures long enough to achieve meaningful changes. An officer deputed with ad hoc powers and subject to sudden transfers can hardly be expected to measure up to the task. As a corollary, no political consideration must colour the policies, objectives, strategies and functioning of a co-operative.

Source: Verghese Kurien, Times of India, 26th March,2006

Land Reform an Unfinished Vital Agenda

3.2.5.7 Both the internal and the external environment of the Indian economy has changed since the first Five Year Plan which emphasized the importance of land reforms. The reform component has been put on the back burner. Questions have been arising as to how important is the ongoing land reform in the present context in which economic policies are driven more by market oriented reforms. There are three

compelling reasons to believe that land reform is even more important today than in the past:

- Land reform is important because the structure of the Indian economy is still dominated by agriculture which provides nearly 60 percent of employment and almost a one-fifth of the GDP. Moreover, hard core poverty still persists extensively in rural areas on an extensive scale which market forces are incapable of addressing. Therefore, both for employment generation and for assault on poverty the issue of land reform has to be faced squarely.
- It is stated objective of the UPA Government that the National Rural Employment Guarantee Programme (NREGP) can be implemented properly only through a decentralized Panchayati Raj system. This scheme can only be successful in reaching the poor if the Panchayats become less dominated by the landed and privileged rural elites. This requires a successful system of land reforms because inequality in land distribution is very often at the bottom of other forms of social discrimination and domination based on gender, caste, minority and tribal affiliation. This requires a new vision of land reforms which would intertwin it with the NREGP. Land reform should also be linked with Bharat Nirman.
- Democratic functioning of our institutions and successful decentralization of Panchayati Raj system is a way forward for the deepening of Indian democracy. This would be feasible only if land reform and significant changes in existing land relations can be brought about to make the pattern of growth more inclusive. Outflow of productive agricultural land, particularly in areas endowed with a strong infrastructural base for agriculture, must be checked through appropriate legal reforms. The decline in CPR should be stopped through suitable regulatory interventions; the legal bindings from the top should be intertwined with political awakening from below. PRIs and other grassroot institutions should play an important role in this direction and should be duly strengthened for the purpose.

3.2.5.8 In view of the above, land reform should be viewed in the entire context of agrarian reforms as ably summed up by D. Bandyopadhyay , "The basic issue in rural poverty turns out to be land reforms, in a sense little more than that resource reform. Resource reform would include land reform per se, community control over water and common property resources, right of forest dwellers and forest based self employed occupations and large measure of gender equity and intergenerational justice. Resource reform is primarily about changing relationships. First, it aims at changing access to land and tenurial relationship. Second, it aims at changing the culture of the exclusion so that the poor can gain access to credit, technology, market and other productive support services. Farmers' suicides in our country only highlight the extent and depth of this culture of exclusion. Third, it aims for the poor to be active participants in the development of policies and programmes affecting their communities and livelihood. Thus Resource Reform would mean – secure access to land/water and secure and fair tenurial relationship plus (+) support services plus (+) participation."

Land to the Landless and Land Redistribution

3.2.5.9 In general, redistributive land reforms have been motivated by three related but distinct objectives:

- To achieve more equitable access to land, so as to reduce poverty and landlessness in rural areas;
- To improve social justice by shifting the balance between different groups in the ownership and control of land and restoring alienated land rights;
- To promote rural development by raising agricultural productivity and creating a class of productive smallholder farmers.

3.2.5.10 These objectives have frequently been combined, but they may also conflict, leading to different types of land reform, targeting the very poor, or alternatively, commercially viable farmers. In particular, whether improvements in equity and social justice also enhance productivity and land use efficiency may depend on the agricultural development model adopted and the wider market context.

Researchers have documented a positive relationship between more equitably distributed land and economic growth. Experience from several East Asian countries (South Korea, Taiwan) shows clearly how a reform delivering more equitable land distribution is fundamental to create sustained economic development, by sweeping away conservative and unproductive land-owning classes, promoting farm modernization, and boosting rural purchasing power and domestic demand to support a growing and competitive industrial sector.

3.2.5.11 The experience of Taiwan and South Korea, where successful land redistribution took place after the end of a major war and under the communist threat, and in the Indian states of Kerala and West Bengal, where land reforms were key elements in egalitarian social change, shows that the success of a land reform programme ultimately depends upon strong political power allied to land reform movements seeking to change the land distribution of the country, and challenging resistance by landed interests.

3.2.5.12 The Government should make all out effort to improve poor people's access to land, as it is crucial for poverty alleviation in some areas. While effort should be made to effectively implement the existing ceiling laws and also to redistribute the ceiling surplus land among landless and semi-landless poor, government should also purchase land from the market and distribute among the land-poor, as being done by some State governments, like Andhra Pradesh (**Box IV**). The large amount of surplus land involved in litigation must be got freed through suitable legislative intervention and distributed to the landless or the near landless households.

3.2.5.13 Government should allocate homestead cum garden plot of reasonable size to all landless families in rural areas, based on either available government land or purchasing land from the market. This will enable the poor landless families to construct house if needed on their own land and also grow some fruit trees, vegetables, rear cows, poultry birds etc. and earn supplementary income. This will also significantly improve their food and nutritional security.

3.2.5.14 While allocating a piece of land to the landless is the foremost step for alleviating rural poverty, the process should be followed up by the major agricultural technology sub-system, quality irrigation, credit system, extension system, seed system, fertilizer system, and marketing system. The main concern is improving the economic level and livelihood security of the poor farmer rather than making a landless person merely a landholder. Positive policy of bringing together various kinds of input supports including technology should be undertaken so that the poor could participate in the development process. The rural banks, NABARD and Land Development Banks should be encouraged and duly equipped for delivering credit, technology and marketing supports particularly to the landless, especially SCs and STs.

Box IV. Increasing Access to Land: The Andhra Pradesh Example

Indira Kranthi Patham (IKP), initiated in 1995 and now operational in 846 of the AP's 1100 mandals, one of the pioneering projects, focuses on the poor women in the State and builds on the State's strong SHG movement to help the poor to achieve tenure security and physical possession of land and empowers them through institution building and enhanced livelihood security. Committees comprising all stakeholders, including officials from the Revenue Department, are handling the matter at State, District and Sub-district levels, undertaking awareness-raising, data management and access administrative support and oversight and legal aid. These (land) non-purchase activities have put 1.2 lakh acres in the hands of the poor within a short period of 18 months.

The land purchase activities of the project assist the landless or nearly-landless poor to purchase and develop small plots of private land and helps the purchaser to access institutional financing for the purpose. With beneficiaries in the driver's seat, IKP, in consultation with the SHGs, purchases land as per pre-purchase business plan and by loaning upto Rs. 30,000 per household to purchase either field plots or house-and-garden plots and to obtain resources for developing these plots, thus factoring in also the costs of improvements and technical assistance. The community coordinators identify the perspective SHGs whose members much meet a set of eligibility criteria and through a direct negotiation between buyer and seller the land is purchased at a price not higher than the maximum set by a Mandal Appraisal Committee. Under this component, in 14 districts purchase of over 2100 acres of land are underway.

Accelerated since October, 2004, the IKP, by August, 2005, had distributed (mostly redistributed) 3.25 lakh acres (85% being government land) to 2.4 lakh beneficiary households with full ownership rights, which were not there before. This was possible through close cooperation among IKP functionaries, Gram Sabhas, the Revenue staff and the farmers. Pattas were given exclusively to a large number of women farmers.

Source: K. Raju and K.A. Vakati, 2005. New Opportunities for Increasing Access to Land: The Example of Andhra Pradesh

3.2.5.15 Positive relationship exists between farm size and degree of under utilization of land, but this gets reduced as capital intensity of production goes up. Therefore, land development grants should particularly be directed towards small farmers in the more developed States while such grants in the rainfed regions might aim at benefiting all sections of the farming communities.

Restoration of Alienated Lands

3.2.5.16 There continues to be widespread dispossession of *Dalits*, tribal communities and other poor from their lands which have been legally allotted to them or should have been in their names. However, there is no official estimate of this and information of the villages where there are a large number of cases. As a consequence there can be no systematic effort by the State to restore possession to the rightful owners. It is essential therefore that a survey be undertaken of all the lands for which SC/ST and other BPL families have a legal right. Collection and compilation of data should be undertaken separately for the SC/ST beneficiaries under various land reform measures. This is the most fundamental task which must be taken up in all the States on a priority basis, since it will provide a base for ensuring the restoration of possession on the one hand, and development including investments on the land and improved productivity on the other. This nationwide survey to be taken up in the States may be supported by the Ministry of Rural Development (Department of Land Resources) and could be coordinated by the Revenue Departments of the States and the Collectors/Deputy Commissioners in the districts could, appropriately, undertake this work.

3.2.5.17 State Governments should strengthen their legal and administrative infrastructure to prevent alienation of tribal land and restore the alienated land to tribals along with plans for productive utilization of such land. On the basis of the survey, a drive for restoration of the possession of lands to the *Dalits* and other poor who have been dispossessed (or never given possession at all) is required to be taken up by the Revenue Departments in the States. This may be commenced, to begin with, in select regions where there are a large number of cases of such dispossession,

and on basis of experience gained, extended to all areas. One Steering Committee should be constituted incorporating the main stakeholders, particularly from the Ministry of Agriculture, Ministry of Rural Development and Ministry of Social Justice and Empowerment to oversee the progress of these issues.

Tenancy Reforms

3.2.5.18 Land tenure security refers to the degree of reasonable confidence not to be arbitrarily deprived of the land rights enjoyed or of the economic benefits deriving from them. Land tenure security is a key part of sustainable development, as agribusiness and smallholders alike need secure tenure in order to invest in the land. Yet, in many parts of the country property rights are weak or unclear, undermined by overlapping land claims and intense competition. This situation creates confusion and fosters tenure insecurity, which discourage agricultural investment and enable elites to grab common lands. Efforts to improve land tenure security have traditionally emphasized large-scale individual titling and registration programmes. Individual titles, a long-standing argument runs, would increase the willingness and ability of landholders to invest, by removing disincentives (as landholders would not invest in the land unless they can be reasonably confident that they will not be deprived of it) and by improving access to credit (as titles can be used as collateral). On the basis of these arguments, titling and registration programmes have been implemented over the past decades in many parts of the country. Land titles, when accompanied with other necessary services and inputs have led to higher land values, greater agricultural investment and higher productivity.

3.2.5.19 In India, land tenancy markets appear to work well, but they face legal hurdles in the shape of tenancy legislation originally intended to protect the interests of the poor: as most developed countries have found, such legislation effectively paralyses rental markets. In different Indian States, land legislation ranges from outright prohibition of tenancies to regulating their terms and conditions. However, implementation of this legislation has led to unintended consequences, driving tenancy underground. The creation of permanent rights for tenants and the outlawing

of tenancy has caused landlords to fear losing their land, limited rental opportunities for land-poor households, and led to the under-utilization of cultivable land and to pre-emptive evictions of tenants before the legislation came into force. The prohibition and excessive regulation of land rental markets tends to restrict land access opportunities, and while clear and secure tenancy rights and the elimination of exploitative practices are important, there is a compelling case for the liberalization of restrictions on both fixed rental and share tenancy contracts. Nevertheless, there remains a case for limited and balanced regulation of tenancy in favour of the poor, providing some measures of security of tenure and curbing the potential for exploitative practices of landlords.

3.2.5.20 The main components of tenancy reform included security of tenure, termination of tenancy, resumption for personal cultivation by the landlord, regulation of rent and confirmation of ownership rights, and the following guidelines were communicated by the Government of India to the State governments for incorporation in the State legislation:

- Security of the tenancy to be conferred on the actual cultivator;
- Fair rent to be fixed between 20 and 25 percent of the gross produce;
- Landowners may be permitted to cultivate land for their personal use;
- The surrender of the tenancy rights with mutual consent;
- In respect of some of the area, the landlord-tenant relationship to be ended and the tenant cultivator be brought directly into contact with the State;
- Disabled persons, defence personnel and other such exemptions to be allowed to lease their land;
- The term "personal cultivation" should be clearly defined if landlords are allowed to remove tenants in order to resume cultivation;
- Tenancy records should be corrected and oral tenancies should be abolished.

3.2.5.21 The guidelines have, however, not been followed uniformly. Many States have banned tenancy, some States have banned only old tenancies as the land has been assigned to the tillers and few States have banned new tenancies only. Thus

there is no uniformity of Tenancy Laws across the States and even there are deviations from the national policy on tenancy (**Annexure II)**. Further, in spite of Tenancy Laws enacted by all the States, their implementation has been dismal. Except 'Operation Barga' in West Bengal where tenants / share croppers were recorded and tenants were given legal status, most other States have done least in this regard. In most States there is no recording of tenancy and in such cases share cropping becomes exploitative. Similarly, absentee land owners do not rent out land for the fear of losing ownership rights or go for informal leasing to the tenants. This also causes inefficient / poor use of the land. On the other hand, access to land by poor has become difficult due to tough tenancy laws, and sometimes, when in dire need, the poor and marginal landholder can not sale his/her land. Wherever tenancy is recorded, the rent is generally not properly fixed according to law and thus the tenants continue to be exploited. Hence, there is a need to examine the State policies on land tenancy and harmonise them as a national policy barring the most critical provisions to be covered under State- specific Acts.

3.2.5.22 Land reform should benefit the actual cultivators who till the land so that the productivity and growth in the agriculture would increase and subsequently, agricultural development will bring forward rural development and overall economic development. In the present scenario of liberalisation, privatisation and globalisation, the land market and the cropping system will be changing. There are already instances of reverse tenancy, contract farming, corporatisation of land, etc. There is a need to have legislation which legalizes the tenancy as an agreement between the owner and sharecropper and both of them should have a right or freewill to cancel it or anull it anytime. Tenure security is thus a major policy issue. To realize the full benefits that can accrue from rental markets, governments need to ensure that tenure security is adequate to facilitate long term contracts, and eliminate restrictions on the operation of such markets, except under special circumstances.

Legalising Land Leasing

3.2.5.23 To ensure equity, efficiency and feasibility, a regulation, which does not come as a threat to the landlords and will also provide security to the tenant, is necessary so that investment comes in, loans come in and there is an increase in the productivity. There is a tendency among the land owners to keep the land fallow rather than leasing it out as they fear that they may loose their land rights. Leasing in and leasing out of agricultural land should be legally permitted within ceiling limits of various States and both the tenant and the owner should have a guarantee of protection of their interests. This will promote occupational mobility of people as well as efficient utilization of land, labour and other resources.

3.2.5.24 A variety of promising initiatives in land leasing by NGOs to facilitate access to land by the poor have emerged. One of the best documented is the work of the Deccan Development Society in leasing out underutilized private land in Andhra Pradesh for use by *Dalit* women on a tenancy basis. Despite the need for small-scale land holders to be free to transact land amongst themselves, experience shows that land sales markets are much less effective than land leasing or sharecropping in providing new land access opportunities for the poor. High transaction costs and lack of access to credit limit the ability of the poor to buy land on the market. Distress sales of land by the poor may also occur, with negative equity outcomes. Nevertheless, the ability to transfer land on a freehold or leasehold basis may create incentives for greater investment and enable use of land as collateral in credit markets.

3.2.5.25 Legalised leasing will be a pro-poor move, as majority of the beneficiaries will be small and marginal farmers, hence should be given high priority. Allowing the lease market to function is good for those who want to lease out their tiny nonviable plot to avail of other opportunities as well as for those who want to supplement their tiny holdings to make them viable. Concealed tenancies are neither good for the tenant nor the landlord. Moreover, informal tenants cannot get loans from formal financial institutions. Studies have revealed that some of the farmers committing

suicides were informal tenants who borrowed from moneylenders and could not pay back because of high interest rates. Legalizing leasing will thus also enhance the access of small and marginal tenants to institutional credit. The move will also eliminate the unilateral fixation of land rent. Further, it is hoped that opening the lease market will attract much-needed private investment in agriculture.

Ownership Rights to Land and Use Rights of Land

3.2.5.26 Land reform has two broad dimensions based on ownership rights to land and use rights of land. In so far as the ownership right is concerned, it is increasingly clear that owners at the top-end of the distribution spectrum often do not accept full time agricultural occupation, nor do they derive their income only from agriculture. In several parts of the country, there has been an increasingly perspective shift in ownership patterns towards neogentlemen farmers and non-cultivating households and non-resident farms. Most land purchases are by these groups and in many respects they have the characteristics of erstwhile rentiers. In some parts of India in which Green revolution had an early start (Punjab, Western U.P.) evidence suggests that near landless farmers have rented out their land to join the category of strict landless groups. While top farmers have also lost, the proportion of small to medium farmers has remained stable. The main lesson to be drawn from this is that alternative possibilities of livelihood must be made available for the now landless peasants. The possible lines of action for coming to grips with the situation are:

1. Redefine self-cultivation and residence qualification;
2. Tighten the ceiling laws in following respects:
    - No further relaxation of ceilings, as there is nothing in technical or factor efficiency argument against this;
    - Allotted and alienated land to be restored;
    - Handing over possession of allotted land;
    - Settlement of court cases and allocation of bhoodan/temple lands to be hastened;
    - Benami transactions / power to reopen closed cases;

- Banning exemptions from agricultural ceiling for land converted to non-agricultural use and for corporate farming; and
- Reduction of ceiling limits to Non-resident Indians and for those who are predominantly non-resident and are non-resident farmers.

3.2.5.27 As regards use rights of land, these should be orchestrated to provide greater opportunities for small farmers. With a view to this, following recommendations mostly related to tenancy or use rights are made:

- Make tenancy relationship open, but record them and regulate security and fair rent;
- Provide access to tenants to agricultural services support and institutional credit;
- Stress use rights in CPRs, degraded wastelands/government land etc.;
- Develop a broader perspective of land consolidation and utilization to enable better land use, greater pooling of services, strengthening and monitoring of SHGs, organisation of small farmer estates, and promotion of cooperative mode of cultivation, joint investment in infrastructure, irrigation etc.

Balancing the Interests of Foreign Investors and the Land Rights of Local Users

3.2.5.28 Land and natural resources are an important sector for foreign investment, in agribusiness, forestry, tourism, mining and petroleum. If appropriate conditions are not in place, natural resource-based investment projects may undermine the ability of local communities to access the resources on which they depend for their survival. This may take the form of expropriation of community lands without adequate compensation and proactive rehabilitation. Investors may also be granted exploitation rights that severely affect the ability of local communities to use their resources, and in many cases, investment projects whether mining operations or large tourism facilities have led to the diversion and pollution of scarce water supplies. While these issues may emerge in relation to both domestic and foreign investments, the involvement of foreign capital in capital-poor countries may affect more profoundly the balance of bargaining power between local resource users and outside investors.

3.2.5.29 In recent years, laws and policies have been adopted to grant local resource users greater tenure security, including in their relations with foreign investors. The legal recognition of collective land rights has been opted in some cases rather than individual titling. In its recent Policy Research Report, the World Bank argues that while the individualization of land rights is the most efficient arrangement in many circumstances, in a number of cases definition of property rights at the level of the group can help to significantly reduce the danger of encroachment by outsiders while ensuring sufficient security to individuals. Indeed, where the primary source of tenure insecurity is outsider encroachment, the best legal response is to recognize and enforce local group rights, and (where it does not cause undue conflict) to demarcate and record certain lands in the name of that group. Above all, awareness and vigil of local communities can greatly help in protecting the CPRs and local natural resources, such as the Chipko Movement in Uttaranchal and stopping of construction of a huge skiing and tourist resort by a foreign MNC in Himachal Pradesh.

Ceiling on Holdings

3.2.5.30 Ceilings on land holdings were imposed to correct the highly skewed distribution of land in the post-independence era. The other economic compulsions were: (i) there was strong evidence indicating an inverse size - productivity relationship, hinting that the aggregate production efficiency is hampered when land is held in large holdings; (ii) there was some evidence that large holders of land left large areas fallow thereby perpetuating uneconomic land use; and (iii) a large proportion of the population were land-based poor who wanted land as an economic resource for their livelihood. It was thought that surplus land could be distributed to such poor people. The land ceilings move was largely to provide social justice and equity and not so much on the grounds of increasing agricultural production and productivity.

3.2.5.31 The main purpose of placing ceilings on landholdings was to detect and acquire surplus land that was above economic holding size and have it redistributed among the landless who require an economic base. However, redistribution failed in most States. Acquiring surplus land was not effective and as the acquisition was

meager the redistribution was also insignificant. This failure was mainly due to the lack of political will and poor management at the village level. The surplus land distributed does not form even 2 percent of the total net operated area, and even this small share was concentrated in only six States (West Bengal, Maharashtra, Andhra Pradesh, Assam, Jammu and Kashmir, and Rajasthan).

3.2.5.32 Yet, the ceiling laws have succeeded in keeping a check on concentration of land in the hands of a few. A large number of experts now agree that the further lowering of ceilings and further implementation of ceiling laws is no longer a feasible option of engendering social equity. Marginalization of the size of holdings, with the proliferation of minuscule holdings, has emerged as a new challenge. The proliferation of small economically non-viable land holdings, a major agrarian handicap, should be stopped through suitable legislative measures.

3.2.5.33 Certain corners have been voicing rolling back land ceiling laws with the argument that the current ceiling limits hinder investment in agriculture and diversification to high-tech agriculture. It is argued that while there are no limits on investment in other sectors why should agriculture face restrictions. It is further argued that economies of scale could be achieved by allowing larger holdings and that large farms would also attract greater investment in the agriculture sector and would generate exportable surpluses and would help to participate effectively in the world market. However, these arguments must be considered in light of the following ground realities:

i. poverty is essentially a rural phenomenon,
ii. nearly 60% of India's population is employed in agriculture,
iii. land, even a small piece of land, is the main anchor of livelihood security,
iv. the unemployment especially in rural youth (and the associated socio – economic tensions) has been increasing and there is limited scope for off-farm or non-farm employment and alternative income, and

v. the lack of access to or entitlement to land and associated resources and generally low agricultural productivity are the main causes of persisting rural poverty.

3.2.5.34 The potential economy must not allow the majority of the rural poor to be further alienated from their main source of survival – the land resource, even a small piece, without providing viable alternative solution. Moreover, as mentioned earlier, family owned small holding farms are more efficient and, if duly supported, can lead to increased aggregate food production, higher level of employment for farm and family labour, higher household food security, improved practices of soil and water resource management and have higher multiplier effects both in rural and urban economy. Thus, the existing land ceiling laws should not be rolled back. However, under certain circumstances, necessited in the interest of the community and majority resource-poor, necessary relaxation may be permitted in case of wastelands. But, the relaxation should not be used to evade income tax or indulging in land speculation.

Land Markets

3.2.5.35 Non-cultivating households tend to buy land mostly as assets or rentiers. The land is used as a "store of value', often with a view to making capital gains from land. As a result, land is not used adequately and efficiently and factor productivity of agriculture tends to be low by international standards. At the other end, land hunger, which is intimately connected with rural poverty, tends to increase, but the high land prices prohibit them to buy land in the open market on their own. The high land prices have, however, induced many marginal farmers to sale off their lands, often without alternative livelihood anchor, thus compounding the rural social problems. Dealing with problems of interlocked markets and correcting market distortions and enhancing land relations is thus an important issue. A massive programme based on a new vision of how the government can ensure that labour is more gainfully absorbed in agriculture and the poorest have some standing in the rural society through ownership of land is needed. In view of this, the following interventions in the land market are essential:

- Long term loans from institutions for land purchase like house purchase for the landless (the IKP experience in Andhra Pradesh, **Box IV**) and making available to them technical assistance to enable them to plough the land in keeping with the needs of productive agriculture and even commercial farming, and providing them with marketing support.
- A systematic programme for conferment of homestead rights and also allotment of homestead for landless poor (The IKP experience in Andhra Pradesh, **Box IV**).
- Contract farming should be redefined precisely indicating how it would protect or enhance the land and livelihood rights of the farmers. Otherwise, it will aggravate instead of solving the problem of agriculture. As discussed earlier, based on equity considerations, promotion of corporate farming through liberalising land ceiling will be generally of little relevance in the Indian context.

Consolidation of Holdings

3.2.5.36 Legislation on consolidation was adopted in some States in order to reduce inefficiency in operations and cultivation. For the most part, these laws and associated consolidation programmes have failed to achieve their goals because of the lack of political will and administrative difficulties. The legislation was difficult to formulate and did not consider the reality of the caste system within the farming communities, and the local processes of politicization. Except in Punjab, Haryana and Uttar Pradesh, consolidation programmes have not made any impact. Given its importance and the extremely unsatisfactory results of this programme, it is essential to evaluate the effectiveness of the legislation and to rethink an institutional solution.

3.2.5.37 Demographic and economic pressures naturally cause fragmentation of land, and marginalization of holdings can be seen as an important outcome of this. The numbers of holdings smaller than 1 ha and especially of those smaller than 0.5 ha have been increasing over the decades. This process causes concern. One successful

approach has been taken by a few groups of small and marginal farmers insome of the States such as Karnataka, Maharashtra Punjab etc. These farmers came together to cultivate a particular crop (strawberries, tomatoes, gherkins, rose or onions) on a contract basis with a price for the produce agreed in advance with the contractor (contract farming). They could therefore overcome the viability threshold to cultivate such investment-intensive crops, but the outcomes were not uniformly successful over extended time and space. These experiments provide an institutional alternative to consolidation of holdings and should be critically researched and promoted as per location-specificity.

3.2.5.38 In the context of globalization, it is clear that the small and marginal farmers are handicapped when it comes to participation in domestic and foreign markets. Their competitiveness is hampered by the crops they produce, by market imperfections and by a lack of access to available information. Other factors that inhibit India's farmers in competitive world markets include the small size of landholdings and low throughput of production. It is difficult for the small and marginal farmers to grow the commodities that are in demand in the world market, mainly because of the high cost of cultivation of these goods and their limited knowledge of them. In order to overcome this problem it is important to encourage farmer-centric contract farming and entrepreneur groups which can take the risk of competing to grow the crops with a domestic and international demand. Contract farming will help efficiently link production, processing, value addition and marketing for small farmers, and deserves a serious attempt.

Integrating Forest, Land and Tribal Policies

3.2.5.39 Forest policy, including the rights of tribal populations, is interactively linked with land policy. Until 1988, forest was considered as the sole property of the State, and State had all the rights to manage and appropriate the revenue generated from forests. However, with the emergence of the concept of joint forest management (JFM) and community forest management (CFM), management and revenue-sharing with the local people (often through Panchayat Raj or similar parallel political

institutions) was considered by many States as a method of involving people and giving them rights on the forest resources. The main emphasis of the 1988 Forest Policy was to arrest forest degradation, retaining as well as enhancing the quality of land use in this sector. The policy also aims to create a partnership between forest dwellers and forest development authorities. The recent Tribal Bill has ironed out some of the limitations of the forest and land use policies and granted following rights to the tribals:

- Right to hold and live in the forest land under the individual or common occupation for habitation or for self cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe;
- Rights such as nistar, by whatever name called, and uses in erstwhile princely States, Zamindari or such intermediary regimes;
- Right of access to, use or disposal of minor forest produce;
- Other rights of uses or entitlements such as grazing and traditional seasonal resource access of nomadic or pastoralist communities,; right of habitat and habitation for primitive tribal groups and pre- agricultural communities;
- Rights in or over disputed lands under any nomenclature in any State where claims are disputed;
- Rights for conversion of Pattas or leases or grants issued by any local authority or any State Government on forest lands to titles;
- Rights of conversion of forest villages into revenue villages;
- Rights of settlement of old habitations and unsurveyed villages, whether notified or not;
- Right to access to bio-diversity and community right to intellectual property and traditional knowledge related to forest biodiversity and cultural diversity;
- Right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving;
- Rights which are recognised under any State law or laws of any Autonomous District Council or Autonomous Regional Council or which are accepted as rights of tribals under any traditional or customary law of any State;

- Any other traditional right customarily enjoyed by the forest dwelling Scheduled Tribes which are not mentioned above but excluding the right of hunting.

3.2.5.40 Implementation and integration of the above Rights and provisions is one of the most pressing areas in the entire agrarian relations and it is perhaps also the area where State policies have been least effective so far. Indeed, tribals are the poorest lot in the country with the lowest human development score. Therefore, it is no wonder that most of the tribal areas in the country are in ferment. The issue of tribal land rights should be taken up on a war footing and the following recommendations are made for this purpose:

- Prevention of land alienation and restoration of alienated land;
- Changes in rehabilitation policy providing land for land, and means of livelihood and not just livelihood compensation; ensure stake for displaced persons in future prosperity;
- Empowerment of tribal community for command over its resources and ancestral domain; and
- Large scale bids for mineral resources should be carefully examined with a view to protecting tribal domain, and appropriate policy of resettlement and rehabilitation of displaced cultivators should be formulated and effectively implemented.

3.2.5.41 Refocusing of management decisions to a more decentralized level of governance and people involvement in these decisions is a major paradigm shift in the Forest Management Policy. As highlighted in a recent FAO- supported study, the JFM system in India needs to be further transformed towards the sustainable development of the community living in and around the forested regions by integrating forest management with sustainable rural development. The study has suggested the following model **(Figure 1)** for management of non-timer forest

products (NTFP) and of forest in general for sustaining livelihood and long-term conservation.

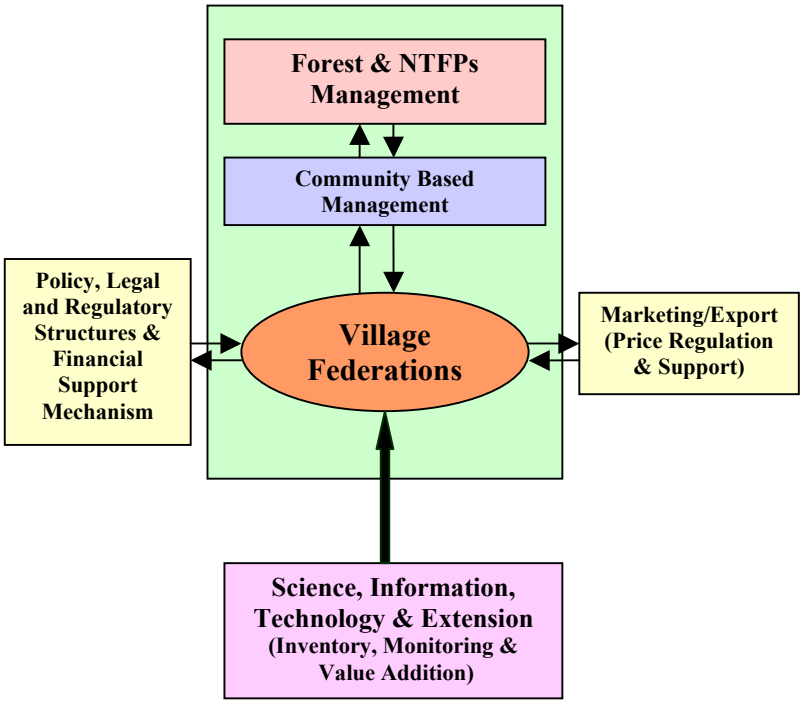

Figure 1. A Conceptual Model for Management of NTFPs and Forest for Sustaining Livelihood and Long-term Conservation

Source: Exploring Options for Joint Forest Management in India; Forestry Policy and Institutions Working Paper No. 7, FAO.

3.2.5.42 As indicated in thee figure, the community assumes the central role in steering all the development processes and the government provides supporting services. The role of the local communities (the central large rectangle in the Figure) are as follows:-

- Led by Panchayati raj institution and other grassroot peoples' organisations, development of local institutional and organizational capacity to undertake development planning and mobilizing local and external resources; provision of health care, drinking water and education;

- Establishment of councils/cooperatives for protection and management of existing forests; creation of new (commune owned) forests in deforested and degraded lands to meet their current and future needs;
- Decentralization of the decision making structure to local level; setting mechanism for inter-departmental cooperation and promoting participation of NGO and local people in the decision making process; recognition of the value of local production systems and cultural diversity; and
- Promotion of local processing of forest-products and their marketing through village cooperatives; development of partnership with private sector and NGOs.

3.3.5.43 The government is required to provide the following support:

- Establishment of legal, regulatory, conflict resolution and enforcement structures for the management of forest and common land resources; mechanism to redirect a part of revenue to the local community from the management of forests and to compensate them for the loss of revenue due to closure of area for regeneration or other technical reasons;
- Organization of science; information, technology and extension (SITE) services to support planning, monitoring and evaluation of forestry development and poverty alleviation programmes and periodic reporting on the state of poverty, progress achieved and constraints in the way;
- Marketing, processing and value addition: In case of NTFPs, there is market failure as well as institutional failure. There are possibilities for private-public-partnership (PPP) in cultivation, processing, value addition and marketing of timber as well as non-timber forest products, which should be harnessed.

The proposed community-government congruence is bound to synergise social, economic and ecological security of forests, forest-dwellers, tribals and other people around forests.

Integrated Coastal Zone Management

3.2.5.44 Coastal zone is defined as an area from the territorial waters limit (12 nautical miles) including its seabed upto the landward boundary of the local self government abutting the sea coast. Coastal zone also includes inland water bodies influenced by tidal actions including its bed and the adjacent land are upto the landward boundary of the local self-government abutting such water bodies. In case of ecologically sensitive areas, the entire notified area/biological boundary of the area will be included in the coastal zone.

3.2.5.45 Coastal environment plays a vital role in nation's economy by virtue of the resources, productive habitats and rich biodiversity. India has a coastline of about 7,500 kms and nearly 250 million people live within a distance of 50 kms from the coast. The coastal zone is also endowed with a very wide range of coastal ecosystems like mangroves, coral reefs, sea grasses, salt marshes, sand dunes, estuaries, lagoons, etc. which are characterized by distinct biotic and abiotic processes. The coastal areas are assuming greater importance in recent years, owing to increasing human population, urbanization and accelerated developmental activities. Over 25% of India's population will live in coastal areas. These anthropogenic activities have put tremendous pressure on the fragile coastal environment. An integrated and ecologically, economically and socially sound and sustainable coastal zone management system should be put in place jointly by government agencies and coastal communities.

3.2.5.46 A Committee was appointed to Review the Coastal Regulation Zone Notification 1991, by the Ministry of Environment and Forest, Government of India, under the Chairmanship of Prof. M.S. Swaminathan. In its Report, February, 2005, the Committee had identified need for extensive micro-surveys to critically assess the socio-economic and ecological assets and liabilities in the coastal zone and suggested that until the micro-surveys are completed the country should strictly adhere to the current rules of CRZ Notification 1991. The recommendations of the Committee for the setting up of a National Board for Sustainable Coastal Zone Management alongwith its supporting professionally-led institutions should be accepted and

promptly acted upon by the Ministry of Environment and Forests jointly with other concerned Ministries and Departments. The proposed public policy facilitation institutions should develop also the capacity for fostering professional conflict resolution mechanisms. They should also develop expertise in ecological economics as applied to the coastal zone. Above all, they should spearhead an ecological literacy movement through ICT based Rural Knowledge Centres.

Rehabilitating Wasted and Degraded Lands

3.2.5.47 Defining degraded lands, the National Remote Sensing Agency (NRSA) for the Department of Land Resources states: "Degraded lands (are those) which can be brought under vegetative cover with reasonable effort, and which are currently under-utilized and land which is deteriorating for lack of appropriate water and soil management or on account of natural causes. Wasteland can result from inherent/imposed disabilities such as by location, environment, chemical and physical properties of the soil or financial or management constraints."

3.2.5.48 There is a great deal of inconsistency in information about land degradation and on size of cultivable waste land available from different sources (**Annexure V**). It is generally agreed that the cultivable waste together with fallow lands cover about 55 million ha. and forest wasteland account for additional 35 million ha. With the increasing emphasis on agro-forestry and with faithful implementation of Joint Forest Policy and the recently passed Tribal Bill, there is ample scope for integrating the development plans of the Forest Wastelands as well as the cultivable agricultural wastelands through participatory micro-planning and programme implementation by grassroot communities and institutions, including Panchayati Raj Institutions, comprising Programme Implementation Agencies (PIAs). As the wasted lands are likely to be owned either by the Government or private parties or communities, PIAs should ensure participation of all stakeholders in a consortium mode.

3.2.5.49 As seen from **Annexure VI**, both natural and manmade factors and their interactions cause land degradation in varying proportions in different agro-climatic

zones, and have assumed serious dimensions in many parts of rural India. Degradation caused and accelerated by human action is more extensive than the one caused by natural factors. The Himalayan region, Peninsular Plateau and Hill Regions are more exposed to this malaise. In terms of popular perceptions, degradation caused by human action could be attributed to sheer poverty of the farming community or to the spillover damages of one or the other type of development activities. While the extent of poverty did exert a significant negative impact on the level of degradation, there was a rather insignificant relationship between development-related factors and land degradation. The resource variable such as net sown area and forest cover also seem to have a significant and inverse relationship with degradation. This, among other things, indicates the importance of such resource variables in enhancing soil quality, increasing fuel-fodder and food production and reducing the compulsions of the farmers to 'mine' the land in an unsustainable manner. The results also strengthen the need for viewing land degradation from the users' perspective.

3.2.5.50 It is clear that land degradation is a localized problem and depends not only on the agro-climatic and socio-economic conditions of the region but also, and perhaps more importantly, on the farmers' access to assets. The livelihood strategies of the poorer farmers are indeed quite different from the profit-maximizing approach of the large and rich farmers. For the land-poor, the available scarce land resource is the very foundation on which their sustenance stands. On the other hand, the land rich usually go more by short term profit gains, possibly because they can afford to overlook and absorb a certain degree of deterioration in the quality of their land.

3.2.5.51 In face of the declining per capita availability of cultivated land on one hand, and the prevalence of large and expanding areas of cultivable waste land, on the other, new policies and action are called for rehabilitating and judiciously utilizing the degraded lands consistent with socio-economic acceptability and technological capability. It is important to build a reliable data-base on the temporal profile of land degradation. Definition and categories of wastelands should be standardized and uniformly adopted by the data collectors, planners and policy-makers. The Himalayan and the Peninsular regions are among the most susceptible regions prone to land

degradation. While watershed programmes extensively cover the latter, the same is not true for the former. There is thus an urgent need to initiate specific land development programmes for the mountainous agro-climatic zones based on watershed approach.

3.2.5.52 Rehabilitation of degraded lands can be achieved primarily through micro-watershed based approach. But, the watershed development programmes have only partially been successful in the northern States. The relevant issue that needs to be addressed in this context is how the polarized and heterogeneous rural communities, a characteristic feature of north Indian plains, can be brought together for a meaningful collective action. The philosophy of the watershed programme is inherently linked with the empowerment of rural communities living within the watershed. Full participation of the communities led by Panchayati Raj Institutions and duly supported by NGOs, is essential.

3.2.5.53 The external assistance for implementing the programme agreed by a participatory approach should directly reach the concerned community/local-level functionaries. After the launcing of the programme, the role of the government and NGOs should be restricted to its mid-term monitoring and evaluation. The success of the land rehabilitation programmes is closely related to an authentic and workable formulation of legislation clearly defining the ownership of natural resources like common grazing land, forest cover and water resources within the village boundaries. In particular, the concept of stakeholders' participation needs to be operationalised through such legislative measures.

3.2.5.54 The land rehabilitation and management policy should be seen as an integral component of the National Land Reform Programmes and in convergence with other related activities it should promote institutional framework that would encourage the productive utilization of land by synergizing the inputs of all concerned Ministries and Departments. The Tenth Plan had emphasized on:

i. Participatory land and water conservation based on a micro-watershed approach;

ii. Involving corporate sector in restoring wastelands and reclaiming degraded lands, with sharing arrangements on public lands while encouraging farm forestry on private wastelands;
iii. Channelising greater resources for the development of wasteland through the involvement of financial institutions;
iv. Capacity building of various stakeholders through training programmes and awareness campaigns;
v. Creation of a comprehensive land use database by using latest technologies in consultation with the local people to capture the ground realities; and
vi. Delineation of "hot spots" of land degradation and using successful experience, undertake participatory microplanning and reclamation measures consistent with agro-ecological and socio-economic settings.

3.2.5.55 The above thrust areas of action are equally valid even today and will remain so at least in the short to medium terms. However, the involvement of the corporate sector should be planned and monitored carefully and critically, particularly keeping in mind the interest of landless and near-landless agricultural families. Linking with the Bharat Nirman and National Rural Employment Guarantee Programme, the landless and near-landless people could be engaged in the reclamation process and such reclaimed lands could be distributed to them individually or in groups (keeping in mind both equity and economies of scale) under an arrangement which will ensure end-to-end approach. The corporate sector could also be allotted adequate area of the land it must have helped to reclaim and serve a " nucleus" whereas the small holders will serve as " estates" under a "Nucleus-Estate: (NE) system to promote cost-effective and competitive "mass production by masses" and *not* "mass production by machines."

3.2.5.56 Depending on agro-ecological capacity and socio-economic viability, the Nucleus–Estates could specialize in specific production-processing-distribution chains *viz* bio-energy plantations, medicinal plants and botanicals productions, agro-pastoral-based livestock production, etc. The Land Use Boards, the Waste Land Development Board, the various Watershed Development Programmes and other

such National, Regional and State level initiatives must congrue together and coordinate their efforts under one umbrella. Since bulk of the degraded and wasted lands are in rainfed areas, particularly arid zones, the recently announced National Rainfed Area Authority could play the archestrating/coordinating role.

3.2.5.57 Permanent pastures, grazing lands, village forests, village ponds and, most important, ground water constitute important common property (CP) resources. The Common Property Rights on these resources are extremely important for the landless and the land-poor households for their sustenance. In the absence of clearly defined rights and institutions for management of these resources, often being no man's land, these are over-exploited and left uncared for. These resources are also encroached upon by rural power lobbies, thus excluding the poor from utilizing them - often the only resource which they could fall back to. While in most States area under common properties has decreased, in some States like Punjab and Maharashtra, despite the increased demographic stress on agricultural land, area under CP resources has increased. Panchayati Raj and other grassroot institutions should determine the size and delineation of CPRs in each village or group of small villages and mange them sustainably especially to support livelihood security of landless and land-poor people. Appropriate rules should be established and adhered to use the rights judiciously for utilizing and conserving the CP resources and for sharing the products derived from these resources.

Land Records and Title

3.2.5.58 An appropriate system of guaranteeing land title and tenure security is essential for growth and poverty alleviation in rural areas. The system can be built only on accurate and valid record of land rights. Therefore, government should strengthen land administration and develop an appropriate system of guaranteeing land title and land tenure security. The Common Minimum Programme of the National Government (NCMP) states, "Revenue administration will be thoroughly modernized and clear land titles will be established". If fulfilled, this will virtually

transform the landscape, economically, politically and socially - there can be no empowerment of the community without entitlements.

3.2.5.59 In fact, a Centrally Sponsored Scheme on Computerization of Land Records (CLR) was introduced during the Seventh Plan Period with 100 percent financial assistance from the Central Government for pilot projects in a few selected districts. The main objectives of the scheme were to: (1) computerize ownership and plot-wise details for issue of timely and accurate copy of the Records of Rights of legal sanctity to the landowners; (2) achieve low-cost, easily reproducible storage media for transparent and reliable long-term land information system; (3) provide fast and efficient retrieval of textual and graphical information; and (4) create a Land Information System (LIS) and database for the agricultural census to facilitate planning and monitoring.

3.2.5.60 The scheme has been operational for the last 15 years, but barring 5-6 States, the progress in most States has been slow. Many bottlenecks are also emerging in the process, including: (1) delayed transfer of funds to the final implementing authority in the field by the State governments; (2) a delay in the development of appropriate software tailored for the specific requirements of different States; (3) a lack of adequate training facilities to the revenue staff who handle computers in the field areas; and (4) unavailability of private vendors to enter data. In addition to these, an administrative system for the computerization has not been clearly set up. It is operated under the State-government revenue departments, sometimes with only partially trained staff. Therefore, a quantum change in this process is needed.

3.2.5.61 The existing scheme “Computerisation of Land Records (CLR)”, should be expanded to integrate title and deed registration, leading to clear titles. To realise this convergence, State Governments should transfer Registration and Stamps to the Revenue Departments. Each State should institute a single, integrated, professional agency for preparation and updating of land records using modern technology, dispensing with the use of stamp paper and providing comprehensive land records, including title, on the Website which could be viewed by all. The “computerised”

land records should be legalised, on the lines of Karnataka's "Bhumi" programme and a few other such initiatives. The Centre should provide bulk of the financial resources for the purpose. Further, officers heading this project should have stable tenures.

3.2.5.62 Village Knowledge Centres or Kiosks should be established at appropriate and accessible-to-all sites, such as at Gramsabha's or Panchayat's premises or at agriclinics following a public-private–partnership approach. Capacities of Panchayat Raj institutions should be strengthened by training concerned personnels, including women, at each centre/kiosk whose connectivity with Sub-Divisional, Tahsil, District and State levels should be ensured. On a sharing basis, 75% from Central government and 25% from State government, training institutes on land records should be established in each State. In initial stages, the operational expenses should be provided by the Centre.

3.2.5.63 A Monitoring and mid-course correction system should be jointly instituted by Central and State governments to undertake and encourage social audits and peer reviews to check the quality of land records available on the Website and functioning of the system at Panchayat and higher levels. While Panchayats should be empowered for the overall management of land and other natural resources, the Panchayati Raj institutions and other rural institutions doing well in land record management should selectively be supplemented with additional financial resources and administrative powers.

Women's Rights to Land

3.2.5.64 Women constitute a large portion of the economically active population engaged in agriculture, both as farmers and as farm workers, and play a crucial role in ensuring household food security, despite enjoying very limited rights to land. The role of women in agricultural production has increased in recent years as a result of men's migration to urban areas and absorption in non-agricultural sectors. However, in many parts of the country, women have little or no access to resources such as

land, credit and extension services. Moreover, women tend to remain concentrated in the informal sector of the economy. In plantations, they often provide labour without employment contracts, on a temporary or seasonal basis or as wives or daughters of male farm workers. Although land and natural resource legislation tends to be gender neutral or to explicitly prohibit sex or gender discrimination in relation to land, it is scarcely implemented in rural areas.

3.2.5.65 Women's unequal access to land is one of the main causes of gender inequality and socio-economic hardship to women, and consequently to the entire society. The absence of land titles prevents women farmers from accessing credit. Enhancement of women's rights and entitlements to land will greatly boost rural economy, poverty alleviation and livelihood security. The following policy actions are suggested to enhance women's ownership and control over land:

- Ensure the recording of women's inheritance shares by the patwari in all land records. In cases where women own land (via any means), ensure that their names are entered in the corresponding land record.
- Land distribution by the government must be done equitably and titles to women should be clearly recorded.
- Help women, individually or collectively in groups, with managing and purchasing assets and leasing land and other associated assets. Enhance access of women groups to village common lands and village forests.
- In recognition of the instrumentality of women's agency in co-managing Commons for subsistence use, policy and legislation should ensure that women be recognized as co-owners and inheritors wherever they reside, irrespective of their marital status.
- Promote group-based production activities related to application of women owned lands such as group-farming by groups of women, group-seed production, or joint management of fish ponds, poultry farms or animal husbandry.

- Enhance women farmer's infrastructural support, credit access, information support, and marketing cooperatives support. Create special risk funds to provide insurance coverage to women-headed farm households for crop failures caused by lack of rain, drought, and damage by wildlife and landslides.
- Develop and support training programmes for government officials and raise awareness at all levels of relevant legislation on women's right to land and resources. This can be done through radio and TV, for example special programmes could be relayed on the issue of women's right to land, and by inserting information messages in slots between news programmes.
- Devise the collection of gender-disaggregated data on land and households in all major government surveys, National Sample Survey, and Agriculture–related censuses. Conduct and widely disseminate, findings of research studies on the correlation between women's land and property ownership with overall well being of women.

3.2.5.66 The Hindu Succession Amendment Act, 2005, passed by the Parliament bears heavily on rights to land ownership for women, especially in context of the increasing feminization of agriculture. The National Commission on Farmers, in collaboration with the M.S. Swaminathan Research Foundation had organized a Consultation on this subject which had made several useful recommendations (**Annexure IV**).

3.2.5.67 The concerned Ministries and Departments at Central and State levels particularly the Ministries of Rural Development, Planning, Law, Tribal Affairs, Panchayati Raj, Agriculture and Environment and Forests should effectively implement the various recommendations of the above-mentioned Consultation and the Ammended Act. For instance, the National Planning Commission, in close consultation particularly with the Rural Development Ministry, should incorporate targets for redistribution of land to women with secure legal rights, including rights to forest land and agricultural land within the 11th Plan, and include land reform and

redistribution and protection of existing land rights as indicators towards poverty mitigation.

3.2.5.68 The Administrative Departments should promote the formation of community-based women's collectives and support groups beyond self help groups (SHGs) to deal with violence and to promote women's property rights. The role of Panchayats to address these issues should be promoted. Awareness-raising programmes should be developed about women's legal rights to land and resources and gender sensitive government programmes among men, women and children in India's villages, small towns and elsewhere. The government and programmatic staff should have legal literacy on the subject

3.2.5.69 Government schemes should be initiated to enable women to lease land collectively by forming groups, with the mandate that the land would be used for collective economic activity (crop cultivation, poultry or animal husbandry) on long-term leases, as in Bihar for fish ponds and in Tamil Nadu for wasteland development. This will assist in increasing women's assets through strengthening skills, knowledge, bargaining power, and access to new technologies. Such initiatives should be linked with Bharat Nirman, National Rural Employment Guarantee Programme, JTY/SGSY and other initiatives of the Ministry of Rural Development.

3.2.6.0 Summary Policy Recommendations

Land Reform at the Centre of the Country's Development Agenda

3.2.6.1 Land is an asset of enormous importance for over 600 million of rural dwellers in India. The nature of rights and how strongly they are held vary greatly, depending on competition for land, the degree of market penetration and the broader institutional and political context. The picture is diverse and complex between States. Nevertheless, certain generalizations can safely be made. Pressure on land is set to increase over future decades, given the impacts of continued population growth, globalization of markets and activities, and climate change.

3.2.6.2 As a resource becomes scarcer and more valuable, those with weak rights to this resource will tend to lose out. In the case of land, particular groups tend to be more vulnerable to such dispossession, including the poor, those in peri-urban areas, indigenous people, women, those relying on common property resources, and those in areas of conflict. A lack of attention to land tenure and security of land rights also risks hampering growth by discouraging local and foreign investment, because of the perceived risks involved where property rights are poorly secured.

3.2.6.3 Land policy in post-Independence India has evolved through different phases. These include: land reforms (tenurial rights, land ceiling, land distribution and land consolidation), land development, including Wasteland Development and Integrated Watershed Development Programmes and lately land administration, land records and titles, land leasing and land markets. The policy interventions have had varying impacts on poverty and the overall development process. The land-reform measures have generally positively impacted equity and poverty reduction. The measures dealing with the quality of land have a partial to significant impact on environmental parameters. In addition to these, theland-policy instruments were instrumental in transforming other development policies.

3.2.6.4 Land reform must therefore be seen as a part of the wider resource reform programme in rural areas and land access should be mainstreamed within the national development agenda, especially the poverty reduction programme. It should ensure secured access to land and water, secured tenurial relationship, support services and a high degree of participation by the poor in collective decision-making under Panchayati Raj Rule. A programme of rural resource transfer would encounter strong resistance not only from the rural elite but also from interests that want to promote agro-business, corporate agriculture and multinational interest in mineral resources often located in tribal areas. A strong political will is needed to implement the various measures, which must be duly monitored and kept progressing at the desired pace. We must recognise that “land reform is not only in the interest of those who have nothing but also in the interest of those who have something to lose.”

Key Areas for Urgent Action

3.2.6.5 The key areas for future land policy action include legalizing the tenancy market, land leasing, contract farming, and improving efficiency and effectiveness of integrated watershed and wasteland development to assume greater significance, and streamlining and updating land records, rights and administration. Such interventions involve internalisation of issues relating to the political economic aspects of the reform measures including institutional reforms.

3.2.6.6 Legislations and their thoughtful and timely implementation are needed to:

- Check the outflow of prime agricultural land which is endowed with necessary infrastructures for high and sustained agricultural productivity (irrigated land).
- Arrest fragmentation and minusculing of land holdings to promote self-reliance and to ensure livelihood security of farm households.
- Redefine self-cultivation and resident qualification to ensure transparent tenancy rights
- Strengthen rights to lands and use rights in the following respects:
    - No further relaxation of ceilings, nothing in technical or factor efficiency argument against this.
    - Allotted and alienated land to be restored.
    - Handing over possession of allotted land.
    - Settlement of land dispute court cases to be hastened, and Bhoodan and temple land and the freed land to be distributed to landless.
    - Quash benami transactions / and grant power to reopen closed cases.
    - Ban exemptions from agricultural ceiling for land converted to non-agricultural use and for corporate farming.
    - Reduction of ceiling limits to Non-resident Indians and for those who are predominantly non-resident and are non-resident farmers.

3.2.6.7 Make tenancy relationship open, and increase tenants' access to agricultural support institutions, such as technology, credit, etc. and repool resources through creating Self Help Groups (SHGs), Small Farmers' Estates (SFEs),and rural cooperatives on NDDB pattern.

3.2.6.8 Appropriate policies are also needed to provide long-term institutional loans to landless and near landless for purchasing land and also to provide them technical assistance to efficiently manage the land and assist them with marketing support. Further, allot them homestead plots to increase their nutritional and livelihood security.

3.2.6.9 The recent Tribal Bill, which elaborates their rights to land use, should be integrated with the National Forest Policy to create a synergistic partnership between forest dwellers and forest development authorities. Large-scale bids for mineral resources should be carefully examined with a view to protecting tribal domain and to ensure proactive resettlement and rehabilitation of displaced persons.

3.2.6.10 Emphasise decentralised governance and decision-making, particularly in Forest Management Policy, and Community Forest Management should become the order of the day. Under this arrangement, the community should assume the central role in steering the development process and the Government should provide services, regulations, and protection to the weaker sections.

3.2.6.11 An integrated and ecologically, economically and socially sound coastal zone management system should be put in place jointly by the Government agencies and coastal communities. As recommended by the Swaminathan Committee, 2005, a National Board for Sustainable Coastal Zone Management alongwith its supporting professionally-led institutions should be established by the Ministry of Environment and Forests in close association with other concerned Ministries/Departments.

3.2.6.12 Women rights to land, especially those enunciated in Hindu Succession Amendment Act, 2005, should be strictly implemented.

3.2.6.13 In order to augment availability of cultivable land, new policies and actions are called for rehabilitating and judiciously utilizing the degraded lands consistent with socio-economical acceptability and technological capability. Reliable data bases on the temporal profile of land degradation is urgently needed. Micro-watershed based development of such areas should be given high priority, particularly in the Himalayan and the Peninsular regions which are highly prone to land degradation.

3.2.6.14 Although proposed in the 10th Plan, the involvement of the corporate sector in the management of waste and degraded lands should be monitored carefully and critically. Linking with the Bharat Nirman and National Rural Employment Guarantee Programme, the landless and near-landless people could be engaged in the reclamation process and such reclaimed lands could be distributed to them individually or in groups (keeping in mind both equity and economies of scale) under an arrangement which will ensure end-to-end approach. The corporate sector could also be allotted adequate area of the land it must have helped to reclaim and serve as a "nucleus" whereas the small holders will serve as "estates" under a "Nucleus-Estate" (NE) system to promote cost-effective and competitive "mass production by masses" and *not* "mass production by machines." The Land Use Boards, the Wasteland Development Board, National Rainfed Area Authority and other concerned bodies should synergise their efforts in rehabilitating and effectively utilising the degraded lands.

3.2.6.15 Panchayati Raj and other grassroot institutions should determine the size and delineation of CPRs in each village or group of small villages and manage them sustainably especially to support livelihood security of landless and land-poor people. Appropriate rules should be established and adhered to use the rights judiciously for utilizing and conserving the CP resources and for sharing the products derived from these resources.

Key Research Areas

3.2.6.16 Comprehensive research is needed to generate reliable information to guide adjustment in or formulation of new appropriate policies. The research areas may include: (i) understanding of the underutilization of land, the causes behind increase in current fallows and around the urban centres, (ii) analysis of the land-lease market; who leases from whom, under what terms and conditions and under what set of circumstances; the role of the caste factor; the economies of scale in production; the response to new technologies and trade opportunities, (iii) how are the land-credit or land-labour or land-credit-product market interlocking and shaping themselves, especially under contract farming? and (iv) how can the initiation, and sustenance of peoples' participation in land development programmes, especially the role of PRIs and other grassroot institutions, can be ensured?

Adjust Mechanisms for Land Redistribution and Distribution

3.2.6.17 Promoting rational access to land, especially where it is highly skewed, is crucial for social justice, political stability, rural development and peaceful co-existence. Large areas under prolonged litigations should be freed and restored soonest to the genuine title holders. Reclaimed and other available lands, such as temple lands, should be brought under dynamic and effective land redistribution programmes. The appropriateness of the ongoing mechanisms should be assessed. A menu of options may be the most viable approach. Provision should also be made to exit farming in a phased and confident manner, if desired. The policy of distribution of land to individual households for cultivation or house sites needs to be balanced with the need to preserve common lands in each village and community rights in these. Gram Sabhas should oversee this activity rather proactively.

Improve Land Administration and Land Tenure Security

3.2.6.18 Simple and inexpensive methods to bring together existing records and make them open to the public are essential in establishing transparent and corruption-free administration of land and property rights. Outdated, inefficient, incomplete and

inaccessible land registers and land administration systems generate conflicting claims and fuel disputes. In recent years there has been considerable innovation in this regard. One welcome shift in mainstream thinking has led to less emphasis on formal individual land titling as the essential tool to secure rights, in favour of a broader range of interventions according to cost and context. There is a need to:

- develop and disseminate a range of tools for improving land tenure security and delivering low-cost land titles (including group titles) appropriate for different groups and circumstances, paying special attention to the specific land tenure security needs of poorer and more vulnerable groups;
- systematically support democratic land institutions and land information systems that are decentralised and problem centred, and make links with existing indigenous and customary mechanisms for managing land; and
- improve access to appropriate and comprehensive systems of land dispute resolution incorporating formal, alternative dispute resolution (ADR) and customary procedures.

Capacity Building to Implement Agrarian Reform

3.2.6.19 New approaches to land policy require investment in essential skills including surveying, land registration, land use planning, land law, valuation and community-based planning and management. This calls for supporting opportunities for professional development, lesson sharing and capacity building, including at the university level, in centres of excellence and through learning networks of policymakers, practitioners and civil society. Building the capacity of citizens to use the opportunities offered by the law is of great importance to bridge this gap. Measures may include awareness-raising campaigns to disseminate information concerning land policies and laws, such as legal literacy programmes for women and vulnerable groups. The Village Knowledge Centres could particularly be helpful in this regard.

Strengthen Civil Society Groups and Networks

3.2.6.20 Supporting civil society initiatives at local, provincial and national levels is a vital element of enabling government to identify effectively and develop appropriate policies in support of improved access to land. The distribution and management of land has important political aspects. Capable and well-informed civil society organizations can play an important role in informing, and in providing checks and balances on government decision-making and the development and implementation of land policy. Exchange of experience through networks of civil society organizations, and analysis and research linked to action planning can also promote the development of appropriate land policies.

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Annexure I

Land policy formulation through planning period

Plan period	Major issues	Policy thrust
First Plan 1951-56	Area under cultivation to be increased. Community development (CD) networks to take of the village commons. Vast uncultivated lands locked under large sizes of holdings.	Land reforms to bring in the fallow under cultivation and increase land use efficiency. Tenant to be given the rights to cultivate land. Abolition of intermediaries.
Second Plan 1956-61	Concern about vast rainfed agriculture, low land productivity and thrust on irrigated agriculture	Soil conservation as an important programme. First phase of land reform implementation. Irrigation development for the rainfed areas. Training and extension work for the technology through CD.
Third Plan 1961-66	Food security concern dominated. Cultivable wasteland to be brought under cultivation. Bringing the lagging regions under mainstream growth.	Area development as an approach. Intensive area development programme adopted for selected districts. An integrated land policy approach was inherent. Soil surveys were taken up.
Fourth Plan 1969-74	Emphasis on food security continued as minimum dietary requirements to be met. Incentives were created for diversion of land towards food crops and enhancing the capacity of such land. Domination of large holding sizes and low allocation and technical efficiency.	Increased emphasis on irrigation and soil conservation in dryland regions and technological change introduced. Higher cropping intensity the main concern. Second phase of land reforms with land ceiling acts and consolidation of holding. Institutional changes brought in.
Fifth Plan 1974-79	Problems of degradation land management in irrigated command areas surfaced. Drought-prone areas attracted attention	Drought-prone area development. Desert area development programmes, and soil conservation started and further enhanced. New impetus to dry farming.
Sixth Plan 1980-85	Underutilization of land resources. Drought-prone areas continued to attract attention. Attention lagging areas of the background of green	Land and water management programme under drought-prone area programme in selected areas.

	revolution required cultivation.	
Seventh Plan 1985-90	Soil erosion and land degradation surfaced as major issues. Land going out of cultivation. Deforestation and degradation of forest lands.	Soil and water conservation and averting land degradation. Specific attention to degraded lands. Wastelands Development Programmes. Long- term view of land management.
Eight Plan 1992-97	Dryland and rainfed areas requiring attention. Degradation of land in irrigated command areas. Peoples' participation surfaced as major issue in land management at village level.	Emphasis on watershed approach. Soil conservation merged with watershed programmes. Agroclimatic regional planning approach incorporated.
Ninth Plan 1997-2002	Land degradation increased significantly. Integrating Watershed Development Programme across various components. Rethinking on land reforms. Gap between potentials and actual crop yields need to be bridged. Need for a long-term policy document.	Bringing the underutilized land under cultivation. Management of wastelands. Maintenance of village commons. Decentralized land management system. Panchayat Raj institutions to manage the village lands. Rethinking on land legislation.
Tenth Plan 2002-2007	An ever-increasing human and animal population pressures have let to drastic changes in the proportion of land utilised for agricultural activities, urbanisation and industrial development. Intensive agricultural practices have caused widespread land degradation adversely impacting various production systems. These areas correlate very strongly with the incidence of poverty in the country, Integrated Watershed Management approach widely promoted to increase productivity and sustainability of such areas has performed below expectation.	On a micro-watershed basis, involve corporate sector and financial institutions restoring and utilising wastelands, build capacity through training and creation of databases, and high priority to "hotspots" and critical interfaces to avoid irreversible damage to the ecosystem. The correction and computerisation of land records, improving the land survey processes and revisiting the earlier land-reform interventions, such as land ceiling and tenancy restrictions are other thrust areas.

Source: from various plan documents. These are not exhaustive statements but only indicative of the thrust. Gaps in the plan periods were annual plans and full plan documents could not be prepared for these gaps (as given in R.S. Deshpande, 2005, Current Land Policy Issues in India. Land Reforms Special Edition, Food and Agricultural Organisation, Rome

Annexure II

Variations in tenancy laws across major Indian states

State	Specific features
Andhra Pradesh	In Andhra region leasing is permitted but regulated. In Telangana region leasing out land by large holders is prohibited. Smallholdings below three family holdings are allowed to lease out land for a period of five years. Exemptions are provided.
Assam	There are no restrictions on leasing out of land.
Bihar	Leasing out is prohibited except for persons with disability. Public servants with a salary not exceeding Rs250 are included under exempt category.
Gujarat	Leasing is prohibited and unauthorized leasing is punishable offence with a fine up to Rs1 000.
Karnataka	Leasing is generally prohibited. Soldiers and seamen are exempted. Recent amendments allow further limited exemptions, most granted on a case-by-case basis. Violations result in land vesting in the state.
Maharashtra	No ban on tenancy, but the tenant acquires the right to purchase the land within one year of the commencement of tenancy.
Madhya Pradesh	Abolished the past leases but not the future leases. Past leases are divided into two categories called Bhumiswami tenant without payment and other tenant with payment. They cultivate on terms and conditions agreed between parties. Other land owners can lease out their lands for one year during consecutive period of three years.
Orissa	Prohibited all future leases. Past leases continue after surrendering half of the leased land to the landlord or rayat.
Punjab and Haryana	There is no ban on leasing and the tenants do not acquire any rights on land.
Rajasthan	The landowners (Khatedar) can lease out for a non-renewable period of five years. Ghair Khatedar tenants can sublease for a period of one year.
Tamil Nadu	Leasing is permitted but the law stipulates that every contract should be in written form and in triplicate. A copy of the document shall be deposited with the revenue officials
Uttar Pradesh	Lease for any period is prohibited. Exemptions allowed for widows, unmarried women, military persons, students and physically disabled.
West Bengal	Fixed-rent leasing is prohibited, but sharecropping is allowed and subject to protection. A person lawfully cultivating others' land is presumed to be a sharecropper and is given permanent and heritable rights with a fixed level of rent (25% if sharecropper provides inputs and 50% if landlord shares in inputs). On resumption the sharecropper has to be left with 1 ha of land and the landowner can resume on a maximum of 3 ha.

Source: R.S. Deshpande, 2005, Current Land Policy Issues in India. Land Reforms Special Edition, Food and Agricultural Organisation, Rome

Annexure III

Policy interventions and their perceived impact

Policy interventions	Poverty alleviation	Conflict management/ equity	Environmental management	Sustainable economic growth	Production efficiency
Abolition of intermediaries	Sig	Sig	Par	Sig	Sig
Tenancy reforms	Sig	Sig	Neg	Par	Sig
Ceiling on size of holding	Sig	Sig	Neg	Sig	Par
Consolidation of holdings	Neg	Neg	Par	Par	Sig
Computerization of land records	Neg	Sig	Neg	Neg	Par
Drought-Prone Area Development Programme (DPAP) and Desert Development Programme (DDP)	Par	Neg	Sig	Sig	Par
Watershed Development Programme	Sig	Sig	Sig	Par	Par
Wasteland development	Par	Neg	Sig	Par	Par

Note: impact levels are perceived as Sig, significant; Par, partial; Neg, negligible.

Source: R.S. Deshpande, 2005, Current Land Policy Issues in India. Land Reforms Special Edition, Food and Agricultural Organisation, Rome

Annexure IV

Consultation (September 2005) on "Hindu Succession (Amendment) Act, 2005 and its Impact on Rights to Land Ownership for Women in the Context of Increasing Feminization of Agriculture" – Observations and Recommendations

- There cannot be a unique model for solution of the problems prevalent in different areas. Different models are needed for different areas.
- The voluntary transfer of land rights of women should be there. Often a woman wants to give land to her daughter, but she is restrained from doing so because of mafia/ criminal pressures who simply grab her land.
- In most villages women get married within 7-8 km distance and they can take care of the land of their parents. Institutional mechanism to implement the law bypassing the obstructions should be thought out. Without protective mechanisms, it will be difficult to implement the Act.
- It is essential that similar rights for cultivation be provided to married and unmarried women. Right to cultivation should be determined by being a resident of the village. If a married woman comes back for some reason she should get access to land.
- The Hindu Succession Act should be renamed Indian Succession Act and be available to any citizen of India on demand. The option should be available to women from minority communities also to appeal under the act.
- Bureaucratic will is needed to address gender inequality. Creating a conducive environment to implement the act honestly is also necessary. The initiative of local officials in the implementation of the act should be publicized for greater adoption by others.
- MPs/ MLAs should set an example by applying the act to themselves. It should be also a part of the service condition of IAS/Central Government employees, Panchayat members etc. Government should also provide incentives to local officers to proactively implement the act. This will promote acceptance by the citizen at large.

- With the Hindu Succession (Amendment) Act now in place, it is necessary that the government fixes a time frame for its implementation.
- A change in mind set is needed to address the issues facing women. There have been instances that the training has been provided to men folk to write their will so that no land is left intestate (without a valid written will), enabling women to demand their rights. Training for writing of will that benefit women folk should be provided.
- Ceiling law and definition of the family must be made uniform across the country. The importance of the act when the male members of the family migrate was emphasized.
- In the case of surplus land transfers, steps should be taken to avoid poor women getting poor quality of land.
- The cost of land registration should be waived or reduced when the land is registered in the name of women or a group of women.
- There should be a control on leasing out practice because if the land is leased out to women farmers or group farmers then they do hard work to develop the land and get better productivity out of it only to find the owners wanting to take back his land. The lease agreement should be such that it can be upheld in a court of law.
- There is a order from the State Government that the wasteland should be distributed to women's groups by the Panachayats but the order is not having the desired effect.
- There is a need to start registration for land with joint pattas and it will be good if men will go for registration. State Govt. should document the wasteland, which is distributed under joint pattas. A wide campaigning is needed to promote joint pattas.
- The ceiling surplus land should be provided to women first, then in joint pattas and remaining land could go to men.
- At present data on ceiling surplus land, land acquired by the govt. and land distributed buy the govt. land under litigation is available for ten states only. There are no records available on how much land is registered in the name of

men and women in agriculture. There is need to collect and computerize the data regarding this aspect and without any bias. There is need to continue consultation with state governments and try to get data in women farmers at Tehsil levels. Data should be gathered to capture the fragmentation of land holdings.

- There is a need to go for Cadastral survey in the North East especially Meghalaya.
- There is a need to operationalise the law with greater awareness and opportunities to take maximum benefit of it.
- There is an urgent need for legal literacy to women in particular and farmers in general about the act. There is a strong need to strategies how this can be done and start legal literacy from school level. Legal aid should be available to the women. Small NGO group exist that are working in this area. Farmer's organizations, bankers and panchayats should play a proactive role in the awareness and implementation of the Act. VKCs can also play an important role in this.
- Groups of women should be formed to access land accompanied by support services to improve the economies of scale because it is difficult to manage the land by individual women as she cannot access the services therefore, often sells the land. There is a need to develop village fund for women's groups to purchase land for agriculture and other developmental activities.
- 80% of the SHGs are women SHGs but virtually none of them are land based. Necessary action should be taken to promote land based women SHGs.
- There is a need for crop diversification and a consolidated approach for off-farm and on-farm activity to enhance the income and productivity of the farm as well as assurance of livelihood and nutrition security at household level.
- Lack of access to finance is a major issue in rural areas. Inability of land banks to provide credit in spite of legislation to the effect in place should be addressed. Loans should be provided at concessional rates where land is in the name of women. Need for changes in collateral system of banking have also to be examined.

- A holistic approach towards allotment of land to women should be adopted. The govt. should also help in developing the land, other basic facilities and soft loans (e.g. Malaysia).
- There is a need for strengthening training for farm women and engendering of training institutions. Training on entrepreneurship development should be made a part of the Agricultural University curriculum.

Annexure V

Various Estimates of Wastelands

Source	Area (mha)	Estimated/Scientific
National Commission on Agriculture(NCA-1976)	175.00	E
Directorate of Economics and Statistics, Department of Agriculture and Cooperation	38.40	E
Ministry of Agriculture (1982)	175.00	E
Department of Environment and Forests (B.B.Vohra)	95.00	E
National Wasteland Development Board (Ministry of Environment and Forests, 1985)	123.00	E
National Bureau of Soil Survey and Land Use Planning, ICAR 1994	187.00	E
Society for Promotion of Wasteland Development (SPWD-1984)	129.58	E
National Remote Sensing Agency (NRSA-1995)	75.50	S
Dr. N.C. Saxena (Secy. RD-WD)	125.00	E

Source: Wastelands Atlas of India 2000, prepared by National Remote Sensing Agency

Annexure VI

Extent of Degradation by Causal Processes in Major Agro-Climatic Zones

Agro-Climatic zones of India (Planning Commission)		As proportion of total geographical area					
		Total Wasteland	Barren & Uncultivable Wasteland	Natural Degraded CWL	Natural +MM Degraded CWL	Man-made Degraded CWL	Total Degraded CWL
I	Western Himalayan Region	45.35	31.17	0.22	2.18	11.78	14.18
II	Eastern Himalayan Region	22.12	0.07	4.14	2.77	15.13	22.04
III	Lower Gangetic Plains	7.33	0.18	1.37	4.28	1.50	7.15
IV	Middle Gangetic Plains	7.52	0.14	0.41	4.42	2.55	7.38
V	Upper Gangetic Plains	8.90	0.29	1.18	6.48	0.95	8.61
VI	Trans Gangetic Plains	7.15	0.09	1.90	3.12	2.03	7.05
VII	Eastern Plateau and Hills	12.25	0.78	0.23	5.02	6.22	11.47
VIII	Central Plateau and Hills	23.28	1.44	2.75	10.66	8.43	21.84
IX	Western plateau and Hills	18.65	1.15	1.40	10.55	5.50	17.45
X	Southern Plateau and Hills	16.31	2.23	0.22	5.99	7.87	14.08
XI	East Coast Plains and Hills	16.78	0.75	0.87	8.99	6.17	16.03
XII	West Coast Plains and Hills	11.52	1.04	0.11	6.51	3.86	10.48
XIII	Gujarat Plains and Hills	21.95	1.93	0.61	16.37	3.04	20.02
XIV	Western Dry	35.21	0.87	22.62	7.30	4.42	34.34
	TOTAL	**17.98**	**2.18**	**2.40**	**7.51**	**5.88**	**15.80**

Source: Wastelands Atlas of India 2000, prepared by National Remote Sensing Agency

CHAPTER 3.3

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

WATER

Land, water and biodiversity represent the three crucial natural assets, which are supplemented by manmade assets like inputs, credit, insurance, marketing and processing. In India, water availability is marked by spatial and temporal variability and scarcity. These are projected to increase due to lesser and skewed pattern of rainfall and rising population. The challenges that this poses for the farm sector include reducing per capita availability of water, deterioration in quality, over exploitation of ground water resources leading to lowering of the water table in many areas. Cost/time over run in completion of irrigation and multi purpose projects and poor maintenance/management of the existing systems would exacerbate the problems. Since water is vital for agriculture, action in ensuring *Jal Swaraj* or self-sufficiency in water availability for agriculture needs overriding priority.

3.3.1.0 Irrigation: Current Status

a) The ultimate irrigation potential for the country has been estimated as 139.88 million hectare (Mha), which include potential through Major and Medium irrigation projects (58.46 Mha), surface water based minor irrigation schemes (17.42Mha) and ground water development (64.00 Mha). By 2004-05, the irrigation potential of 99.36Mha has already been created.

b) Given the delay in the completion of on going projects, an Accelerated Irrigation Benefit Potential (AIBP) programme was launched in 1996-97 for accelerating implementation of on going irrigation/multi purpose projects on which substantial progress had been made and which were beyond the resource capability of the State Government or in advanced stages of construction and could yield irrigation benefits soon. Under AIBP an additional irrigation potential of 3.25 million hectare

through major/medium projects and 121.15 thousand hectare potential through minor irrigation has been created up to November 2005.

c) Under Bharat Nirman 10 Million hectares of additional irrigation capacity is to be created by 2009 through major, medium and minor irrigation projects complemented by ground water development. Keeping in view the present status, the target for creation of irrigation potential under Bharat Nirman has been proposed to be met largely through completion of on going major/medium projects and utilization of completed projects/schemes. Minor irrigation projects to cater to the requirements of small and marginal farmers, dalits and tribals have also been included in Bharat Nirman.

3.3.2.0 Major and Medium Irrigation Schemes

a) Over the past 150 years huge investments in large-scale water infrastructure were made and there is no doubt that the country benefited from its direct and indirect effects. However, international comparisons have revealed that vast potential remains untapped in terms of capacity to store and generate power.

b) The ultimate major & medium irrigation potential in the country has been estimated to be 58.46 M ha. For the country as a whole, 66% of this ultimate irrigation potential has been created. However, there is considerable variation from almost full development in Tamil Nadu to negligible in case of Meghalaya. While the Gangetic plains and Eastern coast have achieved a relatively enhanced stage of irrigation development the arid region and the high rainfall receiving areas have a low level of achievement. As of 1st April 2005, there were 221 approved major & medium projects under construction. When completed, these projects would create an irrigation potential of 14.93 M ha out of which 6.80 M ha has since been created till March, 2004.

3.3.2.1 Problems Related to Creation of New Major & Medium Infrastructure

Irrigation coverage still extends to only about 40 percent of net sown area. Expansion of surface major and medium irrigation infrastructure has been rather slow due to the following reasons:

a) It is increasingly getting difficult to set up new projects that give optimum multiple benefits due to conflicting interests of participating states.

b) Land acquisition is a long process subject to protracted litigation and compensation, when finally decided, is not paid for long periods.

c) Relief and rehabilitation policies have been formulated in the States, but their implementation has hardly ever left satisfied communities due to bad planning, slow release of funds etc.

d) Inter basin transfer of water by linking of rivers has also raised political and hydrological concerns.

e) Just as the share of agriculture in the total gross capital formation has declined in the last two decades, coming down by half from 15.4% in 1980-81 to 7.08% in 2000-01, the share of irrigation also in the total Plan outlays has been reduced from 16.33 % in the Fourth Plan to 6.77 % in the Tenth Plan. In absolute terms, the position is even worse since the overall Plan outlays have grown substantially and the costs also have gone up.

3.3.2.2 Problems with the Existing Infrastructure: Inefficient, Inequitable, Unsustainable and Conflict Ridden Use of Irrigation Water

a) Large investments have been made and huge infrastructure has been created but this has not translated into "on time" and "on demand" availability for farmers. There has been a wide disparity between design and delivery, inadequate command area development and poor maintenance/rehabilitation resulting in seepages, water logging and salinity in head reaches and poor conveyance in tail areas. Estimates of tail-enders deprivation vary from 7-91% and it is estimated that water use efficiency in canals is not even 40% of the possibility.

b) Large water infrastructure suffers from insufficient soil conservation in upstream areas leading to the problem of silting of the dams, cutting the expected life of the dam. This also implies that there is less water for the second crop (Rabi) as provision of drinking water in cities has the first call on reservoir water.

c) Land gradient & capillary spread of field channels have not got adequate attention leading to poor availability for tail-enders. Small and marginal farmers

suffer more as it is difficult for them to arrange for investment in bullocks/laser machines for land levelling.

d) Political considerations led to proliferation of new projects without adequate attention to completion of on-going projects or maintenance of existing projects. The resources were therefore very thinly spread. Many departments had a very bloated work force often recruited due to political pressures. Staff salaries, especially in the wake of the Fifth Pay Commission, have consumed meagre maintenance budgets. Further, the financial burden of surface irrigation and power subsidies and market borrowings of irrigation Corporations for surface irrigation development have contributed to many States facing crises rendering them unable to spend on maintenance.

e) The inability to charge/raise charge for irrigation water from canals and electricity for pumping has led to a financially unsustainable system. Poor water delivery and reliability have also discouraged farmers from paying up their water charges, thereby crippling Water User Associations (WUA) even where they exist. Recovery of cost is very difficult with departmental rivalry coming in the way of enforcement. Poor recovery coupled with budgetary constraints and poor systems management adversely affect proper operation and maintenance and lead to deterioration of the irrigation systems and threaten their sustainability.

f) Under pricing of water has also reduced the farmer's incentive to save and use water efficiently and over application of water especially in Punjab has led to water logging / salinity in the head reaches. The under pricing of water has also led to cultivation of water intensive crops like paddy and sugarcane, especially in water scarce areas where they should have been contra-indicative. Coupled with poor targeting of energy subsidy this has led to unsustainable use of ground water in many parts of the country.

3.3.2.3 Multi-User Conflicts

a) Simultaneous existence of scarcity of water and inefficiency in its use remains a paradox. This has also led to multi user conflicts at several levels. The World Bank Draft Report, 2005-" India's Water Economy: Bracing for a Turbulent Future" has elaborated the water conflicts at several levels.

3.3.2.3.1 Conflicts at the Inter-state Level

a) In the words of Planning Commission "Inter-state conflicts over water sharing have been the bane of water resources development in the country. Tribunals have been constituted in the past for Narmada, Godavari and Krishna. Tribunals for Cauvery, Ravi-Beas and Krishna (second Tribunal) are presently engaged in adjudication. Although time limits have now been prescribed for Tribunals, still the adjudication process is a long drawn affair. Tribunal decisions are interpreted differently by Co-basin State and this again leads to disputes in operation of the Award". This has lead to a situation where in most cases there is no clarity about who can use what amount of water. When there are awards they are incompletely specified and have no accompanying enforcement mechanism.

3.3.2.3.2 Conflict between Upstream and Downstream Riparian in Intra-State Rivers

a) Water sharing in closed basins is increasingly becoming contentious within the same state eg. the Viagai basin in Tamil Nadu.

3.3.2.3.3 Conflict within Irrigation Projects

a) An important recent case is that of the Indira Gandhi Canal where the farmers in the first half of the project to be completed were allowed to share the water for the whole project, on a temporary basis, with this water to be gradually reduced to their design share as the other command areas were completed. But this fact was either communicated informally to the farmers or not communicated to all. They thus became accustomed to having plenty of water and planted water intensive crops. When the time came for them to reduce their water to the originally envisaged amount they perceived this as "confiscation" and revolted.

3.3.2.3.4 Conflicts between Farmers and Environment

a) After the construction of the Laava ka Baas Dam a rainwater harvesting structure was constructed in the Bharatpur Sanctuary. Existing farmers claim that they have been squeezed by this and have refused to allow release of water for the Bharatpur Sanctuary.

3.3.2.4 Policy Issues Related with Surface Irrigation (MMI)

3.3.2.4.1 Issues with Creation of New Infrastructure

a) While it is difficult to initiate new irrigation projects quickly a concerted effort is required to expedite ongoing but unfinished projects involving 13.4 million hectare of potential. The AIBP scheme introduced recently is proving useful in creation of new irrigation potential through completion of major and medium projects started much earlier. The Tenth Plan Mid Term Review had observed that the "AIBP is sluggish on benefit delivery. Currently, projects are prioritized on the basis of likely completion time and continue with no further projects financed till selected projects are completed. This allows selected projects to drag and pre-empt resources from other projects. A better priority may be to allocate across projects according to the likely additional irrigation possible from a given investment within given time, without insisting on project completion but with actual benefits monitored directly through remote sensing or otherwise".

b) Allocation of funds for completing the existing projects should give top priority to projects, which are at the stage of more than 75% completion. Second priority should be for projects in the range of 50 to 75% completion. This would help in ensuring that the benefits of investments start flowing faster. The existing budgets for micro irrigation and repair and restoration of water bodies is extremely small and must be enhanced substantially since such projects would be completed faster and would be subject to less litigation and relief and rehabilitation problems.

c) Inter State rivers lead to legal disputes involving substantial costs and delays. A mechanism should be in position to finally decide Inter-State disputes, which should then be taken out of the purview of Courts, in public interest. Inter-State river water disputes should be handled by the Govt. of India with the setting up of a River Board with statutory powers and comprising of technical experts, stakeholders and States Governments and some eminent persons drawn from media, academics and some economists. 50 years after the passing of the River Board Act, it has not been used even once to deal with inter state river disputes.

d) Proceeds of disinvestment of Public Sector Undertakings could be set apart in a Corpus Fund, which should be exclusively used for ensuring required funds for

irrigation projects. With the assured supply of funds, it should be possible to complete the projects in a time-bound fashion.

e) The main purpose behind large projects is irrigation water for farmers but this leads to the displacement of a large number of farmers in the catchment area raising their discontent. **Prior informed consent** of the affected community should be taken with the help of Gram Sabha/Panchayat before the approval of any new project.

f) Bharat Nirman has proposed to bring 10 million hectares of new area under irrigation. A nationally debated and accepted strategy should be evolved for this.

g) Concept of protective irrigation/localization needs to be revisited to have compact distribution system as irrigation managers have been unable to operate irrigation system as designed. With growing importance given to watershed development, water availability first needs to be established before taking up any new major and medium projects. Several major and medium projects have very limited or almost no inflows.

3.3.2.5 Promoting Efficient, Equitable and Sustainable Use of Irrigation Water: Price Initiatives

a) As for subsidies on inputs such as water and power, these should also be viewed in terms of the possible distortions and deleterious effects that they may be causing. For example, over-exploitation of ground water and ecological degradation from water-logging, salinity, etc., due to subsidised or free power or wasteful use of canal water leads to tail ender problems on the one hand and inadequate funds for the maintenance of delivery systems due to negligible user-charges on the other. There are distortions in crop planning too, camouflaging the scarcity of water/energy.

BOX-I

The Energy Irrigation Nexus: Metering vs. Rationed & Flat Tariff Regime

1. Option 1: Metered tariff: Using a metered tariff, a power utility can confidently recoup its costs and supply customers with as much power as they want, when they want it. However cost and logistical problems with installing meters would be substantial.

2. Option 2: Flat Tariff with rationed supply: The flat rate currently in use is without rationing of supply, which encourages the wasteful use of both energy and water. The switch in approach would involve (1) gradually raising tariffs to cut power utility losses; (2) supplying farms with fewer hours of power per year, but ensuring a quality power supply during periods of moisture stress; and (3) metering at the feeder level to measure and monitor farm power use, to allow good management.

Source: IWMI

b) The supply oriented management regime of canal water regime should have an integral component of demand management encouraged through volumetric supply and pricing of canal water. This is urgently needed to encourage water efficiency and resources for operation and maintenance. On grounds of equity also, surface irrigation and its subsidies benefit medium and large farmers and those in the head-reaches of canals. Distribution of canal subsidies is regressive and a marginal farmer receives approximately one-tenth of the subsidies received by a large farmer. The canal water-pricing regime has to have an appropriate cross subsidy element, which targets the poor.

c) The National Water Policy, 2002 also provided for setting water bodies initially to cover operation and maintenance costs and gradually charging for capital costs and it was also stipulated that the charges should be linked to the quality of service provided. However, due to the fear of annoying the more influential farmers, most States have not implemented this Policy leading to avoidable burdens on the States' budgetary resources.

d) Rationalization of water rates and standardizing O&M components is a pre-requisite for sustainability of associations. Revenue officers collecting the charges should be sensitized.

e) Financial Sustainability of WUAs is very important. Viability of the users' organization depends on a large extent on the freedom given to them to fix and collect charges. Government must exercise restraint when announcing waiver of water rates.

Policies adopted by Government have tended to harm the interests of users who promptly pay. The culture to pay for the resource used needs to be promoted.

3.3.2.6 Issues Related to Operation and Maintenance: Irrigation Management Transfer

a) The irrigation water management system has been criticized on account of non-involvement of farmers in decision making at any stage- planning, execution and management. It has been pointed out that without active participation of beneficiaries, the irrigation system cannot be managed efficiently for which sufficient financial support is required.

b) National Water Policy, 2002 had emphasized that the management of water resources should incorporate a participatory approach by involving not only the Government agencies but also stakeholders in various aspect of planning, design and management. Involvement of stakeholders and beneficiaries in design, construction and maintenance of irrigation systems will help in efficient, equitable and sustainable use of water. Irrigation Management could be transferred to WUAs for the distribution of water, setting of charges, collection of revenue and repair and rehabilitation thereby enhancing the efficiency of the irrigation facilities. Recognizing the need for legal framework for Participatory Irrigation Management (PIM), the Ministry of Water Resources has brought out a Model Act to be adopted by the States for facilitation of PIM. Consequently, 10 states namely, Andhra Pradesh, Bihar, Goa, Madhya Pradesh, Maharashtra, Karnataka, Kerala, Orissa, Rajasthan, & Tamil Nadu, have either enacted new Acts or amended the existing Irrigation Act to facilitate PIM. In all, more than 55, 000 WUAs have so far been formed in 23 states covering an area of about 10 million hectare, majority of which are under MI schemes. Some of the remaining States have been encouraging participation of farmers in Irrigation Management under Cooperation/Society Act at outlet level. Despite this progress, PIM is not working effectively in all States.

c) Evaluation studies of PIM carried out in MP and AP, which have introduced participatory management by legislation, have shown mixed outcome. Introduction of warabandi, increase in acreage, reduction in theft, timely availability of water etc. have been reported as some of the benefits in these two states. However WUAs are

hampered by political interference, lack of funds, substandard work, poor participation of tenant and women farmers in these two states. Another case in point is the Gujarat example where there is no law for PIM but enabling environment has been created for WUAs to flourish. This was made possible by close co-ordination between the WUAs and the Government leading to the latter creating a facilitating environment, software support provided by NGOs., and freedom of the WUAs in fixing even higher rates. The software support provided by credible NGOs costs a fraction of the investment per hectare for creation of new infrastructure or rehabilitation but helps in establishing and strengthening of the participatory management.

d) In the words of Shri Anil Shah, Chairman, DSC, Ahmedabad, PIM is not a panacea to cure all ailments of canal irrigation. Enabling environment has to be created to make participatory irrigation work.

e) Water availability gap determines how well PIM will work, i.e. with too much or too little water PIM does not work. It works best in areas of moderate water deficiency.

f) For successful transfer of the irrigation management the farmers should be convinced that the canal is theirs and its upkeep is their own responsibility. For this, hand holding after transfer of management for at least five years is necessary. In this context, capacity building of water users as well as staff involved assumes significance. Changing attitude of staff and preparing them to work with users and render technical assistance are necessary. To meet the capacity building needs, WALMIs need to undertake training of trainers and prepare the material required for training. NGOs, working well, need to be involved in capacity building.

g) The other constraints in implementing the PIM effectively like deficiencies in the irrigation supply system, unreliability of water at distributary's/minor/outlet head, lack of training and leadership and cooperation of irrigation departments need to be addressed adequately. Agricultural extension services should be integrated with irrigation services. Proper roadmap and milestones will have to be devised and rigorously implemented.

h) Enabling legislation is a pre- requisite but without strong political and

administrative will, it will be impossible to implement PIM on a large scale.

i) A project approach, with users' organization at the primary or sub-system level and federations of user's organizations at the distributary and the project level will work better.

j) Modifications to and rehabilitation of canal network, providing adequate arrangements for regulating the flow of water and measuring flows at different points are necessary to make them amenable for PIM implementation. Technical problems cannot be resolved through new institutional arrangements. In other words the canals should be handed over only after repair and maintenance work has been carried out at the major level.

k) The Union Finance Minister had stated in the Budget speech, 2006 that "The Ministry of Water Resources will revamp the Command Area Development Programme to allow participatory irrigation management through Water Users' Association". For soil conservation efforts co-ordination exists at apex level. However, liaison at ground level is very poor. Water should be released from the reservoir only when required. Transfer of maintenance to the WUA is much better as workers are not engaged when there is no work but canals should be handed over only after extensive repairs. Distributory downwards the operation and maintenance of canal conveyance should be handed over to the farmers. A National Conveyance and PIM Authority should be established. There is an acute problem of waterlogging and nearly 2.46 million hectare of land has to be reclaimed back for cultivation. For this purpose a Land Reclamation Authority should be established.

BOX II

Eight Fold Principles for Success of Participatory Irrigation

1. Centrality of Community Based Organisations (CBOs): Constituted by primary stakeholders, CBOs must be at the centre of planning, budgeting, implementation, and management of all natural resource development programmes. The ability to elect its own office bearers and appoint their staffs that is authorised and competent to carry out all financial transactions (instead of government officers) is the hallmark of a robust CBO. The CBO should work closely with the Gramsabha in planning, budgeting, and implementing the programme. Command Area Development and Water Management (CADWM) Guidelines of February 2004 (Ministry of Water Resources), has laid down as a pre-condition the setting up of a WUA but the guidelines do not clarify the role, responsibilities, or resources available to a WUA. State irrigation departments may examine the extent to which the WUAs in their respective states are in a position to function as farmer-centered organisations, particularly the position of its secretary and its authority to raise local resources.

2. Equity: Equity is of critical significance at all stages. Suitable mechanisms and safeguards must be incorporated into the design and execution of the programmes so as to ensure participation of the disadvantaged. The impact of deprivation was all the more startling as the tail-enders raised low value crops, frequently leaving their land fallow, with the result that the productivity of head-reach farmers was 1.5 to 5 times that of the tail-enders. The tail-enders are treated as second-class farmers by the irrigation authorities and as second class citizens by the local shopkeepers and money-lenders.

3. Decentralisation: Participation of the farmers requires flexibility in norms to suit varying local conditions. The local authorities should have the flexibility. In the CADWM Guidelines there is no indication of ways in which farmers' organisations at various levels should be empowered or the ways in which state irrigation department officials at various levels are to be authorised for providing requisite support to farmers' organisations.

4. The Importance of Facilitating Agencies: This principle states enjoined that rural communities require facilitating agencies that are skilled in motivating and organising local groups to work for a common purpose. Facilitating agencies, preferably competent NGOs, should be selected by the concerned government agency through rigorous and transparent processes. In promoting vibrant WUAs experienced and competent NGOs can play a crucial role. NGOs are better placed to ensure that WUAs understand the significance of sharing costs such as that of rehabilitation, collecting contribution, and providing better management of water distribution particularly to the tail-enders and other deprived. Keeping these and other roles of the facilitating agency in view, watershed programme of MoRD provides 10% of the project cost, as overheads of the NGOs working as facilitating agencies. NGOs need to be compensated at the rate of Rs.500 – 600 per hectare to enable them to provide software support that covers promotion of WUAs, rehabilitation of the canal system, and water management for three irrigation seasons

5. Monitoring and Evaluation of the Processes: A participatory, outcome/impact-oriented and use-focused Monitoring and Evaluation (M & E) system should be put in place to obtain concurrent feedback and undertake mid-course corrections in the programme design and implementation systems. At present the Central Government has no scheme of monitoring PIM by independent competent agencies. There is a need for an empowered committee, preferably constituted at the centre, or by the state government, to commission independent, competent researchers to monitor the working of PIM and provide feedback to the policy makers periodically.

6. Training and Software Support: A structured strategy and operational guidelines have to be developed for training required for key functionaries of PIM. State governments implementing PIM have to develop strategy to ensure that competent training organisations provide training to key functionaries in the farmers' organisations, irrigation department and NGOs in each of the phases of PIM: pre-launch, during launch and post launch. Further, since office-bearers of WUAs and officers change, it is necessary to take periodical, say annual, review to find out how many new functionaries have joined PIM set up and arrange for their training. Even otherwise, refresher courses should be held where the key functionaries review the working of PIM and consider fresh short-comings and opportunities in the working of canal irrigation.

7. Sustained Momentum of Development: This principle suggests that the facilitating agencies should be mandated and supported to initiate productivity enhancement and value addition. However, the current status of PIM concentrates only on water distribution, and not on other factors for productivity enhancement and value addition. Rather than introducing traditional extension in a top-down manner, it is important to develop innovative ideas and practices should be developed that will enable the farmers to raise substantially productivity of existing crops, diversify into more remunerative crops, and realise more value for their produce.

8. Organisational Restructuring of Government Agencies: The present structure of PIM in the state administration is unsuitable for sustained policy making and their satisfactory implementation. There is need to examine the possibility of a more efficient, productive, and accountable structure at the project level in large irrigation projects. After gaining experience at the project level, restructuring can be considered for the State Irrigation Department: it can be converted into an empowered executive authority that will have the responsibility, accountability, authority, and resources to ensure that various projects under PIM function with efficiency, equity, and sustainability.

Source: Sri Anil Shah, Chairman, DSC

3.3.2.7 WUAs and Panchayati Raj Institutions

a) In Major and Medium Irrigation, the management is on a hydraulic (canal) basis and not village-wise. In many cases only a part of the village is irrigated. Therefore, organisation comprising of water users is likely to be much effective. Involvement of Panchayats is likely to politicise and complicate the situation. When 73rd Amendment does not include Major and Medium irrigation but Minor irrigation, it may be desirable to have only user organisations and their federations manage water.

b) Panchayats can help Water Users Associations by giving supplementary grants for maintenance in case their resources permit. They can also provide assistance to WUA in any outstanding disputes between them and governmental agencies because of their commanding position in the village society and administrative system. Panchayat's help can also be sought by a WUA for resolving any outstanding dispute among its members. WUAs can also draw upon the services of Panchayat's physical and administrative infrastructure for managing their affairs till such time as they are in a position to have their own infrastructure.

c) In order to facilitate interaction between the two institutions it would be useful if a representative of Panchayat is made a permanent invitee to the meetings of the Management Committee of WUAs. Similarly a representative of WUAs should be made a permanent invitee to the meetings of Panchayats. The arrangements can be reviewed later on in the light of the experience gained in this respect. A similar arrangement can be thought of with respect to relations between Zila Parishad (district level Panchayat) and distributory level WUA or a federation of WUAs at district level in case they exist.

3.3.2.8 Pro-poor Transfer of Irrigation Management

a) To make IMT more pro-poor, and to ensure the viability of WUAs, which depend heavily on the labour contribution of small farmers, policy makers should take steps to ensure that poor farmers participate equally in decision-making processes. These steps include raising awareness and access to information, and making the election of WUA committees more competitive and transparent. The relative absence of small scale farmers from committees and general meetings means that they may not gain the crucial benefits that could be realized from IMT.

BOX III

Making IMT more pro-poor

1. Clearly define the rights of farmers. Andhra Pradesh Farmers, management of Irrigation Systems (APFMIS) serves as a good model for this. By law, farmers have equal decision-making power within the WUA, regardless of farm size (i.e,) one farm, one vote).

2. Raise awareness, especially among poor farmers. In forthcoming publicity campaigns, state policy makers and the civil service should ensure that farmers understand the IMT process and their rights and responsibilities.

3. Reform the election process within WUAs. This is the single most effective way to substantially improve small-scale farmers' inclusion in the WUAs. Election of new presidents and committee members should be vote-based rather than consensus-based, to promote competition between several candidates. Ensuring this, and also that farmers are well-informed, will increase transparency and equity.

4. Differentiate between those farmers in the command area who use canal water and those who use alternative sources of irrigation in defining rights. A high proportion of farmers do not use canal irrigation at all (or may use it only in some years)-relying instead on alternative water sources. The management of canal irrigation does affect the availability of alternative water sources, such as ground water and hence the farmers who depend on them, but obviously not to the same degree as farmers who depends solely on canal water.

5. Monitor, by farm size, participation in the WUA (in elections, decision making process, fee collection etc.) Research showed farm size to be a reliable indicator of poverty for intra-scheme comparison. And, data are generally readily available, so that monitoring costs are minimal. Monitoring overtime provides a good indication of equity trends and is a prerequisite for ensuring pro-poor IMT.

Source: IWMI

3.3.2.9 Institutional Intervention for Water Management

a) During the 1970s and the 1980s, the World Bank and USAID invested heavily in creating more than a dozen state level Water and Land Management Institutes (WALMIs). Infrastructure and facilities were superb and things ran smoothly until their funding ended. State Governments had taken over them but due to fund shortages their functioning is reduced to low performance knowledge institution. There is a need to transform the existing water management institutions into world-class institutions for forward thinking research, policy formulation and development. These no longer deliver high- value thinking, insights and perspective. They also fail to deliver the crucial handholding and capacity building support to WUAs.

b) WALMIs have been handled by various departments leading to confusion in methodology/policies. Since this involves the appropriate and conjunctive use of land and water it should be preferably with the agriculture department of State Government.

3.3.3.0 Minor Irrigation Schemes (Surface)

a) Minor Irrigation through surface water covers water sources (tanks and small reservoirs) with a cultural command area (CCA) of less than 2000 ha. According to the census of Minor Irrigation conducted with reference year 1993-94, the number of tanks for lift irrigation schemes was 84,347 and the number of storages for surface flow irrigation scheme 3,08,958. In addition, 83,510 permanent diversions and 83,248 temporary diversions were in existence. Together, they account for irrigation potential of 10.04 Mha or about 10.3% of the total irrigation potential created in India.

b) About 70% of the ultimate potential through surface water based minor irrigation schemes has since been created. Of the balance potential of 5.15 Mha, majority of the area lies in Madhya Pradesh, Andhra Pradesh, Nagaland, Maharashtra and Assam.

c) It may be noted that there is considerable variation from State to State. While full (or even more) potential through minor irrigation has been tapped in Uttar Pradesh, Punjab, Haryana, Rajasthan and some of the Union Territories, it is as low as 17% in Manipur and 20% in Madhya Pradesh.

d) Many currently used tanks in the southern region were constructed in the past centuries. They account for more than one-third of the total irrigated area in Andhra Pradesh, Karnataka and Tamil Nadu. Tank irrigation is less energy and capital intensive and mainly serves subsistence agriculture in a widely dispersed region. It has a special significance to mainly rice growing small and marginal farmers. Tanks also play a vital role in conserving water at a local scale.

3.3.3.1 Decline of Tank irrigation

a) Tank irrigation, which is not only low cost source of irrigation for small and marginal farmers, but also predominantly managed by them, has gradually declined. The Report of the National Commission for Integrated Water Resources Development points out that the carrying capacity of tanks has decreased over time for a variety of reasons and that the restoration and renovation of tanks and other local sources is a priority task.

b) Key reasons identified for the decline of tank irrigation in India are as follows:

i. Encroachment in the tank foreshore and along the feeder channels has reduced supply of water to tanks;

ii. Accumulation of silt in the tank basin/bed has reduced the water holding capacity of the tanks;

iii. The construction of dams/reservoirs in the upper watershed or catchments area has prevented the water supplies from reaching downstream tanks;

iv. Rapid development of groundwater irrigation in the tank command areas has reduced the participation of farmers in tank related works which ultimately reduced the area under irrigation;

v. It has also been confirmed that the poor design of new tanks has resulted in low level of performance;

vi. Inadequate maintenance expenditure by the government coupled with absence of statutory powers for stakeholders to maintain and manage the system is another problem affecting tanks and other traditional irrigation sources;

vii. Break down in village institutions like "kudimaramath" due to caste and other conflict, the community participation which was part and parcel of tank irrigation development has declined drastically;

viii. Crop diversification away from rice mono cropping remains elusive coupled with declining profitability of rice cultivation in many of the minor irrigation projects.

3.3.3.2 Key Issues in Restoration of Tank Irrigation

a) In pursuance of the announcement made by the Finance Minister in the Budget Speech for the Year 2004-05, a scheme for "Repair, Renovation and Restoration of Water Bodies directly linked to Agriculture" has been taken up as a State Sector Scheme. The Pilot Scheme is being implemented through District-Level Implementation Committee with active community participation. The main objectives of the scheme are to restore and augment the storage capacities of water

bodies and to recover and extend their lost irrigation potential. 20,000 water bodies with a command area of 1.47 million hectares have been identified in the first phase with estimated cost of Rs. 4,481 cr. The participating States will be requested to sign a memorandum of understanding and the water bodies in that State will be taken up for repair, renovation and restoration in 2006-07.

b) NCF had recommended that the traditional sources of irrigation like tanks, etc. should be preserved and maintained with the participation of local Panchayats and the community. Farmers should be encouraged to use the silt in the village tanks for their own fields, so that they also deepen the dried up tanks during the summer season. New technologies developed by ICAR and other institutes for the purpose should be widely demonstrated and adopted. In this context, nearly 1,000 field demonstrations are proposed to be organized by State Governments. Community surface water storage facilities should be provided to all the needy villages where the piped water supply of the Public Health and Engineering Department (PHED) is inadequate to meet the drinking water needs. With an additional rainwater surface storage of 137 mcm, raising the total capacity to 531 mcm, domestic needs of all arid villages of Rajasthan not covered by PHED could be met. About 70-80% harvesting of rainwater may provide community storage to all.

c) Small water-harvesting and storage structures, with a water spread area of a few acres, are known all over the country under various local names. They usually consist of a bund built along a contour, like a miniature version of an irrigation tank but without sluice gates and canals. For instance, the Kohlis, who are a small group of cultivators residing in the district of Bhandara, Maharashtra, built some 43,381 water tanks over several centuries, which formed the backbone of successful irrigation in the area. So is the community managed Phad Irrigation system that existed in Maharashtra. These should be strengthened and supported.

d) In western Rajasthan, the hub of the country's arid zone, adopting an integrated water management programme, the "**dying wisdom**" of traditional system of rainwater harvesting in tanka, nadis, khadins, talab, etc. should be revived and restored. Over time, the capacity of *Khadins* and other water storage structures have decreased due to land degradation and crop intensification. Improvement of these devices and structures through enhancing and sensitizing group awareness and their

better management are the needs of the hour. Panchayats, Gram Sabhas, community organizations, NGOs and CSOs must play major roles in this effort.

BOX IV

NGO Strategies for Small Tanks

1. NGOs have placed much emphasis on the variety of roles the small tanks play in their socio-ecologies. As an example, PRADAN operates a rainwater conservation project in the Alwar district, Rajasthan, that aims at reviving the traditional *paal* (bund) system of rainwater harvesting. It has helped village groups build over 110 *paals* in several micro watersheds. PRADAN discovered early, the value of working on a system (or cascade) of *paals* covering an entire micro-watershed. A series of *paals* built in a zigzag manner in a micro-watershed capture and impound the floods flowing downstream, prevent massive soil erosion and greatly reduce flood pressure on the dams constructed downstream. At the same time, they produce dramatic impacts on both farm economies and the hydrology of these areas, mainly by improving groundwater recharge.

2. Tarun Bharat Sangh (TBS) works with *johads* in roughly 550 villages in the Ruparel river basin, Alwar district. Their water-harvesting work covers approximately 6500 square kilometers. This large range makes its impact more visible, and serves as an example for other villages who request for similar work. With a core staff of less than 100, TBS had several hundred volunteers chosen in the villages where they work, and they have evolved into small grassroots organizations.

3. Over the years, they developed a set of norms and rules that are generally accepted; for example, people who benefit have to contribute the labor required. They also contribute some material and cash. TBS tops this up with financial support for the hire of tractors and cement. TBS's own 'home-grown' engineers also provide crucial help in community organization, finding out the needs and concerns of participating members, and designing a structure that addresses these needs. Each *johad* then is differently designed to meet the unique needs of each site and group.

4. TBS's works are low-cost compared to government structures. A couple of middle-sized *pucca bandhs* (dams) in the village of Bikhampur cost only around Rs. 30000 (US $700) each, besides farmers' contributions. The same bandhs would have cost around US $ 10000-15000 had they been built by the Irrigation Department.

e) There is some dispute about the desirability of use of low cost check dams etc. for trapping excess water flow during and post monsoon on the ground that this would interfere with catchments of village tanks. It is, however, felt that more often than not water in rivulets/nullahs flows into minor rivers which, in turn, ultimately merge with the sea. Very few of such nullahs/rivulets feed the small tanks and, therefore, construction of check dams is not likely to interfere with optimum catchments of monsoon water in such tanks. On the contrary, such check dams promote ground water recharge, involve low construction cost, require little maintenance and provide opportunity for drinking water for human and cattle post monsoon and also provide opportunity for economic activity like vegetable growing on the sides of the check dam, especially by women groups. Clearly, therefore, the

benefits outweigh the perceived dangers. The efficiency of such check dams in drought prone areas/market areas like Jhabua (MP) has been well demonstrated and appreciated. Check dams, as desirable activity, therefore, should be continued by utilizing labour available under NREGP.

f) The best strategy for rehabilitation is to view tanks as complex socio-ecological systems with multiple stakeholders groups and multiple uses. For each rehabilitation option, policy makers would, of course, have to consider the expected output, the financial investment required, and also the possibility of unrest in excluded parts of the population, and compare the appeal of the various solutions to motivate the farmers and other stakeholders, as members of WUAs, to participate in tank maintenance and water management.

g) Crop diversification with appropriate technological, market and institutional interventions should be promoted.

h) Renovation and rehabilitation of local community based irrigation sources should be made a major component in rural infrastructure projects. Rehabilitation of community irrigation systems should be an integral component of all rural employment generation programmes.

3.3.4.0 Minor irrigation: Unsustainable Withdrawal of Ground Water

a) The era of Ground Water exploitation started in 1960. The major facilitators of ground water usages included expansion of electricity supply (hydropower), availability of credit and cheap technology. Ground water pumping helped in overcoming water logging and salinity. Other advantage of ground water included abundance and timely supply. A major anomaly is that ground water utilization is low in eastern region where it is abundant due to energy shortage.

b) The problem of untimely and unreliable water faced in canal command areas was solved by resorting to ground water utilization by the farmers. But self-provision of water for irrigation and household purposes was an indicator of the failure of public water supply system. Tube well proliferated in canal commands because public irrigation managers were unable to deliver irrigation on demand. Urban household

also relied on boreholes because municipal service was inadequate and unreliable. There is an inherent inequity bias with resource rich farmers in a better position to use the ground water for irrigation and household purposes. Small and marginal farmers are not in a position to carry out investments for exploiting ground water. Easy availability of ground water also allowed farmers to grow water guzzling crops in areas they were contra- indicated.

c) A recent survey by Central Ground Water Board (CGWB) indicates that out of the 7414 identified units (blocks/talukas/watershed), 471 are "Overexploited" and 318 are "Critical or Dark" units. Thus, less than 11% of the total units fall under the category of "over-exploited" and "critical". It may be noted that ground water is still available for exploitation in the eastern parts of the country, in Madhya Pradesh and Chhattisgarh and in specific pockets of Andhra Pradesh, Karnataka, Maharashtra, and Jammu & Kashmir. In Punjab, Haryana, Rajasthan, Gujarat and Tamil Nadu, the rechargeable quantum of ground water has been exceeded and mining of static reserves has commenced.

d) There is a lack of concerted regulatory policy to restraint the over-exploitation of ground water. Recharge is also not mandatory.

e) Progressive decline of water table has reduced the recharging capacity of dug wells especially in hard rock regions. For newer wells, the farmers have to dig deeper. A competitive deepening of wells leads to increase in cost of water and affects the small and marginal farmers, who own dug wells. In dark blocks, individual farmers are free to exploit further the ground water, thereby adversely affecting the existing wells.

g) For tube wells, there is embedded energy subsidy, which has adverse fiscal implications for State finances. In fact increase in the depth of aquifer leads to rise in pumping cost which, in turn, will lead to rise in input cost(if power is not free) or rise in subsidy costs.

3.3.4.1 Conflict Areas

a) Conflict over excessive ground water withdrawal between indigenous communities and cola multinational has been reported in Kerala.

3.3.4.2 Policy Considerations

a) Utilization of ground water potential is dependent on availability of electricity, which is a major constraint. The quantum as well as quality and duration of the power supply is unsatisfactory and is a major issue, especially since the farmers feel that they are being discriminated compared to the cities where the more vociferous urban consumers get better supply. While additional generation capacity has not been coming up adequately in view of resource constraint in the State Electricity Boards, the problem is made worse by widespread power thefts not only in the rural areas, but by the more affluent city dwellers, especially industries. Instead of relying on the State machinery, the people must be encouraged through financial incentives in reporting cases of thefts and there should be a very prompt follow up for disconnection and levy of very heavy penalties.

b) There is also a great scope for better management of the grid and the distribution network, including zoning, to ensure that the farmers get electricity at set hours even if it is for a restricted period.

c) Since ground water irrigation is mainly through field channels, it is essential that the water supply continue for a sufficient time to compensate for the initial loss due to absorption.

d) The watershed programmes should adopt a **million well recharge programme** to be linked to a rebate in the rate of interest provided under the enhanced agricultural credit programme, on priority basis.

BOX V

Groundwater Recharge and Rain Water Harvesting in Arid Regions

1. Groundwater recharge must be made compulsory for urban as well as rural settings. Due to negative water balance and higher withdrawals, there is hardly any build-up of groundwater in arid regions. Though starved for water, arid regions also face floods, may be once in 10 years, as recently witnessed in the arid agro ecosystem of Gujarat, which may generate on an average 2100-6200 mcm water. **It is estimated that if 1/3rd of floodwater is made to recharge the groundwater, it can sustain five recurring droughts**. Ephemeral river water should be used to recharge groundwater through check dams, percolation tanks, sub-surface barriers, sand fill dams, induced recharge, etc.

2. The feasibility of rainwater harvesting through farm ponds in areas with rainfall above 400 mm has been well established. Also, there are many examples of recycling such harvested water for successful raising of horticultural crops. It is estimated that **in arid region there is potential of harvesting 70% of rainwater for recycling as well as ground water recharge**. Under NATP, seven check dams were constructed in different areas, which led to recharging of ground water, by 80 m in Matyana watershed area of Junagarh in Gujarat. It is claimed that in four years time farmers could reap economic benefits as a result of sale of fruits and crops raised through use of the water for supplementary irrigation. Such **"bright spots"** should be used for training farmers and extension staff and should be replicated widely by State Governments.

Source: NCF Second Report

e) All the Technology Missions should also contribute to the national scheme to retain, renovate and restore the water bodies that are linked to agriculture.

f) There should be a symbiotic interaction between the National Rainfed Area Authority, the National Horticulture Mission, the Technology Missions and the National Rural Employment Guarantee Programme.

g) Tenth Plan had envisaged community-level investment on artificial recharge of ground water and on rainwater harvesting, and had mooted legislation to regulate groundwater use. If the latter is to extend beyond imposing ban on sinking new wells for regulation at the aquifer level, panchayats will need the power to regulate allocation and pricing of ground water. For this to be acceptable, panchayats must be able to deliver visible gains over what is possible through individual ownership. Besides capacity building, this requires that community control receives more government support.

h) Farmers need technical advice in site selection for borewells, particularly in the Southern Plateau region.

i) A water literacy movement should be launched and regulations should be developed for the sustainable use of ground water.

j) A farmer friendly insurance cover for failed wells is needed for ground water development.

k) There is a need for a Pani Panchayat in every village consisting of the Members of the Gram Sabha who could help in getting the available water distributed on an equitable basis.

3.3.4.3 Integrated Management of Ground Water and Surface water in Irrigated Areas

a) Ground Water Resources within irrigation systems should be mapped and monitored with respect to quantity/ depth and quality.

b) In areas with good ground water resources within irrigation schemes, farmers should be encouraged to sustainably tap these resources.

c) The availability of good quality ground water should be taken into account when allocating irrigation water at system & distributory level.

d) In irrigated area underlain by saline aquifers, irrigation-efficient measures should be promoted to prevent further salinization of fresh water resources.

e) Surface irrigation systems could also be used innovatively for ground water recharge.

3.3.5.0 Rainfed Areas

a) The most important characteristic of the rainfed areas is the extreme variability observed in rainfall both in spatial and quantitative dimension. Most of the rain occurs in 100 hours in a year; frequently heavy rainfall occurs within a short period of time and evaporation exceeds precipitation during most part of the year.

b) Close to two-third of cultivable area, falling in rainfed zone and much of it undulating and hilly, was generally bypassed by the Green Revolution. The yields of the rainfed crops have been stagnating at low levels and huge yields gaps persist. The annual rate of growth of coarse cereal output declined to nearly zero in 1990s. The net per capita availability of pulses has fallen to the level of 1950s.

c) Indiscriminate spread of deep tube wells in the hard rock regions of India has only aggravated the water crisis there. Water tables have fallen precipitously and soil health has greatly deteriorated in the intensively cropped rice/rice systems.

d) The farm sector provides livelihood and employment to nearly three-fourths of the population in the rainfed regions. Not surprisingly, these regions have emerged as concentrations of mass poverty and hot spots for civil strife. A majority of the 200 poorest districts in the country are in the rainfed regions. An overwhelming majority of the scheduled tribes depend on the rainfed farming.

e) Rainfed regions are characterized by great agro-ecological diversity. For example, soil conditions and water availability may vary significantly even within a village in undulating and hilly terrains. The great variation in rainfall across the country is the other well-known source of ecological diversity in the rainfed regions. The undulating and hilly landscapes also tend to be ecologically " interconnected" – what happens upstream affects the downstream and isolated actions bear no results.

f) In his recent inaugural address at the 93rd Session of the Indian Science Congress, the Hon'ble Prime Minister spoke of an "agricultural growth plateau". He acknowledged that the "technologies and strategies unleashed by the first Green Revolution have run their course". He spoke of the need for a second green revolution with a special focus on dryland agriculture and small and marginal farmers.

g) Climate changes will significantly impact the environment as well as livelihood and quality of life in resource fragile areas such as coastal, arid and semi arid regions. While rising seas will inundate and submerge the low lying areas, atmospheric dynamics will subject drylands to even more variable and scantier rainfall regimes.

3.3.5.1 Water Shed Approach in Rain fed Areas for Sustainable Development

a) It was felt necessary to develop a coherent strategy for water conservation and management for rainfed areas. Watershed development programme had been introduced as a strategy for increasing over all development in rain fed areas by increasing the availability of moisture and water. During the Sixth Plan, some model watershed programmes were introduced. The National Watershed Development Programme for Rainfed Areas was introduced on a massive scale during the Seventh

Plan. Water shed approach was and is still thought to be the most appropriate one for lifting the economy of the rainfed areas in a manner that is efficient, equitable and sustainable. While expanding the pace and scope of watershed development, much greater attention needs to be paid on why past efforts have delivered less than promised. Following are some of the explanations offered.

3.3.5.2 Problems

a) There are too many agencies of the Central and State governments implementing watershed schemes. Rainfed agriculture and area development in the country, particularly watershed projects, are implemented by the Ministry of Agriculture, Ministry of Rural Development, Ministry of Water Resources, Ministry of Environment and Forests, Planning Commission and Externally-funded Projects. There have been considerable divergence and overlapping amongst the various projects implemented by different Ministries of the Government of India, let alone any fruitful linkages and synergies among the programmes and projects. This makes a coordinated approach towards prioritised planning and implementation rather difficult.

b) Major problem with the present programmes (such as watershed development) meant for the rainfed areas is that at each level they are administered by people like the Collector/CEO, Zilla Panchayat/Panchayat Secretary who have much else on their hands. The sharp focus needed to implement watershed programmes is often missing because they have many other competing priorities. With many competing priorities and insecure tenures, agency heads cannot follow the endeavour that calls for focused, long-term engagement. The Government organisations at the field level lack the essential technical expertise. Expertise in processes of community mobilisation is also limited.

c) Watershed development is capacity-intensive and inherently slow. The present rate of expenditure of Rs. 5000 to Rs. 6000 per hectare under the Government of India's watershed programmes does not make for drought proofing. Watersheds also take a long time to fructify. The limit of 4 to 5 years is ,therefore, wasteful.

d) Some Watersheds are poorly designed.

e) Most projects do not reach full potential in terms of agricultural production except under initiative and supervision of a few Non-Governmental Organizations (NGOs).

f) In many cases, watersheds have not been properly maintained because community involvement waned after the initial development stage. In any case, community involvement in watershed planning and design has typically been low; and distributional problems are persistent, arising from existing inequalities in land distribution because of ill-defined rights and encroachment.

3.3.5.3 Policy Issues

a) The country is already spending more than Rs. one lakh per hectare for making water available through canal irrigation. Funds should be provided more liberally for watershed programme on more liberal terms for quickening the pace of watershed development and drought proofing. Forward looking comprehensive watershed programmes like the KAWAD watershed in Karnataka provide for Rs. 15,000 per hectare.

b) An abrupt ending of watershed programme in the watershed villages at the end of the project period of 4-5 years is not appropriate for making the best use of the experience and institutions created during the project period due to the following reasons:

c) In the limited period and funds allocation, it is not possible to adequately develop land and water resources of the watershed project area.

d) The social institutions painstakingly built up during the intensive project period of watershed development, have no clear direction and role to continue the momentum after 'the project period'. Without responsibilities and activities the Watershed Associations and the groups deteriorate and disintegrate.

e) 'Watershed Maintenance and Development Fund' accumulated out of people's contribution, is wasted in absence of clear guidelines for their employment for productive purposes. Such funds in the country are estimated at about Rs. 500 crores.

f) Huge government sums are being proposed and spent on isolated programmes

of large number of such cases. A few examples are development of catchment areas of irrigation projects, scheme of ponds development, horticulture, livestock development, drip irrigation, farm machinery etc. All such programmes are of great relevance and benefits to the underdeveloped areas where the vulnerable communities live which can immensely benefit by incorporating such schemes in their plan of integrated development at the macro level. This could be termed "**Watershed Plus**" signifying that watershed will not remain an activity focused only on soil and water conservation but should encompass and integrate measures that could increase productivity and provide value addition to the community living in such difficult areas.

g) A more structured and monitorable system with much greater community participation needs to be put in place. There is a need for basic change in the institutional set up in the Government for managing the programme. The National Common Minimum Programme had envisaged that the Government would introduce a special programme for dryland farming in the arid and semi- arid regions of the Country. A National Rainfed Area Authority is proposed to be setup to manage the watershed programme. The structure and mandate for the National Rainfed Area Authority (NRAA) appropriate to the goal of enabling communities living and farming in rainfed areas to achieve Jal Swaraj both in relation to drinking and irrigation water needs is under the consideration of the Govt. of India.

3.3.5.4 Watershed Development Projects and Panchayati Raj Institutions

a) If the objective is poverty alleviation through watershed development, then it is only possible if the watershed dwellers plan, implement and organize together and collectively maintain created assets.

b) The argument that PRIs are constitutionally mandated and therefore should be the only instruments for watershed development is not convincing. Unless the PRI is people-mandated and legitimized, it will only remain an ineffective and toothless structure. If the people through a process of dialogue and consensus decide that their particular PRI enjoys their confidence, then, they will mandate it to implement a watershed project. If not, given that the objective is watershed development, it can be nobody's case to argue that they should have no alternative.

BOX VI

Recapitulating NCF Recommendations on rainfed areas in the First Report

Productivity and Livelihood Enhancement in Rainfed Areas: Towards a Rainbow Revolution

Major Recommendations

1. Establish a **National Network of Advanced Soil Testing Laboratories** capable of testing large volumes of soil samples for 16 macro and micronutrients – 1000 laboratories in all parts of the country, with 500 of them being located in dry farming areas, where there is scope for doubling average yields immediately through addressing the deficiencies of micro-nutrients in the soil, in addition to attending the needs for N, P, K.
2. Highest priority should be given to augmenting water availability by vigorously promoting **rainwater harvesting, restoring water bodies and a million wells recharge programmes.**
3. **Convergence and synergy of all agricultural programmes around a watershed**: We have recommended the formation of a **National Federation of Farm Technology Missions** which can assist the watershed community to access the provisions of appropriate technology missions like those relating to oilseeds, pulses, cotton, horticulture, dairy, etc. In addition, we propose the setting up at the national level a **Commission for Sustainable Livelihood Security in Dry Farming Areas** under the Chairmanship of an eminent farmer, who is an achiever in increasing productivity and income per every unit of water.
4. **Lab to Land**: Large-scale demonstrations should be organized on catalytic interventions both factor oriented, such as application of micro-nutrients for improving soil health and implements for improving soil physical properties (soil physics, chiseling and enhancing rain water absorption) and system oriented, such as crop-livestock and crop-livestock-fish integrated systems. These would be undertaken in collaboration with CRIDA and ICRISAT.
5. Post harvest processing and value addition in collaboration with CFTRI and private sector should receive priority attention. A post harvest technology wing should be added to each Krishi Vigyan Kendra to bridge the gap between production and post harvest technologies and the KVKs may be redesignated as **Krishi and Udyog Vigyan Kendras (KUVKs)**.
6. **Rainbow revolution** should be promoted in rainfed areas achieving substantial enhancement in the productivity of millets, pulses, oilseeds and livestock through large scale adoption of highly successful new technology packages, such as hybrid pigeonpea. Fifty thousand **Farm Schools** should be established in the fields of farmer-achievers.
7. Create pulses and oilseeds villages (eg. *Arhar* Villages, Sesame Villages) for specialized enhanced production (ensuring full availability of quality seeds and other specified inputs), efficient processing and remunerative producer-oriented marketing of the selected crops as well as the optimization of producing more crops and income per every drop of water by cultivating low water-requiring crops.
8. **Rainwater harvesting through farm ponds for supplemental irrigation and recharging the dead open wells:** In most of the rainfed areas, the seasonal rainfall which comes as downpour, substantial part of that goes waste through runoff causing soil erosion as well as impoverishing the soil through soil erosion. It has been demonstrated throughout India that harvesting of excess runoff and storage into farm ponds as well as restoring water bodies and recharging the dead open wells is a very feasible and successful option for improving the groundwater recharge as well as enhancing the productivity of rainfed agriculture through supplemental irrigation. In the areas with rainfall above 400 mm these technologies could be widely adopted which will enhance the cropping intensity, diversify the system into high value crops, increase the productivity and incomes from rainfed agriculture and at the same time, create assets in the villages. These technologies have shown remarkable increase in the groundwater as well as productivity and incomes for the farmers. The watershed programmes should adopt a **million well recharge programme** to be linked to a rebate in the rate of interest provided under the enhanced agricultural credit programme, on priority basis. All the Technology Missions should also contribute to the national scheme to retain, renovate and restore the water bodies that are linked to agriculture.

Source: NCF First Report

c) To conclude, in the words of Crispino Lobo, if done right, with people in the driver's seat and an enabling administrative and policy environment, watershed development can contribute significantly in meeting the difficulties of the farmers in the rainfed areas and achieving some of the Millennium Development Goals.

3.3.6.0 Sea Water

a) The First Report of NCF had made recommendations on enlarging opportunities for sustainable livelihoods based on a pro nature, pro poor, pro woman orientation and strengthening environmental defence systems in the wake of the devastating tsunami in the coastal areas. It was recommended that the coastal bio-shield movement should be initiated along the coastal areas, involving the raising of mangrove forests, plantations of casuarina, salicornia, laucaena, atriplex, palms, bamboo and other tree species and halophytes which can grow near the sea. They will serve as speed-breakers under conditions of coastal storms, cyclones and Tsunami. They will in addition serve as carbon sinks, since they will help to enhance carbon sequestration and thereby contribute to reducing the growing imbalance between carbon emissions and absorption. Mangroves are very efficient in carbon sequestration. They also promote sustainable fisheries by releasing nutrients in the water. In addition, they will provide additional income and make coastal communities eligible for carbon credit.

b) The Coastal Bio- shield can also involve agro-forestry programmes, like the intercropping of casuarinas with hybrid pigeon pea (cajanus cajan) or Red gram, to be undertaken by farming families. Thus, the Bio-shield movement will confer multiple benefits to local communities as well as to the country as a whole.

3.3.7.0 Recycled Water

a) Water reuse is already becoming an integral part of water management in many water-scarce areas. For example, it is common practice for farmers in Egypt and North China to place small pumps in drainage ditches to reuse water. The irrigation agency supports this reuse strategy by blending drainage water with fresh water to increase the useable supplies. Millions of farmers in Indo-Gangetic plains employ shallow tube wells to recycle the water that percolates through the soil layer-

effectively capturing and using water before it flows out of the basin. This practice also gives farmers more control over the amount and timing of irrigation applications- with dramatic effects on yields.

b) Many farmers living near urban setting rely on wastewater from cities for their crops. Irrigating with low-quality water is often the only option; but even when farmers do have access to canal irrigation, many prefer wastewater because they are guaranteed a constant supply, and the nutrients the water contains allow them to save on fertilizer. Pollution and health risks should be considered when crafting reuse strategies. The problem is that in many cases reuse is by an unregulated individual or community initiative- often ignored by water management agencies. This leads to suboptimal situations in terms of degradation of water quality, human health, and water productivity.

3.3.8.0 Water Use Efficiency: More Crop Per Drop

a) Getting more crop per drop-improving water productivity- will enhance food security and incomes of the poor in canal, tank command and rainfed areas; will enable us to use the water storages and irrigation infrastructure more efficiently and make more water available for nature, industry and domestic users.

3.3.8.1 Irrigation and Cropping Pattern

a) Regulate cultivation of water intensive cash crops in “dark and grey zones”. All new crop varieties being introduced in the country from any source should be assessed for their water requirement.

b) Research should focus on producing crops that can yield more with less water, withstand water scarce conditions, and thrive on low quality (saline/alkaline water).

BOX VII

Where is More Research Needed?

1. Crop breeding for drought-tolerance, water conservation, and ability to thrive on low-quality water.
2. Understanding the interaction between water management practices at different levels-field, system, basin.
3. Co-managing water for agriculture and the environment.
4. Appropriate pro-poor technologies and practices for improving water productivity at field and system levels.
5. Policies and incentives needed to implement water-saving technologies and practices.
6. How to manage irrigation water for multiple uses-for crops, for domestic use, for other income-generating activities.
7. Tools and models to support responsible decision making for valuing the productivity of water in its various uses and examining trade-offs.

Source: IWMI

c) Agronomists should present their data not just based on productivity per hectare but also based on net income per unit of water.

d) Supplemental irrigation combined with on- farm water harvesting practices reduces vulnerability to drought and helps farmers get the most out of the scarce resources. Priority should be given for in situ moisture conservation like compartment bunding, ridges and furrow, tide ridges, double cropping, strip cropping, mulching and vegetative barriers.

e) Land and water degradation constraint efforts to improve water productivity. Soil erosion, for example, reduces not only soil depth but also its capacity to hold water and the amount of nutrients it contains.

BOX VIII

Enhancing Water Productivity and Saving Water and Soil Erosion

Large tracts of cotton soils, particularly in the Central Zone, are shallow with hardpan at about 8 to 10" depth causing several interdependent soil, water and plant nutrition problems. Breaking the hard pan will obviate the problems in many ways. Rainwater is stored deep, down wherefrom it will not easily evaporate and is available to plants for a prolonged period and a much healthier and larger crop is produced. These reduce the need for irrigation particularly to deep-rooted crops like cotton to as low as 20% of that normally required, and thus the water productivity will increase manifold. But, despite this knowledge and know-how this water conservation technology has generally not been adapted in India. Chiselling (1 m interval) in rainfed areas would need high power prime movers such as 50 hp tractors because of larger draft requirements. Such tractors were not available until few years ago. Presently, both high power tractors and chisel plough are available to do the job. Traditionally, lack of high power tractors, research efforts, and extension efforts did not permit large-scale adoption of the chiselling operation. The cost of chiselling is estimated to be Rs 1000/ha. However, large scale demonstrations of about 100 ha. each in about 200 watersheds in 40 districts should be undertaken to assess the efficacy of the approach in terms of energy, economics and environment. Based on the results, a national plan should be prepared to benefit from the technology.

Source: NCF Second Report

3.3.8.2 Precision Irrigation: Sprinkler and Drip

a) Individual farmers must adopt water conservation and management practices like water harvesting, introducing low cost precision technologies such as laser land levelling and drip etc to match allocation as closely as possible to crop water requirement. Awareness amongst farmers for natural resource conservation should be encouraged.

b) Various forms of precision irrigation- mainly sprinkler, drip irrigation systems can increase yields considerably. In South Asia and Africa, very low- cost bucket and drip sets are offering low cost technological solutions to water use efficiency. They deserve a thought on widespread uptake.

c) Though many States have been facing the problem of water scarcity except a few States, the technology is not popular. 50% of area under drip irrigation lies in Maharashtra. Due to high implementation cost, theft etc sprinkler irrigation is also not popular.

d) In the Vidarbha region of Maharashtra, farmers with the help of NGOs started using pipes and micro tubes to water their cotton fields for a longer time from

open shallow wells. Most striking was the use of low grade, light weight pipes used for making ice candy locally called 'pepsi' which costs less than Rs. 1000/acre as compared to micro- irrigation kits that cost Rs. 12,000/acre and branded drip irrigation systems that cost Rs. 60,000/acre.

e) Cost of micro irrigation systems, which are essential for water use efficiency, could be decreased through abolition of taxes, including VAT. Taxes on use of raw materials for the manufacture of micro irrigation systems should also be substantially reduced.

f) Lease financing for micro irrigation by manufacturing firms to provide credit support, as in case of cars, should be promoted.

g) Full reduction of expenditure for all investments by private sector in promoting dryland agriculture should be provided to supplement Government's efforts in the field.

h) There should be contracting and sub-contracting of the distribution system in the command areas to bring in greater efficiency in water distribution.

i) Drainage line treatment should be encouraged.

j) Irrigation system needs to be modernized to enable delivery of water on demand basis to farmers through pipes based on crop-water requirements.

k) Since micro irrigation covers only 2.2 million hectares against a potential of 62.5 million hectares, the coverage under this system should be accelerated through public-private partnership.

l) Channels of water from source to field as well as creation of water harvesting facility needs inclusion in the Micro Irrigation Assistance Package.

m) Human resource development, both for farmers as well as for manufacturers, needs to be promoted for optimum utilisation of the potential for micro irrigation.

3.3.9.0 Water Quality

a) Water quality also needs attention since water often gets polluted at sources with pesticides residue and toxic chemicals. Nearly 65 % area in Thar Desert has

saline groundwater, having at places fluoride and nitrate levels beyond the permissible limits, thus compelling people to use scarce surface water storage for drinking. Ingress of soil salinity in coastal areas poses yet another serious problem. There is also the problem of arsenic poisoning in ground water. The problem of arsenic poisoning abounds because people residing in regions blessed with abundant surface water such as West Bengal increasingly depend on the groundwater for drinking and irrigation purposes. There is an urgent need to remove this dependency by making available other safe drinking water options – for instance, surface water, which is arsenic free. West Bengal has 7000 cubic meter of available surface water per capita. Effective management of surface water including rivers, canals, water bodies, lakes, ponds and rainwater can reduce groundwater dependency in drinking water and irrigation.

3.3.10.0 Water Markets

a) Analysts believe that the informal water market is growing rapidly, and it may catch up with Rs. 8000 crore organized market of bottled water soon. With ground water getting limited day by day the unorganized water market all over the country has grown. Big farmers or landowners installed tube wells with electric pumps and sell water mostly to marginal farmers for irrigation purposes. The price varies from Rs.3 per hour in the Godvari basin to Rs 45 per hour in parts of Gujarat. The supply of water to tankers for domestic purposes fetches Rs. 200 to Rs. 250 per tanker, which goes upto Rs.400 during summer. Many experts feel that there is nothing wrong in selling water. However, the State should enact law to regulate the market.

b) It has also been argued that introduction of a system of enforceable Water Rights needs consideration. It has been argued that moving towards a formal water entitlement system first requires clarifying that water is publicly owned and that water entitlement is usufructory - it is a right to use, not a right to own water. Further, it has to be related to the sustainable use of surface and subsurface resources. However, in practice it may be difficult because of lack of clarity on who has the right to use what water.

c) It is felt that water markets are a contentious issue since the fundamental point about ownership of scarce resource of water has not been finally addressed and opinions differ on its ownership by the Central Government/State Government/Local Authority/PRI/ People. The situation is complicated because of imbalance between supply/demand and history is full of examples where a market develops to deal with the situation. Since in practice it may be difficult to formulate and even more difficult to implement a law on the subject in all the rural areas, it may perhaps be best to leave the issue to the wisdom/consensus building at Gram Sabha level.

3.3.11.0 Multiple User Conflict and Conjunctive Use Of water

a) Through years of neglect, the water bodies particularly river systems in the country have faced massive pollution level arising out of increased and unrestrained industrial activity. This has recently affected the fisheries resources particularly in the rivers.

b) There has been inadequate attention to maintenance of water bodies like ponds, floodplain lakes (beels) etc., and even recently constructed reservoirs and ponds/tanks have reduced capacity for stocking of fish due to growth of water hyacinth etc.

c) Multi-user conflicts and excess extraction of water for multifarious uses lead to depletion of fish stocks.

d) There are a few other challenges viz. multiple use of water leading to scarcity of water in future affecting aquaculture activities, large scale diversion and abstraction of water in view of emergence of new river valley projects.

e) Water abstraction owing to construction of dams has resulted in reduced flow affecting the migratory run of fishes. The increased pollution and silt load have further aggravated the problem of water quality and fish carrying capacities. Happiness of fish is indeed an index of the quality of water. Yamuna is highly polluted due to discharge of effluents.

3.3.11.1 Aquarian Reforms

a) The fish farmers are not getting the same concessions in income tax, water

and power tariffs, etc. as the agriculture sector does, although aquaculture is recognised as a part of agriculture, even by NABARD. Therefore, policy intervention is required to treat aquaculture at par with agriculture. Necessary policy guidelines on uniform long term leasing of all suitable water bodies need to be circulated to states/Union Territories for streamlining the efforts to enhance production and productivity through aquaculture. Policy intervention is also required for the effective management of in-shore fisheries and rational exploitation of deep sea, offshore and oceanic fishery resources for the overall development of marine fisheries. Subsidiary industries relating to fisheries like culture of pearls, development of global trade of ornamental fish to provide high-margin business opportunities for fishers, setting up of adequate fish marketing network etc. are some of the other areas which need adequate attention.

b) Fisheries Department must be consulted by the Irrigation Departments of States while managing the water resources, since single-minded attention to irrigation can work to the serious detriment of the fisheries resources. Water allocation policies should be in tune with the biological threshold levels for fisheries so that both the water resources and fish resources could be optimally utilized. In fact even while the Irrigation Department could continue to manage the head works and the canals, the management of the water resource for fisheries in terms of stocking, exploitation, conservation, fishing rights etc., must be under the exclusive control of State Fisheries Department, if the production and productivity of fisheries in reservoirs is to be raised.

c) Water is critical for fish; it has non-consumptive use in fishery sector. It also acts as substrate for its growth and sustenance. Therefore, any water management issue affects fishery directly. The emerging freshwater scarcity needs to be recognized as an issue of utmost importance. There is a growing awareness that increased water use by humans not only reduces the amount of water available for future industrial and agricultural development but also has a profound effect on aquatic ecosystems and their dependent aquatic life, including fishes. Balancing the needs of the aquatic environment and other uses is becoming critical in many of the river systems in the country as population and associated water demands increase. In this context, what is often lacking is the understanding that planning environmental water allocation means

striking the right balance between allocation of water for direct human use and indirect human use.

d) Large areas in the country have suffered from the problem of salinity due to excessive irrigation and inappropriate water management. While these soils have been treated with gypsum to control the salinity, which is costly, a more profitable utilisation of such saline soils can be through culture of Scampi. The technology is indigenously available and the States using the saline soils/water for production of scampi should launch special extension efforts and incentives to popularize freshwater prawn farming.

e) Hills have more water than land. Schemes such as running water fish culture offer great scope and promise in the expansion of aquaculture in cold-water States.

f) Productive utilization of water bodies such as reservoirs, rivers, inland saline/alkaline lands, and waterlogged areas like beels, oxbow lakes and derelict water bodies (At least 75% of the water spread area to be brought under aquaculture in place of the present level of about 40%).

g) There is need for a comprehensive set of Aquarian Reforms in order to foster the sustainable and equitable use of both coastal and inland waters for capture and culture fisheries. Introduction of Aquarian Reforms to help the fishers and the spread of fish enterprises based on the principle of gender and social equity as well as ecology are long overdue, even though concerns have been voiced in various fora over time. These reforms would, inter-alia, consist of leasing policy for major inland water resources like ponds, reservoirs and river system etc, as well as coastal areas for aquaculture, water tariff at concessional rate at par with agriculture, power tariff again at par with agriculture for small and marginal fishers, insurance against accidents/livelihood threatening events, enforcement of close season to permit sustainable fisheries in river system, the reservoirs and ponds.

h) While the elements of Aquarian Reforms are obvious, their implementation over the years has been less than satisfactory for various reasons. It is suggested that the DAHDF should set up a small Committee, which should go into these elements keeping the requirements of gender and social equity and ecology in view and give its recommendations on the lines of land reforms, for adoption by the states after consultation with all stakeholders.

3.3.12.0 General Considerations for Policy

a) The bulk of the investment that has taken place both in the public and the private sectors is accounted for by investment in augmenting irrigation resources: canal irrigation in the case of public investment and groundwater exploitation in the case of private investment. In order to make the investment more productive, it is necessary to invest more for completion of incomplete irrigation projects, better water management in the running projects and augmenting land and ground water resources in the non-command areas through the watershed development approach.

b) Water because of its multifarious uses presents an equally large number of issues and conflicts. Since water is fundamental need both to human life as well as to agriculture including livestock and fisheries, where practiced, public policy has to be designed in a manner, which is not only efficient in usage but also affordable and sustainable. Above all, the policy has to be socially and politically acceptable as well as egalitarian in order to satisfy human and animals needs.

c) Even more importantly, agricultural and industrial growths are inter-connected and both target the same resources for water. This throws up important issues of ownership and management of water resources and the irresponsibility of the industry, in view of its large resources, to return the water it consumes in terms of both quantity and quality to the community. Aquarian reforms, therefore, involve a close and sensitive look at the strengths, weaknesses, opportunities and the threats to the water system and arrive at an acceptable policy for harnessing conservation and usage of the most precious resources for life – "water".

d) Water use efficiency is as important as creation of additional capacity, but insufficient attention has been paid to the dissemination of knowledge for improving water use efficiency and its application on the ground. There is little incentive to follow the improved practices in view of the present management policies and pricing of water. The existing system of water delivery and pricing have in fact encouraged wasteful use of water. Attention should, therefore, be paid on encouraging efficient water use. There should be empowerment of WUAs through devolvement of adequate powers and capacity building at the grass root level. The involvement of farmers in the management of irrigation systems at all levels and with adequate

powers should be actively encouraged, particularly in order to deal with the problems faced by tail-enders in the canal system.

e) Farmer awareness about water and its efficient use can lead to greater sense of responsibility. WUAs should be empowered and could be encouraged to charge and collect water and electricity rates from farmers based on volume of actual consumption or based on quantities of water received or electricity consumed. The collected revenues should be retained by the Associations for maintenance and development of irrigation facilities.

f) Principle of social ownership of water should be accepted and measures should be taken to ensure equitable distribution of water resources. This would require a check on unrestricted exploitation of water resources.

g) Water conservation, equity, fairness, and public good will have to be the basis of water policies. Privatization should not work against the interests of small and marginal farmers. Irrigation policies need to be viewed in a holistic manner and made pro-poor.

h) A new comprehensive Water Law should be enacted for integrated water resources management, dealing with surface and ground water as well as with all aspects of water conservation and usage would be needed to overcome a fragmented approach to water. Multiplicity of laws relating to water has resulted in problems of the enforcement. A new comprehensive enactment will also lead to repeal of several conflicting and redundant laws. Autonomous Water Resources Regulatory Authority at State Level (similar to Electricity Regulatory Authority) should be constituted to look into all water sector issues.

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CHAPTER 3.4

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

FISHERIES

India is the third largest producer of fish and second largest producer of inland fisheries in the world. It provides cheap and protein rich food and earns the valuable foreign exchange. This sector also provides livelihood to some 11 million people involved fully/partially in fisheries and on subsidiary activities connected with the sector.

3.4.1.1 India has large resources of untapped water bodies which can be utilized by traditional fishers and small/marginal farmers and landless labourers to earn additional income through use of low input technology like use of compost and weeds and use of seasonal ponds, roadside canals etc., NGOs can assist poor and ill-educated farmers through training, micro credit and assistance for marketing.

3.4.1.2 The potential of inland aquaculture can be gauged from the fact that one cubic meter of water can produce about 3 kg. of rice but can produce 6 kg of fresh water fish. The latter uses much less fertilizers too. Fresh water aquaculture therefore has to attract larger funding support specially for feed and technology in the interest of poor for whom it can provide 50-80 % of animal protein comparatively cheaply.

3.4.1.3 The Tenth Plan has already adopted a holistic approach for sustainable development of fisheries and aquaculture for optimizing production and productivity, optimizing the export of marine products, generation of additional employment opportunities and improving the socio-economic conditions of the fisher community with adequate attention to gender issues, and conservation of aquatic resources and genetic diversity.

3.4.1.4 Fisheries have been presented in detail in Chapter 3 of the Second Report of NCF. Some of the major recommendations, however, are summarized for urgent attention in the interest of the fishers:

i. Treat aquaculture at par with agriculture in order to provide concession in income tax, water and power tariffs at par with agriculture.

ii. Develop of policy guidelines on uniform long term leasing of water bodies by States/Panchayati Raj Institutions exclusively for Cooperative Societies/Self Help Groups (SHGs) of genuine fishers , especially women.

iii. Effective enforcement of close season for fisheries conservation through provision of financial support of Rs. 1500 per month per family instead of to Rs. 300 per month per family, as at present during the close season.

3.4.1.5 Enforcement of a strategy for achieving the objectives of **"Fish for All"** by**;**

a) **Enhancing** productivity in all inland ponds and achieving sustained high production per cubic volume of water in them; giving integrated attention to capture and culture fisheries both in inland ponds and in coastal areas.

b) **Ensuring** the adoption of responsible and sustainable fishery practices in the area of marine fisheries and introducing a code of conduct for this purpose.

c) **Establishing** agro-aqua farms, involving the cultivation of mangroves and *Salicornia, casuarinas*, cashewnut, coconut and other appropriate tree species and the culture of prawns and shrimps.

d) **Spreading** quality literacy among fisher families with reference to sanitary and phytosanitary measures and codex alimentarius food safety standards.

e) Improving facilities for fish landing, storage, transportation, processing and marketing.

f) **Developing** social marketing techniques, which can help to ensure the availability of good quality aquatic products to resource-poor consumers.

g) **Introducing Aquarian Reforms** to help in the spread of fish enterprises based on the principle of environmental sustainability, economic viability, social, general equity, nutritive quality and food safety. Aquarian Reforms should aim to promote harmony between artesenal and mechanized fishers and Agriculture and Aquaculture and cover both Indian and coastal water resources.

h) **Organizing Fish for All Training Centres** for fisher families based on the principle of learning by doing, to impart latest technical skills ranging from capture or culture to consumption. Helping both resource poor producers and resource poor consumers through sustainable self-help groups is a major objective of the "Fish for All" programme.

i) Specific segments, which have potential for employment and income generation, are as under:

i. Increased exploitation of under utilized fish species

ii. Promotion of:

a. Backyard fish culture

b. Air breathing fish culture

c. Cold water fish culture

d. Running water and game fish culture

e. Fresh water shrimp culture

f. Ornamental fish culture

g. Seaweed culture

h. Artificial Pearl Culture

i. Mussels culture

j. Sea cucumbers

iii. Encouragement of sea ranching and artificial reefs for resource conservation and sustainable exploitation.

iv. Area expansion for semi-intensive brackish water shrimp culture

v. Quality control of seed and feed

vi. Improvement in marketing infrastructure and setting up of cold storages/cold chain

vii. Setting up of Conflict resolution mechanisms with participation of fishermen involved in artesenal and mechanized fisheries.

viii. Technology transfer and awareness generation regarding safety issues amongst fishers involved in marine fisheries.

ix. Technology transfer and awareness generation regarding quality control in fishing operation and landing.

x. More Fisheries harbours/ fishing lending centers particularly for artesenal and mechanized fishers.

xi. Provision of Mother Ships, which can ensure hygienic handling of catch in mid ocean and permit longer voyages in the sea by fishers.

xii. Provision of Small dredgers to service fish landing centers and make them more efficient.

xiii. Research, production and wide dissemination of labour saving devices/ containers particularly for women involved in marketing/ processing.

xiv. Investment in infrastructure for small farmers, aquaculture estates, particularly effluent treatment plant

xv. Popularization of consumption of processed fish to spur demand and to attract large private sector investment in fish processing leading to employment generation

xvi. Research in technology for cost effective and producer level processing and packaging including value addition by fishers.

xvii. Enactment and enforcement of laws to regulate mesh sizes and trawler designs to ensure sustainable levels of exploitation of fish.

xviii. Affordable insurance schemes for fishers in view of hazardous nature of their work.

xix. Preparation of schemes for pension for fishers more than 60 years of age to ensure social security for this vulnerable segment.

xx. Research and production of affordable and efficient fishing boats.

xxi. Effective and regular system of consultation with fishers for polices affecting their livelihood including responsibilities for management of resources like fish landing center etc, which are vital to their livelihood.

xxii. Investment in mother boats to assist fishers in undertaking longer journeys into the sea and maintenance of quality of catch.

xxiii. Promotion of knowledge centers in fishing villages for dissemination of information regarding efficient fisheries practices / weather conditions at sea etc.

xxiv. Infrastructure development in fishers' villages through utilization of resources in Bharat Nirman for improving quality of life for fishers.

CHAPTER 3.5

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

LIVESTOCK

Livestock sector has produced 90.7 million tonnes of milk, 45.2 billion eggs, 44.5 million kg of wool and 2.12 millions tonnes of meat during 2004-05. The value of the Livestock output is estimated to be around Rs.165 thousand crores. India, at present, is the first in milk production, fifth in egg production and seventh in total meat production in the world.

Total Livestock output increased at 3.8 per cent per annum during the Ninth Plan, even though it was slower than the 4.5 per cent growth rate during 1980-97. While the growth rate of Livestock has been 3.6 per cent, the growth rate in crop output has been 1.1 per cent per annum only after 1996-97, according to the Mid Term Review of the Tenth Plan.

Further, Livestock production in India is largely an output of small holders and contributes to livelihood of over 70 million rural households. Unlike land holdings, the Livestock holdings are fairly equitable with over 70 per cent of all species owned by smallholder groups of small/marginal farmers and landless labourers. In 2003, India had some 283.4 million bovines, 61.5 million sheep, 124.4 million goats, 13.5 million pigs and 489 million poultry. Even more importantly, Livestock provides a major source of supplementary income for a huge majority of rural households and the sector is therefore, highly livelihood intensive. The sector has provided sustenance to families during drought and other natural calamities.

India ranks first in respect of cattle and buffalos and second in goats, third in sheep and seventh in poultry population in the world and nearly 90 million people work in Livestock sector. The contribution of Livestock sector to the Agricultural GDP has increased from 18.1 per cent in 1981 to 26 per cent in 2004-05. The

contribution of Livestock and fisheries sector in the total GDP during 2003-04 was 6.3 per cent.

Total export earnings from Livestock and poultry related products were Rs. 4734 crores in 2003-04.

Given India's agro climatic diversity, a large variety of Livestock is available for transportation, tillage, milk, meat, and other by-products, and for providing additional livelihood to the farmers. In particular, Angora rabbits, ducks, turkey quails, parakeets as pets can be bred to cater to the emerging niche markets in the urban areas.

Improvement in Livestock production is an important pathway for increasing the income of marginal and small farmers and landless labourers, given the uncertainties of crop production. Market opportunities due to the anticipated rise in demand for Livestock products, will provide an avenue for resource-poor farmers to increase production, improve their livelihoods, reduce malnutrition and thereby, contribute to the goal of overall poverty alleviation. However there is need to provide an enabling environment in which small producers are able to take advantage of the opportunities, overcome the challenges and meet the threats. Constraints to increased Livestock production will need to be properly identified and addressed.

3.5.1.0 Highlights of the NSS Report No. 493 on Livestock Ownership: 2002-03

a) An estimated 69 per cent of rural households and 11 per cent of urban households operated some land during the kharif season of 2002-03.

b) As many as 79 per cent of rural households in 2002-03 (kharif season) possessed land of a size of 1 hectare or less. About 32 per cent possessed less than 0.002 hectare of land.

c) The *cattle* population in rural India, which was between 160 million and 170 million during the 20 years prior to 1991-92, declined to 154 million in 2002-03.

d) The *buffalo* population in rural India continued to grow from 69 million in 1991-92 to 76 million in 2002-03.

e) The stock of *poultry* in rural areas declined from 193 million in 1991- 92 to 182 million in 2002-03.

f) The stock of *working cattle* in rural areas declined by 25 per cent between 1991-92 and 2002-03, reflecting the falling importance of bullock power in cultivation and allied activities.

g) The stock of *in-milk cattle* in rural India showed a slight fall of about 2 million from its 1991-92 level of 30 million.

h) The number of *sheep and goats* in rural areas declined from 85 per 100 rural households in 1991-92 to 64 per 100 households in 2002-03.

i) The share of marginal holdings in total stock of in-milk bovines, which was only 20 per cent in 1971-72, continued to rise from 44 per cent in 1991- 92 to 52 per cent in 2002-03.

j) The share of marginal holdings in total poultry stock continued to grow from 55 per cent in 1991-92 to 63 per cent in 2002-03.

3.5.2.0 Highlights of NSS Report No. 497 on Farmer Households: 2003

a) Tribal farmer households possessed larger number of cattle heads compared to farmer households of other categories. There were 173 heads of cattle per 100 Tribal farmer households. While SC farmer households had 98, OBC farmer households had 126 and the others had 132 cattle per 100 farmer households.

b) While ST/SC farmers had 40 to 45 buffaloes per 100 farmer households, the OBC and Other category had 78 to 80 buffaloes per 100 farmer households.

c) Farmer households in the lowest monthly expenditure class or the poorest category had 31 buffaloes per 100 households, whereas the highest monthly expenditure class had 113 buffaloes per 100 households.

d) Of the average monthly income of a farmer household, Rs.969 came from cultivation. Wage earning contributed Rs.819 while the non-farm business generated Rs.236 and income from farming of animals brought in only Rs.91 per farmer household.

e) About 58 per cent of the farmers kept some kind of farm animals. Households engaged in dairying spent on an average Rs.814 per month on dairy farming. Farmer households who kept poultry spent on an average Rs.129 per month on poultry farming.

Table 1 : Number per 1000 of households reporting owning of Livestock and poultry of different types for each size class of household operational holding in India

Rural

Size class of Operational holding (ha)	No. of households per 1000 households reporting owning of								
	Cattle			Buffalo	Other large heads	Sheep, Goats	Fowl*, duck	Other birds	Pigs and rabbits
	Cross Breed	Non-descript	All						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Nil	0	0	0	0	1	20	44	2	1
≤ 0.002	45	390	421	262	8	359	161	29	37
0.002-0.005	56	323	378	297	15	317	130	10	20
0.005-0.040	91	91	426	298	9	260	221	16	27
0.040-0.5	60	357	409	215	3	191	195	12	13
0.5-1.0	72	528	588	311	5	214	213	12	18
1.0-2.0	80	563	622	374	7	203	186	10	15
2.0-3.0	90	609	670	412	7	203	164	11	11
3.0-4.0	101	676	744	519	7	157	138	7	11
4.0-5.0	90	644	708	531	13	184	100	5	7
5.0-7.5	100	712	776	549	38	229	113	5	16
7.5-10.0	182	640	780	635	29	140	79	2	3
10.0-20.0	132	791	861	559	94	253	41	4	0
>20.0	116	822	847	649	140	194	34	0	32
All sizes	51	319	361	214	5	152	143	9	11
Estimated No of hhs	**75283**	**471791**	**533201**	**315651**	**8055**	**224875**	**211987**	**12604**	**16900**
No. of sample hhs	**3467**	**17795**	**20595**	**11125**	**459**	**8206**	**10417**	**533**	**1853**

* Includes hens, cocks and chickens

Source: NSS Report No. 493: Livestock Ownership 2002-03, 59th Round

Table 2 : Percentage distribution of land operated for farming of animals for each size class of household operational holding in India.

Rural

Size class of operational holding (ha)	Per cent of area operated for farming of animals	Percentage share of area operated for							Estd. no. of hhs with plots used mainly for animal farming (00)	No. of sample hhs reporting plots used mainly for animal farming.
		Dairy	Piggery	Poultry/ Duckery	Fishery	Bee Keeping	Farming of other animals	All		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Nil	-	-	-	-	-	-	-	-	-	-
≤ 0.002	77.66	68.61	1.57	9.49	0.00	0.00	20.33	100.00	9609	299
0.002-0.005	66.26	69.58	1.78	8.20	0.09	0.01	20.34	100.00	36784	1835
0.005-0.040	50.42	70.56	2.85	13.78	0.13	0.00	12.68	100.00	86812	2098
0.040-0.5	1.91	56.49	0.76	16.95	16.27	0.58	8.95	100.00	102511	2902
0.5-1.0	0.80	54.34	0.27	3.64	31.29	0.38	10.08	100.00	74207	2203
1.0-2.0	0.59	51.14	0.27	1.76	32.44	0.00	14.40	100.00	63171	2828
2.0-3.0	0.58	47.67	0.03	0.23	31.61	0.00	20.46	100.00	25469	1244
3.0-4.0	0.52	38.77	9.14	2.26	38.41	1.17	10.25	100.00	13015	653
4.0-5.0	0.43	58.86	0.11	0.63	37.20	0.00	3.20	100.00	9019	545
5.0-7.5	0.42	45.06	0.03	1.52	12.45	0.00	40.94	100.00	9171	512
7.5-10.0	0.23	78.36	0.00	0.06	17.04	0.00	4.54	100.00	3110	179
10.0-20.0	0.22	88.59	0.00	0.60	0.00	0.00	10.81	100.00	4265	161
>20.0	0.22	91.11	0.00	0.00	6.88	0.00	2.02	100.00	797	30
All sizes	**0.72**	**55.87**	**1.16**	**6.58**	**22.65**	**0.26**	**13.49**	**10.00**	**437940**	**15489**
Estd. No of hhs	**-**	**342444**	**3496**	**20160**	**7989**	**254**	**65196**	**437940**	**-**	**-**
No. of sample hhs	**-**	**11874**	**259**	**964**	**398**	**11**	**2062**	**15489**	**-**	**-**

Source: NSS Report No. 493: Livestock Ownership 2002-03, 59th Round

The number per 1000 House Holds (HH) reporting owning of Livestock and poultry for each size class, generally declines with the decline in the landholding size, except for bovines. Lower the landholding size, lower is the number per 1000 HHs owning Livestock (Ref. NSSO Report No. 493).

Similarly, the nil category (operating no land or up to 0.002 Ha) representing some 32 per cent of the rural population, shows a steady decline in the number of animals held per 100 HHs during the period from 1971-72 to 2002-03. This seems to be true in respect of almost all species of Livestock and poultry (Source: NSSO report 493) held by them. Labour being the major input of this category of resource poor farmers for Livestock production, the trend perhaps shows that the income from Livestock production looks less and less attractive for them over time.

Table 3 : Changes in stock of Livestock and poultry held by the nil category of house hold operational holdings

Type of animals	Stock of Livestock per 100 HH operational holdings		
	1971-72	1991-92	2002-03
Percentage of nil category of house hold (HH) operational holdings	27.4	21.8	31.9
No. of in milk bovines / 100 HHs	16	6	1
No. of in milk Cattle / 100 HHs	9	3	0
No. of in milk Buffaloes/ 100 HHs	7	3	0
Small Ruminants / 100 HHs	45	20	4
Pigs / 100 HHs	5.2	2.0	0.3
Poultry / 100 HHs	56	49	17

Source: NSS Report No.493, 59th Round.

This category has no resources to improve productivity, no risk taking ability and no good quality animals which could respond to inputs for productivity enhancement. At the same time, poverty reduction requires paradigm shifts through which the under-privileged should be enabled to earn better and gradually grow out of subsistence system through application of appropriate technology, skills, market linkages, information and service delivery systems. The goal should be to support the subsistence farmers to "live" and not "leave". Unless helped to gradually become competitive through some of the ways listed below, it is likely to become increasingly difficult for them to co-exist/ compete with the commercial type production units. Their number being very large, providing options of employment for this category might remain extremely difficult. Some suggestions in this regard are:

a) Support creation of institutional structures, owned, responsive and alive to the needs of this category. Depending on the local environment, these could be Producer Cooperatives, Producer Companies, Self Help Groups with their Federations, Producer Associations etc. as may be locally suitable.

b) They cannot be expected to leapfrog in to highly productive and profitable systems. However, appropriate support through a multi-agency partnership to function under an integrated umbrella, enabling an economy of scale to ensure viability, may be provided.

c) Market access, being the most important component, may be established for Livestock/ Livestock products, either by equipping these organisations with

infrastructure, capacity and skills, or through suitable linkages or institutional arrangements such as Public-Private Partnerships/Contract Farming etc. so that assured price and round the year market are assured.

d) Their risk-taking capacity being nil, Government may support them through (i) prevention and control of diseases in the form of complete cover in the identified intensive production zone and through isolated number of vaccinations (ii) provide risk coverage under appropriate insurance schemes (iii) build their capacities through extension, training, exposure visits etc. in line with the rate of growth expected.

e) An animal health system, taking advantage of both traditional system of medicine extended by trained Animal Health Workers at the grass-root level and supported by modern medicine, mainly for ailments which are not amenable to traditional medicine, may be introduced, preferably through their own institutions or on public-private partnership. Their economic burden on treatment being very large and unaffordable, the government may financially support them establish such an economically sustainable system, in the initial 5-7 year period.

f) Their institutions may be supported to take up effective breed improvement programmes so as to steadily improve the quality of their animals. To avoid risks, the breed selected for productivity upgradation should match with the capacity building efforts taken up or vice versa.

g) Most categories of resource poor farmers, being dependant on Common Property Resources (CPRs), user rights may be assigned to the community organisations for development, regeneration and use of CPRs for livestock production. In this respect, hundreds of successful examples established on ground with community participation by Sevamandir in Rajasthan, Foundation for Ecological Security, Gujarat etc. in many parts of the country may be documented and disseminated as models for replication. Facilitating a mechanism for effective interdepartmental coordination could reduce undue delays in the process.

h) Commensurate with the above steps, least cost supplementary feeding on scientific lines may be promoted through their SHGs/Associations/Cooperatives etc., always keeping an eye on the cost and incremental earning to the farmer.

i) Through appropriate policies, the private sector could be made to play a partnership role in the process. Keeping in view the economic position of the resource poor farmers, additional inputs and services should only be on the principle of (i) Value addition to result in incremental benefit after offsetting its cost and risk (ii) Government to support such endeavour with an idea to make the system self - sustainable over a 3-7 year period.

j) All these are to be directed in such a way to ensure that the incremental income generated is not only able to meet the costs and risks, but are able to provide a net income attractive enough to retain them in Livestock production - in any case not less than the income opportunity for labour prevailing in the area.

k) It should also lead to a gradual reversal of the growth in the number of low productive Livestock contributing to further degradation of the environment.

l) Given the right support, Livestock production has the potential to demonstrate such growth. Government should make efforts to try out such models on a pilot scale and, once established, widely disseminate and replicate in newer areas.

3.5.3.0 Segmentation of Livestock Farmers

a) It must be appreciated that Livestock in India is highly segmented. A vast majority of Livestock producers come from **under-privileged section** of rural community and need a Livestock development and research paradigm to achieve sustainable Livestock development. This section represents a sizeable population of rural families and contributes substantial Livestock produce. Livestock are important in their livelihood culture and they have limited alternative opportunities for employment. Studies have shown that development of small holders' mixed crop - livestock production is one of the most effective methods of poverty alleviation.

b) In contrast, the **resource-rich section** of the rural population also utilizes Livestock development for optimising their wealth. This section has the means and ability to obtain the desired variety of Livestock and the inputs and services needed to harness them. From the point of view of the national economy as well as exports, output of this resource-rich segment of the population is also important.

c) However, it should be appreciated that the constraints as well as the remedial measures for these two segments have to be different and policies must be clearly targeted in order to be effective.

3.5.3.1.0 Under-privileged Section Scenario

Some of the characteristics of the Livestock production by this category can be listed as under:

a) Livestock keeping is traditional and a part of livelihood system with strong socio-cultural linkage. This linkage has profound influence on production systems but is not given due weightage by research organizations.

b) Livestock are kept with multiple objectives, an aspect which is usually ignored. The main objectives are – meeting family and farm needs, asset building and getting supplementary income.

c) The production systems are highly internalised, based mainly on farm and family resources. Output of one sub-system is input for the other sub-system. External inputs are low.

d) Perceptions of resource poor farmers regarding economics and benefits from Livestock are at variance with classical economic and technical considerations.

e) Indigenous Livestock cow, goat, poultry though considered low producing, are preferred as these niche well with the conditions.

f) Assured subsistence is preferred to risky high production since they have no risk taking ability. High reliability of production is desired.

g) Low producing animal/bird is useful to the family and none of these is non-productive. It is a fallacy to believe that all farmers, poor as well as rich want the same strategy of high value, high inputs including health care and feed and involving high risks in marketing.

h) Families settled in developed areas have adopted more productive animals and practices.

i) Women play a major role in Livestock production and most of them have good knowledge about Livestock behaviour and local feeds. This is usually ignored

by Research Organizations. Extent and nature of involvement varies within and between regions.

j) Adoption of technologies and scientific recommendations is very poor, probably due to lack of confidence in these or most of these are not relevant for the underprivileged.

k) Traditional systems of health and breeding services are commonly used and modern services are either not accessible or not adopted.

l) Traditional animal feeding and management practices are commonly followed and modern ones are adopted by very few. Livestock producers are not fully convinced of the benefits of modern ones over the traditional.

The constraints specifically being faced by the **under-privileged Livestock producer** can be listed as under:

a) Access to modern Livestock services, especially veterinary services are poor and effective and efficient services are not available. Privatisation of services is not likely to be useful for the underprivileged.

b) Marketing support is poor and prices received for products are low. For example, majority of milk producers get only 50 per cent of the price paid by consumer.

c) Credit support for purchase of animals and its maintenance is not easily available.

d) Goat, Pigs and Backyard poultry are most commonly kept by the underprivileged and these get very little development / research support.

e) Extension/advisory services for underprivileged Livestock producers are not easily available. Extension, concentrates on transfer of Technology – and often works like a postman.

f) Extension officers are often insufficiently informed, not well-trained for the job, lack adequate communication skills and extension material is scarce. Hardly any attempt is made to assess information needs.

g) Appropriate technologies and recommendations for improving Livestock productivity, under systems prevailing with the underprivileged are not available.

Hardly any research programme is developed keeping underprivileged producer in focus.

h) Training programmes are often not practical and provide stereotyped training. Most programmes cover all aspects of animal husbandry and hardly any attempt is made to assess specific training needs.

i) There are very few training programmes planned to suit women.

j) Improved animals that would 'niche well' with the systems of the underprivileged and adverse agro-ecological conditions in which majority of them live, particularly the ecologically fragile regions, are not available. There are hardly any programmes to assess their needs and produce or make available such animals.

k) Feed, fodder availability is a major constraint and conventional approach to improve the situation does not work with the underprivileged. Not much work is done for ecologically fragile areas. Developing common property resources needs more of social engineering than technical expertise.

l) There is an increasing reduction in availability of grazing lands due to spread of irrigation and crop cultivation, banning of grazing on lands belonging to the Forest Department and wildlife sanctuaries.

m) Social aspects of livestock-keeping are usually ignored though they have profound influence on the systems.

n) Traditional Livestock breeders have made major contribution to development of indigenous breeds. However, not much research and development effort is planned for them – there is much to learn from these groups on Livestock management under adverse conditions.

The policy for poverty eradication and improvement of Livestock production in sustainable manner would therefore need the following ingredients:

a) A paradigm shift in Livestock research and development programmes, keeping in view the constraints of the poor.

b) 'Sensitisation and orientation of Livestock research and development planners for taking a 'pro-poor approach'.

c) Integration of Livestock development should be with crop improvement and Natural Resource Management – development programmes.

d) A system of situation analysis and assessment of needs and constraints focused by the underprivileged in different agro-climatic conditions.

e) Farmer participation on farm research on the basis of adoption of the outputs of technology by the under-privileged.

f) Development of a separate Livestock extension system, which should be pro-active and should assess needs before presenting them to research system and thereafter assess the impact of the research recommendations.

g) Development of producers' organizations with full involvement of the underprivileged.

h) Development of common property resources for dealing with seasonal/ locational fodder scarcity.

i) A shift from the conventional approach to fodder development through integration of food, horticulture and fodder crops since spare land may not be available for exclusive cultivation of fodder.

j) More research into improved varieties of fodder crops given the soil/irrigation constraints of the underprivileged.

k) More research on socio-economic and production system of small animals like goats, pigs and backyard poultry to benefit the small/marginal farmers.

l) Need to study traditional poultry production system critically and take participatory approach in planning their development. There is considerable scope for their productivity through a sustainable and environmentally sound system, less dependent on costly external inputs.

3.5.3.1.1 Livestock and Environment

a) Thousands of poor farm households in India depend on different forms of Livestock to varying degrees for their subsistence. The role of Livestock in livelihood generation is well recognized. Livestock also play an important role in eco-system protection. Livestock manure contributes to soil porosity, water-holding capacity, soil

nutrient retention capacity and provides a suitable climate for soil micro flora and fauna. However, Livestock if improperly managed can also cause damage to the environment. In the subsistence based Livestock production system prevalent in most semi-arid regions of India, common lands are the primary source of Livestock feed for landless households, marginal farmers and pastoral communities. Forests, pasture lands, nala bunds and roadside plantations are important sources of fodder. However, too large a number of animals on common land can cause intense grazing pressure leading to overgrazing and degradation of the natural resource base.

b) Fuelled by a growing population, rising income and rapid urbanisation, the demand for Livestock products is rising. In the absence of a clear focus on Common Property Resources (CPRs) and fodder and biomass development, increased Livestock production is likely to have negative consequences on the environment (land, water, vegetation, air, and bio-diversity). This ultimately affects landless, marginal farmers and pastoralists who depend on these resources for their livelihood.

c) Some major issues, which need attention urgently, are:

3.5.3.1.2 Shrinkage and degradation of Common Property Resources

a) Grazing is the most important source of fodder for both large and small ruminants. Most grazing takes place in forest areas, non-arable lands, along streams roads, permanent pastures and grazing areas and land under miscellaneous tree crops and groves.

b) Factors that limit access to various resources are:

i. Reduction in land available for grazing and drastic decline in watering points.

ii. Proportional decrease in CPRs in villages and decrease in their biomass potential as traditional systems of collective management of CPRs break down.

iii. Notification of several pasture lands as protected areas which has forced pastoralists to vacate them.

iv. Restrictions on grazing on JFM sites as specified by Forest policies.

v. Lack of engagement of key stakeholders such as government and non-government bodies and institutions in policy formulation

vi. Imposition of restrictions and bans on grazing during watershed interventions and afforestation programmes. If such restrictions are simultaneous the impact on dependent Livestock is disastrous.

3.5.3.1.2.1 Implications

a) Poor availability of fodder leading to uncontrolled grazing in turn resulting in diminished vegetative cover and accelerated degradation through erosion.

b) Loss/lack of access to grazing land

c) Ceiling on the number of Livestock, small ruminants in particular due to social fencing and restricted access to fodder in watershed development programme.

d) Restrictions on common grazing land areas often result in a shift to stall feeding systems. This may not be a suitable option for landless, small and marginal farmers. In addition, women are required to spend extra time collecting and / or cutting and carrying feeding materials for Livestock.

e) Degradation and decline of CPRs make it difficult for the poor and landless to maintain Livestock (particularly local or "desi" cattle and small ruminants).

3.5.3.1.2.2 The Solutions could be

a) Establish productive CPRs in terms of biomass sources that enable people to develop a greater stake in developing, protecting and using them

b) Create a bigger stake for communities (all stakeholder categories including sheep/goat rearers) in the development, management and sustainable utilization of CPRs.

c) Provide compensatory opportunities for upgrading production systems and /or off-farm employment to the affected families in case of non-alternate options for CPRs.

d) Organize primary groups within the Village Forest Protection Committees to democratise the larger bodies and allow room for individuals in decision-making.

e) Hold multi-stakeholder consultations prior to forming User Groups.

f) CPRs should be assigned to User groups to permit scientific biomass/pasture development.

g) Improve the effective role of Panchayati Raj Institutions in Natural Resource Management (NRM), which is currently seen as minor.

3.5.3.1.3 Pollution from Industrial Livestock and poultry production

a) Pollution from industrial livestock and poultry production in the future is going to be a major threat in India, especially in view of the ongoing Livestock revolution. The rapid growth in the demand for animal protein due to the increase in income, population growth and urbanization may cause a quick evolution of the most sustainable mixed farming systems in India giving rise to an industrial production system. Trends reveal that large industrial cattle farms that are not land based are increasing, especially in the urban and peri-urban areas. This may lead to environmental (air, water) pollution, mainly because management of cattle manure is difficult (unlike poultry manure) and easily enters water routes. This is a small problem at the moment but may intensify with time unless control measures are undertaken. This problem can be managed since cattle owners operate on a large scale and will be able to invest in precautionary measures.

b) The poultry sub-sector in India is one of the fastest growing segments of the agricultural sector today. These poultry units are mainly concentrated around urban and peri-urban areas and there is no integration with crop production systems. This causes increasing concerns relating to environmental pollution.

c) The transformation of the poultry sector from a backyard activity into a commercial activity has resulted in the involution of farming systems, causing loss of various breeds of country birds which are suited to backyard systems with low input requirements and low health risks. This has also adversely affected income generation opportunities for rural women.

d) The presence of pesticide and antibiotic residues in Livestock products is also a growing problem in India. Most crops are sprayed with pesticides, which then find entry into animals through crop residues. Similar problems are caused by the rampant use of antibiotics for the treatment of animals. This is a quality and trade issue. As a result of low attention to food safety and quality, Indian Livestock products face difficulties in entering the export market.

3.5.3.1.3.1 The Solution lies in

a) Enforcement of environmental regulations relating to the use of pesticides and antibiotics, disincentives on urban / peri urban Livestock keeping and incentives for crop-livestock integrated farming system.

b) Technological options comprise development and promotion of indigenous breeds suitable for backyard systems, adoption of manure management techniques, which will make them economically viable.

3.5.3.2.0 Resource Rich Section Scenario

a) This section has access to the exotic breeds, high quality feed, preventive and curative health care through paid services from professionals, access to credit, access to organized marketing including export avenues due to their large scale and assured supply of the Livestock product and facilities for providing sanitary and phyto-sanitary certification etc. Most research has gone to benefit this segment, which, in turn, has undoubtedly contributed to growth of poultry and commercial dairying etc. and has led to substantial export earning also. This segment can and would benefit from corporatisation of the Livestock sector through large-scale operations, preventive and curative health measures through production and easy supply of vaccines/medicines, affordable supply of feed, modern abattoirs, better processing and network of cold storages as well as facilitation of export procedures in view of perishable nature of the Livestock commodity.

b) However, even this segment of Livestock farmers / corporates needs several reforms to optimise their performance and tap the domestic and global potential fully. Reforms for this segment would also indirectly benefit the

comparatively better small scale Livestock producers, since there are significant synergies. These can be listed as under:

i. Include meat as an eligible item in Vishesh Krishi Upaj Yojna. Restore APEDA's financial assistance for upgradation of export-oriented abattoirs/ processing plants, which was in force till 2002.

ii. Include buffalo meat under APEDA's Transport assistance scheme for new markets in Africa /CIS where freight cost from India is much higher than from competing countries.

iii. Restore Duty Entitlement Pass Book (DEPB) scheme for frozen buffalo meat.

iv. Exempt service tax on transportation of meat products processed for exports, especially since this facility is already available for fruits, vegetables, eggs etc. even for domestic consumption.

v. Give special attention to premium priced buffalo-calf meat for niche market abroad.

vi. Concentrate on health of Livestock for abattoirs processing meat for export in order to satisfy the sanitary and phyto-sanitary standards required in EU.

vii. Revamp and simplify the schemes of the Ministry of Food Processing Industries in order to ensure that the flow of financial assistance is in tune with the published provisions.

viii. Ensure thrust on value added processed meat products, so that India could compete in international market where it, even today, has a small presence.

ix. Take up cost effective artificial insemination programme for the resource rich farmers/corporates, involving high yielding exotic breeds, in the Dairy sector.

x. KVKs and private veterinary clinics should deliver quality health services, both preventive and curative, at a cost since dairying for such resource rich producers would be almost a commercial activity.

xi. Large corporates on the pattern of NDDB, should come up in all the parts of the country and should do hand-holding for producers starting with

production to marketing and export, including processing, in the Dairy sector.

xii. Corporates should also need to provide similar hand-holding and go in for contract farming for other Livestock, by taking care of the provision of animal health care and hygiene to assured purchase of the produce of the farmers. They would thus undertake a commercial activity in a decentralized manner, thereby preventing the possibility of large-scale disease infestation in a single farm and also interest people around their processing facility.

xiii. Poultry sector has already seen such examples of large-scale production, leading to a quantum jump in the production of eggs and birds in the country, thereby benefiting the producers as well as the consumers in both urban and rural areas. Organisations like National Egg Coordination Committee have contributed to the setting up of a National Egg Grid leading to well publicized and fairly uniform egg prices etc. Similar initiative would be possible and necessary for other animals in the interest of producers as well as consumers and also in the interest of macro level management of Livestock.

xiv. Eggs could be included in the Mid Day Meal programme in order to push up demand, which in turn could benefit producers also besides meeting the nutritional requirements of children.

xv. Professional Managers specifically for the Livestock sector should be produced and trained to provide management services for large-scale operations in the Livestock sector especially for the resource rich producers including corporates.

xvi. Efforts should be intensified for removal of non-tariff trade barriers for export of Indian milk products and ingredients, especially for SAARC countries and beyond. Joint ventures should be encouraged to bring the technology of large-scale operations and production for niche markets.

xvii. In order to further enhance the potential of Livestock industry, India has to deal with the problem of direct and indirect subsidies and non-tariff

barriers by developed countries, and try for a greater market access to our products and a reasonable degree of protection of domestic industry through enhancement of tariffs to the permissible extent. India also has to guard against several diseases like Avian Flu etc., which can cause immense damage to the industry and farmers. Prevention of such diseases is perhaps the best option and this can be achieved through establishment of several regional testing and analytical labs with latest facilities and scientists, instead of relying on a single laboratory at Bhopal.

3.5.4.0 General Issues

a) A **National Policy on Livestock** should be formulated keeping the objectives and capabilities of the various categories of farmers owning Livestock. Special attention should be paid to **Policy on Livestock Breeding,** particularly cross breeding, in order to enhance and sustain the productivity of domestic stock**.** The Policy should address the entire production – consumption – export chain and should be pro-active, pro-poor and gender sensitive. Simultaneously, the policy should identify methodologies, which could link the poor and underprivileged producers with the more capable farmers and the Livestock industry in a win-win relationship, so that all of them could benefit from the global opportunities opened up by WTO as well as the rising domestic demand for good quality animal products in the wake of our encouraging economic growth and rising incomes in the urban areas.

b) It needs to be stressed that the analysis of the smallholder subsistence system and the resource rich commercial system is a static snapshot of the current situation. However, since economic growth is a dynamic process, the smallholder subsistence system would have to be enabled to carefully graduate on to a resource rich commercial system, since it may not be feasible for the former to continue an unviable existence for long. In the meantime, the smallholder system may have to maintain a mutually collaborative symbiotic relationship with the commercial system.

c) Production objectives of the various categories of farmers must be clearly understood in a participative mode and a strategy for breed improvement, feed formulation; supply of services and marketing etc. should be tailored for these

objectives. A uniform policy for all segments of farmers in all parts of the country may not succeed.

d) Krishi Vigyan Kendras (KVKs) can be and should be a strong tool for providing support to farmers for all aspects of Livestock including marketing. KVKs are perceived to be focusing too much on crops and horticulture and their Livestock component needs to be strengthened through better staffing and tie up with research.

e) In spite of rapid growth of tractorisation and other implements of farming, many small and marginal farmers are not able to afford the cost of purchase and maintenance. Draught animal power, therefore, would continue to be necessary for mixed crop-livestock farming system, which is the preponderant mode in India.

f) Mixed crop-livestock production system is a common feature, particularly for the small and marginal farmers in India. Many of such farmers are turning to Organic farming to enhance their incomes from their smallholdings. Bullock power, therefore, represents a major resource and opportunity. Bullocks provide dung/urine, which could be used by the farmers to enrich their hungry soil and improve the soil structure/health. Enriched manure from the bullock dung reduces use of costly fertilisers and is a critical input for Organic farming.

g) Bullocks can and should be increasingly used in conjunction with farm machinery meant for smallholdings in order to encourage minimum tillage and enhance employment opportunities, while cutting out expenditure on costly tractors/machinery and diesel. At the macro level, this would result in reduced pollution and lesser subsidy bill and lead to sustainable eco-friendly agriculture. Several innovations like Kamdhenu bullock driven tractors have been developed, which can perform a variety of operations at a much lower cost. These technologies would also need to be encouraged for adoption on a larger scale.

h) Cyclical use of poultry/ ducks, pigs and fishery particularly in the North-East have proved very profitable and could be popularised all over the country especially where some water is available for fisheries.

i) The requirements of Livestock should invariably be kept in mind while planning for crops in the watershed.

j) Farmer Workshop on Farming Systems should sensitise the participants on efficient use of crop residues for Livestock.

k) Among total population of Livestock, only a fraction falls under the descript breeds for milk and draught purposes. The remaining fraction presently is described as non-descript. There is an urgent need that, some specific breeds should be identified amongst the meat producing species and genetically improved through selection, for further production.

l) Attempt should also be made to select the breed with good performance from the local geography for grading up of non-descript rather than only using the germplasm of exotic or established breed from remote areas.

m) The WTO regulations now expose the small and marginal farmers to global competition. The Government should provide them the minimum protection and support measures permissible under the WTO for poverty alleviation and livelihood protection.

n) Subsidies, though very small compared to other sectors, have been used to support free supply of animal health care, artificial insemination and other services through Government departments. Subsidies have also been used as part of poverty alleviation programmes, to enhance the participation of the poor in Livestock development. However, better targeting and reach of such direct or indirect subsidies in favour of the poor farmers is desirable.

o) It has often been argued that Livestock sector growth in recent decades has been largely a response to the market pull, and that the productivity of subsistence farming system is so low that with even moderate market-stimulus, producers are able to effortlessly raise output and productivity using the inherent 'slack' in the system, in the form of under-utilized family labour and crop residues, and with moderate improvements in breeding efficiency.

p) In the States of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh, chances are high that large farmers will move out of dairying – which they may find uncompetitive in the absence of a powerful market pull, leaving it to small and marginal farmers. In contrast, some of the better-endowed areas – in the north and the west – will, in all likelihood, emerge as frontline milk-sheds of the country. In areas

experiencing strong 'market-pull', mixed farming may weaken and semi-specialised Livestock farming may increasingly emerge as the dominant mode of organising production. Private investments in value-adding technologies near the consumer-end of the production chain would perhaps increase while public and co-operative investments near the production-end would stagnate. Without early and drastic reforms in legal framework and bureaucratic environment, many producer co-operatives may take a beating; and as co-operative and public systems for technical input supply – such as they are – wilt under progressive resource crunch, there is a likely emergence of an institutional void in many areas in production support systems serving small producers. All these changes will bring smallholder Livestock farmer under pressure. This pressure may ease but only if there are growing opportunities for off-farm work or for urban wage employment.

q) Like many agrarian countries such as Sri Lanka, Bangladesh and Pakistan, Indian Livestock product markets are filled with cheaper imports, giving India neither a global foothold nor a sector that can support livelihood of the rural poor any longer. It is necessary and important to develop a creative and positive response to this challenge. Progress and efficiency should not be antithetical to the interests of the resource poor; indeed, it should be the opposite.

r) Even the resource poor have begun to realize that poor services do not take them very far even when they are free. They would be ready to pay a reasonable market price if the service is of good quality. It may, therefore, be desirable to out-source several veterinary services to the private sector consisting of veterinary graduates setting up Livestock Clinics. This may be necessary since resource constraints have prevented the establishment and efficient operation of veterinary services with full complement of staff in the public sector, to fully cater to the rapidly increasing number of animals. It would be desirable and indeed cheaper to subsidise the provision of such out-sourced services to small and marginal farmers. Such a policy would also spur the employment of Veterinary graduates and lead to an increase in the number of students opting for veterinary courses in Agricultural Universities, commensurate with the potential of the Livestock sector in India and its importance for the mixed crop-livestock farming by small and marginal farmers.

s) It may be necessary for the Government to set up fully integrated pilot projects covering all aspects of the production – consumption - export chain to provide handholding to Livestock farmers. While the Government could take care of credit and risk cover, disease prevention and control, the private sector could take care of AI services and marketing and processing. In this, public-private partnership model, smallholder production could be backed with guaranteed price by the private sector in a win-win relationship. This model could be very suitable for small ruminants, poultry etc. and could be started in districts with potential and could later be up-scaled.

t) Institutional reforms for providing economies of scale to smallholders would be necessary. This could be through cooperatives, self help groups, production companies and public-private partnerships.

u) Government should encourage schemes which cater to production of Angora rabbits in suitable agro-climatic zones and ducks, turkey, quails and parakeets as pets for supply to the niche markets emerging in the urban areas due to rising incomes. Such production should be generally encouraged in areas around the cities and near roads in the interest of logistics.

v) Since 16.6 per cent of rural households have up to 0.01-hectare land holding, Livestock would have to be the major source of income for them as their incomes from crops are likely to be negligible. Similarly, 58 per cent of rural households have land up to 1 hectare and this large target group can supplement its income through Livestock.

w) Priority should, therefore, be given to marginal farmers producing coarse grains in different areas. Since coarse grains may not be very remunerative in the market, it could be used as low cost feed for Livestock. The targeted farmers should be provided a mix of Livestock, cattle and poultry after consultations and in a participatory mode through loans on concessional interest of 4 per cent and with a maturity period of five years and a moratorium of two years in view of the gestation periods involved.

x) An yearly review should be prepared cooperatively by the Government department and the target group to quantify the income generated at the farmers' level through the supply of Livestock.

y) **It needs to be stressed that progress should be measured in terms of rise in the income of the farmers and not merely through macro-level production/export statistics.**

3.5.4.1 Policy Initiatives Needed

a) Transform the national and global market pull into an engine for generating sectoral and national competitive advantage, and create conditions which propel and enable sectoral decision-makers to creatively utilise the opportunities offered by the new economic environment to establish competitive advantage not only at the farm-level but also at industry and sector levels, making India a leading player in global Livestock product markets through sustained and all-round improvements in quality and efficiency.

b) Enable the small producers to participate in the process of Globalisation, and to promote institutional and technological change that will enable resource poor households and women throughout our countryside, but especially in the agriculturally backward and poorly endowed regions of the country, to gainfully participate in the processes of growth and modernisation of the Livestock sector.

c) Ensure the ecological sustainability of Livestock sector growth and modernization, that is, to constantly monitor the environmental impact of the new market-induced growth processes in the Livestock sector, and design programmes and policies to effectively mitigate their adverse ecological impacts.

d) The thrust of the Government policy should be to remove all impediments in the way of achieving such competitive advantage through changes in the legal and regulatory framework, and through a policy and institutional environment that promotes productivity, excellence and competitive advantage. The central thrust of the Livestock sector policy should be to generate a strong market pull, which will facilitate this transformation.

e) Globalisation and marketisation creates phenomena of islands of high-tech, capital and input intensive, market-oriented production systems flourishing near processing plants, while the majority of rural households continue to pursue traditional systems. While the market takes care of the growth and competitiveness, government policy must focus on strategies to prevent exploitations and unsustainable

practices, and to integrate the small producer to the larger process of sectoral growth, in a win-win mode.

f) A real danger of market-led approach is that firm-level interests often acquire priority over sectoral and national interests. It is entirely possible that a handful of manufacturers and processors, especially with global linkages, are able to take full advantage of the liberalised regime and create pockets of excellence and competitive advantage while the rest of the sector languishes. As the custodian of the sectoral and national interests, the prime role of the Government is to shape the market pull to serve the sectoral and national interests. In order to take maximum advantage of the 'market-pull' for lifting the sector up by the bootstraps, it is critical to promote supportive institutional frameworks and operating mechanisms.

g) The Government needs to devise specific policies and programmes to enable and encourage small holders - the main actors in Indian Livestock production - to progressively approach global levels of efficiency and output. This would involve, among other things, promoting diversification in agriculture through access to better quality - rather than subsidized - credit support, information and technical support needed for them to exercise options for diversification, extension support needed to optimise resource use, and, in general, to help small holders to pull in the inherent slack in the system to their advantage.

h) Finally, a big area for aggressive experimental and promotional work is the organisation of smallholder livestock production. Throughout the world, the modernisation of Livestock production is accompanied by major reorganization of production. There are currently a large number of small-scale, mostly subsistence production units producing for the market. In essence, in this process, the subsistence farmer is joined by entrepreneurs who profit from pursuit of productivity growth. This is essentially how modernisation produces growth. In India, we have seen this process occurring in the poultry sector in the past decades, resulting in a bi-polar production organisation. On the one hand, we have a small number of large, very efficient producers and on the other; we have a vast backyard sector with low productivity and no market orientation. Given time, the globalisation could produce similar centralising tendencies in other livestock systems as well. Public policies must make this process as pro-poor and gender-sensitive as feasible.

(i) A recent World Bank study has examined the drivers for pro-poor growth and has recommended (a) give priority to diversification, both to high value agriculture and a dynamic non-farm sector, increasingly linked to agro and urban industrialisation, (b) shift emphasis to less favoured areas, which may now and in future provide higher returns in terms of both growth and poverty reduction.

(j) It is critical that Livestock researchers understand how livestock systems are changing, whether in the systems in more marginal areas or, in the rapidly changing systems responding to market demand for livestock and livestock products. Secondly, within different systems, it is important that a mixture of technology, policy and institutional innovations be combined if sustainable and equitable livestock sector growth is to be achieved. Thirdly, beyond broader livestock sector growth, specific attention will need to be paid to how the poor can benefit from the emerging opportunities. This will not happen without targeted and intelligent public sector research and development action.

(k) Livestock policies would be more pro-poor if they include strategies for (i) establishing the basics for livestock production through secure and adequate access to inputs like land, feed, and water as well as risk-coping mechanisms for natural disasters and price shocks, (ii) kick-starting domestic livestock markets to promote a pro-poor credit market and efficient, pro-poor system of animal health and extension service and adequate access to output market for small holders and (iii) supporting and expanding livestock markets through encouragement to sustainable production of high quality commodities, research for feed and breeds, environmental protection, food quality control, certification and grading to enable the products to be competitive in international markets and to avoid small holders being crowded out by foreign competitors.

3.5.5.0 Genetic Improvement

a) There is urgent need to establish scientific genetic improvement programs (and strengthen existing programs) for all important indigenous breeds of large and small ruminants (including cattle, buffaloes, goats, sheep, camels) and poultry. This will help in achieving the dual objectives of breed conservation and genetic

improvement. In such programs, emphasis should be placed on accurate genetic evaluation using modern statistical methods.

b) Existing Government programs have generally not been successful in producing large numbers of improved Livestock germplasm. Therefore, the private sector should also be encouraged to establish breeding programmes with appropriate breeding objectives.

c) Breed improvement programmes may be based on field recording/progeny testing of animals maintained at the farmers' level. Improved progeny selected through field recording should be used for future breeding programmes.

d) Scientific selective breeding programs also need to be established for crossbred cattle with different levels of exotic breed inheritance.

e) Only progeny tested 'proven' bulls which are the product of scientific breeding should be used for semen production.

f) Large corporates on the pattern of NDDB should come up in all parts of the country which should do handholding for producers starting with production to marketing and export, including processing.

g) Most of the economically important characters in farm animals like milk production, rate of gain (growth), efficiency of gain, carcass quality, etc are quantitative traits. These traits are controlled by a large number of genes, which may act adaptively, multiplicatively and interact epistatically with each other or exert dominance. Identification of quantitative traits and exploitation of these polygene characters using biotechnologies has immense potential.

h) More research inputs based on farmers' feedback and requirements of different soil types/fodder availability and costs would be needed to cater to this requirement. In particular, the opportunities of fodder by indigenous breeds should also be tapped, in view of their hardiness and adaptability.

3.5.6.0 Dissemination of Genetic Improvement

a) All semen production stations need to be monitored strictly to ensure that they follow the guidelines laid down by OIE and maintain high standards of quality control at all stages.

b) Quality animals are not available in adequate numbers and are also dispersed leading to inefficient supply chain of frozen semen.

c) Inadequate facilities for production, maintenance and supply of frozen semen hinder insemination in far-flung areas. There is insufficient involvement of the private sector and trained rural youths in the task of providing artificial insemination facility. The service covers only some 20 per cent of the breeding females among cattle and in not even 5 per cent of buffalo; the conception rate to AI is less than 20 per cent. In short, the quality of AI services in India is very poor.

d) 100 million doses of semen must be made available in a year to inseminate the cows and buffaloes for breed improvement and sustenance of milk production.

3.5.7.0 Research and Training

a) Livestock vocational training at district / divisional /agricultural university level needs to be started to prepare **Para Veterinarians**.

b) Curriculum for Para Veterinarians should be standardized and should be supplemented through attachments with Institutions/Governments/NGOs for supplies, support, supervision and quality control.

c) Veterinary colleges in the Agricultural Universities should receive greater focus and funding to come up with digital Extension Content development so that farmers can access the required information through IT network.

d) There is need to undertake progeny testing programmes, since there are virtually no testing bulls available and good genetics require use of biotechnology techniques.

e) There is a need to set up a system of animal registration and performance data recording. Good work has been done in this area by Maharashtra Animal and Fisheries Science University, Nagpur, and needs to be replicated.

f) There is a need for creation of a Regulatory Authority of animal breeding quality assurance, which could consider and decide on issues relating to artificial breeding services in rural areas.

g) The current ban on importing semen and embryos should be considered for relaxation under regulated conditions, since it would require a decade for progeny selection of bulls and till then we have to depend on imported semen and embryos.

h) Progeny testing programme would involve testing potential bulls for genetic disorders and production potential with the help of gene markers. This could be attempted afresh through setting up of well-equipped biotechnology centres in each State, which could run on commercial basis. In view of importance of buffalo in India and its well-known capability, there is a need to formulate buffalo semen production protocols and develop Hazards Analysis Critical Control Point (HACCP) standards for semen supply to rural areas.

i) To promote livestock marketing access to farmers, Maharashtra Animal and Fisheries Science University, Nagpur has developed a web-marketing platform at www.pashubazar.com. This initiative also needs to be replicated so that rural Agri-business centres, veterinary dispensary, Dairy Corporation and rural cyber café could provide franchise Livestock marketing services to farmers. The site can also be used for sale/purchase of farm equipments etc. Animal health and productivity services at veterinary centres are becoming redundant in view of absenteeism and logistic problems in carrying sick animals to the centres. Farmers now request door service, provided quality inputs are made available. The farmers need assured services for Livestock purchase, genetic improvement, and breeding and production improvement consultancy, and feed diagnostic approval services. There is a great scope for privatisation of such services through trained veterinarians on the pattern of Agri - clinics. A franchise approach with mechanism of cost recovery would be desirable.

j) Promote Institutions and establish mechanisms to ensure quality consciousness in milk, meat, vaccine and other products of this sector, encourage research and innovation, and to enhance sector level efficiency in quality production, value addition, procurement, processing, storage and marketing of all Livestock products.

3.5.8.0 Breed Conservation

a) In recent years, a widespread consensus has developed that the best way to conserve breeds is to facilitate the maintenance of them as part of functional

production systems and in the social and ecological context in which they were developed and continue to develop. Thus community-based conservation of Livestock breeds should be encouraged and supported.

b) In order to protect the local breeds against indiscriminate cross-breeding with exotic species, it would be necessary to set up **Living Gene Banks** for local breeds like Rathi, Bhadawari etc. The existing Suratgarh Farm could be used for this purpose. However, supporting low input smallholder systems is a more promising approach to biodiversity conservation.

c) There is need to have some kind of control on breeding of small ruminants in the villages. Forming 'User groups' in the villages might help in doing this. The farmers in one or more villages may form such 'User groups'. The 'User group' may decide to keep certain breeding males and those could be used on payment basis.

d) In comparison to many exotic pure breeds and crossbreds, our indigenous dairy cattle, like Haryana and Sahiwal, also known as Brahmans abroad, show a greater degree of heat tolerance with minimum loss of body weight during exposure to stress, nutritional deficiency and transport, as well as low mortality rate and good reproduction rate and longevity. Similarly, the Indian Red Jungle fowl (*Gallus gallus*), Frizzle fowl and Naked neck fowl are better known for heat tolerance quality. Among the different genetic groups of sheep, Malpura and Chokla show a greater degree of heat tolerance value.

e) Accreditation of indigenous breeds by State Governments by way of registration is warranted. The registration programme should be expanded for all breeds and strive to identify animals with higher productivity. State Governments should carry out field recording of performance of the animals with help of other agencies and State Animal Husbandry Departments. NGOs should be encouraged and given incentives to start this kind of work.

3.5.9.0 Gender Issues

a) There is a variation in the extent and nature of the involvement of women in Livestock management as well as their perception, knowledge and views between regions and socio-economic strata. Despite variations, women mostly handle aspects

like milking, care of young and sick animals, cleaning and feeding. This is significant for design of extension and training strategies.

b) Consequently, training and extension programme in Livestock need several changes. Prevailing illiteracy, household responsibility leading to limited time and mobility and women' priorities and felt needs should be considered and provided for, in gender focused programmes for their training.

c) Women's knowledge of animal behaviour, feed resources, useful medicinal, fodder plants and bushes etc. should be developed and utilised.

d) Since women generally attend to most of the activities relating to feeding of animals and milking as also primary processing of milk products such as curd and butter, there is need for dissemination of knowledge to them on aspects of better feeding and maintenance of Livestock and disease control.

e) More research is needed for equipments, which could reduce the drudgery of women in handling of Livestock and processing of Livestock products.

f) More mentoring is needed for women's self help groups so that they could be more efficient in handling their Livestock wealth and for improving livelihoods.

3.5.10.0 Problems of Small Ruminants

a) Small Ruminants contribute about 10 per cent to the total value of Livestock sector but receive only 2.5 per cent of the public spending on this sector. They account for 14 per cent of meat output, 4 per cent of milk output and 15 per cent of hides and skin output. Goats are widely distributed in various agro-climate regions but have special significance for West Bengal, Rajasthan, U.P. , Maharashtra, Bihar and M.P. Sheep density is the highest in arid and semi-arid eco system and they have special significance for nomadic communities and in A.P., Rajasthan, Karnataka, Tamil Nadu, J&K and Maharashtra. In general, the small ruminants make an important contribution to the sustenance of small and marginal landholders and the landless.

b) The critical issues for this sub-sector are poor awareness regarding their importance in the livelihood system, lack of active rearer organisations, pressure on fodder resource base, inadequate veterinary health services, lack of focus on genetic

improvement, reduced access to credit and insurance, lack of efficient market mechanisms, and poor inter departmental coordination.

c) The approaches to these issues would consist of development of multi stakeholders platforms for knowledge sharing and inter-departmental coordination, promotion of gender balanced, small ruminant, rearer organisations, capacity building of rearer groups, mechanisms to improve veterinary health services, institutional arrangements for improved access to credit and insurance, selective breeding for breed improvement and systems to improve access to remunerative markets. It would be useful to set up a pilot study to understand the balance between stocking rate and biomass availability.

d) There is an urgent need to have some kind of regulation and proper marketing policy for small ruminants and their products. The policy should also focus on export requirement. For this, regional goat/sheep Marketing Boards may be constituted. The boards should ensure quality standards and remunerative prices for producers.

3.5.11.0 Problems of Organized Dairy Marketing

a) There are 100 million farm holdings in our country out of which at least 5 million holdings should be motivated to establish organized dairy units which can be monitored and linked up with modern amenities of bulk cooling, refrigeration, transport, storage and processing of surplus milk into products.

b) The latest techniques such as use of BST (Bovine Somato Tropin) and ET (Embryo Transfer) etc. have not been applied to its full potential, which should be made available to farmers at a reasonable cost to increase the production by 20-25 per cent.

c) There are many villages having the potential for milk production but not covered in Operation Flood (OF) programme. For example, the percentage of villages covered by OF in UP, Rajasthan, MP, WB and Bihar was 21, 15, 9, 5 and 9 per cent respectively. Out of 168 Milk Unions, 119 Milk Unions (70.8 per cent) are running in loss. The major causes, which may explain the closure of societies/unions are : i) active price competition with informal traders especially in the villages around cities, ii) single milk collection point: this increases travel time and waiting time, iii) village

politics, iv) dishonesty, v) Alternative opportunities like soybean cultivation (in Madhya Pradesh) provide higher income than dairying; and also fewer by-products for cattle feed than the cotton and groundnuts they replace, vi) rejection of the Anand principles of farmer control in many States, vii) under-utilization of processing capacity in some of the loss making unions resulting in high overhead cost and huge interest burden to these unions, viii) milk unions fail to dispose of all milk collected during the flush season through their own channels or the National Milk Grid. As a result, they are compelled to convert the surplus milk into milk powder and butter oil to be used only in the lean season. In this process, a large sum of the milk union's money is blocked and creates a shortage of working capital which further leads to non-payment to milk producers, a major cause for poor procurement performance of many loss-making unions.

d) Among the loss making unions, 22 dairy cooperative unions have the capability and the potential to become self-sustaining entities in time. Their performance has been mainly constrained by insufficient growth in milk procurement and marketing. They can effectively turn themselves around through appropriate interventions and many of them have already initiated steps to do so. 44 cooperative milk unions/federations have suffered losses due to internal factors such as lack of professional management, overstaffing, poor capacity utilization and external factors such as the negative impact of government pressures to increase milk procurement prices, withhold upward revision in sale prices, increased competition and restrictive cooperative legislation. Their turnaround seems possible with the infusion of external financial assistance since they are endowed with significant procurement and marketing potential. It is necessary to put in place a mechanism that can regularly collect reliable data on the performance of the organized private sector dairy industry of the country to enable the cooperatives to compete with private companies.

e) The crucial agenda is to devise ways to ensure that the sector globalises in a participatory format; that it grows fast but with active and gainful participation of the resource poor and women throughout India. And, in achieving this aim, strong producer co-operatives can be the best possible answer.

f) It is certainly necessary for the Government to take initiative not only to radically reform the co-operative act to facilitate business performance and concerned success but also to turn the dairy co-operative movement over to its members.

g) As an organisation, which has steered India's dairy development over the past three decades, the NDDB is in many ways best placed to lead the globalisation of Indian dairying. To do this, it needs to redefine its charter: it needs to swiftly remove the bugs from the Anand pattern so that at least half – but preferably many more – of the co-operative unions put their act together for the global market place: it then needs to lead the co-operative dairy sector to the global platform by a series of swift and proactive moves to set up plants in several Asian countries. While in their current State, producer co-operatives face many odds against national and global competition; their unique potential strength is in the area of quality. Dairy co-operative members are accustomed to supplying milk on the basis of fat and SNF tests for decades, but attach little or no premium on bacteriological quality. This cannot be said about a majority of private operators even in the organized sector, leave alone the informal sector. If India has to meet high quality standards that global competition will imply, co-operatives will find it the easiest to meet them, especially if they can translate better quality into higher income for their members.

h) The co-operative sector's other major strength is the NDDB, with its technical, managerial and marketing capability and its ability to build farmer-to-farmer alliances in other countries. Keeping these in view, the NDDB should aggressively seek and establish an early foothold in overseas markets. The Government can assist the NDDB to perform this role in a number of ways but firstly by making the changes necessary in the legal and regulatory framework so that the NDDB-supported co-operatives can operate freely as farmer owned businesses.

i) Use of synthetic milk should be banned in view of health hazards and in order to enhance demand for genuine milk from the rural areas, which would in turn mean higher incomes for farmers.

BOX-I

Poultry Farming

Poultry farming has become one of the fastest growing sub-segments in the agricultural sector.

Poultry industry contributes Rs. 35,000 crores to the GNP and provides employment to over 3 million persons, and is the only segment of the Agriculture economy, which is growing at about 17 per cent per annum. Some of its features are:

a) It is an efficient converter of maize and soyabean into nutritious animal protein feed.

b) Poultry litter is excellent manure, containing 4.8 per cent nitrogen, 2.8 per cent phosphorous and 2.3 per cent potash. 40 birds kept in deep litter for a year can produce one tonne of manure to fertilize one hectare of paddy or maize, two-hectare sorghum or half hectare of intensively cultivated vegetables.

c) Poultry farming is labour intensive, needs comparatively little capital and provides quick returns. It has great potential for non-farm employment and for retardation of rural migration.

d) India with its strong agrarian base and favourable climate is a highly economical location for poultry production.

e) Forward looking private companies like Shri Venkateswra Hatcheries have contributed substantially to breed improvement and spread of poultry farm through a package of services. Similarly, a consortium of private stakeholders has self-regulated the industry and performed substantial marketing functions through the National Egg Coordination Committee. Such initiatives are unique to poultry in the animal husbandry segment.

Problems

a) There is a severe shortage of major feedstuff viz. maize, which accounts for 50 per cent of all feedstuff and 75 per cent of the total cost of production of eggs and boilers. Profitability of the sector, therefore, is highly sensitive to price fluctuation in maize.

b) There is a substantial infrastructure constraint for storage, distribution, marketing and export including a shortage of refrigerated road transport and efficient cold chain. In addition there is a shortage of a proper testing system and hence pesticides/ anti-biotic/ hormone residuals cannot be tested sufficiently to meet the requirements of the exporters.

c) Even through poultry sector is a sub-segment of the agriculture sector, it is subject to restrictions on use of agricultural land and also attracting high electricity tariff and sales tax and is also subject to different land and labour laws compared to Agriculture based industry.

d) Poultry industry faces a dangerous future due to the threat of totally unrestricted free trade and the challenge posed by producers like Brazil with their low prices for "whole chicken/chicken products" in view of their large farms. India is ranked number one in competitiveness for egg production and number two for chicken production.

e) The threat due to lower prices of chicken meat is also due to the fact that "chicken legs" considered as delicacy in India are treated as dark meat and dumped at a low price by foreign countries in India. EU and US provide large subsidies to their farmers and the prices of maize there also are lower leading to cheaper feed prices.

Mention however, must be made of the threat posed by unknown and known diseases like Avian Flu through H5N1 and other viruses, through imports. Such diseases can cause extensive damage to health of flocks and the economy of farmers. Above all, it can cause a substantial reduction in demand for poultry and egg causing steep fall in prices. The best option is to prevent such diseases through establishment of testing in analytical laboratory at important ports and facility for quick analysis, quarantine and deportation. While import of vaccines for H5N1 virus is banned, it is felt that the ban should continue, because we do not have the facility for check of isolation and testing of the vaccine. H5N1 is an unstable, mutating and very fragile virus and the entire issue of the need desirability and implications of vaccination should be thoroughly studied by a team of scientists.

Source: Dr. Anuradha J. Desai

j) In US and Europe, consumers prefer the breast and breast meat of chicken, as it is considered as "white meat" or lean meat. The legs, which are considered as dark meat, or red meat, have no demand there. Due to the strength of export subsidies chicken legs were exported by US to Philippines and Sri Lanka at ridiculously low prices, thereby ruining thousands of poultry farmers in those countries. If chicken legs or legs meat is imported into countries like Sri Lanka and Nepal which have Free Trade Area (FTA) with India and re-exported to India, after a token value addition – at zero duty under the FTA - that could cause enormous damage. Therefore, the extreme cautions and vigilance are necessary to ensure that prescribed value addition norms should be strictly adhered.

k) Our layers yield a Hen-Housed production of 320 eggs; and our broilers attain a bodyweight of 1.7 kg in 37/38 days with a feed conversion ratio of 1.7 – and that too, with a feed containing 2800/2900 kilo.cal energy, as compared to 3200 kilo.cal in USA/Europe. This superior productivity makes India one of the least cost producers of eggs and poultry in the world. Therefore, with a level playing field Indian can compete with any country, not only in the Indian market but even in International market.

3.5.12.0 Disease Control Issues

a) The spread of Veterinary dispensaries and the availability of medicines are grossly insufficient.

b) The cost of veterinary medicine is fairly high with very little production in the public sector to keep a check on the prices fixed by the private drug companies, particularly multi nationals.

c) A separate Veterinary Drug Controller should be appointed since the Drug Controllers are too busy with medicines meant for humans.

d) Poor infrastructure and communication facilities make prompt access to veterinary services difficult.

e) Emphasis should be placed on disease prevention rather than curative treatment. Vaccine development, production and complete protection of the animal population using all available vaccines are absolutely necessary. International

collaborations and linkages should also be developed for diseases that are of concern in other countries also and where expertise or facilities available within the country are inadequate. The ICAR should give the highest priority to developing new vaccines against diseases such as bluetongue and contagious caprine pleuro pneumonia. Once developed, the technology should be transferred immediately to a mix of public veterinary biological institutions and private entrepreneurs, so that the vaccines can become available to Livestock keepers straightaway. In recent times, this development path was followed most successfully by IVRI with the PPR vaccine and the vaccine became available within minimum time after its development. Teams of scientists from public institutions making such important achievements should be given appropriate incentives.

f) The State Governments' Veterinary biological manufacturing units should be strengthened with adequate funding.

g) There should be quality control agency in place, monitoring the quality of all vaccines produced all over the country.

h) The State Governments should have a separate cadre for the disease diagnostic laboratories and vaccine-manufacturing units. Experts should always head these units.

i) Foot and Mouth Disease, which causes heavy economic losses to the farmers needs priority.

j) Government should provide total disease prevention and control cover area- wise, followed by a public notification so that private industries could set up processing units in such disease controlled areas and meet export requirements as well as benefit farmers of the local areas.

k) In view of the recent WTO regulations, sanitary and phytosanitary provision and risk analysis, it has now become important to achieve harmonization in the vaccine production for live stock and poultry. The Standardization Division at Indian Veterinary Research Institute, Izatnagar should be upgraded as National Veterinary Biological Product Quality Centre. Twelve-selected biological units of the country should develop their infrastructure, meeting GLP (Good Laboratory practice) requirements. All these units should have autonomy.

l) Animal Quarantine Certification Station (AQCS) needs upgradation in the country. The Animal Quarantine, Certification and Enforcement Authority should be created and necessary autonomy/ authority to function as an independent body should be empowered with appropriate authority so that the movement of animals with risks of infection/ disease could be adequately controlled through important airport, seaport, international land routes and movement within the States. Border posts at land routes on western and eastern international borders and small quarantine stations at seaports like Mumbai, Chennai, Kolkata and Goa can be created. In addition inter-state check posts be strengthened and more created, if necessary.

m) Animal disease diagnosis and accreditation as per the international standards, development of an effective surveillance and monitoring system for animal diseases, animal quarantine, certification and enforcement are the function and duty of the Central Government. Keeping in view the importance of animal health control in the post-WTO era, these functions of the Department should get top priority.

n) The prevention and control strategies require promptness in action which can be achieved when the gap between the outbreak and its reporting to planners is reduced. To reduce the gap, there is a need to have a computer based national disease surveillance and monitoring system with intra and inter-district linkages so that proper control of disease could be achieved at a time and forecasting and appropriate measures could be taken to the remaining parts of the district, state and country.

o) Arrangements should be made for immediate transfer of information in the form of reports on WTO agreements, emerging diseases, disease surveillance, etc. so that country could be prepared for any change at short notice.

p) Strengthening of quarantine system with attention to Bio-safety and Bio-security is necessary: All five quarantine stations should be strengthened with diagnostic laboratory facilities for sampling and adequate provision for animal/poultry space, feeding, management, etc. made.

q) Establishment of a National Bio-security Resource Centre to enable government, commodity groups, veterinarians, and producers to meet the challenges of animal health emergencies.

r) Government should put an effective disease reporting and surveillance system and an Emergency Preparedness Plan to counteract outbreak of contagious diseases.

3.5.13.0 Input Issues

a) Most farmers cannot afford stall-feeding in view of high cost of feed supplied by private producers.

b) Area specific mineral mixtures based on locally available and affordable raw materials should be suggested by Agricultural Universities for production in the public/private sector.

c) There is insufficient production and supply chain facility from the public sector to keep the prices in check.

d) Due to shrinkage of common lands due to encroachment etc. and non-management of wasteland, as well as shortage of fast growing fodder tree species, our Livestock is grossly under-fed.

e) There is insufficient extension effort for popularisation and planting of nutritious tree species like Subabul for supply of proteins to the Livestock.

f) There is a shortage of fodder baling machines for efficient management of fodder, especially for transportation.

g) Likely future scenario of demand and supply position in relation to forages is given below. It reveals a huge deficit (prevailing and expected) in green fodder in the country. The available fodder can meet the demand of only 46.7 per cent of total Livestock.

Table 4 : Supply and demand of green and dry fodder – projected estimated

(Million tonnes)

Year	Supply		Demand		Deficit as percent of Demand	
	Green	Dry	Green	Dry	Green	Dry
2005	389.9	443	1025	569	61.96	22.08
2010	395.2	451	1061	589	62.76	23.46
2015	400.6	466	1097	609	63.50	23.56
2020	405.9	473	1134	630	64.21	24.81
2025	411.3	488	1170	650	64.87	24.92

Source: Report of the Working Group on Animals Husbandry and Dairying for Tenth Five Year Plan

Projected balance between demand for and supply of green and dry fodder presents a challenge for fodder production in the coming years. While the deficits are anticipated to increase as a proportion of the requirements in both the cases, the situation appears grimmer in case of green fodder. Focused strategies and concerted efforts are the need of the hour to face up to this challenge.

Table 5: Availability, requirements and deficit of concentrates for Livestock

(Million tonnes)

Concentrates	2003-04	2004-05	2005-06	2006-07
Available	43.14	44.35	45.63	48.27
Required	120.52	123.59	127.09	130.55
Deficit (percent)	64.21	64.12	64.10	63.03

Source: Report of the Working Group on Animals Husbandry and Dairying for Tenth Five Year Plan

a) There is a need for Livestock Feed Corporation and fodder security including creation of feed and fodder banks at convenient location. The cultivated fodder production is limited to less than 4.5 per cent of the area under cultivation and it is estimated that dry matter availability is short of the requirement by 30 per cent and concentrate ingredients are also deficit to the tune of over 80 per cent.

b) There is need of extension effort for popularisation of quality enrichment of fodder through treatment with molasses etc.

c) Cost issues also often prevent quality enhancement of feed and fodder.

d) The poor quality and insufficiency of feed has led to insufficient tapping of the resources available in the form of improved varieties of animals.

e) Taxation on veterinary medicines and semen and other veterinary equipments should be abolished in order to benefit the farmers in the Livestock sector.

f) Subsidy in the Livestock sector is meagre. Against Rs. 300 crores of direct subsidies in the Livestock sector, agriculture gets Rs. 16,000 crores as direct subsidy from the Central Government alone.

g) Immediate and long-term loans in the Livestock sector amount to Rs.2,500 crores, which are around 5 per cent of the total credit of the agriculture sector .

h) Cash credit cards and micro credit are virtually unheard of in Livestock production and the scheme of Kisan credit card does not cover Livestock credit. Consequently, more than half of the farm level credit for Livestock production comes from moneylenders, affecting the viability of the Livestock sector for the farmers.

i) Livestock risk is a major issue for farmers considering that the Livestock sector contributes nearly 26 per cent of the agricultural GDP and Livestock distribution is more egalitarian than land. Livestock provides a much-needed diversification of farmers' income as also a regular cash flow in contrast to seasonal inflow from crops and hence it is critical to ensure affordable, cost effective and efficient Livestock insurance.

j) Notwithstanding the problem of designing and integrated insurance product, in view of the multiplicity of animals in terms of types, breed, age group and quality etc., the work on providing affordable insurance policies, which would be easy to administer and operate and which would result in prompt verification of claims and their settlements, should be taken up with a greater sense of urgency. The Union Cabinet has recently approved a Livestock Insurance Scheme in 100 selected districts. The scheme has been formulated to insure 15 lakh animals with 50 per cent subsidy from the Central Government towards the premium. The scheme should be expanded and implemented actively to benefit farmers.

k) Thousands of tonnes of fodder grasses from common lands go waste every year in the rainy season. Therefore, research and development efforts must be made for better harvesting of fodder resources (especially pasture grasses) when it is

abundant in rainy season. Efforts should also be made for improvement in bailing and storage of this fodder for better utilization during lean season.

l) There is an urgent need to re-evaluate and re-orient the government's current strategy for the delivery of veterinary services. Greater role for private veterinary service providers and out-sourcing of these services to a certain extent, while optimising the existing service delivery system and manpower for vastly enhanced coverage and sustainable delivery of services, should be the goal in future.

BOX II

Some feedback from farmers and other stakeholders on Livestock Service Delivery System (LSD) in Andhra Pradesh

1. Set up community driven Livestock service delivery system for first aid, vaccination, de-worming, Al. etc. outside the government. Also establish community driven LSD in tribal areas, initially paid for by the Government.
2. A large majority of farmers expressed willingness to pay for medicines and services.
3. Animal health & breeding services, even by Govt. staff, should be home delivered. Some also recommended free door delivery of Vet. Services by qualified Vets.
4. Encourage 'Gopalmitra' (Para-vet.) system for delivery of Al and minor Vet. Services (MVS). Gopalmitras should be selected from amongst Livestock farmers.
5. Organise regular Vet. Camps in all Mandals to address breeding problems of bovines.
6. Promote preventive veterinary care on cost sharing between Govt. and farmers.
7. Provide regular subsidized vaccinations and de-worming for small ruminants and back yard poultry through skilled, village based Lady Animal Health Workers (LAHW).
8. Build capacity of shepherds to select, multiply & use f improved Rams and Bucks.
9. Provide a package of assistance to encourage stall-feeding of small ruminants.
10. Encourage production and use of fodder, grasses and their seeds by farmers.
11. Provide special packages to improve subsistence livelihoods of tribal communities through training, capacity development, technology transfer and service support.
12. Assign high priority to provision of credit for Livestock production.
13. Promote women self help groups in tribal areas. Impart skill training to farmers to promote self-help and self-reliance.

* Under the project 'Assessment and Reflections on LSD System in AP' a collaborative project taken up with the Dept. of AH, GoAP (2003-05).

3.5.14.0 Marketing

a) There is a general shortage of appropriate and conveniently located marketing network and itinerant traders often exploit the farmers.

b) Due to poor infrastructure of roads and transport facilities the farmers are not tapping the best markets for prices, even though milk and poultry are exceptions where an efficient marketing network has sprung up in the cooperative and private sectors.

c) Retail marketing outlets in urban areas are still deficient in terms of space and hygienic location.

d) Domestic demands are constrained by religious issues e.g. Muslims do not consume pigs and the Hindus do not consume bovines, particularly cows.

e) Efficient and modern abattoirs, barring exceptions, often do not conform to hygienic and quality control regulations and insufficient attention is paid to the disposal of refuse.

f) Better machinery/containers need to be diversified for transportation of milk, particularly by women to save them from the traditional and tiring methods of carrying milk as head loads. Similarly better transportation vehicles should be designed to enable easier transportation of milk containers.

g) There is no well-organized marketing system for Livestock and meat in India. Since sheep are mostly raised by poor farmers, there is need to organize them into cooperative groups so as to operate organized selling. This should prevent exploitation by traders and help them to get appropriate share of consumer's price.

h) Bullocks would continue to be used in selected areas for haulage where buses/ tractors are not available for transportation purposes.

i) In India food consumption basket is also diversified in favour of non-food grain items like milk, meat, egg and fish. The consumption of animal origin food is, however, small as per ICMR norms.

j) Ever increasing demand for Livestock products is the basis for future ‘Livestock Revolution’.

k) There is little meaning in enhancing milk productivity without providing marketing facilities. A good year of milk production would bring cheer to the dairy farmers of Gujarat (which has an effective marketing network under AMUL for milk collection), but not in States like Orissa, Bihar, Kerala and Karnataka because the

excess supply would lead to prices falling or the Milk Unions in these States suffering losses. NDDB could initiate a programme for creating a buffer stock for milk powder during the flush season.

l) The fine wool production in the country is around 4 million kg and the demand from the industry is around 35 to 40 million kg of fine wool, which is mainly imported from countries like Australia. Attempts are also made to utilize the short staple fine wool in cotton system and the trials undertaken are quite successful and they are inviting the attention of the industry.

m) There is a crucial need to effectively implement the relevant provisions of the MMPO to ensure food safety, quality and hygiene. A mechanism has to be evolved for accelerated growth of dairy industry in both public and private sector.

n) Pig rearing has largely remained with the weaker sections of the society, especially scavengers, both as a source of income and a choice of meat for consumption. Cost of inputs and returns were not a serious concern in this system. However, availability of quality pork for a variety of consumers is a scarce item. In the recent years, entrepreneurs have shown interest in pig production, processing and marketing activities as an organized enterprise. Pork products industry has to develop to meet the requirements of the three categories of consumers - traditional consumers, local area consumers (small scale pork processing units) and elite consumers, hotels, restaurants, etc. (Modern processing units on a factory scale). India could consider exporting pork products, as potential markets exist in Southeast Asian countries. Bacon factories have to be brought under private management for improving piggery prospects.

o) The development of live animals' market information system is vital, as data is a key input to well-informed planning and decision-making. Thus, it is virtually a public good and the Government should actively support this activity. Appropriate scheme should be formulated to strengthen the market facilities and introduce a scientifically managed market for conducting marketing operations as well as collecting proper data on Livestock marketing. No such effort was made in the previous plans and hence need to be given priority.

p) Although the organized sector has shown fast growth in the last three decades, it still accounts for only 30-35 per cent of the total milk marketed in the

country. On the other hand, a far larger proportion of milk continues to be marketed by the unorganized sector – comprising innumerable vendors, small processors, merchants, manufacturers and retailers of indigenous milk products.

q) In the case of milk production, unlike grain production, there is no system of subsidized procurement by the Government. Therefore, any attempt to accelerate the growth rate should be linked with corresponding increase in demand. Measures are needed to increase the purchasing power of the rural and urban poor and also to exploit the market of Indian dairy products for both internal and external consumption.

r) There is a need to transform the national and global market pull into an engine for generating sectoral and national competitive advantage, that is, to create conditions which relentlessly propel – and enable – sectoral decision-makers to creatively utilize the opportunities offered by the new economic environment to establish competitive advantage not only at the firm level but also at industry and sector levels, making India a leading player in global Livestock product markets through sustained and all-round improvements in quality and efficiency.

3.5.15.0 Quality Control Issues

a) Control issues both for domestic consumption and export need substantial improvement.

b) Meat exporters have to adopt Hazardous Analysis Critical Control Point (HACCP) standards. This involves the adoption of quality standards from the stage of production to the stage of export, including processing en-route. This naturally requires substantial awareness generation among producers of the primary product, processors and exporters.

c) Modern abattoirs also have to adopt good manufacturing practices and monitoring of toxic residues, specially pesticides, heavy metals and antibiotics in meat.

d) Quality control of the frozen semen as well as day old chicks of poultry is necessary although this is not yet practiced adequately.

e) Quality control at affordable prices is of utmost importance and there is a need for efficient quality check for the feed being made available to the farmers.

f) Quality control also needs to be strengthened at the processing stage not only for meat but also for animal products like egg powder, cheese pork products etc.

g) Quality standards need to be revisited in consultation with processors and exporters in order to prepare standards, which are implementable, affordable and acceptable, both to domestic and foreign buyers.

h) Looking to the large consumption in the domestic market since 65 per cent of our population is non-vegetarian, difference of standards could be prescribed for domestic and export markets.

i) Revise and redraft the Milk and Milk Products Order for effective implementation of quality standards: carefully review the current apparatus of enforcing these standards in collaboration with the industry and restructure them, if necessary, for greater effectiveness and industry participation.

j) Above all, quality control of Livestock education has to be ensured in order to tap the advances in this sector globally.

3.5.16.0 Utilization of Waste

a) Livestock would also be an essential component of the mixed crop Livestock marketing system, particularly for organic farming. Livestock also is necessary for many innovative practices like bio-dynamic fertilisers etc.

b) Pigs continue to be used as natural scavengers and cow dung is the basic feedstock for the gobar gas plant, which would be increasingly needed in the country in view of the dwindling fuel resources in the rural areas.

3.5.17.0 Processing Issues

a) In spite of substantial advancements, Livestock offers scope for improvement in processing.

b) Quality of finished leather depends substantially on the efficiency and technology for treatment of the carcass. This, however, is a major constraint since

there is insufficient dissemination of technology and technique in the rural areas for treatment of carcass.

c) Most of the value addition takes place in the industrial sector, while there is a need for encouraging technology for **value addition at the farmer's level** for enhancing his income.

d) There is a need for greater research for development of technology, processing and machines which could enable farmers to produce semi-processed/ processed products for the market for supply to more sophisticated processing industries.

e) Policies are needed for greater integration of production and processing.

f) Policies are also needed for attracting more private sector investment for handling of animal products and setting up of processing units for domestic consumption and exports. This could be in the form of earmarked sub-zones within industrial areas or creation of exclusive Livestock industry processing zones with sufficient infrastructure for common facilities like washing, disposal of waste, cold storage etc.

g) Greater attention needs to be paid for processing milk for more diversified milk products / cheese.

h) Processing of meat from goats and other under-processed animals would be necessary.

i) There is a need to encourage sophisticated processing in speciality meats needed abroad.

j) In view of increasing demand in the urban areas for popular Indian meat dishes, in the wake of rising incomes, processing should increasingly focus on "ready-to-eat" meat and egg preparations featuring the various regional cuisines of India.

k) Wool processing from sheep to produce speciality woollens offers another promising area for processing. Similarly, pig, rabbit and camel skin products, if processed appropriately, can fetch higher earnings for processors and ultimately for the farmers.

l) The Angora rabbit production is popular in hilly areas of H.P., U.P., Eastern region and Tamil Nadu. One Angora rabbit can give net income of Rs. 150 to 200 per year. Such successful experiences should be widely adopted through creation of grass root institutions and public-private linkages.

m) Technological progress in the production, processing & distribution of Livestock products will be central to the positive outcome of the 'Livestock Revolution'.

n) The poultry processing industry is still in a nascent stage of growth. Presently 97 per cent of the production is sold as live birds. Only 3 per cent is processed and sold as chilled/frozen. One of the obstacles in the way of growth of poultry processing industry is high incidence of duties and taxes – both on the processed products as well as on the equipment for processing e.g. the cumulative impact of Excise Duty Sales Tax, Surcharge on Sales Tax, Octroi and turn over Tax. If the processing industry has to expand, it would be necessary to reduce the burden of duties and taxes substantially, at least until such time as the market's share of the processed products grows to a level of 25-30 per cent of the total volume of the production.

o) Although the organized sector has shown fast growth in the last three decades, it handles only about 30-35 per cent of the milk marketed and about 65-70 per cent of the market share is still in the hands of unorganized sector. This sector is characterized by innumerable vendors, small processors, merchants, manufacturers and retailers of indigenous milk products. So far, the Government efforts for dairy development are restricted to cooperative sector only. Time has come to bring about structural changes in the unorganised sector. In order to achieve this, the following programmes should be undertaken:

p) Processing at the village level: Since the production is primarily through small producers, it makes collection of milk twice daily cumbersome and uneconomical in remote areas. Primary processing and manufacture of milk products can be taken up at village level. This would, however, require development and standardization of technology.

q) Quality upgradation in small sector manufacture: The small manufacturer of indigenous products viz. Halwai should be assisted to upgrade his processing and

improve quality of the products through use of hygienic practices and improved equipment.

3.5.18.0 Contract Farming

a) Individual Livestock farmers are often exploited by middlemen in view of lack of bargaining and absence of economies of scales.

b) There is a good possibility for encouraging contract farming in the Livestock sector where individual farmers contract with large producers/processors for regular supply and pre-determined prices. Large processors can provide good quality frozen semen/feed/disease control and other veterinary services to farmers to ensure a win-win situation.

c) NDDB pattern has shown efficacy of this system for milk and this can be extended to the entire Livestock sector provided adequate incentives are given to the industry to encourage them to invest in this profitable but risky field.

d) Small farms, which were set up under various self-employment schemes were not so successful – mainly due to lack of technical and marketing support. This obstacle can be removed, if we encourage the concept of **poultry estates** – comprising of a central unit, or a "mother unit", and a number of producers attached to it. The mother unit rears the birds up to point of lay; takes care of all the critical aspects like brooding, vaccination etc. It supplies feed and other inputs to the producers and also takes care of marketing and repayment of loans out of the sale proceeds. The producers will be required to handle only the simple operation of feeding and watering the birds and collection of eggs etc. Such poultry estates can be successfully operated by rural women – and can play a very important role in economic empowerment of women.

BOX III

Contract Farming

The Nestle India Limited – one of the largest and oldest firms in dairy business in India sources nearly 250 million kg milk annually through contract farming from over 85000 producers spread over more than 1500 villages in Punjab. With an assured market at their doorsteps the producers could save transaction costs to the extent of 90 per cent and reaped double the profits than the non-contract producers selling directly in the market. The price received by the contract producers was no less than the market price. Besides, they also received feed, medicines, fodder seed etc., and veterinary and agronomic services. Nearly 60 per cent of the producers had 5 or less dairy animals.

The case of contract farming in broiler production relates to Venkateshawara Hatcheries Limited in Andhra Pradesh. The firm shares nearly 80 per cent of the cost of production (chicks, feed and medicine) and provides veterinary services to the contract producers with buyback of entire production. The producers receive fixed remuneration on per bird basis for their contribution to production costs. The transaction costs to the producers are not much as the entire costs related to supply of chicks, feed and medicines is borne by the firm. The major benefits for the contract producers were assured returns, and transfer of production and market risks to the firm. On an average, contract producers received 13 per cent higher profits compared to non-contract producers. About one-third of the producers were small (<5000 birds).

Source: P.S. Birthal *et.al*, NCAP, New Delhi, 2005

3.5.19.0 Commercialisation

a) Slowly but surely, the farmers would have to move from mere subsistence rearing to more profitable but more risky and more costly production systems. This can be done when feed and management system help to augment the productivity in terms of quicker weight gain, better food efficiency, increased yields and reduced incidence of disease and mortality.

b) NGOs and research institutions / universities / State departments need to substantially enhance their efforts to provide training to young and educated farmers. They could be provided technology, financial incentives and handholdings through the initial years to act as role models.

c) Employment in Animal Husbandry sector was 9.8 million in major States (out of which 7.90 million were in rural areas) and 8.6 million in subsidiary States. Women constitute 71 per cent of the labour force in Livestock farming. In dairying, 75 million women are engaged as against 15 million men.

d) Diversification of a crop based rural economy into a crop-livestock mixed farming system must be encouraged for rapid economic development and generating equitable income and employment in the country.

e) It is estimated that more than 25,000 people in different parts of the country are directly dependent for their livelihood on layer farming. Similarly broiler farming provides direct sustenance to more than 1 lakh farmers. In addition, more than one million people are directly or indirectly dependent on poultry farming. Thus, it is estimated that the poultry sector is providing direct and indirect employment to about 1.6 million people in the country. It is also important to note that unlike other industries, the Poultry sector provides employment opportunities even to unskilled labourers and women. Employment generation in the Poultry sector can, therefore, be comparatively easily achieved through enhancement of demand for eggs and poultry meat. Considering the protein deficiencies in our country, lower cost of poultry compared to mutton and the health benefits of 'white' meat, this should not be difficult, in spite of the temporary scare created by Avian Flu.

f) As per the opinion of the World Bank experts, with an initial investment of Rs. 200 crores in Operation flood II, the net return/year to the rural economy has been Rs. 24,000 crores. No other major development programme all over the world has matched this input-output ratio.

3.5.20.0 Exports

a) India still accounts for miniscule part in the world trade in livestock products and there is a great scope for prosperity both for the farmers as well as for the processors and exporters if due attention is given to efficient monitoring and stringent quality control.

b) WTO has led to opportunities as well as threats in the Livestock sector. India with its large Livestock population and farmers need to increase the domestic demand as well as opportunities by streamlining the supply chain and attention to HACCP standards as well as Codex Alimentarius standards.

c) There is a great need for strengthening of the cold chain through encouragement to the construction of the cold storages and refrigerated vans for transportation of meat instead of live animals.

d) Dairy products accounted for the largest expenditure on export subsidies in the post-WTO period. In 1998, the US provided export subsidies on dairy and poultry meat with dairy reaching 90 per cent of the US volume limit. The level of subsidies offered by the US and the EU for SMP and Butter respectively account for 55-65 per cent of the domestic price of these commodities in India.

e) Indian tariffs for dairy products are low as compared to major countries. For SMP, the bound tariffs are 237 per cent in Canada and 176 per cent in Korea - as against the renegotiated 15 per cent on the first 10,000 MT and 60 per cent thereafter for India. For Butter the bound tariff works out to a phenomenal 648 per cent in Japan, 351 per cent in Canada, 113 per cent in the EU and 100 per cent in the US - as against 40 per cent in India. These computations are based on current international prices, exchange rates and other relevant assumptions. The tariff on butter/butter oil and cheese needs to be increased from 40 per cent to at least 75 per cent.

f) The infrastructure in handling of Livestock products also needs to be modernized at the ports in view of the highly perishable nature of the commodity. Such credit arrangements need to be worked out by the EXIM Bank in consultation with exporters to cater to the realities with international trade in this sector.

g) The extensive use of export subsidies (mainly, the EU and the US) in world trade in dairy, meat and poultry products depresses the world market prices and makes the products from all non-subsidizing exporting countries such as India uncompetitive. The size of export subsidies and the high proportion of world trade to which exports subsidies are applied both suggest that there is a need to strongly negotiate complete elimination of export subsidies in the upcoming WTO rounds.

h) Ministry of Commerce should collect the data on global trade, production and demand, global prices and subsidies provided and analyze them to project the future global market situation in respect of Livestock products..

i) There are many competitive advantages for India in dairy products trade such as higher quantum of production and lesser cost of production than any other countries. India enjoys competitive advantage over New Zealand, Australia and USA (Average cost of production-US dollars 0.32 per litre) of being able to produce milk at a lower cost (US dollars, 0.16 per litre).

j) India's international trade in Livestock and Livestock products is mainly in live animals (17 per cent), meat and meat products (82 per cent), dairy products and eggs (1 per cent). At the global level, India's exports and imports account for only 0.17 per cent of each. Meat and meat products have dominated the exports from Livestock.

(k) Domestic Market Intelligence should be collected and disseminated by the Department of Animal Husbandry, Dairying and Fisheries (DAHDF) on production, demand, import and export, future projections domestic prices and projections and concerns on Bio-diversity.

(l) The DAHDF should also coordinate with the Ministry of Commerce, DGCIS and other relevant organizations on important issues arising out of the International regulatory system (WTO/SPS) with reference to Livestock products like WTO provisions, analysis of Indian trade intelligence, non-tariff export barriers, global market intelligence, Indian trade intelligence, Import management, Export management, SPS notifications, SPS gaps and concerns, etc.

Government departments and other organizations are discharging most of the above-mentioned functions currently, but there is a lack of coordination and unified policy direction. An Advisory Committee on International Regulatory Matters (WTO/SPS) pertaining to Livestock Products could be set up to take an integrated, prompt and pro-active view.

3.5.21.0 Pastoral Community

a) Pastoralists are people who predominantly depend upon Livestock for livelihood and graze their animals on common property resources. They are often nomadic. These communities use indigenous knowledge in animal breeding; adopt seasonal and spatial grazing systems which are holistic, complementary to forest ecology and symbiotic with agro-eco system. They benefit farmers by supplying organic manure, plough bullocks or means of local transport of agriculture produce. Pastoral livestock is linked to the conservation of wild animal species. Survival of pastoralism is crucial for sustainable land use, conserving domestic biodiversity and providing means of producing food in dry lands without depleting ground water

resources. Livestock breed are linked to cultural diversity and there is a link between ethnic / social groups and specific breeds. For Livestock only in situ conservation achieves all conservation goals with ex situ conservation only as a back up. Unfortunately, in India, a major factor for reduction in animals of indigenous breeds is the closure of forest for declaration as a Sanctuary / National Park and harassment from Forest Department staff.

b) The livelihoods of pastoralists and smallholder farmers are threatened by the progressive loss of grazing land for their animals, limitations to mobility, inadequate or inappropriate government policies, and lack of animal health and other services. These developments are also causing the progressive loss of the Livestock breeds and species that provide rural livelihoods and life-style options. The problems of the pastoral community can be listed as under:

i. Grazing permits are denied in traditional grazing sites.

ii. Original pasture land/drinking water ponds are encroached or converted for other purposes.

iii. Common property resources or grazing lands are sometimes allotted to corporations, thereby leading to a shortage of vital grazing areas for sustainable Livestock production.

iv. Pastoralists are excluded from forestry programme like Joint Forest Management and Biodiversity Conservation.

v. Forests are closed completely for tree planting and rotational grazing system is not adhered to for providing alternative grazing sites in a participatory mode.

vi. Pastoralists are conservers of domestic animals biodiversity, contributing to ecology and economy. They should be integrated in forestry programme in a holistic manner, utilizing their traditional knowledge.

vii. The proposed Scheduled Tribes (Recognition of Forest Rights) Bill should provide restoration of traditional grazing / camping rights in forest areas to formalize their entitlements through issue of permanent grazing cards. A tree planting programme must be accompanied with alternative grazing land/ drinking water provisions

viii. In-depth documentation and characterization of indigenous Livestock breed should be carried out to recognize and protect the rights of local community.

ix. Common land assigned to Forest department and unutilised or encroached land should be retrieved and brought under the control of Gram Sabhas for pasture land development.

x. Camel milk should be included in Dairy Acts of States like Rajasthan in order to encourage demand and ensure a remunerative price for the pastoralists and farmers maintaining camels.

xi. An effective system of transfer of know-how directly to the camel-breeders should be put in place through extension of the activities of the National Research Centre on Camels.

xii. There should be a total ban on slaughter of fertile and healthy female camel.

xiii. Rajasthan's camel population has shown a steep decline of 24 per cent since 1997 and many promising indigenous breeds are getting lost. There should be a **National Policy on Camels** in view of their socio-economic value and their contribution to the bio-diversity, particularly for the pastoralists and others in States like Rajasthan.

xiv. Mechanisms should be put in place to protect pastoralists from unscrupulous elements/officials when they migrate with their camel and sheep across States.

xv. Sheep, goat and camel should be included in the Famine Code.

3.5.22.0 Miscellaneous

a) Land should be provided to every below-poverty line family but holding some land, for purchasing a basic unit of cows/buffalo/poultry etc.

b) The conjunctive use of Livestock, therefore, should be studied at greater detail to ensure that they are not only treated as raw-material for industries consuming milk for their requirement of milk and meat but are also developed for meeting these requirements of rural areas.

c) The productivity of our milk cattle is very low (1.5 lit animal/day). Artificial insemination facilities have not reached the doorstep of farmers. Animal health coverage should be given greater priority in State budgets.

d) The AH extension has been not given its due in previous Plans. There is great scope of AH extension to contribute towards poverty alleviation and self-employment scheme being implemented in the country.

e) Technology supported and demand driven Livestock revolution will be the future engine for growth that could ensure nutritional security, livelihood of rural poor and women empowerment.

f) Sustainable and financially viable Livestock and poultry farming, which will generate wealth and self-employment through entrepreneurship, is the need of the day.

g) External markets are an extremely important source of demand and these should be tapped much more aggressively.

h) Public sector lending in Livestock sector is very low leading to poor capital formation.

i) There is a need for consolidation and convergence of all animal husbandry related activities and schemes operated by different ministries.

j) Animal husbandry services need to be delivered at farmers' door and linked with cost recovery for economic viability.

k) DAHDF should play the role of a regulatory authority, particularly for quality control, more actively.

l) Commission on Agricultural Costs and Prices (CACP) could be asked to undertake estimation of cost of production of various Livestock products also and suggest reasonable prices.

m) Livestock extension is primarily based on providing services and goods; it needs to be treated differently from crop related extension activities.

n) An integrated approach is necessary for regeneration of the grazing lands.

o) To promote animal care and well being, veterinary institutions like universities, colleges, hospitals, dispensaries and NGOs working on Livestock care system need to be strengthened.

p) The delivery and input cost of all the services need to be recovered, from the resource rich farmers on commercial basis in order to be sustainable.

q) NDDB should focus on the dairy development activities all over the country, both in organized and unorganised dairy sectors.

r) In the short run, in zones with high incidence of poverty and low resource endowments, emphasis should be on research strategies that are less capital intensive, have higher probability of success that are well accepted by the clientele and yield a good rate of return. Animal nutrition and health fall in this category.

s) In the long run, genetic research would be a key factor in growth and development of the Livestock sector. Development should focus on upgrading the native breeds of cattle and buffalo since the poor keep them for various functions.

t) The Policy needs to focus on improving the basic conditions through improved management of land and water resources in the drought prone regions. This would imply a shift from techno-managerial approach towards dairy development to a more holistic approach, which simultaneously helps regeneration of land and water resources and at the same time improves the share of the poor in the Livestock sector, especially in the drought prone regions where it is needed the most. At present, the dairy sector has moved into the areas where the basic conditions with respect to land, water and other agronomic features are relatively more favourable. The next stage, however, will have to be significantly different where regeneration of land and water should become an integral part of the dairy development.

u) The dairy development programmes, therefore, need to take the imitative for pasture development and thereby strengthen the backward linkages covering a larger number of households and area.

v) In this respect the dairy development agencies might be in a better position to shoulder the responsibility of developing pastureland. It could offer direct incentives in terms of increased returns from such activities. The watershed programmes devoid of these linkages might find it difficult to involve people in

development of CPRs. The need, therefore, is to co-ordinate the activities whereby the dairy development agencies may take the major lead towards regeneration of the community pastures and water resources. This is essential if the benefits are to reach the poor in drought prone regions.

w) Regulated grazing requires community effort. The present laws and people do not feel concerned about the conditions of CPR's. Therefore, transfer of ownership or some mechanisms to make people feel concerned about village resources can be a point for action. Though presently they have grazing rights in forest and grazing lands but they are using these in negative ways leading to collapse of traditional systems of management.

x) It has to be recognized that in the general field of agriculture 70 per cent of the farmers are small and marginal farmers, and they have access to a total of 30 per cent of the land in this country. Of these, 67 per cent own Livestock and the general pattern is that these Livestock units are very small and financially non-viable. These people are also poorest of the poor. Bulk of them live below the poverty line without any access to normal channels of credit and are unable to take advantage of government's benevolence through its various schemes. Despite the efforts of the government during last five decades, these poor are in continuous penury, as they did not get a chance for making some marginal improvement in their lives. They remain poor because they have no access to the presently available technologies nor to the credit regimes; consequently they cannot increase their assets. What they market is perishable and, therefore, the middlemen and traders exploit them by offering low prices, which are invariably below the cost of production. Traders fix farm gate prices and these are quite often below the production cost.

y) There is urgent need for Livestock owners to be provided with relevant literature in Hindi and local language regarding the common diseases of Livestock, their diagnosis and control procedures.

3.5.23.0 Specific Issues for North-Eastern States

a) Quality pigs are not available for breed improvement and pork has to be imported from other States. This problem can be tackled through establishment of nucleus pig breeding farms in each State with exotic Hampshire pigs and indigenous

strains. Similarly, one nucleus farm in each district headquarter should be established for produce of pig with 75 per cent exotic inheritance. Further, a breeding unit should be established at the block level with capacity to produce improved pigs for distribution to farmers at village level at the rate of 5-6 pig per farm family. Briefly, a graded pig programme should be taken up for breed improvement over time.

b) Due to logistic problems government machinery is unable to provide effective and timely delivery of services like feed, vaccination, artificial insemination etc. while NGOs / SHGs/ Cooperatives should be increasingly involved in this task. Research findings on use of locally available feed for location specific pig rations need to be disseminated. Sweet potato based pig feed should be encouraged because of its local availability. Similarly processing units should be established for utilizing groundnuts cake for pig feed. SHGs/Cooperatives/unemployed youth need to be trained in delivering artificial insemination services to pig growers.

c) A Regional Research Laboratory for animal diseases diagnosis using conventional and molecular techniques needs to be established. SHGs/Cooperatives should be trained for vaccination to supplement the efforts of the Government.

d) In view of popularity of the pork and its value added produce in the region, one modern abattoir should be set up in each capital city with processing facilities. Existing butchers with traditional skills should be employed in these abattoirs, after skill upgradation through training. Facilities for processing of non-edible offals from these abattoirs should be provided to optimise utilization of resources.

e) Poultry also presents great scope for exploitation and income generation. A Nucleus Breeding unit with grandparent lines needs to be established in each State. Backyard poultry should be encouraged through promotion of varieties like Vanaraja, Giriraja, Gramapriya etc with collaboration of various stakeholders.

f) In respect of Piggeries, existing integrated progeny development scheme should be carefully assessed to identify regions for poor utilization in spite of the vast potential for progeny in the North East. Apparently, farmers are unwilling to relocate to areas with poor availability of water and electricity, mainly to Farmers' piggery villages. Further, piggery villages would not succeed without active base farms. Lastly, the programme has concentrated on passage of subsidy without adopting a holistic approach involving backward and forward linkages, specially marketing.

g) The programme is also constrained with low level of entrepreneurship due to the limited risk taking capacity of the farmers, inadequacy of parent stock, poor infrastructure at farm level for rearing pigs, poor outreach of veterinary services, low value addition and processing facilities etc. The scheme should be restructured, with focus on the poorer section of the society who is deficient in financial resources, scientific knowledge and efficient rearing practices. Instead of piggery villages, it may be desirable to adopt cluster approach at village level for pig production, covering all aspects of supply, fattening and marketing. It would be desirable to develop successful models of crop-dependent piggery development and in their popularisation through demonstration by KVKs. Participatory research and development on piggery practices and management with focus on the felt technological needs of the pig farmers should be ensured. Differential implementation strategy should be planned for upland and higher uplands. A simple preventive disease control programme should be implemented through village youth, especially for control of diarrhoea, in weaning pigs and parasitic diseases.

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CHAPTER 3.6

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

AGROFORESTRY: INTEGRATING THE NEEDS OF TODAY AND TOMARROW

3.6.1.0 Definition and Concept of Agroforestry

3.6.1.1 "Agroforestry is a sustainable management system for land that increases overall production, combines agricultural crops, tree crops and forest plants and/or animals simultaneously or sequentially and applies management practices that are compatible with the cultural patterns of local population" (Bane et al.,1977).

3.6.1.2 Agroforestry, the word coined about three decades ago, is now seen as a science-based pathway to achieve natural resource management and poverty alleviation addressing several of the Millennium Development Goals. It has emerged as an efficient multi-functional land use and management system that optimises land productivity on a sustainable basis by involving positive interactions between its components in time and space where woody perennial, trees or shrubs, are grown with arable crops. In operational terms, it satisfies three basic conditions: (1) there exist at least two plant species that interact biologically, (2) at least one of the plant species is a woody perennial and (3) at least one of the plant species is managed for forage, annual or perennial crop production.

3.6.1.3 The escalating worldwide interest in tree planting activities during the past three decades (1970 onwards) resulted in the emergence and popularization of several terms ending with word 'forestry' viz., Community forestry, Farm forestry, and Social forestry. In all these one thing is common i.e., people's participation in tree planting activities – not necessarily with agricultural crops or animals as is in Agroforestry. The social forestry is considered to be the practice of using trees or tree

planting specifically to pursue social objectives, to help the poor people to improve their living conditions and meeting their routine requirements of fuelwood and fodder. The purpose of all these forestries is growing trees and using them to provide fuel, medicine, minor timber and fodder. The major distinction between Agroforestry and the above other terms is that Agroforestry emphasizes the interactive association between woody perennials and agricultural crops and animals for multiple products and services, whereas the other terms simply refer to planting the woodlots.

3.6.1.4 The Agroforestry System is capable of yielding timber, fuelwood, biofuels, food, fodder, feed, and medicinal and industrial non-timber products, and conserve and rehabilitate ecosystems. However, in recent times it is often equated with the timber production on the farm, particularly in northern India. It is estimated that about half of the country's timber requirement is produced through the Agroforestry systems. There is a need to recognize that Agroforestry in India has numerous forms and combinations – ranging from timber based systems in the north to Kerala home gardens, Khejari systems in semi arid/ arid regions of Rajasthan, and so on.

3.6.2.0 Need and Scope of Agroforestry

3.6.2.1 Relationship of man with trees and the land use systems is as ancient as the very evolution of human civilization and use and domestication of plants. Tree-based farming systems integrating trees into agriculturally productive landscape - a practice known as Agroforestry, is an age old practice. In India, Agroforestry has been a way of life for over 5000 years. Shifting cultivation in India is prehistoric and partly a response to agro-ecological conditions in the region. Horticulture as co-existent with agriculture is found to have been prevalent in India from early historic period (500 B.C. to 1st century A.D.). References occur in different texts of the Vedic literature. The cultivation of date palm, banana, pomegranate, coconut, jujube, *aonla*, *bael*, lemon and many varieties of other fruits and requirement of livestock in agriculture and mixed economy of agriculture and cattle breeding may be traced in proto-history chalcolithic periods of civilization. The role of many common trees such as *Khejri* or *sami* (*Prosopis cineraria*), *aswattha (Ficus religiosa), palasa*

(Butea monosperma) and *varana (Crataeva roxburghii)* in Indian folk life has been mentioned in ancient literature of *Rig Veda, Atharva Veda,* and other Indian scriptures. Traditional Agroforestry systems manifest the rural people's knowledge and methods to benefit from complementary uses of annuals and woody perennials on a sustained basis. It also indicates that the farmers have a closer association with trees than any other social group and promoters of forests.

3.6.2.2 The farmers and land owners in different parts of the country integrate a variety of woody perennials in their crop and livestock production systems depending upon the agro-climatic conditions and local needs. Most of these practices are however, very location specific and information on these are mostly anecdotal. Therefore, their benefits have remained vastly under-exploited and unextrapolated to other potential sites. It has now been well recognized that Agroforestry can address some of the major land-use problems of rainfed and irrigated farming systems in India and that a great deal can be accomplished by improving the indigenous systems. With the current interest in Agroforestry worldwide, attempts are being made in India to advance the Agroforestry techniques using indigenous and exotic multipurpose and nitrogen-fixing woody perennials.

3.6.2.3 One of the important criteria that should guide the Agroforestry efforts in India is the "high-value low volume system concept." The other criteria should be that the post harvest, value addition, packaging and marketing are made as an integral part of the system as a whole; a broadened approach from just production, as has been in the past. Another important consideration is the recognition of the fact that Agroforestry systems also provide environmental services (which are often overlooked) in addition to the economic gains and other contributions. It is worth mentioning here that Agroforestry systems are probably the only means for getting the desired tree cover in the country, especially in States that have low forest area.

3.6.2.4 Currently, of the nearly 300 million ha arable land in the country, including about 68 million ha under forests, a little over 25 million ha are under tree plantations (**Table 1**). Of this, 1.24 million ha are under farm forestry/Agroforestry. However, as

projected by the Planning Commission (2001) under the Greening India programme, additional 28 million ha can be brought under Agroforestry in a 10-year period, increasing the total Agroforestry area to over 50 million ha.

Table 1. Area under Tree Plantations in India

S. No.	Plantation type	Area (million ha)
1	Agroforestry and Social forestry	23.00
2	Externally aided Social Forestry	
	a) Farm Forestry/Agroforestry	1.24
	b) Village woodlots	0.50
	c) Strip plantations	0.07
	d) Rehabilitation of degraded forests	0.24
	Sub-total	2.06
3	By NGOs/VAs	0.04
4	Tree growers co-operatives	0.04
5	Conservative forestry	0.19
	Total	**25.32**

Agroforestry for Food, Fuel and Fodder Needs

3.6.2.5 It is important to note that there will be a further significant decline in crop land per head by the middle of this century due to population increase. There being no scope for increasing the area under cultivation, additional food production must accrue through increased productivity or from land not conventionally considered arable. A management system, therefore, needs to be devised that is capable of producing food from marginal agricultural land and is also capable of maintaining and improving the quality of producing environment.

3.6.2.6 Fuel wood is one of the established sources to meet energy requirement. At present we are utilizing 60-80 million tonnes of dry cowdung, equivalent to 300-400 million tonnes of freshly collected manure. The Agroforestry has both productive and

protective potential, and it can play an important role in enhancing the productivity of our lands to help meet the demand of ever- growing human and livestock population.

3.6.2.7 ***Food***

1. Enhanced sustainability of cropping systems through soil and water conservation by arrangements of trees to control run-off and erosion.
2. Enhanced food and feed production from crops associated with trees through nitrogen fixation, better access to soil nutrients brought to the surface from deep tree roots, improved availability of nutrients due to high cation exchange capacity of the soil and its organic matter and mycorrhizal associations.
3. Food for man from trees in the form of fruits, nuts, cereal substitutes etc.
4. Feed for livestock from trees.
5. Micro-climate improvement due to trees, particularly shelter-belts and wind-breaks in arid and coastal areas.

3.6.2.8 ***Water***

1. Improvement of soil-moisture retention in rainfed croplands and pastures through improved soil structure and micro-climate effect of trees.
2. Regulation of stream flow, reducing flood hazards and a more even supply of water through reduction of run-off and improvement of interception and storage in infiltration galleries.
3. Improvement in drainage from waterlogged or saline soils by trees with high water requirements.
4. Bioremediation of water by sequestration of heavy metals and other toxic wastes by trees.

3.6. 2.9 ***Energy***

1. Fuel-wood for direct combustion.
2. Pulp wood for paper industry.
3. Pyrolytic conversion products such as charcoal, oil and gas.
4. Ethanol produced from fermentation of high-carbohydrate fruits.
5. Oils, latex and other combustible saps and resins.

6. Waste wood for wood based power plants to generate electricity in a decentralized manner.

3.6.2.10 ***Shelter***

1. Building materials for shelter construction.
2. Shade trees for people, livestock and shade-loving crops.
3. Wind-breaks and shelter-belts for protection of settlements, crop lands, pastures and roadways.
4. Fencing: live fences and fence posts.

3.6.2.11 ***Raw Material for Industries***

1. Raw material for pulp and paper industry.
2. Tannins, essential oils and medicinal ingredients.
3. Wood for agricultural implements and various crafts.
4. Fibre for weaving.

3.6. 2.12 ***Cash***

1. Direct cash benefits from sale of tree products.
2. Indirect cash benefits from increased productivity.

3.6.3.0 Types of Agroforestry Systems and Steps for Developing Agroforestry Technology

3.6.3.1 Agroforestry systems have been classified on the basis of structure, function and socio-economic aspects. The structure of the Agroforestry system can be defined in terms of its components and the expected role or function of each. In this system the type of components and their arrangement are important.

Nature of Components

3.6.3.2 On the basis of nature of components following common Agroforestry systems / practices are prevailing in different agro-ecological regions of India:

1. Agri-silviculture (trees + crops)
2. Boundary plantation (trees on boundary + crops)
3. Block plantation (block of trees + block of crops)
4. Energy plantation (trees + crops during initial years)
5. Alley cropping (hedges + crops)
6. Agri-horticulture (fruit trees + crops)
7. Agri-silvi-horticulture (trees + fruit trees+crops)
8. Agri-silvipasture (trees+crops + pasture or animals)
9. Silvi-olericulture (trees + vegetables)
10. Horti-pasture (fruit trees + pasture or animals)
11. Horti-olericulture (fruit trees + vegetables)
12. Silvi-pasture (trees+pasture/animals)
13. Forage forestry (forage trees + pasture)
14. Shelter-belts (trees + crops)
15. Wind-breaks (trees + crops)
16. Live fence (shrubs and under- trees on boundary)
17. Silvi or Horti-sericulture (trees or fruit trees + sericulture)
18. Horti-apiculture (fruit trees + honeybee)
19. Aqua-forestry (trees + fishes)
20. Homestead (multiple combination of trees, fruit trees, vegetable etc).

Besides these common Agroforestry systems, there are many more component combinations followed in different agroecological regions of India.

Arrangement of Components

3.6.3.3 The arrangement of components gives first priority to the plants. Even in Agroforestry system involving animals, their management according to a definite plan, e.g. a rotational grazing scheme, gives precedence to the plants over animals. Such plants arrangements in multi-species combinations involves the dimension of space and time.

Functional Classification of Agroforestry Systems

3.6.3.4 Two fundamental attributes of all Agroforestry systems are productivity and sustainability.

1. ***Productive Functions:*** The various productive functions (producing one or more products) of Agroforestry systems are food, fodder, fuel-wood and other woods, besides other products.

2. ***Protective Functions:*** The protective functions (protecting and maintaining production systems) of Agroforestry systems are wind-break, shelter-belt, soil conservation, moisture conservation, soil improvement and shade (for crops, animals and man) and nutrient cycling.

Socioeconomic Classification of Agroforestry Systems

3.6.3.5 Based on such socio-economic criteria as scale of production and level of technology input and management, Agroforestry systems are grouped into three categories.

1. ***Commercial System:*** The term commercial is used whenever the scale of the production of the output (usually a single commodity) is the major aim of the system: the scale of operations is often moderate to large and ownership may be government, corporate or private; labour is normally paid or otherwise contracted. Examples include commercial production of agricultural plantation crops, other crops or pasture animals; with permanent under planting of food crops, or pasture/ animals; commercial production of shade-tolerating plantation crops such as coffee, tea and cocoa under overstorey shade trees; rotational timber or food crops system in which a short phase of food-crop production is used as a silvi-cultural method to ensure establishment of timber species (various forms of *taungya*); commercial grazing and ranching under large-scale timber and pulp plantations etc.

2. ***Intermediate Agroforestry System:*** Intermediate Agroforestry systems are those between commercial and subsistence scales of production and management, production of perennial cash crops undertaken on medium to small scale, wherein

the cash crops cater for cash needs, and the landowner or those with long- term tenancy rights to land, reside and work themselves on the land, supplemented by paid temporary labour. Various Agroforestry systems in many parts of the world can be considered intermediate systems, especially those based on plantation crops such as coffee, cocoa, numerous fruit trees and short-rotation timber species.

3. ***Subsistence Agroforestry System:*** Subsistence Agroforestry systems are those wherein the use of land is directed towards satisfying the basic needs, and are managed mostly by the owner or occupant and his family. Cash crops including sale of surplus production of commodities, and all forms of traditional shifting cultivation are the most widespread examples.

3.6.3.6 The words 'systems' and 'practices' are often used synonymously in Agroforestry literature. However, an Agroforestry system is a specific local example of a practice, characterized by environment, plant species and their arrangement, and socioeconomic functioning. An Agroforestry practice denotes a distinctive arrangement of components in space and time. The most common Agroforestry practices that constitute the diverse Agroforestry systems throughout the tropics along with their main characteristics are listed in **Annexure I**. The essential characteristics of the different regions in India and the major Agroforestry emphasis in each are summarized in **Annexure II**. The major types of Agroforestry systems found in different agro-ecological zones along with the nature of their main benefits and role have been summarized in **Annexure III**.

Suitable areas for Agroforestry

3.6.3.7 The following type of land can be assigned for Agroforestry:

- Cultivable land
- Field boundaries
- Along with farm roads and *nallah* sides affected by erosion.
- Pockets within cultivated holding where cultivation is not possible
- Old fallows

- Cultivable waste
- Other areas like community or panchayat land etc. in which Agroforestry can be incorporated.

Suitable Tree Species for Agroforestry

3.6.3.8 The following considerations should be kept in view while selecting the species.

- Suitability for growing under the prevalent agro-climatic conditions.
- Utility of trees for meeting the needs of farmers for timber, fodder, fuel, fruit and fibre etc.
- Preference may be given to indigenous and fast-growing species, and leguminous and other nitrogen-fixing species. Species that provide raw material for cottage industries should be encouraged.

Type of Tree Species

3.6.3.9 Though the primary concern is to keep up the production level of the arable crops , the following criteria are worth considering for planting trees under the Agroforestry system :

- Non interference with arable crops ;
- Easy establishment ;
- Fast growth and short gestation period ;
- Non-allelopathic effects on arable crops;
- Ability to fix atmospheric nitrogen ;
- Easy decomposition of litter ;
- Ability to withstand lopping ;
- Multiple use and high return; and
- Ability to generate employment.

3.6.3.10 It is extremely difficult to select species having the ability to fulfill all these criteria. Therefore the researcher and extension workers can allot some points for each criterion, in consultation with the farmers who are directly taking part in

adopting Agroforestry on their fields and select the species that score the most points. It is truly a participatory and decentralised decision-making process.

3.6.3.11 **Tree Species based on Specific Utilization Purpose**

1. ***Fodder-cum-fuelwood Species*****:** *Albizia amara, Albizia procera, Albizia lebbeck, Erythrina indica, Gliricidia sepium, Hardwickia binata, Leucaena leucocephala, Pithecellobium dulce, Prosopis cineraria, Sesbania grandiflora,, Sesbania sesban*.
2. ***Fuel-wood and Timber Species*****:** *Acacia nilotica* var. *cupressiformis* , *Acacia nilotica, Albizia lebbeck, Albizia procera , Azadirachta indica, Cassia siamea, Casuarina equisetifolia, Dalbergia sissoo, Dendrocalamus strictus, Pongamia pinnata, Melia azaderach, Parkinsonia aculeate, Thespesia populnea.*
3. ***Softwood and Pulpwood Species*****:** *Ailanthus excelsa, Ailanthus tryphysa, Bombax ceiba, Paraserianthes falcataria, Populus deltoids., Bamboo* species
4. ***Fruit and Vegetable Species*****:** *Annona reticulata, Annona squamosa, Artocarpus heterophyllus, Emblica officinalis, Moringa oleifera, Zizyphus mauritiana.*

Priority for Selection of Species

3.6.3.12 After the screening of the species to suit the agro-climatic conditions, the next aspect is profitability. Ideally, the production of agricultural crops should not be affected. But in reality, farmers want to earn higher total returns. Uncertainties about the marketing of wood can be greatly reduced by establishing a suitable marketing network to handle the Agroforestry produce. Varying agroclimatic regions (15) require different types of trees to suit them. The species priority of MPTS based on research experience has been worked out. Names of five MPTS based on priority for each region are presented in **Annexure IV.** One may find that the species of *Eucalyptus* sp*., Acacia nilotica, Casuarina equisetifolia, Dalbergia sissoo, Gmelina arborea, Populus deltoides, Leucaena leucocephala* are prominently common in

many regions. Emphasis on research on these species in these regions is required. However, considering the country's needs of industry and domestic sectors six species were considered by the Task-Force on Agroforestry for according top priority in research and development of Agroforestry in the country . These species are *Acacia nilotica,* Bamboo*, Casuarina equisetifolia, Populus deltoides, Eucalyptus* sp. and *Prosopis ceneraria*. Thus, system and species priorities are indicated to emphasize the future direction of research on Agroforestry in the country. The choice of MPTs for different rainfall patterns and rotation cycles are presented in **Annexures V** and **VI**, respectively. The priority ratings for different Agroforestry systems are also given to focus on those modes for optimizing the resources (**Annexure VII**), and described later in Section 3.6.5.0.

Steps for Developing Agroforestry Technology

3.6.3.13 The following questions (check list) should be kept in mind for establishing appropriate Agroforestry system:

1) For what sites is it appropriate?
    i. What kinds of soil, rainfall, slope?
    ii. For what size and type of farm, in what landscape niche?
2) For what functions is it intended?
    i. What can farmers use it for?
    ii. What are the trade-offs between functions?
3) Which species or varieties are recommended?
    i. Which multipurpose trees and shrubs? Which varieties?
    ii. Which associated crops or livestock species can be used?
4) Which arrangements are recommended?
    i. How many of each component, in what configuration and spacing?
    ii. What kind of tree or crop rotations can be used over time?
5) What management practices are recommended?
    i. How and when should trees be established?
    ii. How and when should trees be trained, pruned, pollarded etc.?
    iii. How should associated crops be managed?

iv. How and when should different tree products be harvested?
v. How and when should tree products be removed or replaced?

6) What technology performance can be expected?
   i. What yield of tree products can be expected and when?
   ii. What yield of associated crops can be expected?
   iii. What service functions will be performed (e.g. erosion control)?
   iv. What economic returns can be expected? How do risks change?

7) What inputs are required?
   i. How much planting material, labour, cash and land are needed?
   ii. What management skills are needed?
   iii. What infrastructure is needed for inputs, training or marketing?

3.6.4.0 Agroforestry Applications

Farming System

3.6.4.1 Agroforestry is a way of natural resource management towards sustained livelihood security. Hence, the resource management issues must be influenced by other available production systems. A major shift might be expected in agricultural production through diversification. These shifts in production system will get further boost because of integration of world markets, urbanization and rising personal incomes. Further, to design appropriate farming systems suited to diverse farming situations, farmers' participation beginning from planning till execution of research and development programmes will be inevitable and they would actually participate in research and extension efforts as foremost partners. In rainfed arid ecosystems, integration of livestock and horticultural crops with annual crops, especially their organic production, is expected to emerge as a major Agroforestry system.

3.6.4.2 Multipurpose Trees are more or less integral part of Agroforestry farming systems. These have been defined as trees and shrubs which are deliberately grown or kept and managed for preferably more than one intended use, usually economically and/ or services in any multipurpose land use system, especially Agroforestry systems. Multipurpose trees provide various uses such as food, fodder, timber,

fuelwood, medicines, resins, gums, etc. Besides, these also provide some indirect benefits such as biological nitrogen fixation, Vascicular Arbuscular Mycorrhizal symbiosis, reduction in soil erosion, increase in water percolation etc. in the form of environment improvement. India is characterized by having wide range of rainfall patterns. As mentioned earlier, suitable multipurpose tree species according to rainfall distribution are given in **Annexure V** and classification of multipurpose trees based on rotation cycle is given in **Annexure VI**.

3.6.4.3 Feeds providing energy, protein, fat, carbohydrate, vitamins and minerals to animals, derived from grasses, tree foliage, straw, tuber etc. grown in Agroforestry systems are fundamental to livelihood security in arid zones. Besides tree fodder, some other Agroforestry products are also used as components of feed formulations and many of these are not yet properly evaluated for their potential to become a part of regular diet of animals/poultry birds. It has been estimated that fallen leaves, flowers, fruits, seeds, etc. available in various Agroforestry systems can make up to more than 50% of the complete feed for ruminants and about 10% of the feed of non-ruminants. Tree fodders are able to provide the fodder in terms of the amount and the nutrients, but the presence of antinutritional factors in many of them makes them unfit for sole use. There is a need to utilize tree fodder/feed optimally and in combination with other commonly used fodder/feed. Systematic research is needed to reduce the antinutritional factors to manageable levels. Extension agencies and animal feed suppliers should be aware of the use of the balanced animal feed and inform the farmers accordingly. Each KVK should have trained staff in animal nutrition and production and impart necessary trainings to the farmers and other stakeholders.

Resource Conservation

3.6.4.4 Water is a critical element for reclamation of degraded lands for sustainable biomass production, ultimately leading to a better quality of life and enabling conditions. Watershed management is an approach for area planning of natural resources, especially land, water and plants, to meet socio-economic needs of human society. Emphasis should be on micro-watershed management plan integrating

protection of the resource base and creation of assets, improvement of productive systems, generation of employment opportunities and ensuring higher income on a recurring basis. Degraded lands because of many limitations can only be improved through Agroforestry, which control erosion, reduce run-off, improve *in-situ* soil-moisture conservation, increase water-table but also improve productivity as well as profitability. Researches involving Agroforestry are required on many areas like watershed hydrology, control of sedimentation, situation-specific cost-effective technologies, production of fodder, forages, industrial grasses and medicinal plants for quick-return and livestock improved production for harnessing maximum benefits from limited biomass.

3.6.4.5 The power of trees in bringing changes can be illustrated by one simple study. Between 1991-92 and 1997-98, canal side plantations in Jaiselmer (Rajasthan) were undertaken on a total of 401 sites covering an area of 9,271 ha. These plantations have brought significant reduction in blown sand deposition in canal (**Table 2**). Consequently, the cost of desiltation was greatly reduced. For instance, for the Sagarmal Gopa Sakha, the net saving on desiltation had increased from Rs. 12,886/ km in 1997 to Rs, 19,755 in 1999.

Table 2. Reduction in Blown Sand Deposition in Canal (m3 Km^{-1}) after Canal Side Plantation

Branch/Distributaries/Minors	1996	1997	1998	1999
Sagarmal Gopa Sakha	4125	2877	2079	1269
Mandau Distributary	2296	777	373	718
Sankla Minor	1949	1165	1009	388
Tibrewala Minor	1875	563	1250	1250

Carbon Sequestration

3.6.4.6 The Inter-Governmental Panel on Climate Change (IPCC) has been asserting that the earth's climate is changing and that its impact will be great on developing countries. To meet this global challenge of climate change, many

countries and institutions have been working with a focus on analyzing the impacts, prospects for adaptation and opportunities for mitigation. India is a signatory to the Kyoto Protocol (1997), which asserts that the country will play an important role in mitigating the effects of global warming. Use of Agroforestry systems, as a mitigation strategy, is a key through a major opportunity for carbon sequestration. Concerted efforts are required to identify practical cost effective means through changes in land-use practices using Agroforestry as an option. India must be able to clearly demonstrate that, with the use of appropriate Agroforestry and other agricultural production systems, the country has improved the carbon balance and atmospheric health and should seek necessary rewards in the global market.

Bio-diversity Conservation

3.6.4.7 India is an important centre of biodiversity, housing over 45,000 plant species and 810,000 animal species, representing 7 % of the world's flora and 6.5 % of the world's fauna. The UN Convention on Biological Diversity calls for conservation of the biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising out of the utilization of genetic resources. Agroforestry innovations contribute to bio-diversity conservation through integrated conservation-development approach. Forest degradation has caused immense losses to the bio-diversity, which can be conserved through Agroforestry by adopting a strategy of conservation through use. The bio-diversity thus conserved shall help in the development or improvement of new varieties or populations and provide new Agroforestry options.

Improvement in Soil Fertility and Structure

3.6.4.8 Plantation of compatible and desirable species of woody perennials on farmland results in an improvement in soil fertility. There are several possible mechanisms of this, which include:

1. Increase in organic matter content of the soil through the addition of leaf litter and other plant parts ;

2. More efficient nutrients cycling within the system and consequently more efficient utilization of nutrient that are either inherently present in the soil or externally applied;
3. Biological nitrogen fixation and solubilization of relatively unavailable nutrients, e.g. phosphate through the activity of mycorrhiza and phosphate-solubilising bacteria;
4. Increase in the plant-cycling fraction of nutrients, with their resultant reduction beyond the nutrient-absorbing zone of the soil ;
5. Complementary interaction between the component species of the system, resulting in a more efficient sharing of nutrient resources among the components;
6. Enhanced nutrient economy, because of different nutrient-absorbing zones of the root system of the component species; and
7. Moderating effect of additional soil-organic matter on extreme soil reactions and consequently improved patterns of nutrient- release ability.

3.6.4.9 Improvement in the organic matter status of the soil can result in an increased activity of the favourable micro organisms in the root zone. Inclusion of trees and woody perennials on farm lands can, in the long run, result in marked improvements in the physical conditions of the soil, e.g. its permeability, water-holding capacity, aggregate stability and soil-temperature regimes.

3.6.4.10 The role of trees in soil conservation and erosion control is one of the most widely acclaimed and compelling reasons for including trees on farm lands prone to erosion hazards. The influence of trees on hydrological characteristics can extend from the microsite to the farm and regional levels.

3.6.5.0 Agroforestry Systems in the Country

3.6.5.1 Agri-silviculture, agri-horti-silviculture, agri-horticulture, hortipastoral, silvipastoral and some other specialised combinations for specific conditions are the major Agroforestry systems practised in varying intensities in different agro-climatic

zones (**Annexure VII**). Agrisilviculture and agihorticulture are the overall most popular Agroforestry systems. The detailed situation in different agro-ecological regions is described below.

Eastern-Himalayas

3.6.5.2 The indigenous tribes like Lepcha and Limbu used to collect large cardamom from natural forests, which were later on domesticated. Among three dozen shade tree species in large plantation areas, alder (*Alnus nepalensis*) is most abundant and preferred tree, which is a non-leguminous nitrogen fixing tree. Besides large cardamom, many food crops like maize, millet, potato, barley, chillies and colocasia are grown with alder. The tree not only provides shade to arable crops, timber and fuelwood but also ameliorates the soil and protects it from erosion on hilly slopes. A yield of 400-500 kg ha^{-1} of cardamom has been reported in a year under shade trees. If a village with 100 families could set aside about 120 ha of land to grow alder trees, all families would be able to get sufficient fuelwood every year and at the same time raise crops under the alder in about 30 ha area every year. Cultivation of coffee, ginger, cardamom, turmeric and medicinal plants under the shade of naturally growing trees in Meghalaya is one of the best examples of successful combination of trees with annual crops.

3.6.5.3 Besides the above system, many trees are lopped for their green fodder which is rich in crude protein and calcium. These are found grown on terraces which are widely spaced, thus causing least yield reduction of inter-crops. Different trees provide fodder at different times of the year sustaining the supply of fodder throughout the year. Among the introduced tree species, *Leucaena leucocephala* (var. S 11) does well at low to mid hills and it could produce 9 t ha^{-1} dry foliage annually under the stocking density of 2500 trees ha^{-1}. In low to mid hills, mandarin orange is a commercial fruit crop which is intensively intercropped with annual food crops, mainly maize. In Meghalaya, pear, plum and peach, and in Sikkim, apple are intercropped with food crops like potato, maize, vegetables, peas and mustard. At some places pineapple is also grown as an intercrop. Among monocrops, tea plantation is common in pockets but now cherry (*Prunus cerasus)* is also planted as

live fence. Shade trees like *Albizia chinensis* may be grown for desired quality of tea which has been reported to add 2.5 to 5.0 t ha^{-1} organic matter to the soil annually containing 63-126 kg N, 18-36 kg P_2O_5, 22-44 kg K_2O, 32-64 kg CaO and 16-32 kg MgO per ha. Department of Agriculture in Mizoram has developed its own contour trench-farming for jhum areas on hills where top portion is of undisturbed forest, middle portion is with horticultural crops and down the hill, terraced rice is cultivated with pineapple and grasses on contours. Many species of bamboo, palms (coconut, arecanut and species of *Licuala, Phoenix, Wallichia, Corypha*, *Caryota)* and rattans (*Calamus* spp.) are cultivated widely in north-eastern areas as mixed or boundary plantations. Pasture in forests is also a common practice. In Sikkim on hilly areas, Nevaro (*Ficus auriculata*) based silvipastoral systems have shown production potential of 15.6-51.6 t ha^{-1} annually and goats could be reared successfully.

3.6.5.4 It has been found that sericulture based system is highly relevant for these areas. Mulberry with frenchbean-groundnut followed by mustard is a profitable cropping system with mulberry, guava/lemon/pear and pineapple in paired rows and grasses on the bunds is an ideal system for silk production and additional income from fruits and cattle rearing. Pedi-cum-sericulture is said to be more viable as the cash returns are more frequent.

Western Himalayas

3.6.5.5 In the Western Himalayas, 60 to 70% requirement of the firewood is met from the arboreal components and several MPTs along the bunds of agricultural lands or scattered trees on the pasture lands were developed depending upon the needs, economics and environmental status of the land. High rate of net primary productivity has been reported in agri-hortisilvicultural systems (206 t $ha^{-1}yr^{-1}$) or agri-horticultural systems (23 t $ha^{-1}yr^{-1}$) and the species number in these systems is as high as 15 tree species. Generally 50 to 100 trees are planted in a hectare for fulfilling a part of the fodder and fuelwood requirements. *Grewia optiva, Celtis australis, Bauhinia variegata, Albizia chinensis, Bombax ceiba, Melia azedarach* and *Toona ciliata* are common MPTs while plum (*Prunus domestica*), apricot (*P.*

armeniaca), peach (*P. persica*), almond (*P. dulcis*) and pear (*Pyrus communis*) are common fruit trees of these systems. Hedge-row intercropping is feasible and important on sloping hilly lands when prunned biomass during cropping season can be used for fodder and fuelwood. Kinnow based horti-silvi-agricultural system at Dhaulakuan, kinnows planted at a spacing of 5m x 5m, has been highly successful. The inter–row spaces were utilized for sowing *Leucaena leucocephala* in the form of hedge rows or scattered trees and maize, soyabean, vegetables and wheat were grown as annual crops. To accommodate the demand for wood for packing of horticultural produce in the region, a horti-silvi-pastoral system was also developed growing trees of Santa Rosa plum at a spacing of 8m x 8m and the interspaces and field boundary were utilized for growing *Populus deltoides* with excellent economic returns. The strategy to develop Agroforestry systems in Western Himalayas should be based on the economy of fruits supplemented with cattle, keeping in view the soil conservation aspect. Therefore, fruit trees must be grown with forages, crops, vegetables and MPTs on small watershed basis. The timber woodlots for supporting cottage industries may help to improve the socio-economic status of rural people.

Indo-Gangetic Plains

3.6.5.6 This region contributes 51.9% to the national food grain output. Farmers use trees according to their need as well as suitability of the species. Many common trees such as *Azadirachta indica, Acacia nilotica, Dalbergia sissoo, Prosopis cineraria, Eucalyptus tereticornis* and *Populus deltoides* are found grown very frequently on farm lands particularly along crop-field boundaries. Some of the common systems found in this region are briefly described below:

Agroforestry Systems for Salt Affected Soils

3.6.5.7 A sizable area in the Indo-Gangetic plains is salt-affected. A package of afforestation techniques has been developed by the Central Soil Salinity Research Institute, Karnal. To rehabilitate alkali soils, augerhole technique is used for planting the saplings of salt tolerant species using 8Kg FYM + 3 Kg gypsum + 10 g $ZnSO_4$ and insecticide powder for controlling termites. In long-term experiments it has been

found that on highly alkali soil (pH>10) *Prosopis juliflora, Acacia nilotica* and *Tamarix articulata* can be grown with success. On soil of moderate alkalinity (pH 9-10), species like *Eucalyptus tereticornis, Parkinsonia aculeata, Terminalia arjuna, Pithecellobium dulce* can successfully be grown. Among fruit trees, aonla (*Emblica officinalis*), guava (*Psidium guajava*), ber (*Zizyphus mauritiana*), Karonda (*Carissa carandas*), Jamun (*Syzygium cumini*) and pomegranate (*Punica granatum*) on raised bunds may be grown applying higher doses of gypsum and farm yard manure. These species may be blended with forage grasses like *Leptochloa fusca, Brachiaria mutica* and *Chloris gayana*. Among herbs of industrial application, species like *Matricaria chamomila, Cymbopogon martinii* and *Plantago ovata* may be grown on moderate alkali soils.

3.6.5.8 On saline soils furrow-method of planting trees has been found successful. *Acacia nilotica*, *A. farnesiana, A. tortilis, Prosopis juliflora, Parkinsonia aculeata, Casuarina glauca, C. equisetifolia,* and *Tamarix troupii* have been found most suitable. *Eucalyptus camaldulensis* is also quite successful. On partially reclaimed lands, *Populus deltoides* and *Eucalyptus tereticornis* are grown as boundary plantations. *Populus deltoides* is preferred on agricultural lands also.

Agroforestry Systems for Soil Conservation

3.6.5.9 In ravine lands, trees like *Acacia nilotica, A. aburnea, A. catechu, Prosopis juliflora, Dalbergia sissoo, Azadirachta indica* and *Pongamia pinnata* are most effective in association with forage grasses like *Dichanthium annulatum, Bothriochlo pertusa, Cenchrus ciliaris, Chrysopogon fulvus, Cynodon dactylon, Sehima nervosum* and *Panicum* spp. *Eucalyptus* – Bhabar grass (*Eulaliopsis binata*) system has been found quite efficient in the Shivaliks which showed the highest economical returns and negligible soil loss (0.07 t/ha) followed by *Acacia catechu* – forage grass (0.24 t/ha) followed by *Leucaena* – napier grass (0.28 t/ha) system. Besides less soil loss, runoff and nutrient losses were also less under Agroforestry systems as compared to those under arable crops. *Vetiveria zizanoides* is also an excellent soil binder.

Agroforestry for Controlling Seepage from Canals

3.6.5.10 Seepage from unlined canals results in waterlogging and salinization. For example, in Hisar Agricultural University Farm, water table has been reported to rise from 15.92 m in 1967 to 1.56 m depth in 1982 after the introduction of Bhakra canal in 1963. A wide belt of trees such as *Eucalyptus tereticornis, Populus deltoides, Syzygium cumini, Pongamia pinnata, Terminalia arjuna, Dalbergia sissoo, Acacia auriculiformis* and *A. nilotica* on both sides of the canal may be created to utilize the seepage water for biomass production. Perennial grasses *like Brachiaria mutica, Coix lachryma-jobi*, species of *Paspalum, Echinochloa colonum* and *Leptochloa fusca* may be grown in waterlogged areas and may be used for forage. *Phragmites australis* a weed grass is also found growing in stagnant water.

Horti-pastoral and Agri-horticultura Systemsl

3.6.5.11 Mango (*Mangifera indica*), guava (*Psidium guajava*), Jamun (*Syzygium cumini*), and ber (*Zizyphus mauritiana*) are the important fruit yielding trees in the entire Indo-Gangetic plains. In Bihar region Litchi (*Litchi chinensis*) is important fruit species. In all these plantations in earlier years of their growth arable crops may be taken. In some areas these are left open for grazing of cattle. But the grazing should be stopped and forage grasses may be cultivated. Several Multi purpose species like *Madhuca indica* and medicinal neem (*Azadirachta indica*) have also shown their preference in most of the region.

Agroforestry in Humid and Sub-humid Region

3.6.5.12 In Tripura tree component is used along with livestock and poultry component, whereas in irrigated areas fish component is also incorporated. Agrisilviculture is common in Raipur and Ranchi areas. *Acacia nilotica, Terminalia arjuna, Butea monosperma, Albizia* spp. are grown in Raipur area while *Zizyphus mauritiana, B. monosperma, Aegle marmelos, Mangifera indica, Schleichera oleosa* (Kusum) in Ranchi area. Homestead Agroforestry is also being practised using *Gmelina arborea, Artocarpus heterophyllus, Madhuca latifolia, Zizyphus mauritiana*

etc.. In Bhubaneswar area agrisilviculture (*Cocos nucifera* for boundary plantation, block plantation of *Casuarina equisetifolia, Anacardium occidentale*) and homesteads are being practised. At both the centres (Raipur and Ranchi) *Gmelina arborea* is also used as timber while *Tectona grandis, Acacia nilotica* are used as timber trees at Raipur and *Shorea robusta* at Ranchi. *Leucaena leucocephala* is used at Raipur and Ranchi for fodder and *Pongamia pinnata, Acacia nilotica* and *Dalbergia sissoo* are also used as fodder at Raipur. *Mangifera indica* and *Artocarpus heterophyllus* are grown for fruits. Other fruit trees are *Moringa oleifera and Syzygium cumini*, in Raipur area and *Psidium guajava, Carica papaya* in and around Ranchi. *Terminalia arjuna* for raising silk worm and *Butea monosperma*, *Schleichera oleosa* for Lac cultivation are being used by the farmers in Ranchi area.

Agroforestry in Arid and Semi-Arid Regions

3.6.5.13 In most of the arid region of the north-western India, Khejri (*Prosopis cineraria*) based silvi-agriculture system is prominent. Almost in all the fields most useful khejri trees and small fruit yielding *Zizyphus nummularia* are found grown in association with rainfed crops. *Zizyphus nummularia* is used for its leaves as fodder for camel and goats and berries for edible purposes. *Acacia tortilis, A. nilotica, A. senegal, A. leucophloea, Capparis decidua, Tecomella undulata, Salvadora persica and S. oleoides* are other common trees found on various grazing lands or as sand stabilizers. *Calligonum polygonoides* is another interesting bush in Bikaner region. *Lasiurus sindicus* and *Cenchrus ciliaris* are prominent grasses in grazing fields as well as in sand dunes.

3.6.5.14 It has been found that besides above native species many woody perennials such as *Acacia albida, Hardwickia binata, Colophospermum mopane, Holoptelea integrifolia* and *Zizyphus rotundifolia* may form the constituents of silvi-pastoral or agrisilvicultural systems in these regions. Studies on the effects of native Khejri and exotic *Acacia albida* on grain production of moongbean and clusterbean, when planted in a space geometry of 5m x 5m, 10m x 10m, and 10m x 5m, showed that the average mean increment in height was 108.2 cm/tree/yr in case of *A. albida* and 14.5

cm/tree/year in *P. cineraria*. The latter did not show any interference in crop yield at any stage. However, *A. albida* during third year showed yield reduction of clusterbean. In wider spaces of 10m x 10m the yield was 1280 kg/ha which reduced to 650 kg/ha and 760 kg/h in spacing of 5m x 5m and 5m x 10m, respectively. Based on a long-term study it has been reported that *Zizyphus rotundifolia* did not show any negative effect on production of cluster bean, pearl millet, moongbean and moth bean, while *Acacia tortilis* had significant negative effect on crop yield. When fodder grasses were grown in combination with ber plants as well as *A. tortilis* tree, the fodder yield and seed production of crops were higher than the yield and seed production of crops in isolation. In Arid regions of Western India, introduction of compatible fuel, fodder and fruit trees in pastures as in agricultural fields acts as an insurance against frequent crop failures, and trees play a pivotal role towards peoples' survival and sustenance in such fragile ecosystems.

3.6.5.15 In Central India, *Dalbergia sissoo, Acacia nilotica, A. eburnea, A. leucophloea, A. catechu, Albizia lebbeck, Azadirachta indica, Butea monosperma, Pongamia pinnata, Holoptelea integrifolia, Balanites roxburghii* and *Dichrostachys cinerea* form important constituents of a silvi-pastoral system. In black cotton soil region very tall grasses supporting this system include *Heteropogon contortus, Chrysopogon fulvus, Themeda triandra, Iseilema laxum, Dichanthium annulatum* and the industrial grass *Cymbopogon martinii*. These can make a sustainable silvi-pastoral system. During the assessment of the soil conservation values of some grasses and forbs in two phases it was found that *Dichanthium annulatum* showed maximum conservation value (upto 89) followed by C*ynodon dactylon* and *Bothriochloa pertusa*. In second phase, *Dichanthium caricosum* showed maximum value (94.4) followed by *Sehima nervosum, Cymbopogon martinii, Chrysopogon fulvus, Iseilema laxum* and *Heteropogon contortus* (all having conservation value of more than 83).

3.6.5.16 In semi arid regions of Peninsular India the systems are more complex as the problem of frost does not exist, therefore, a vast number of trees (both fruit yielding and MPTs) exist on agricultural fields. *Borassus flabellifer, Tamarindus*

indica, Acacia leucophloea, A. catechu, Casuarina equisetifolia, Cassia siamea, Eucalyptus tereticornis, Albizia lebbeck, and many others are frequent trees on farms. *Leucaena leucocephala* has also been adopted as a common hedge-row-crop in many areas

Agroforestry Systems for Coastal and Island Regions

3.6.5.17 Low lying water logged marshy areas, flood plains, and ill-drained lands are the common features in the coastal areas swamps and river banks are occupied by the mangroves and associate halophytes. Other natural vegetation includes evergreen, semi-evergreen and deciduous forests on uplands and grazing lands in pockets. Plantation crops integrated with livestock and poultry and rice fields are main features of this region.

3.6.5.18 The systems and practices of Agroforestry range from apparently 'simple' forms of shifting cultivation and farming in forests to sophisticated hedgerow intercropping systems, from systems involving sparse stands of trees on farm lands to high density, complex multistoreyed homegardens of lowland; and from systems in which trees play a predominantly 'service' role (e.g. shelterbelts) to those in which they provide the main commercial product (e.g. intercropping with plantation crops). Most of the systems are site-specific with very few examples of their extrapolatibility

3.6.5.19 Though many scientific inputs are given to plantation crops and multiple cropping systems are adopted but quite large areas under coconut plantation are still neglected and remain open for grazing. These areas may be brought under multistoreyed cropping systems. Spices like clove and cinnamon may be planted as middle storey crops and pineapple or forage grasses like hybrid napier (*Pennisetum purpureum*), kazungula (*Setaria anceps*) and guinea (*Panicum maximum*) and legumes like *Stylosanthes guianensis* or industrial grasses like lemon grass (*Cymbopogon fulvus*) may be grown as cover crops. Rubber and red oil palm plantations may also be integrated with other spice or forage crops particularly the legume covers. Monoculture of plantation crops should be discouraged and a multi-

storeyed plantation system should be raised as has been demonstrated in Jirka Tang Farm in Andaman where even the forest-trees are retained in multi-storeyed plantations and almost all plantations including spices, coffee and fruit trees have been accommodated as under-storey crops.

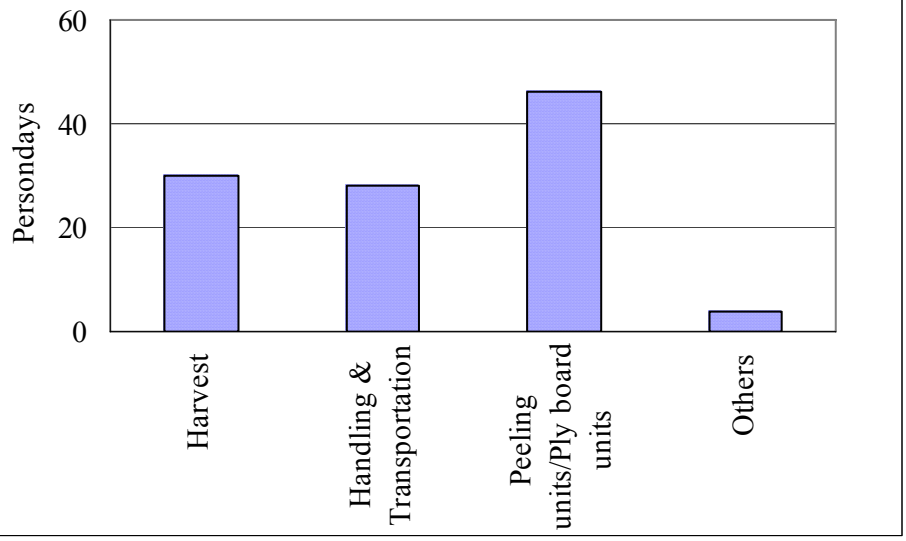
3.6.6.0 Socio-Economic Aspects

3.6.6.1 The main socio-economic outcomes of Agroforestry development programmes in the country may be summarised as below:

- Rehabilitation of >1 million ha salt affected wastelands through Agroforestry.
- Eucalyptus plantations in over 3.1 million ha.
- Indo-gangetic region having > 1 miliion ha Poplar/ Eucalyptus- 6-8 years rotation; 108 personday/ha post-harvest employment in Poplar (**See Box I**).
- Small holders emerging as the timber suppliers of the 21st century.
- 30 million trees of poplar producing 1.125 million m^3 industrial wood annually are standing in Uttar Pradesh, Haryana, Uttaranchal, Punjab, Himachal Pradesh and Jammu and Kashmir with agricultural crops (equivalent to 60,000 ha pure plantation @ 500 trees ha^{-1}).
- 25000 ha equivalent plantation of Poplar are now being established every year under Agroforestry situation with 6-8 year rotations.
- >10 million ETPs (Entire transplants)/year grown in nursery; against this, current requirement is > 15 million ETPs/year.
- >7000 ha of degraded forest lands in Andhra Pradesh planted with improved Eucalyptus clones; >35000 ha marginal lands/year being planted in Andhra Pradesh.
- *Prosopis juliflora-based* fuel and charcoal making; in Tamil Nadu alone 6.34 million mandays and 7.03 million womandays employment created by using this system.
- TBOS (Tree Bearing Oil Seeds) potential in India is 52.33 lakh MT with employment to 0.44 million people.

- Silivipastoral system on an average cycle of 10 years could generate 120 mandays/ha/year employment.

Box I. Post Harvest Employment in Poplar/ha (108 personday/ha)



3.6.6.2 The Planning Commission Report of "The Task Force on Greening India for Livelihood Security and Sustainable Development" (2001) provides economic analysis of 24 Agroforestry models being practiced in different agroclimatic conditions of the country. They all reflect a high Benefit / Cost ratio (1.5 to 3) and Internal Rate of Return (15 to 40%). An ICAR study has revealed a B:C ratio of 3.0 in case of Poplar based agrisilvipasture in Western Uttar Pradesh. The other findings from the region with major policy implications are as follows:

3.6.6.3 *Traditional Agroforestry sub-region*

- The bound/border system of Agroforestry was the most common practice in the region with tree species like *Azadirachta indica* and *Acacia nilotica.* The tree stock was 15.6 per farmer and the tree density was inversely proportional to the land holding.
- The fuel wood needs prompted majority of the farmers (50.6%) to patronize the trees on farmlands. The other major reason was supplementary income (24.4%).

- The annual mean wood produced and harvested worked out to 0.42 t /farm household. Out of this the marketed surplus was almost 49 per cent. While 51 per cent of the farmers harvested some tree/tree produce in the past three years, only 37 per cent of such farmers had marketed surplus. The tree/tree produce was mostly disposed off by the farmers to the local traders. Often the village traders bought the same and the tree produce reached the nearby urban markets for processing and consumption.

3.6.6.4 *Intensive Agroforestry sub-region*

- Field bound/boundary plantations of trees was predominant (78.1%) followed by agrisilviculture (21.9%). The most common tree species are Poplars (*Populus deltoids)* and *Eucalyptus tereticornis* hybrids. While the former was seen on bunds and under agrisilviculture, the latter was solely seen on bounds/boundaries of agriculture fields.
- The tree density worked out to 146 trees/ha under bund system with 64 per cent of Poplar and 33 per cent of Eucalyptus tress on an average. The tree density was 481 trees/ha in case of Poplar - based agrisilviculture.
- Private nurseries accounted for majority source (40.7%) of planting material for Agroforestry. The forest department and the corporate sectors extended the technical know-how (68.1%) for tree cultivation under Agroforestry.
- Monetary considerations mostly dominated (88.8%) the decision making in favour of Agroforestry by the farmers.
- The Benefit Cost Analysis indicated that higher B:C was in case of Poplar - based agrisilviculture with 3.00 followed by bund system with Poplar at 2.84.
- There is general decline in the prices of wood especially Poplar by about 14-30 per cent over the period 1996-2000. This decline was further alarming in the next couple of years. This is mainly due to decrease in demand for the plywood as well as increase in Poplar area. The same has to be checked may be by announcing a minimum support price, as the same would reduce the drain of foreign exchange in the form of reduction in timber imports to some extent.

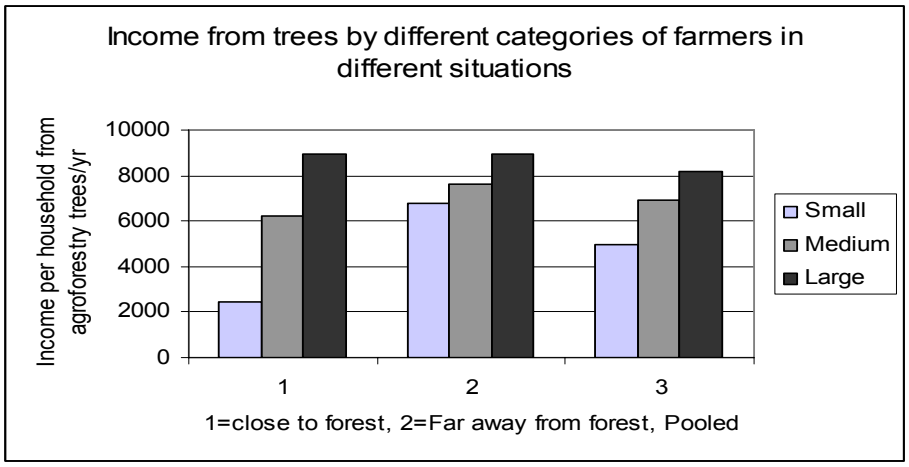
3.6.6.5 **Boxes II and III** give socio-economic profile of a Poplar-based Agroforestry project in Yamunanagar (Haryana). It may be seen from the **Box II** that the adoption rate of the technology is extremely high, especially in irrigated lands, and the average income of the adopters is almost three times of that of the non-adopters. As seen from **Box III**, when Agroforestry households were located close to forest, the income was almost proportional to farm size, but if located far away from forest, the income of small households almost tripled and those of medium and large households increased only by about 15 and 3 percent, respectively. Inclusion of livestock in Agroforestry systems increased the income considerably and the increase was almost proportional to the number of animals owned by the households, and the increase was much larger when the farming households were away from forest.

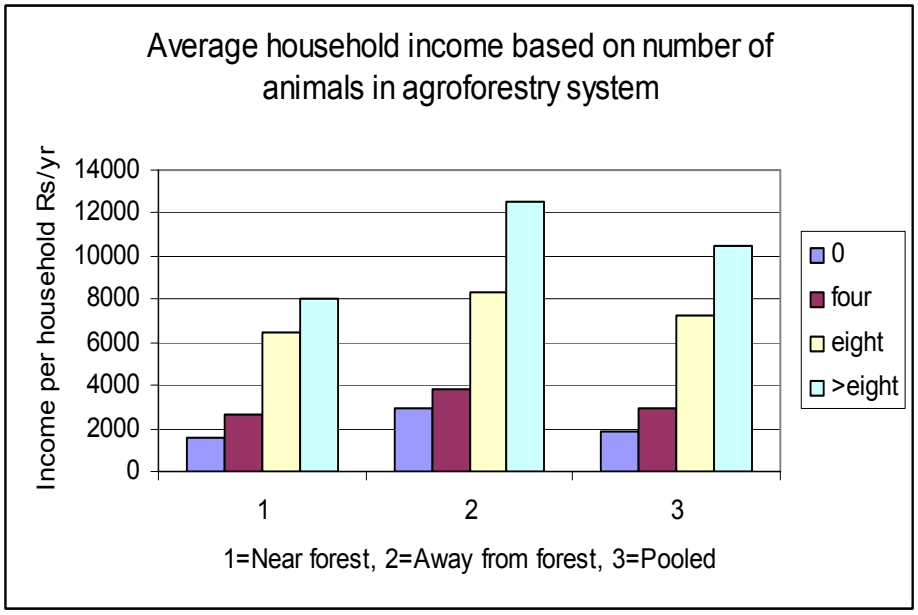
Box II. Poplar Based Agroforestry in Yamunanagar (Haryana)

- Agroforestry is more popular in the villages which are far away from the forest area. Around 61% households of the villages away from the forests received their income from the trees of Agroforestry whereas only 35% in the villages near the natural forests.
- Landless farmers get equal benefit from Agroforestry. The average annual income of the households from the trees of Agroforestry and natural forests increases as the holding size increases in both the groups of villages.
- Economic dependence on trees income increases with increasing family size and number of animals in both the groups of villages (near and away from the natural forests). But the trend is reverse in case of natural forests.
- Rate of adoption in the villages far away from forests is 94% as compared to households of the villages near the forest boundaries.
- Around 48% households use Agroforestry for getting wood as a source of cooking.
- The overall percentage of farmer households adopting Agroforestry for the irrigated land increases with increasing holding size i.e., from 87.61% to 99.14%, whereas, for unirrigated land this percentage of households is comparatively low i.e., from 69.81 % to 95.65%.
- Level of education plays a dominant role in increasing income from the Agroforestry. Percentage contribution is slightly higher 80.63% in case of educated farmers whereas it is 79.02% in case of illiterate farmers.
- Most of the medium and large farmers adopted Agroforestry as a major source of income.
- The overall income from Agroforestry in villages away from natural forests is more (86.5%) compared to villages near to forests (76.41%). The overall annual income from trees of Agroforestry is Rs. 8377 for adopted households whereas corresponding income for non-adopted households is only Rs. 2638.

Source: Rai et.al.(1999)

Box III . Income profile of Agroforestry households, Yamunanagar.





3.6.6.6 A study on economic impact of Subabul (*Leucaena leucocephala*) based farming system (Agroforestry) was undertaken in four districts *viz*., Khammam, Krishna, Guntur and Prakasham of Andhra Pradesh. Three land uses and land cover changes were type I- Subabul for pulp wood; type II- Subabul with intercrops; and type III- Subabul with animal husbandry and intensive fodder use. Their adoption rates are, 29.7 , 23.3 and 47.1per cent, respectively. The economic analysis indicates that Type III farmers earn higher returns, B: C ratio of 3.67 as compared to B: C ratio of 1.88 to 2.58 in Types I and

II (**Table 3**). As suggested by the study, several of the type-I and type-II farmers are shifting to the type-III system for better cash flow. Subabul leaf meal production was identified as another significant opportunity to supply the fodder from areas like Guntur and Khammam to fodder deficit areas like Praksham districts with intensive fodder use. This activity can provide employment opportunity to the unemployed youth on the one hand and better resource use along with nutrition on the other. The role of institutional credit support and an effective extension system was substantial in achieving the success. Such experiences should be replicated widely.

3.6.6.7 With the fossil fuel prices soaring so high, jeopardising overall economic growth in petroleum importing countries, the country must develop its own renewable energy production and use system, of course, consistent with economic viability and technological feasibility. The agro-technological and socio-economic prospects of some of the potential species, especially *Jatroph*a for fuel and *Prosopis juliflora* for bio-energy, should critically be examined and timely necessary actions should be taken to harness the potential. The All India Coordinated Research Project on Agroforestry centres at their Andhra Pradesh, Tamil Nadu and Karnataka Agricultural Universities have collected germplasm of Jatropha, Karanj and other biofuel species and are evaluating them. Agrotechniques for improved production of the selected genotypes are being standardised.

3.6.6.8 In fact, *Jatropha* plantations are being raised in several States, mainly in Chhattisgarh, Uttaranchal, Andhra Pradesh, Tamil Nadu, Karnataka and Haryana. But, often, the quality of the planting materials is poor and the expected results in terms of yield and income are not being realised. Efforts should be focused on developing superior and stable genotypes (high yielding varieties). Nurseries should be established at strategic locations for production and distribution of quality planting material. In vitro culture facilities should also be available to hasten the pace of multiplication of elite materials.

Table 3: Relative Economics of Raising Subabul (3 Year Rotation) in Different Typologies of Andhra Pradesh

Type –I	**Direct Seeding**			
Year	Input (Rs)	Output (Rs)	Benefits(Rs.)	B:C ratio
1	13393	685	-12708	**2.55**
2	3625	1815	-1811	
3	14950	79100	64150	
Total (Rs)	31968	81600	**49632**	
Seedlings through transplanting				
Year	Input (Rs)	Output (Rs)	Benefits(Rs.)	B:C ratio
1	19534	548	-18986	**2.25**
2	3158	1452	-1707	
3	15857	84750	68893	
Total (Rs)	38549	86750	**48201**	
Type II:	**Subabul + Cotton (During I year only)**			
Year	Input (Rs)	Output (Rs)	Benefits (Rs.)	B:C ratio
1	40893	32185	-8708	**1.90**
2	3625	1815	-1811	
3	14950	79100	64150	
Total (Rs)	59468	113100	**53632**	
Subabul + Black gram (During I year only)				
Year	Input (Rs)	Output (Rs)	Benefits(Rs.)	B:C ratio
1	18893	15685	-3208	**2.58**
2	3625	1815	-1811	
3	14950	79100	64150	
Total (Rs)	37468	96600	**59132**	
Subabul + Tobacco (During I year only)				
Year	Input (Rs)	Output (Rs)	Benefits(Rs.)	B:C ratio
1	62893	72685	9793	**1.88**
2	3625	1815	-1811	
3	14950	79100	64150	
Total (Rs)	81467.5	153599.5	**72132**	
Type III	**Subabul + sheep farming**			
Year	Input (Rs)	Output (Rs)	Benefits(Rs.)	B:C ratio
1	24393	50685	26293	**3.67**
2	13625	51814.5	38189.5	
3	24950	129100	104150	
Total (Rs)	62968	231600	**168632**	

Source: P.S.Pathak, 2005

3.6.6.9 A refinery is being set up by 'D'- Oils - a British Company in Chennai with 8000 t / yr production capacity. The refinery is expected to start functioning by

2007. As we know, in Karnataka, biodiesel is used in generators for supplying electricity to a number of villages since 1998. This model of decentralized production of energy is ideally suited for Indian conditions for linking agricultural production with agroprocessing and value addition, besides generating additional rural employment. It is estimated that Tree Borne Oil Seeds (TBOS) potential in India is over 5 million tonnes with an additional employment potential of 0.44 million people.

3.6.6.10 As regards bio-energy, *Prosopis juliflora*, which was considered as an abnoxious weed in certain areas, is now being cultivated as an Agroforestry species in large areas in Andhra Pradesh, Gujarat and Karnataka. The total area in three districts of Gujarat (Bhuj, Patan and Surendranagar) is 1.71 lakh ha (2005), with a potential of 1.53 lakh t of charcoal production and 18.55 lakh mandays per rotation employment generation. For fuel and charcoal making, employment was generated for 6.34 million mandays and 7.03 million womandays in Tamil Nadu. *Prosopis juliflora* is a major source of fuel for boilers of the power generation plants in Andhra Pradesh. Rs. 700-1300 /t is the price offered for its wood at factory gate depending on the season and moisture. Three plants in A.P. have developed captive plantations of *Prosopis juliflora*. Commissioned biomass-based power plant capacity in Karnataka and Andhra Pradesh was 266 MW with 46 power generation units in operation, with almost 78 % in Andhra Pradesh alone.

3.6.6.11 In coastal zones, mangroves are the most important bioresource and their use as a major source of bio-energy should be promoted through suitable institutional supports, while ensuring their comprehensive conservation and sustainability as bio-shield. A time-frame programme must be chalked-out for rehabilitation of mangroves along coasts. Techniques are available for planting of mangroves, a massive programme should be framed and implemented without further waste of time. More agro-based industries should be developed in coastal areas to create more employment through value addition to products based on coconut, oil palm, honey, cashewnut, rubber, fruit, fish & shrimp, milk, beverage, medicines, poultry, sea food and mangrove products.

3.6.6.12 The total CO_2 emission reduction potential (as a consequence of not using the coal in thermal plants) of the biomass based power plants (on account of 16000 MW potential/yr) is 35.3 million t/yr. Although many plants have been commissioned, they are yet to be registered with the UNFCC. As on March 6, 2006 only 2 plants from A.P. (18 MW) have been registered with UNFCC for a saving of 39670 t of CO_2 per annum. India should position herself effectively to harness the environmental costing provisions under Kyota Protocol.

3.6. 6.13 Agroforestry will play a decisive role not only in supply of timber products, thus saving the forest, but would also be extremely effective in meeting the paper, pulp and viscose requirements. Per caput paper consumption per year in India is less than one-sixth of that in China (**Table 4**). The demand is growing annually at 7 per cent and our capacity is growing at a rate of 4 to 5 per cent, necessitating huge annual import. Agroforestry plantations could be expanded at wasted and degraded lands through a Nucleus - Estate arrangement to meet this demand. The private sector must play a proactive role in filling this gap.

Table 4. Relative Paper Consumption (kg/year)

Country/Region	Kg/Year/Person
India	4.5
China	28.3
Asia	26.9
World	52.6

3.6.7.0 Agroforestry Research and Technology Development

3.6.7.1 India has been at the forefront of Agroforestry research. Although Agroforestry research in the ICAR system and other Indian institutes and universities has been in progress since early 1950s, the Council launched the All India Coordinated Research Project on Agroforestry in 1983. Presently, 36 centres (11 ICAR Institutes + 25 SAUs) representing all ago-climates in the country are involved. The National Research Centre on Agroforestry, one of the ICAR Centres, was established at Jhansi in 1988. The Indian Council of Forestry Research and Education

(ICFRE) also supports Agroforestry research in education in various parts of the country. A number of State Agriculture Universities (SAUs) are also having focused research activities and education in the field of Agroforestry. Private sector initiatives in Agroforestry such as those by WIMCO, BAIF, IFFDC, ITC are worth mentioning. In all, more than 2000 scientists and technicians are engaged in Agroforestry research, development and education in the country. The main research and development outcomes are listed below.

- Characterisation of Agroforestry systems in different agroclimatic zones of the country; by developing a diagnosis and design approach and using them for survey, a benchmark information for major Agroforestry systems has been prepared.
- Collection and evaluation of multipurpose tree species – creation of arboretums in different agro-climatic zones.
- Tree selection and improvement particularly of Poplar, Shisham, Neem, Semal, Subabul and Eucalyptus.
- Priority Agroforestry tree species were identified for different agroclimates.
- Management practices for different Agroforestry systems were standardized and their efficacies and economic returns (B:C ratios) were worked out to show the usefulness of the systems under specified agro-ecological and socio-economic settings.

3.6.7.2 The ICAR system has analysed the strength, weaknesses and opportunities of Agroforestry research and development system in the country (**Table 5**). Based on this analysis and keeping in mind the new national and international developments, increasing domestic demand for pulp and paper and other forest products, the overall objectives of the Agroforestry Research and Development Programme of the ICAR, announced recently, are quite sound, as given below:

i. Enhancing the output of specific products such as fodder, fuelwood, pulp wood, small timber and crop yield;
ii. Improving the overall productivity of small farms with minimum external inputs in different agro-ecological regions;

iii. Devising management techniques that can facilitate profitable use of degraded and unproductive land; and

iv. Providing environmental amelioration through watershed protection, soil conservation etc.

Table 5. SWOT analysis of Indian Agroforestry Research and Technology Development

Strengths	Weaknesses	Opportunities	Threats
Forestry as a phytoclimate	Location specific research needs	Exploiting /rich biodiversity	Bird damage to crop and the unchecked growth of wild life.
High Biodiversity	Lack of Wood based enterprises affecting farmers income	Developing Linkage with institutions and SAUS	Illicit/Over grazing by the livestock
Carbon fixation and sequestering potential of trees	Long gestation period of the woody crops	Small scale tree based industries and employment generation	Pest and disease complexes due to secondary hosts.
Well trained man power	Lack of Transferable technologies	Sustainable production system to improve farmer's economy and quality of life	Changing Government forest policy, especially pertaining to leasing of forests land, and forest products, which have a bearing on Agroforestry production.
Vast network of 35 AICRPAF Centres for coordination and consultation	Quality seed and planting material	Bio-remediation for improvement of the soil and environment quality	
	Policy about tree felling	Improving nutrient base of the human food	
	Market imperfections and financial support		

Source: ICAR, 2005

3.6.7.3 In order to achieve the above objectives, the following thrust areas have been identified:

- Increase wood resources to meet the growing needs of households and industries.
- Environmental amelioration through the carbon sequestration, bioremediation and resource conservation.
- Enhance livelihood and employment avenues.
- Technology transfer and human resource development.

3.6.7.4 In addition, the following specific areas deserve attention:

- Aqua-culture research keeping mangroves intact.
- Genetic improvement of identified potential multi-purpose trees.
- Organic farming, mycorrhizae in relation to Agroforestry and integrated pest-management in Agroforestry.
- Developing net-works for transferring proven technologies to the farmers.
- Developing decision support systems for replication of successful Agroforestry systems/practices.
- Exploring unexploited and under-exploited species of high economic value, such as medicinal, aromatic, oil-yielding plants etc.
- Exploring marine algae or sea weeds for food, medicine and green manure.
- Viable techniques for rehabilitation of degraded salt-affected areas involving good quality forages, MPTs, plantation crops and plants of industrial application, with due attention to quality assessment of the products obtained from saline habitats.
- Saline agriculture, including conjunctive irrigation with saline water, developing halophytic crops involving fish, shrimp culture and poultry with Agroforestry

systems, genetic improvement of salt-tolerant plants, raising nursery with saline water and multiplication and conservation of useful genetic material.

- Promotion of national and inter-national collaborative research programmes.

3.6.7.5 Analogous programmes are being pursued by other concerned agencies such as the Indian council of Forestry Research and Education, Wasteland Development Board, the Ministry of Environment and Forest etc, including the initiatives on biofuel and bioenergy in several Departments. However, there is little convergence and coordination among the various programmes. The Planning Commission may evolve an effective mechanism for synergistically linking and managing the linkages among the various programmes.

3.6.7.6 An integrated approach is necessary for research and development of coastal zone agriculture and Agroforestry which can impart sustainability to the productivity and save the fragile coastal ecosystems from degradation. A national information system may be launched to serve as the data bank of coastal zone planning. Environmental laws should be followed strictly in coastal zones to check the over exploitation of land, water and vegetation, particularly the mangroves.

3.6.8.0 Policy and Institutional Supports

3.6.8.1 The country's mission on Agroforestry must be to advance the science and practice of Agroforestry towards a massive increase in the use of working trees on working landscapes, especially by smallholders rural households, to help achieve sustained livelihood security. Agroforestry efforts at the national level should strategically focus on tackling poverty, food security and environment through the following four channels:

i. Overcoming natural resource degradation in intensive productive irrigated systems;
ii. Arresting land degradation and productivity loss in small holder farms in sub-humid and semi-arid areas;

iii. Searching for sustainable alternatives to slash and burn in tropical humid areas;

iv. Providing shelter belt and livelihood security in coastal areas.

All the above issues can be addressed through the following four interdependent approaches:

- By seeking to understand the basis for sound land management, and then quantifying the long term consequences of Agroforestry practices on small scale agriculture so as to develop locally relevant land management options. Thereby, it should provide innovations that built a sustainable platform for achieving food security and income through increased production of Agroforestry products for home consumption and sale.
- By delivering approaches, strategies and methods for product development, tree domestication and access to high quality germplasm, and diversification of integrated farming systems in response to farmers' needs. Agroforestry efforts at the national level should, therefore, be able to provide innovations that enable farmers to diversify their enterprise to capture market opportunities and provide nutritional and health benefits.
- By examining the role of Agroforestry and landscape mosaics in generating environmental services, reducing deforestation and aiming to improve related institutions and incentive and reward systems. This way we should be able to open up broader market linkages between farms and society's needs for a better environment, as also to buffer farmers against the effects of climate change, and facilitate appropriate recognition of social costs and benefits.
- By strengthening of Agroforestry R and D institutions, and human resources development and education, we should be able to build institutional capacity in generating and applying innovations.

3.6.8.2 Appropriate policies and their effective implementation (governance) is important for realising benefits of Agroforestry. Many rules, regulations, tariffs and conflicts between States and communities have been major hurdles in the growth of tree culture. Enabling mechanisms and services, such as land rights, appropriate

technologies, credit support and market access must be synergistically intertwined with the production systems.

Regulatory Aspects of Tree Felling and Transport

3.6.8.3 State regulations and permit systems for felling of trees and for timber transportation have been main interferences in marketing of timber grown on farmers' land by private investment and have been major discouragement to the expansion of Agroforestry. The rules and procedures for felling, transport and sale of major farm forestry species should be totally liberalised, and the local Panchayati Raj institutions should be delegated with powers to issue necessary permits, if any at all. At present, there is wide variation in the initiatives taken by different States. It is high time to evolve common guidelines on these issues, simplify the process and remove red tapism. Policies on inter-state transport of farm forestry produce also require simplification and streamlining. This will facilitate easy movement of farm forestry produce from production to consumption areas. The existing state monopoly on trade of commercially important non-timber forest products (NTFPs) should be reviewed with a view to promote greater private sector participation in NTFP production.

3.6.8.4 The practice of supply of forest produce to industry at concessional long term leases should cease as it distorts the market and works against the interest of private Agroforestry. Import of pulp and timber was placed in open general licence (OGL) list and tariffs are not applicable since 1985. This was done to prevent deforestation in the country. While the deforestation continues unabated, the price distortions negate private efforts. Out of over 270 paper mills, hardly eight are producing or procuring pulp locally and desired private investments are not forthcoming to raise soft wood on wastelands and agricultural fields.

3.6. 8.5 Raising of agro forestry species on forest lands by the government should be discontinued as the same can be grown more easily and efficiently by the farmers on their farmlands. Apart from directly affecting the farmers' market, this also acts as a hindrance to liberalisation of felling and transit rules pertaining to these species.

The government should consider revoking the ban on export of wood-based products and imposing a higher duty on import of wood-based raw material to safeguard the interest of the domestic producers. Further, the industry may be given some concessions in excise or sale tax. In this way, domestic production will be encouraged and industries will also have greater incentive for improving wood conversion ratios and overall efficiency and competitiveness.

3.6.8.6 Availability of quality seedlings, seed and other planting materials and their initial establishment in the field resulting in recommended population density are fundamental to productive Agroforestry. Often, the quality and success rate of seedlings supplied by the government either free or at heavily subsidised rates is low, thus is a drain to the public funds meant for Agroforestry promotion. There is an urgent need to review this policy. Part of the resources should be reallocated for developing and producing high quality clones and seedlings which may be supplied on reasonable rates to farmers and backed up by suitable extension efforts, including setting up of demonstration plots and Farm Schools. The farmers will not mind procuring the planting materials at reasonable rates as long as these are certified stocks of high quality.

Marketing Infrastructure and Economic Incentives

3.6. 8.7 Marketing of farm forestry produce is not organized. No forest-based industries, except that at the village or cottage level should be permitted in the future unless it has been first cleared after a careful scrutiny with regard to assured availability of raw material. In any case, the fuel, fodder and timber requirements of the local population should not be sacrificed for this purpose.

3.6.8.8 As more farmers take to Agroforestry, a system of market regulation along the lines of agricultural markets needs to be put in place. In the absence of such a regulatory mechanism, the volatility of markets may result in collapse of the Agroforestry industry.. While the Agricultural Marketing Cooperative system introduced in Andhra Pradesh is a laudable first step, it is required to adequately

regulate the farm forestry markets and to protect the interest of both the producers and consumers.

3.6.8.9 In addition to the regulation of wood markets, a suitable market information system along the lines of agricultural markets is called upon to inform the farmers regarding major buyers, prevailing prices at different places, trends and procedures, etc. The Village Knowledge Centres should play a proactive role in collecting and disseminating necessary market information.

3.6.8.10 Introduction of positive incentives can go a long way in popularising tree farming. The Chandi Prasad Bhatt Committee, set up by the Ministry of Environment & Forests (November 1998) recommended introduction of national tradable afforestation credits to encourage tree planting by private land owners. These credits will allow tax benefits to the farmers. The small land owners who do not have any tax liability could sell these credits to others.

3.6.8.11 The standing trees on farm lands are exempted from wealth tax. It is an incentive to farmers for maintaining valuable trees on farms. However, the trees are not taken as collateral for grant of loan. The financial institutions should consider the issue of treating trees as collateral for grant of loan. Joint Pattas for trees should be issued to women farmers. NABARD should facilitate implementation of Agroforestry projects by private sector and rationalise the procedure for timely and adequate flow of credit to farmers specially smallholders, and livelihood financing should be extended to SHGs.

Equity, Empowerment of Landless and Disadvantaged Groups through Cooperatives

3.6.8.12 Improvement of degraded lands, poverty alleviation, productive employment generation, fuel, timber and fodder production by the active participation of women, landless and disadvantaged sections of society was launched from 1986-87 by the Indian Farmers Fertilizers Cooperative (IFFCO). A subsidiary called Indian Farm Forestry Development Cooperative (IFFDC) was floated. Leased

wastelands of Revenue Department of Government of Madhya Pradesh, democratically elected village bodies (Panchayats) of Rajasthan and private lands in Uttar Pradesh were managed by the cooperatives. Even a landless or socially disadvantaged wage earner engaged for planting Agroforestry spares a part of his/her wage to buy shares. In this process he or she becomes a permanent stakeholder of Agroforestry which provides much needed or most effective social protection. Demands of human-being or livestock pressure during early phases of plantations is minimized by setting up other micro-enterprises. During 1995-2001, about 20,397 ha of wastelands was planted with multipurpose trees and 2.87 million person days employment was generated with 45% being women beneficiaries. A total of 107 Primary Farm Forestry Cooperative Societies with a membership of 21,753 and 518 Self Help Groups were registered. A revolving fund of Rs.4.58 million was circulated among 663 Self Help Groups. Availability of fodder and credit-promoted livestock rearing, conservation and amelioration of soil, water and biodiversity were encouraged. Similar institutions (National Tree Growers Cooperatives) floated by the National Dairy Development Board are also promising initiatives for raising equitable Agroforestry by communities. The membership is gender neutral and is pro-poor with more than 76% being landless. The programme is socially equitable since 88% members belong to socially disadvantaged groups of people. These experiences should be widely replicated and further strengthened by linking them with Bharat Nirman, National Horticulture Mission, the National Rural Employment Guarantee Programme and other such programmes.

Kyoto Protocol

3.6.8.13 This is an important agreement of the United Nations Convention on Climate Change for promoting trading in green house emissions. Agroforestry systems planted on abundantly available wasted or degraded lands can sequester carbon and other emissions. Soil organic stocks have improved in most of the Agroforestry systems established in the recent past. However, bench marking of Agroforestry based stocks prior to 1990 and inventorization as well as certification of additional sequestrations is called upon to get into trading in emissions. Trained and

highly motivated cadre of technicians should be organized to take advantage of this provision and also to register India's leadership in capturing new global opportunities when climate change is already a reality.

Promotion/Participation of Industry

3.6.8.14 Demand of soft wood by paper mills, match, plywood, chips, packing cases and supports goods industry is on the rise. Most of the grass based pulp and paper mills are shifting to soft wood. Ban on felling in natural forest in many areas has been imposed by Hon'ble Supreme Court of India. Similarly, many pharmaceutical, drugs, natural medicinal and energy generating companies are interested in the promotion of Agroforestry. Poplar based Agroforestry in North India was promoted by WIMCO Company by making available new clones, healthy nursery plants, customizd plantations and signing of buy back agreements. Nearly 200 poplar wood based industries emerged during the last two decades in the twin city of Jagadhari and Yamuna Nagar of Haryana State with an annual turn over of about Rs.1000 crores. Large amount of financial resources were mobilized by selling public shares with attractive returns by many plantation companies. Teak plantations were raised on degraded leased lands by some of them. However, unfortunately, land use was ultimately diverted for the construction of tourist resorts or motels by some of them whereas most of the other companies disappeared. Corporate sector was offered some financial grants by the Ministry of Rural Development for raising pulp and wood industry based raw material during the Ninth Plan (1997-2002), but the overall outcome was rather discouraging. Leasing and contracting of land, including wasteland, to the corporate sector must be done carefully. Instead, landless and near – landless farmers should be allotted surplus and watelnads and organised in groups. The corporate sector could join these small farmers' estates as their nucleus under a Nucleus-Estate contractual arrangement.

Strengthen Extension and Public-Private Linkages

3.6.8.15 The extension agencies should be supported by a strong research unit which would identify suitable species, prepare yield and volume tables, fix rotation,

and in a participatory mode establish demonstrations and collect useful data for the user farmers. Research and technology outcomes should be strengthened to a level so as to become a real motivating force. Agroforestry and Farm forestry extension is a specialized activity and needs a separate infrastructure and human resources with a systems bias. Training of agroforestors as well as of trainers should regularly be organised. Strategically-located KVKs and ATMAs of the Ministry of Agriculture and similar outfits of the Ministry of Environment and Forests, particularly the Indian Council of Forestry Research and Education and the counterpart State institutions and organisations should regularly organise the training programmes and also establish system-based demonstrations,

3.6.8.16 Some of the wood-based integrated pulp and paper mills such as WIMCO, ITC, are promoting Agroforestry plantations by supplying Eucalyptus, Casuarina, Leucaena, Poplar and Acacia hybrid seedlings for pulp wood production. These companies have opted to promote Agroforestry plantations on marginal lands by providing high quality seedlings, technical extension services and buy back guarantee at remunerative prices to farmers. Fast growing, high yielding and disease resistant Eucalyptus clones with 3 to 4 times higher productivity have been developed by ITC Bhadrachalam Paper Board Limited. They have also selected ten promising Casuarina clones. WIMCO has developed their own poplar clones. Keeping in view size and diversity of India, these are very small and limited initiatives which require replication and scaling up. In addition, farmer-friendly Contract Farming should also be promoted. The public sector should essentially be involved as a facilitator in providing regulatory and services supports to strengthen production – processing – marketing chains.

Financial Requirement

3.6.8.17 The working group of the Greening India Programme of the Planning Commission, 2001, had estimated that 28 million ha additional land could be brought under Agroforestry in a ten year period. This is doable, hence should be implemented. The financial requirement for the Greening Programme would be of the order of Rs

48,000 crore in 10 years. The annual requirement would be Rs 4,800 crore against the current availability of Rs 1601 crore. Bharat Nirman, National Rural Employment Guarantee Programme (NREGP) and "Food for Work" scheme should meet most of the expenses for this task. Additional funds, if needed, could be met from the plan budgets of Central and State Governments under various schemes of afforestation/tree planting, desert development, drought-prone area development, watershed development, command area development, settlement of shifting cultivation, wasteland development, National Horticulture Mission and other schemes of rural development. Externally-aided projects should also be formulated for availing assistance from various sources.

3.6.8.18 Institutional finance should be mobilized through normal run schemes of NABARD but should reach the farmer as directly as possible. Industries should also be enthused to participate in the Greening Programme through transfer of technology, supply of quality planting material and a captive market for the growers. Institutional funding is very important in areas where a farmer-industry nexus is to be established. However, the experience in the last 10-15 years shows that the flow of institutional finance into forestry programmes has been minimal and this malady should be rectified. Grassroot institutions, Panchayats and Gram Sabhas must play leading role in mobilising village communities, District Consortia on Agroforestry, involving public private, farmer and nongovernmental organisations should be constituted to provide collective technological and management support and for ensuring appropriate utilisation of resources.

Synergy

3.6.8.19 In order to contribute to the gigantic task of Greening India and harnessing the power of trees in 10 years timeframe, it is proposed to set up an Agroforestry Authority of Indiaby synergising the efforts of concerned Ministries and Departments for effective implementation, alliance, cooperation, partnership, monitoring and evaluation of the programme. The Agroforestry Programme will ensure environmental, food and livelihood securities, alleviate poverty and mitigate the adverse impacts of pollution and health hazards. It will reduce regional disparity,

bring desirable peace, prosperity and happiness and ensure an optimistic future for generations to come.

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Annexure I

Major Agroforestry Practices and their main Characteristics.

Agroforestry practice	Brief description (of arrangement of components)	Major groups of components	Agroecological adaptability
Agrisilvicultural systems (crops – including shrub/vine/tree crops – and trees)			
(1) Improved fallow	Woody species planted and left to grow during the 'fallow phase'	w: fast-growing preferably leguminous h: common agricultural crops	In shifting cultivation areas
(2) Taungya	Combined stand of woody and agricultural species during early stages of establishment of plantations	w: usually plantation forestry spp. h: common agricultural crops	All ecological regions (where taungya is in practices); several improvements possible
(3) Alley cropping (hedge-row intercropping)	Woody species in hedges: agricultural species in alleys in between hedges; microzonal or strip arrangement	w: fast-growing, leguminous, that coppice vigorously h: common agricultural crops	Subhumid to humid areas with high human population pressure and fragile (productive but easily degradable) soils
(4) Multilayer tree gardens	Multispecies, multilayer dense plant associations with no organized planting arrangements	w: different woody components of varying form and growth habits h: usually absent; shade tolerant ones sometimes present	Areas with fertile soils, good availability of labour, and high human population pressure
(5) Multipurpose trees on crop lands	Trees scattered haphazardly or according to some systematic patterns on bunds, terraces or plot/field boundaries	w: multipurpose trees and other fruit trees h: common agricultural crops	In all ecological regions esp. in subsistence farming; also commonly integrated with animals
(6) Plantation crop combinations	(i) Integrated multistorey (mixed, dense) mixtures of plantation	w: plantation crops like coffee, cacao, coconut, etc. and fruit trees, esp.	In humid lowlands or tropical humid/subhumid

	crops (ii) Mixtures of plantation crops in alternate or other regular arrangement (iii) Shade trees for plantation crops; shade trees scattered (iv) Intercropping with agricultural crops	in (i) fuelwood/fodder spp., esp in (iii) h: usually present in (iv), and to some extent in (i); shade-tolerant species	highlands (depending on the plantation crops concerned); usually in smallholder subsistence system
(7) Home gardens	Intimate, multistorey combination of various trees and crops around homesteads	w: fruit trees predominate; also other woody species, vines, etc. h: shade tolerant agricultural species	In all ecological regions, esp. in areas of high population density
(8) Trees in soil conservation and reclamation	Trees on bunds, terraces, raisers, etc. with or without grass strips; trees for soil reclamation	w: multipurpose and/or fruit trees h: common agricultural species	In sloping areas, esp. in highlands, reclamation of degraded, acid, alkali soils, and sand-dune stabilization
(9) Shelterbelts and windbreaks, live hedges	Trees around farmland/plots	w: combination of tall-growing spreading types h: agricultural crops of the locality	In wind-prone areas
(10) Fuelwood production	Interplanting firewood species on or around agricultural lands	w: firewood species h: agricultural crops of the locality	In all ecological regions
Silvopastoral systems (trees + pasture and/or animals)			
(11) Trees on rangeland or pastures	Trees scattered irregularly or arranged according to some systematic pattern	w: multipurpose; of fodder value f: present a: present	Extensive grazing areas
(12) Protein banks	Production of protein rich tree fodder on farm/rangelands for cut-and-	w: leguminous fodder trees h: present	Usually in areas with high person : land ratio

	carry fodder production		
(13) Plantation crops with pastures and animals	Example: cattle under coconuts in south-east Asia and the south pacific	w: plantation crops f: present a: present	In areas with less pressure on plantation crop lands
Agrosilvopastoral systems (trees + crops + pasture/animals)			
(14) Homegardens involving animals	Intimate, multistorey combination of various trees and crops, and animals, around homesteads	w: fruit trees predominate; also other woody species a: present	In all ecological regions with high density of human population
(15) Multipurpose woody hedgerows	Woody hedges for browse, mulch, green manure, soil conservation, etc.	w: fast-growing and coppicing fodder shrubs and trees h: (similar to alley cropping and soil conservation)	Humid to subhumid areas with hilly and sloping terrain
(16) Apiculture with trees	Trees for honey production	w: honey producing (other components may be present)	Depending on the feasibility of apiculture
(17) Aquaforestry	Trees lining fish ponds, tree leaves being used as 'forage' for fish	w: trees and shrubs preferred by fish (other components may be present)	Lowlands
(18) Multipurpose woodlots	For various purposes (wood, fodder, soil protection, soil reclamation, etc.)	w: multipurpose species: special location-specific species (other components may be present)	Various

Note: w = woody; h = herbaceous; f = fodder for grazing; and a = animals.

Annexure II

Main Characteristics and Agroforestry Emphasis in the Major Agroecological Regions of India.

Characteristics	Himalyan region	Indo-Gangetic alluvial plains	Arid and semi-arid region	Humid and sub-humid region	Tropical coastal and Island region
Climate	Varies from temperate cold alpine to sub-tropical; rainfall 8 to 350 cm in west, 200-400 cm in east	Very hot summer and cold winter; rainfall 30 to 200 cm; ground frost common in winter	Dry-humid to very hot, sub-humid; rainfall in arid 40-65 cm; in semi-arid 70-125 cm.	Humid to sub-humid; hot; rainfall 100 to 400 cm, monsoonic	Tropical humid, lowlands; rainfall 60-310 cm
Geographical spread	Extreme northeastern to northwestern regions covering parts of Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Meghalaya, Mizoram, U.P., Himachal Pradesh, Jammu and Kashmir; elevation 1000-3000 m	Below foot hills of Himalaya covering about 47 million ha of Punjab, Haryana, Delhi, U.P., Bihar, Parts of W. Bengal; elevation 150 to 600 m.	Spreads over Rajasthan, Gujarat, Punjab, Haryana; parts of U.P., M.P., A.P., Maharashtra, Karnataka and T.N.	Spreads over parts of Assam, Meghalaya, Mizoram, Tripura; West Bengal, Orissa, M.P., and the Southern states; elevation 150 to 1500 m	Coastal regions of West Bengal, Orissa, A.P., T.N., Kerala, Karnataka, Maharashtra and the Islands
Soils and vegetation	Light to heavy	Mostly alluvial with patches of saline and	Sandy to clay loam;	Alluvial to clay loam; Oxisols,	Entisols, Oxisols,

	textured, immature, mostly Inceptisols. Alpine scrub sub-alpine coniferous, tropical evergreen, semi-evergreen forests, alpine grasslands	alkali soils. Plant woodlots of *Eucalyptus, Populus, Acacia,* etc. Xerophytic trees and shrubs occur naturally in degraded soils.	xerophytic thorny scrub forests and woodlands and psamophytic scrub vegetation, grazing lands	Alfiosl. Evergreen, semi-evergreen and deciduous forests	Inceptisols, Alfisols. Evergreen, semi-evergreen, moist deciduous, littoral and mangrove forests
Main land-use systems	Grazing lands, forestry, horticultural and forestry species with agricultural crops, shifting cultivation in NE.	Agricultural crops (Wheat, pulses, sugarcane, oil seeds), commercial wood lots, MPTS with crops and along boundaries, degraded grazing lands.	Trees and shrubs in crop fields and along boundaries permanent grazing lands having trees and shrubs with stunt growth.	Cash crops (tea and large cardamom), agricultural crops, shifting cultivation, forests.	Plantation crops and multistory eyed cropping, field crops, fish culture, forestry.
Main land-use and ecological problems	Excessive deforestation, degraded lands, over-grazing, land sliding and shortage of fuel and fodder.	Soil salinity, water logging, decline in soil fertility due to over-cultivation, fuel and fodder shortage.	Drought, overgrazing, salinity, extension of sand dunes, low water table, soil erosion, degraded lands.	Deforestation, soil erosion, soil acidity and consequent problems, decline in soil fertility, shortage of fuel and fodder, shortening of fallows.	Deforestation and degradation of environment, coastal erosion, acid-soils and related soil problems, soil erosion along slopes, shortage of fodder.
Major Agroforestr	Planting woodlots on	Soil reclamation using MPTS, NFTs,	Raising shelter belts, wind	Intercropping with nitrogen	Afforestation of coastal regions

y emphasis	hills, contour farming blended with mpts, management of pastures, raising orchards.	suitable grasses; growing NFTs/shrubs with crops along field boundary, raising woodlots on degraded lands.	breaks; growing NFTs in field, raising woodlots (NFTs) on degraded lands.	fixing trees, alley cropping, improved fallows.	with littoral and mangrove species, aqua culture with mangroves, multistoreyed cropping system; alley cropping.

Annexure III

Major Types of Agroforestry Systems and the Nature of their Benefits in different regions of India.

Major types of existing AF systems	**Major types of benefits / social attributes of systems**
A. Himalayan Region	
1. Shifting cultivation	Major requirements of food for the family, leads to soil deterioration
2. Taungya	Food for family, soil conservation, timber
3. Fruit trees in combination with agricultural crops and fodder trees	Production of fruits, food crops, fodder and fuel wood.
4. Fodder trees with pastures	Fodder, fuel, cattle rearing
5. Seasonal grazing in forests	Fodder, cattle rearing
6. Trees and grasses for soil conservation	Soil conservation, fuel, timber, fodder
7 Fruit trees in combination with pastures and fodder trees	Fruit, fodder, fuel
8 Cash crops in forests/shade of trees	Cash, spices, fuel, fodder
B. INDO-GANGETIC PLAINS	
1. Trees for rehabilitation of degraded lands (saline/sodic/eroded)	Reclamation of degraded lands, fuel, fodder
2. Fodder trees in degraded grazing land	Fodder, fuelwood, soil conservation
3. Commercial trees on slopping land with commercial or forage grasses	Cash, soil conservation, forage, fuel
4. Trees on boundaries of agricultural fields	Food crops, fuel, timber, cash crop protection
5. Fodder banks	Fodder, soil conservation, fuel
6. Block plantation	Cash, lumber, fuel
7. Industrial plantation with crops	Cash, food crops

8. Fruits Orchards and multi purpose trees	Cash, fruit, fuel, fodder
9. Fruit or shade-trees on agricultural farms	Food crops, shade, fruits
10. Trees along canals, road sides	Control on water logging and seepage avenue, fuel, forage
11. Trees on community grazing land	Shade, fuel, forage, cattle rearing
C. ARID & SEMI-ARID REGION	
1. MPTs on agricultural fields	Fodder, fuelwood, cash, crops, minor products
2. Trees for soil reclamation/ sand dune stabilization	Reclamation of soil/stabilisation of sand dunes, fuel, fodder, minor products
3. Wind breaks	Soil conservation, fodder, fuel
4. Fruit trees with MPTs	Cash, fruits, forage, fuel, minor products
5. Trees on pasture/grazing lands	Forage, fuel, shade, cattle rearing
D. HUMID AND SUB-HUMID REGIONS	
1. Home gardens	Production of multiple out puts
2. Plantation-crop combination	Cash, multiple products
3. MPTs on agricultural fields	Minor products, crops
4. Trees and grasses for soil conservation	Soil conservation, fodder, fuel
E. COASTAL AND ISLAND REGION	
1. Plantation crop combination	Cash, multiple products
2. Multistoreyed cropping	-do-
3. Home gardens/steads	-do-
4. MPTs with aquaculture	Fish, fuel, fodder, minor products
5. Trees on pasture lands	Fodder, soil conservation
6. Grasses under plantation crops	Forage, cattle rearing, multiple products
7. Shelter belts and wind breaks	Shore/beach stabilization
8. Boundary trees on agricultural crops	Fodder, fuel, minor products
9. Mangrove plantation	Shore protection, fuel, fodder, coastline protection
10. Mangrove with fish, prawn, pearl Culture etc.	Shore protection, fish/prawn, fuel, fodder, etc.

Annexure IV

Multipurpose Trees' Priority in Different Agroclimatic Regions

Agro-climatic regions	**Priority**				
	1	**2**	**3**	**4**	**5**
1. Western Himalayan Region	*Grewia optiva*	*Populus ciliata*	*Toona ciliata*	*Casuarina australis*	*Acacia catechu, Robinia pseudoacacia*
2. Eastern Himalayan Region	*Michelia champaca*	*Alnus nepalensis*	*Gmelina arborea*	*Morus laevigata*	*Pinus kesiya*
3. Lower Gangetic Plains Region	*Eucalyptus* hybrid	*Acacia auriculiformis*	*Gmelina arborea*	*Acacia nilotica*	*Azadirachta indica*
4. Middle Gangetic Plains Region	*Populus deltoides*	*Anthocephalus cadamba*	*Eucalyptus* hybrid	*Dalbergia sissoo*	*Acacia nilotica*
5. Upper Gangetic Plains Region	*Populus deltoides*	*Eucalyptus* hybrid	*Dalbergia sissoo*	*Anthocephalus cadamba*	*Leucaena leucocephala*
6. Trans-Gangetic Plains Region	*Populus deltoides*	*Eucalyptus* hybrid	*Dalbergia sissoo*	*Melia azedarach*	*Acacia nilotica*
7. Eastern Plateau and Hills Region	*Gmelina arborea*	*Tectona grandis*	*Eucalyptus* hybrid	*Casuarina equisetifolia*	*Leucaena leucocephala*
8. Central Plateau and Hills Region	*Azadirachta indica*	*Eucalyptus* hybrid	*Tectona grandis*	*Acacia nilotica*	*Leucaena leucocephala, Hardwickia binata*
9. Western Plateau and Hills Region	*Azadirachta indica*	*Acacia nilotica*	*Eucalyptus* hybrid	*Leucaena leucocephala*	*Tectona grandis*

Agro-climatic regions	Priority				
	1	**2**	**3**	**4**	**5**
10. Southern Plateau and Hills Region	*Ailanthus excelsa*	*Eucalyptus camaldulensis*	*Tamarindus indica*	*Ceiba pentandra*	*Casuarina equisetifolia*
11. East Coast Plains and Hills Region	*Casuarina equisetifolia*	*Gmelina arborea*	*Acacia mangium*	*Tectona grandis*	*Dalbergia sissoo*
12. West Coast Plains and Ghats Region	*Casuarina equisetifolia*	*Eucalyptus* hybrid	*Acacia mangium*	*Terminalia tomentosa*	*Artocarpus heterophyllus*
13. Gujarat Plains and Hills Region	*Prosopis cineraria*	*Eucalyptus* hybrid	*Ailanthus excelsa*	*Dalbergia sissoo*	*Leucaena leucocephala*
14. Western Dry Region	*Prosopis cineraria*	*Acacia nilotica*	*Azadirachta indica*	*Ailanthus excelsa*	*Dalbergia sissoo*
15. The Islands Region	*Casuarina equisetifolia*	*Gmelina arborea*	*Gliricidia sepium*	*Samanea saman*	*Terminalia catapa*

Annexure V

Suitable Multipurpose Tree Species for Locations having Different Rainfall Distribution.

Locations with good annual rainfall (Bhubneswar, Ranchi, Rewa, Varanasi)	Locations with moderate annual rainfall(Akola, Anantpur, Bangalore, Bellary, Hyderabad, Indore, Solapur)	Locations with poor annual rainfall (Dantiwada, Hisar, Hoshiarpur, Jhansi, Jodhpur, Rajkot)
Alnus nepalensis, Bauhinia purpurea, Casuarina equisetifolia, Dalbergia sissoo, Emblica officinalis, Gmelina arborea, Grewia optiva, Hardwickia binata, Melia azaderach, Morus alba, Populus species, *Sesbania* species, *Terminalia* species	*Acacia nilotica, Ailanthus excelsa, Albizia lebbeck, Butea monosperma, Casuarina equisetifolia, Dalbergia sissoo, Eucalyptus* species, *Leucaena leucocephala, Tamarindus indica, Tamarix articulata*	*Acacia albida, Acacia catechu, Acacia aneura, Acacia nilotica, Acacia senegal, Colophospermum mopane, Eucalyptus camaldulensis, Parkinsonia aculeata, Pithecellobium dulce, Prosopis cineraria, Prosopis juliflora*

Annexure VI

Classification of Some Multipurpose Trees Based Upon Rotation Cycle

Classes	**Multipurpose trees**	**Rotation period (life cycle in years)**
Very short	*Casuarina, Eucalyptus, Lantana, Leucaena, Gliricidia sepium, Lawsonia, Moringa, Parkinsonia, Sesbania, Vitex, Bamboos*	Less than 5 years
Short	*Casuarina, Eucalyptus, Erythrina, Gmelina, Inga, Leucaena, Morus, Parkinsonia, Populus, Zizyphus*	6-15
Medium	*Acacia, Albizia, Azadirachta indica, Cassia, Grevillea, Gmelina, Mangifera indica, Pinus, Robinia,*	16-25
Long	*Alnus nepalensis, Borassus flabellifer, Cocos nucifera, Dalbergia, Grevillea, Ficus, Juglans, Madhuca, Pinus, Tamarindus indica, Tectona grandis*	26-60
Very long	*Cedrus, Ficus, Shorea,*	61-100
Extremely long	*Ficus bengalensis, Ficus religiosa*	More than 100 years

Annexure VII

Agroforestry Systems Priority in Different Agroclimatic Regions of India

Agro-climatic zones	***Agroforestry Systems***					
	Agri-silviculture	**Agrihorti-silviculture**	**Agri-horticulture**	**Horti-pastoral**	**Silvi-pastoral**	**Specialised**
1. Western Himalayan Region	4	4	5	4	4	-
2. Eastern Himalayan Region	5	3	5	4	3	5 jhum
3. Lower Gangetic plains Region	5	-	3	2	2	Energy
4. Middle Gangetic plains Region	4	-	2	-	-	Homestead
5. Upper gangetic plains Region	5	-	5	-	-	Agrihortisilviculture
6. Trans-gangetic plains Region	5	-	5	-	-	Agrihortisilviculture
7. Eastern Plateau & Hills Region	5	-	4	3	4	Block Plantation
8. Central Plateau and hills Region	4	-	5	4	4	Block Plantation
9. Western Plateau and hills Region	4	-	5	2	4	-
10. Southern Plateau and hills Region	5	-	3	2	4	-
11. East Coast plains and hills Region	4	5	4	2	2	Home garden/Shelterbelt
12. West Coast plains and Ghats Region	4	5	4	2	2	Homegarden
13. Gujarat plains and hills Regions	4	2	4	3	5	Block Plantation
14. Western Dry Region	5	3	4	-	5	Shelterbelt
15. The Islands Regions	4	5	4	1	2	Homegarden

No. 1-5 indicate the priority practiced mode 1= Least and 5= Highest

CHAPTER 3.7

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

PRO-SMALL FARMER AGRICULTURAL RESEARCH AND TECHNOLOGY POLICY

3.7.1.0 The Agrarian Distress

3.7.1.1 The Green Revolution, ushered in the country in 1968, has been heralded as one of the two most important achievements in the post-Independence era (the second being the country emerging as the largest functional Democracy in the world). It has helped India almost triple its foodgrains production, mostly through yield increases, and halve the percentages of rural poverty and food insecurity between 1968 and 2000. The Revolution was triggered by the development and large-scale adoption of High Yielding Varieties (HYVs) of rice and wheat, based on technology packages comprising improved seeds, increased fertilizer-use and assured water supply (irrigation). The process was duly supported by the provisions of inputs, marketing linkages and remunerative prices – the three support pillars of success of the Green Revolution. Above all, the necessary political will and farmers' enthusiasm and commitment were there in plenty.

3.7.1.2. Despite the Green Revolution and satisfactory overall National GDP annual growth rate of about 7 percent in recent years (now over 8 percent), the country is home to one-fourth of the World's hungry and poor. Worst, the number of hungry had increased from 203 million in 1995-97 to 221 million in 2000-02. To put faces behind figures, nearly 15 percent of our children are "wasted" and over 60 percent of the pregnant women and lactating mothers are anemic. Inadequate purchasing power is the main cause of the hunger at household and individual levels. Over 400 million children, women and men belonging to families with small and

marginal holdings as well as landless labour families are in deep distress. India is far off the track in achieving most of the Millennium Development Goals.

3.7.1.3. The agricultural growth rate during the past five years has decelerated to about 1.5 percent from about 3 to 3.5 percent during the preceding 20 years, thus dropping below the population growth rate, for the first time during the past 40 years. Capital formation in agriculture at 1.3 percent of the GNP is also one of the lowest in recent decades, adversely affecting irrigation and rural infrastructure development, whereas agriculture accounts for about 20 percent of the national GDP and 60 percent of the employment. Unemployment has increased to 9.1 percent, thus we have many more mouths to feed than hands working. The rural-urban divide (the Bharat-India divide) and regional imbalances have further widened and threaten national integration. The per capita income disparity between the farm and non-farm sectors has more than doubled from 1:3 to 1:6 during the last 30 years, threatening the social fabric and peace in rural India, especially in the chronically depressed regions.

3.7.1.4. The average farm size is going down and nearly 80% of the farm families belong to the marginal and small farmer categories. Fortunately, the ownership of livestock is more egalitarian. Enhancing small farm productivity, and increasing small farm income through crop-livestock integrated production systems and multiple livelihood opportunities through agroprocessing and biomass utilization, are essential both to meet food production targets and for reducing hunger, poverty and rural unemployment.

3.7.1.5. Our farm and fisher families have often been subjected to the fury of nature in the form of drought, unseasonal and heavy rains and floods, and climate change. Institutional support to small farmers is weak. The same is true of post-harvest infrastructure. The spoilage losses can be as high as 30% in the case of vegetables and fruits. Institutions, which are supposed to help farmers, such as research, extension, credit and input supply agencies, are by and large not pro-poor and pro-women. Mechanisms for risk mitigation are poor or absent. Hardly 10% of farmers are covered by crop insurance. Farm families are also not covered by health insurance. There is no Agricultural-Risk Fund. Both risk mitigation and price stabilization are

receiving inadequate policy support. The cost of production is often higher than the minimum support price, due to ever-increasing prices of diesel and other inputs. The cost-risk-return structure of farming is becoming adverse, resulting in growing indebtedness in rural areas and number of suicides among farmers. No wonder, a recent NSSO survey revealed that nearly 40 percent of farmers would like to quit farming, if they have the option to do so. Unfortunately, there is little option for them except moving into urban slums.

3.7.1.6. Technology fatigue in agricultural development is being felt widely. The total factor productivity growth rate particularly in the main Green Revolution belts of rice-wheat or rice-rice systems has decelerated. The huge foodgrain buffer stock (about 60 million tonnes) built a few years ago has almost disappeared and the government has decided to import about 2 million tonnes of wheat to rebuild the stock to the minimum desired level. This may push up international prices of wheat and of other foodgrains, and, if domestic prices and public foodgrain distribution system are not regulated and controlled, the price hike may benefit traders/hoarders and access to food on part of the poor may further deteriorate.

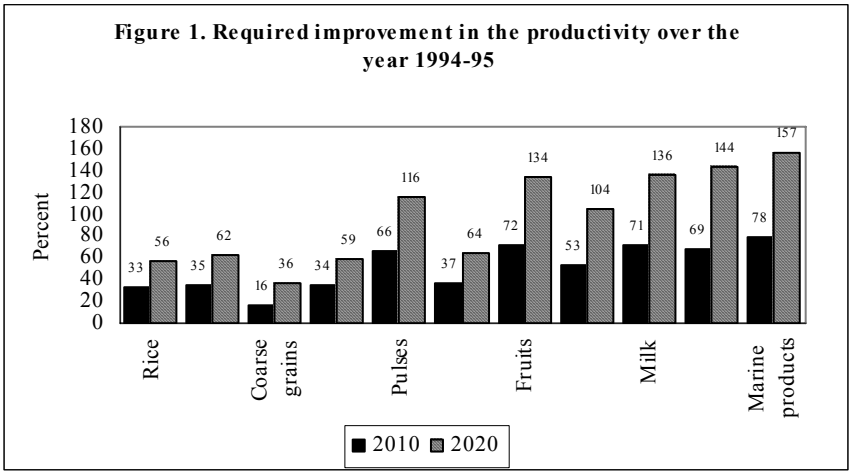
3.7.1.7. Green Revolution technologies are scale neutral but not resource neutral, since inputs are needed for output. Hence they have generally bypassed the vast rainfed areas and resource-poor farmers. A large number of crops and cropping systems were not touched by the Green Revolution process. The faulty use of inputs in Green Revolution areas has not only reduced the production efficiency, but also caused environmental and economic losses. For instance, the excessive drawl of underground water for irrigation has resulted in drastic drop of water table and uncontrolled flooding of fields uncoupled with drainage has caused serious waterlogging and salinity problems. Likewise, unbalanced use of fertilizers has adversely impacted soil health and lowered fertilizer productivity.

3.7.1.8. The problem of technological fatigue is further compounded with huge technology transfer gaps at various levels. Average national yields of most agricultural commodities in India are about 40 to 50 percent of the corresponding World averages. The gaps between potential and realizable and between realizable

and average realized yields in the country are generally around 50 to 100 percent, respectively. The existing exploitable yield gaps should be seen as an opportunity for future growth that is consistent with agro-ecological, environmental, socio-economic, political and technological settings in the major production regimes. With newly-improved methodologies for systems analysis, and greater access to relevant data, reliable estimates of potential yields in specific agro-ecological regimes are increasingly available. Such estimates will assist in estimating more reliably the gaps between actual and potential yields, and will assist also in charting strategies to bridge yield gaps through mutually reinforcing packages of technology, services and public policies.

3.7.2.0 New Challenges and Opportunities

3.7.2.1. Our Prime Minister has rightly emphasized the need to double annual foodgrain production from the present about 210 million tonnes to 420 million tonnes within the next 10 years. Since land is a shrinking resource for agriculture, the pathway for achieving these goals has to be higher productivity per units of arable land and water. Factor productivity will have to be doubled, if the cost of production is to be reasonable and the prices of our farm products are to be globally competitive. On an average, rice and wheat yields will need to be enhanced by about 40 percent and pulses, oilseeds, maize, millets, sorghum and horticultural commodities yields by about 50 to 100 percent (**Figure 1**).



Source: Kumar, Praduman, 1998. Food Demand and Supply Projections for India. Agricultural Economics Policy Paper 98-01. New Delhi: Indian Agricultural Research Institute

3.7.2.2. Gene revolution and ICT revolution are sweeping the world, especially the fast expanding knowledge-rich and knowledge-based economies. The first Green Revolution has failed to connect itself with these revolutions. The powers of biotechnology and ICT have not been internalised in India's agricultural transformation process, although there are some "islands" of successes, *viz* Bt cotton hybrids and e-chaupal and sporadic Village Knowledge Centres. The national biotechnology policy is still in the making while area under "illegal" biotech varieties (Bt cotton hybrids) has been expanding fast (alongwith "legal" varieties). On the other hand, the conventional extension system has almost collapsed and there is limited involvement of the private sector in technology generation and transfer, other than that in hybrid varieties.

3.7.2.3. The high priority to achieve the MDGs notwithstanding, opening up of the economy and integration in global market implies dismantling of protective restrictions intended to safeguard national interests, and enhancing our competitiveness. Food self-sufficiency, maintaining low food prices, raising agricultural exports, and investments for upgrading production potential in a cost-effective and sustainable mode are overriding concerns. These have generated a stream of protective and incentive instruments (all bunched in AMS) which need adjustments under the liberalized regime and imply massive restructuring of the price structure. Agriculture is responding to these forces as well as to changing IPR regimes.

3.7.2.4. In the post-WTO era, both export and import of India have increased substantially. However, the increase in imports was relatively higher than that in export, thus bringing down the proportion of surplus to GDP from 3.2 percent in triennium ending (TE) 1995 to 2.7 percent in TE 2004, although there was a hump in the initial post-WTO years. This trend has adversely affected our self-reliance in agriculture. The value of export required to financing imports increased from 32 percent in the pre-WTO era to 57 percent in the post-WTO era. Huge imports of

vegetable oils and of pulses have depressed domestic prices of these commodities and adversely impacted their domestic production and producers' income.

3.7.2.5. Agricultural growth in recent years has thrown new sectors and regions into prominence. Livestock, fisheries, horticulture, specialty enterprises (spices, medicinal, aromatic, organic) and value-added products illustrate this trend. Market-driven diversification in a global perspective has become the new paradigm driving future agricultural growth. The most profound shift pertains to rapid privatization in all domains - production, consumption, investment, technology, etc. and concomitant decline in State control. Alternative instruments and approaches are evolving to transform agriculture and a very important part of this 'learning' phase is a redefinition of the role of the State. Public goods, welfare imperatives, other regulatory needs, and other areas of market failure will continue to need government intervention. A matter of concern globally is shrinking investment in international public goods.

3.7.2.6. Rising capital intensity, particularly in the high-growth sectors of agriculture, has set in motion a new set of forces leading to biased knowledge, technological and market developments and thus exacerbating the problems of poor and small farmers. Declining growth in public investments and eroding institutional infrastructure are other disturbing features of the current trend. World agriculture, particularly trade, places high premium on quality, and public health, food safety and overall agricultural biosecurity concerns have become central themes of global regulatory negotiations. Equally important issues are sustainability of natural resources (particularly land, water and biodiversity) and other environmental externalities including global warming and climate change.

3.7.3.0 The Premise and Needed Paradigm Shifts to Strengthen Technology-led Revitalization of Indian Agriculture

3.7.3.1. Technology is the engine of growth and transformation and must address the above issues and opportunities. In consort with traditional and conventional technologies, cutting edge technologies, such as biotechnologies, ICT, space and

satellite technologies, GIS for land use planning and weather forecasting, etc., should be synergised and channelised to meet the human needs and aspiration with due consideration of equity and food, health and environment safety and ethical aspects. National agricultural research and technology policy and actions should ensure that science and technology, as prime mover of change, must specifically address the needs and prospects of majority small and resource-poor farmers and landless agricultural labour families, and help mainstream the gender concerns. Institutional, human capital and policy supports must capture the positive effects and minimize the negative effects of globalization and liberalization and of revolutions in biotechnology and information and communication technologies. Technology choice should thus be made according to agro-ecological and socio-economic conditions and market demand.

3.7.3.2 Not simply promises, but new science and technologies are already providing us new ways of tackling the difficult challenges. For example, the nutritionally improved rice, potato and cassava will greatly help in achieving nutritional security. Poor man's crops, such as millets, cowpea, sorghum, chickpea and groundnut are receiving greater research attention. Biotechnologies jointly with Bioinformatics has already helped develop cereal varieties with greater tolerance to soil alkalinity and toxicity and which require less water.

3.7.3.3 Enhanced and sustained farmers' income must be the main objective. To enhance the income, livelihood, nutrition and health security of farmers through mutually reinforcing packages of technology, techno-infrastructure, services, public policies, home and external trade and global competitiveness.

3.7.3.4 Based on a meaningful interaction between science and policy, relevant policies are needed to promote knowledge economies and to bring the much-needed congruence among productivity, sustainability, profitability and equity. The "Indian Enigma" of the co-existence of enormous technological capability and entrepreneurship on the one hand, and extensive under-nutrition, poverty and deprivation, on the other, must be resolved. Thus, it is not only biological and

physical sciences, but also humanities including economics and social sciences, which must all interact dynamically to yield wholesome results.

3.7.3.5. The following paradigm shifts are needed in technology generation and transfer mechanisms geared to revitalize Indian agriculture, and should be internalized in the national policy:

- The first paradigm shift relates to a shift in research approach from a single commodity based and monodisciplinary to a farming system based and multidisciplinary.
- The second shift demands a change from a top-down (training and visit system) extension approach to a participatory (effective research-extension-farmer-market-consumer interface) approach of technology generation, assessment, refinement and transfer.
- The third shift seeks the integration of molecular biology, bio-technology, bio-informatics, nanotechnology and other cuttingedge technologies with conventional as well as traditional technologies for speedy, more precise and wholesome gains.
- The fourth shift seeks greater congruence between productivity, sustainability and equity and creation of enabling mechanisms and inclusiveness for generation and adoption of new technologies. Cost-effectiveness of production, quality and safety in food and other products, and GMO biosafety and overall agricultural biosecurity, will assume high significance in the globalised and liberalized world.

3.7.4.0 Research and Technology Policy for Agricultural Renewal and Farmers' Welfare

Towards an Ever-green Revolution

3.7.4.1. The future of our agriculture depends on our ability to increase productivity per units of arable land and irrigation water in perpetuity without associated ecological harm, a process known as "ever-green revolution". Inaugurating the 93rd

Session of the Indian Science Congress on January 3, 2006, our Prime Minister, Hon'ble Dr. Manmohan Singh had observed that the technologies and the strategies unleashed by the first Green Revolution have run their course. He emphasised that we need a Second Green Revolution, particularly in non-food crops, in horticulture and in new plant varieties, and desired that as our agricultural growth plateaus, there is a need for a renewed thrust on research that can enhance farm productivity and sustainability, especially in rainfed areas. The Prime Minister reiterated that "we need greater emphasis on research that can increase the efficiency of utilization of inputs; that can improve farm management practices; that can reduce post harvest losses through better post-harvest management technologies in storage, transportation and processing; that can, in the final analysis, increase both yields and value addition at the farmer level leading to better incomes, especially of the small and marginal farmers."

3.7.4.2. Both technology fatigue and technology gap should have no place in the Indian R&D system. In fact, at this juncture, technology should flow faster through the pipeline and more options should be available to users, and agricultural research, education and extension systems should be revitalised. Science and technology development towards an Ever-green Revolution must avoid the shortcomings of and build on the R&D foundation laid during the First Green Revolution. It must concurrently address the following four interrelated groups of technology generation and development priorities and approaches.

- Protecting yield and productivity gains, extending the gains to new areas, and enhancing yield ceilings and achieving new gains; bridging yield gaps; minimizing post-harvest losses, augmenting value addition and improving productivity and farmers' income; and promoting eco-technologies rooted in the principles of ecology, economics, equity and employment.
- Exploiting the gene revolution (biotechnology); benefiting from information and communication technology revolution, space, nuclear and

nanotechnologies; and promoting knowledge-based precision farming systems, intensification and diversification.

- Protecting and improving natural resources (land, water and biodiversity); addressing environmental concerns, ecological security, agricultural biosecurity and sustainability; and managing climate change and natural disasters.

- Seeking congruence of productivity, profitability, sustainability and equity; addressing gender issues and problems of the poor and the excluded, particularly of small and marginal farmers and land-less agricultural labourers; and managing liberalized trade in the globalized world by addressing issues related to global competitiveness in the context of the WTO/ AoA.

3.7.4.3. In particular, the Ever-green Revolution must be inclusive, pro-poor and address the concerns of rainfed and other non-congenial agro-ecological regimes. It must benefit from the latest developments in biotechnology, ICT, and other cutting edge technologies and synergistically link these technologies with conventional and traditional technologies and knowledge. Among other things, the challenges and opportunities arising from globalization and liberalization and the prospects of prevention of post-harvest losses, processing and value addition should be addressed under the Ever-green Revolution.

3.7.4.4. Thus, policy provisions must humanize technologies, and should emphasize:

- Enhancing capabilities for sustainable livelihood, and providing for new livelihood opportunities for the poor,
- Improving the productivity, profitability and sustainability of communities' assets, and establishing effective linkages between community mobilization and the government and other service providers,
- Ensuring the congruence and synergism among environmental, economic and social (gender and other equities) securities, and

- Empowering communities, especially the vulnerable ones, to harness new and appropriate technologies and enabling them to blend traditional local technologies with modem technologies.

3.7.4.5 With the above backdrop, the researchers and technology developers thus must ask themselves the following questions in deciding their research and technology development priorities:

- Will the technology lead to higher productivity across all farms, water regimes (rainfed drylands), soil types and regions, not just large farmers and well-endowed ones?
- How will the technology affect the seasonal and annual stability of production, especially the highly risk prone rainfed areas suffering from high instability?
- How will the technology affect the energy balance, eco-system and the sustainability of farming?
- Who will be the winners and losers from the technology – and how will it affect the majority small and marginal farmers, the poor and deprived ones?

Defending the Yield/Productivity Gains, Extending the Gains and Elevating the Gains: Strengthening Strategic, Anticipatory and Cutting-edge Research

3.7.4.6. A three-pronged reiterative and synergistic approach of research and technology development is needed to defend the gains made in the past, to extend/expand the gains to new areas and to elevate the gains to newer heights (breaking yield barriers and achieving higher productivity and farmers' income).

3.7.4.7. As regards protecting the yield gains, under certain production regimes there are signs of decline in actual yields, which must be arrested. A long-term strategy and a site-specific and knowledge-intensive integrated management of diseases and pests and soil-fertility management and integrated fertilizer use orientation are needed for technology transfer, adoption and monitoring by extension advisory systems and the farmers themselves. Soil-test based balanced fertilizer

application, particularly micro nutrients, real-time nitrogen management by leaf chlorophyll meter or leaf colour chart and soil nutrient budgeting, will be the elements of precision agriculture to sustain high yields and lessen the inputs-related deceleration of partial factor productivity.

3.7.4.8. Anticipatory research, risk assessment and management viz. management of Avian Flu strain H5N1 and prevention of the devastating wheat stem rust strain Ug99 from its entry and establishment in India, coping with climate change and natural disasters, contingency production systems should receive due priority and support. This approach calls for a paradigm shift in the technology transfer approach, based on intensive knowledge and higher capacity of extension agents of both public and private sectors. A District Technology Consortium approach involving scientists, grassroot institutions, corporate sector, NGOs, financial institutions and farmers is urgently needed.

3.7.4.9. Regarding extending the gains to newer areas, research and technology development for non-congenial agro-ecological and socio-economic settings, such as rainfed areas, especially arid drylands, hill and mountain agro-ecological zones, coastal lands and degraded lands should receive much greater priority and support than in the past. It is encouraging that yields of major crops have continued to increase during the past 35 years; they are projected to increase towards 2030, albeit at a decelerating rate, but nonetheless implying the continued need for developing the technologies wherewith to achieve increased yields. For instance, rice, central to the nation's food security must maintain annual yield growth of about 2 percent towards the year 2020 to meet the demand. As cropping intensity becomes increasingly important, the features of crop duration and high per day productivity become preferred attributes. This calls for focused research and technology development for increasing input and natural resource use efficiency. The proposed National Rainfed Area Authority, describe later, should play a crucial role in promoting participatory research and technology transfer in rainfed areas.

3.7.4.10 As regards breaking yield ceilings, conventional breeding and management practices continue to offer great prospects of developing new super ideotypes, hybrids, and new life forms characterized by greatly enhanced new levels of yield, productivity, and adaptability, such as the Super New Plant Type, Super Hybrid, aerobic and NERICA rices and extra-long-spike, and hybrid wheat cultivars. These will be complemented by various genetically engineered products. Quality, consumer preferences, cost effectiveness, and environmental aspects of production, distribution and consumption of these new types will need to be critically analysed in order to assess efficiency and efficacy of their large scale popularization in the broader context of food security, poverty alleviation, sustainability, equity and agricultural biosecurity. Agro-processing, value addition, efficient marketing and trade and dynamic diversification (including niche production and organic farming) should be judiciously emphasized to enhance productivity, efficiency, competitiveness and income – a win-win situation for all.

Enhanced and Sustained Productivity and Income

3.7.4.11. The country may launch a national movement of technological revitalization of agriculture in this fast expanding knowledge society and the NARS comprising all ICAR institutions, Agricultural Universities and private sector institutes may commemorate 2006-07 as the Agricultural Technology Year to mark the 60th anniversary of our Independence. The major aim of this year should be to strengthen participatory research and knowledge management with farming families and the organization of about 60,000 Lab to Land programmes in the area of post-harvest technology and value addition to primary products to enhance farmers' income through forward linkages, as highlighted in the Third Report of the NCF. There should be a proper match between production and post-harvest technologies and a post-harvest technology wing should be added to every Krishi Vigyan Kendra and KVKs should be redesignated as Krishi Vigyan and Udyog Kendras (KVUKs). Farm Schools should be established in the fields of farmer-achievers in order to foster farmer to farmer learning of new technologies. Value addition to biomass such as through establishing Rice Bio Parks and producing eco-boards from cotton stalks,

will help generate skilled jobs and additional income. Organic Farming and Low External Input Sustainable Agriculture (LEISA) techniques should be promoted along with Integrated Natural Resource Management and Integrated Pest Management (IPM) techniques, and all programmes designed to foster access to technologies must be gender sensitive.

3.7.4.12 Agricultural scientists should state the performance of new varieties and technologies in terms of net income per hectare, and not just in terms of yield per hectare. The aim of technological transformation of farming systems should be to enhance income per hectare on an environmentally sustainable basis. For landless agricultural labour and other unemployed rural youth, the aim should be to convert them into skilled workers, thereby adding economic value to their time and labour. The training should be in skills which can help in organizing market-driven enterprises. The Bharat Nirman and National Rural Employment Guarantee Programme of the GOI should help foster job-led economic growth in villages and bring about a shift from unskilled to skilled work based on new technologies, and stop job-less and job-loss growth.

3.7.4.13. The economic viability of farming depends heavily on assured markets and remunerative prices. The production-processing-marketing-consumption continuum should be rendered farmer-centric and each link in the chain should receive timely and adequate research and technological attention and should be synergized with each other. In this context, Land Use Boards both at Central and State level could play a vital role, but have not done much in the past and need to be suitably restructured, strengthened and activated. There is an urgent need for a National Land Use Advisory Service, linked to State and Block Level Land Use Advisory Services on a hub and spokes model. These can be virtual organizations with the capacity to link land use decisions, especially diversification of farming systems, with ecological, meteorological and particularly marketing factors on a location and season specific basis. The National Land Use Advisory Service can be linked to the proposed Indian Trade Organisation (ITO) as elaborated in the Third Report of the NCF. It should have continuous contact with all credible national and international sources of

information on relevant technologies and resources in all subsectors of agriculture and on domestic and international markets. Without economically, technologically and ecologically sound and proactive advice on land and water use, farmers will have to fend for themselves in taking decisions on what to grow, where to sell and at what price, which may often prove unfriendly.

3.7.4.14. The 'contract farming' model of agribusiness is gaining momentum. However, usually devoid of formal contract between the farmers and the prospective buyers, the arrangements could be biased in favour of the agribusiness organization. But, there are beneficial effects of such arrangements to the farmers in the matter of access to adequate/timely credit, good quality inputs, new technology, employment generation, introduction to new crops, separation of production and marketing risks and better farm practices etc. The need is to develop a comprehensive, clean, equitable and farmer-centric model agreement, which cannot be abused against the farmers. Special care needs to be taken regarding clauses dealing with quality standards, withdrawal conditions, pricing standards, paying arrangements, acts of God clauses and arbitration mechanism. Till such a code of conduct is introduced and the farmers are empowered by formation of groups/cooperatives to deal with the agribusiness unit on their behalf, one has to be rather cautious about these arrangements.

3.7.4.15. In a globalised economy, we should develop appropriate institutional instruments and policies to safeguard the livelihood security of nearly 70% of our population who depend on crop and animal husbandry, inland and marine fisheries, forestry and agro-forestry and agro-processing for their work and income security. Risk Mitigation and Price Stabilization Funds will be needed. All Technology Missions and the Small Farmers' Agri-business Consortium (SFAC) should be restructured and suitably funded under competent professional management. As highlighted in earlier NCF Reports, each Mission should have measurable time-bound goals and should not only be subsidy-rich and primarily concerned with subsidy distribution, but should concentrate on technology-led agricultural transformation.

The Mission Director, an eminent professional, should be in position atleast for a period of five years.

Natural Resources Management

3.7.4.16. India's Agricultural Renewal heavily depends on the restoration and enhancement of the health of our soils, water and genetic resources, which have unfortunately been degenerating fast under various pressures. Appropriate crop-livestock-fish-tree integrated farming system should be pursued for sustaining and enhancing the natural resources.

3.7.4.17. ***Soil Health***: Establish a National Network of Advanced Soil Testing Laboratories. The existing laboratories should be retooled and reequipped and the staff retrained in order to enable them to provide each farm family with a Soil Health Card, which contains integrated information on the physics, chemistry and microbiology of the soils. The Soil Health Cards should stimulate balanced fertilization, including the amelioration of micro-nutrient deficiencies. In order to improve organic (carbon) balance of soils, through campaigns and demonstrations, the introduction of fodder/ grain legumes in the crop rotations as also green manuring as well as composting of all agricultural residues and wastes and the use of microbial fertilizers and farmyard manure should be promoted to the maximum extent possible.

3.7.4.18. Methods of soil health enhancement through integrated nutrient supply will have to be prescribed and farmers should be assisted to adopt the recommendations. A dedicated cadre of soil technicians/scientists for the National Movement on Soil Health Care with defined targets and resources (functioning equipment and trained human resources at the soil testing laboratories) should be created. Community Land Care movements may be launched by Panchayats. Needless to assert, soil health enhancement and removal of their hunger and thirst especially in rainfed dryland areas hold the key to improving the return from investment in other inputs like seeds and water.

3.7.4.19. Breeding soils for higher productivity may be undertaken in the case of problem soils and wastelands. Wasteland development could be linked to the production of biofuel and industrial raw material (for the production of paper and board, rayon, packaging material etc) as well as fodder, firewood etc. People must be made aware and sensitised of the shrinking capacity of soils to absorb any more abuse. A National Soil Charter structured on the "World Soil Charter of FAO" and "UN Soils Convention" should be created to ensure soil health security.

3.7.4.20. ***Water:*** Jal Swaraj or self-sufficiency in irrigation water availability is the need of the hour. Water is a public good and a social resource and not private property. The privatization of water supply distribution is fraught with dangers and could lead to water wars in local communities. Increasing supply through rainwater harvesting, recharge of the aquifer and water conservation should become mandatory. In addition, a nationally debated and accepted strategy for bringing 10 million hectares of new area under irrigation under the Bharat Nirman programme should be developed. All existing wells and ponds should be renovated. Demand management through improved irrigation practices, including sprinkler and drip irrigation, should receive priority attention. A water literacy movement should be launched and regulations should be developed for the sustainable use of ground water. Farmers need technical advice in site selection for borewells, particularly in the Southern Plateau Region. A farmer-friendly insurance cover for failed wells is also needed for ground water development. Seawater farming should be promoted in coastal areas through the cultivation of mangroves, salicornia, casuarinas and appropriate halophytic plants. The conjunctive use of rain, river, ground, sea, and treated sewage water should become the principal method for the effective use of available water resources.

3.7.4.21. In water scarce areas, the land use system should place emphasis on the cultivation of high value, low water requiring crops, such as pulses and oilseeds. Pulses and oilseed villages can be promoted where all farmers work together in harvesting rainwater and sharing the water equitably for growing pulses and oilseeds. Promotion of "Hybrid Arhar (pigeon pea) villages" can be the starting point of a

pulses revolution. In paddy and sugarcane, water saving methods of cultivation like those inherent in the "System of Rice Intensification" (SRI) methodology should be perfected and popularized. More crops per drop of water should not remain just a slogan. Land use decisions are also water use decisions. Hence, the choice of cropping systems should be based on irrigation water availability including rainfall pattern. Watershed management should be linked to the different Technology Missions as emphasized in our earlier reports, so that the concurrent availability of water and of the other inputs like seeds needed to optimize the benefit from irrigation water can be ensured. Low cost green houses can be promoted in areas where evaporation exceeds precipitation during many months in a year. Panchayats may be assisted in launching water literacy and water quality management programmes and in promoting participatory irrigation and efficient water use management. Extra efforts are called for minimizing water pollution due to pesticides, other agrochemicals and toxic substances.

3.7.4.22. Both the anthropogenic and natural causes of occurrence of poor quality water are known and their piece-meal solutions are also known. Looking into vast areas under such problems and their adverse impact on agricultural production, an 'Integrated Water Use and Management System' is to be developed to address the problem in a sustainable and holistic manner. Biodrainages should be promoted towards reclamation of saline, waterlogged and other wastelands. Along with irrigation, drainage development should also be considered an integral part of national water use policy.

3.7.4.23. A National Research Centre on Glacierology should be established for collection, storage and dissemination of information on status of seasonal/perennial snow and ice. The Centre should undertake research on understanding the interaction amongst biological processes, physical environment and the climate change and develop early, medium and long-term warning systems and advise on trends of water availability and overall hydrological situation in the medium and long-term.

3.7.4.24. ***Biodiversity:*** Biodiversity, comprising genetic resources, is the building block of functions and forms of living organisms and will always be needed to produce new genotypes to meet the ever changing needs of humankind. New sciences of biotechnology and bioinformatics, coupled with conventional sciences, should be judiciously used for developing efficient and effective methods of conservation, utilization and exchange of genetic resources. Due to economic and population pressures the resources are eroding fast. Moreover, their availability is getting increasingly restricted due to their propriety protection under several systems. The Cartagena protocol for conservation, biosafety and sharing of genetic resources provides largely accepted and harmonized current practices and standards, and should be accepted by all countries. Along with Plant Breeders Rights, Farmers' Rights should be honoured and implemented for equitable and fair sharing of benefits arising from the use of genetic resources. In this context, the indigenous rights over genetic knowledge and women's sphere of plant knowledge as well as the Farmers' Plant Back Rights should be recognised under any intellectual property rights regime. The PVPFR Authority should ensure strengthening of national biodiversity management capacity, implementation of the Farmers' Rights, execution of the TRIPS and SPS commitments, and judicious use of the Natural Gene Fund and the National Biodiversity Fund.

Pro-Small Farmer and Pro-Poor Technologies for Inclusive Development and Economic Security

3.7.4.25.. Science and technology must promote inclusive development by addressing the needs and opportunities of small farmers, poor, less-favoured areas, neglected and excluded communities. Even biotechnology can be geared towards this cause. Benefits and risks associated with new technologies should be studied carefully before they are recommended to resource poor farming families.

As repeatedly emphasized by Nobel Laureate Amartya Sen, the lack of entitlement to basic resources is the main cause of hunger and poverty. Scientifically informed agrarian reforms to grant titles to land and water, and increased access to credit, knowledge and markets, will enhance productivity, sustainability (through better land

and water care) and income, thereby resulting in appreciable reductions in hunger and poverty. Engendering these changes and technologies and socioeconomic safety nets designed for small-scale and marginal farmers are essential for supporting rural livelihoods, and this aspect should be explicitly highlighted in national policies.

3.7.4.26. As highlighted by the Prime Minister, agricultural research and technology development must address the challenges and opportunities of small farmers. In this context, we must differentiate between small farms and small farmers. The small could be beautiful if managed and supported suitably, otherwise both remain "small". Farmers owning less than two hectare cultivated land are classified as small farmers and those owning less than one hectare are categorised as marginal. Generally, those owning around 2 hectare irrigated land, with an average family size of 5-6 persons, are able to achieve and sustain their livelihood solely from agriculture. But, marginal irrigated land farmers and those owning even around 2 hectare rainfed land are often hardpressed to secure their livelihood solely from agriculture, as their income is generally small and inadequate to access desired inputs, technologies and markets, resulting in perpetual low agricultural productivity and depressed production. For such households, timely availability of adequate institutional credit at reasonable rates or even 30 per cent supplementary off-farm or non-farm income are essential to access the necessary inputs, technologies and markets to keep them out of the poverty trap and to render them efficient producers.

3.7.4.27. Studies reveal that, other things being equal, primarily because of the full indulgence and commitment of the family labour, small and marginal farms, as compared to large and medium-large farms, are more efficient and have higher productivity, cropping intensity and diversification index. Further, as discussed later, if organized in groups (Small Farmer Estates, Cooperatives, SHGs or Farmers' Clubs), with desired economies of scale and with effective backward-forward linkages, small and marginal farms would generally be viable and effectively contribute to the national production, productivity and sustainability. But, the same size small farms, if owned by resource-poor small farmers with little access to formal credit, insurance, irrigation, technology and market, become non-viable and suppress

household as well as national productivity, income and livelihood security.

3.7.4.28. Recognising that alternate employment opportunities are limited and the number of small, marginal and sub-marginal farmers constitute nearly 80 percent of the rural households, and their number continues to grow, increasing productivity of such farms, predominantly comprising crop-livestock integrated systems, should be a priority goal of the Central and State Governments. Multiple livelihood opportunities should be promoted through strengthening production-agroprocessing-biomass utilisation-marketing chains. The National Agricultural Research System (NARS), encompassing public, university and private sectors, should topically and judiciously align their research and technology development priorities and programmes with the farmer's capacity, need and aspiration by promoting participatory research.

3.7.4.29 The ownership of livestock is much more egalitarian since resource poor farming families own a majority of cattle, buffalo, sheep and goats. Livestock and livelihoods are very intimately related in our country and crop-livestock integrated farming is the pathway for farmers' well-being. The major constraints experienced by such families relate to fodder, feed and healthcare. There is an urgent need for establishing Livestock Feed and Fodder Corporation to assist SHGs to produce good quality animal food locally, by providing seeds and planting material of improved varieties. The role of fisheries should also be strengthened and integrated. Particular attention should be paid to help SHGs of fisher families in producing seed and feed for aquaculture. The market value of Indian fishes should be enhanced by promoting special organic fish products and air-breathing fishes as health foods and promoting utilisation of underutilised species.

3.7.4.30. Alienation of small and marginal farmers from commercial banking and fair marketing systems is their major handicap in harnessing new technologies. It is encouraging that the 2006-07 Budget has reduced the rate of interest for crop loans to 7 percent. However, keeping in view the decline in the profitability of agriculture, increasing farmers' distress and indebtedness, the Government may consider providing support to the banking system for further reducing the interest rate to 4

percent and minimise the hassles and redtape in procuring loan. The small farmers in distress hotspots should not be charged compound interest on arrears. Micro-financing should be changed to "livelihood" financing to further enhance the access of the poor to various services. A long-term policy on agricultural credit needs to be developed to include wider coverage, including consumption and entrepreneurial needs of farmers. The Central and State Governments should jointly create an Agriculture-Risk Fund to provide relief to the farmers in case of successive droughts and other calamities. Special efforts are needed to issue Kisan Credit Cards to the unreached and needy farmers, especially women farmers. Small and marginal farmers should also be saved from distress sale by pledging loans to them against their warehouse receipts.

3.7.4.31. Small farm productivity should be enhanced not only for increasing food and nutritional security of majority small farmers, but also for generating marketable surpluses which must be disposed off timely and remuneratively to enhance farmers' income. MSPs for the commonly produced commodities should be appropriately fixed (based on C_3 cost) and timely announcement (of the MSP), procurement and payment should be ensured. Enhanced income of the farmer will lead to increased per capita consumption and enhanced domestic demand for a larger and diversified food basket and consumer goods at household levels, stimulating overall economic growth. Further, urbanization and globalization have fuelled dietary convergence and dietary adaptation. These present both an opportunity to reach lucrative new markets and a substantial risk of increased marginalization of smallholders and poor people leading to even deeper poverty. In order to capitalise the opportunity, smallholders must organize themselves in cooperatives or as Small Farmers' Estates or SHGs to undertake group farming and contract farming to enhance their economies of scale and competitiveness and should be guided by well-researched and structured diversification and intensification, and supported both by the public and private sectors for training and skill development and start-up funds.

Mainstreaming the Smallholder in High-value Agriculture

3.7.4.32. Involvement of smallholders in high value agriculture is crucial for achieving inclusive and equitable development. The role of the corporate system in the overall food chain is becoming important, highlighting the need for greater and effective linkages between public and private sectors in the changing food situation of the country. This linkage must be addressed by the country's innovation and research system. Indian supermarkets are increasingly retailing and distributing not only processed food but also fresh vegetables and fruits and other agricultural products and are playing an important role in the food chain. This has also put an increased pressure on food management and processing. In this transformed scenario, we must not forget the role of small and marginal farmers who are not only producers but also constitute the bulk of the poor consumers as customers. Small farmers thus must get a foothold in this changing food chain. The hub and spokes model of the Nucleus Estate-System to provide centralised services to support decentralised production should be promoted. Agri-clinics, agri-business centres and SFAC could play an important role in this direction.

3.7.4.33. In order to mainstream the small landholders into the high-value agricultural and supply chain, the strategic partnership between public and private sectors will be needed. Such an arrangement should be built to pool risk and resources to bring actors together to resolve market failures. Supply chain plays important role in cooperation of the partners to specify high quality products to generate value and consumer demand. Such a win-win situation is particularly favourable for smallholders in terms of higher prices, knowledge, reduced losses and assured markets. However, smallholders are not able to make these demands due to market failures attributed to information asymmetries, organisational failure, high transaction cost and regulatory failures. The synergy of the public-private partnerships, especially involving the smallholder is bound to create mutual benefits and confidence and can remedy market failures which cannot be undertaken separately by public and private sectors.

3.7.4.34. The market failures can be remedied through: creation of research contribution to deliver high quality varieties, particularly suitable for processing,

development of third party certification organization and public-private-partnership-led initiative to create producers' organisation to improve marketing and build linkages with processors, as suggested in the NCF Reports in relation to the creation of Small Farmers Estates (SFEs) on the NDDB model. The PPPs must be at the chain-level to intervene in all major bottlenecks, as targeting one may not benefit the whole supply chain. Bulk vending should be promoted to cut cost and also to mainstream small producers in market chain. Establishment of effectively functioning rural warehouses and transport connectivity and facilities, especially in hills and mountains and dryland arid zones, will be essential for linking the smallholder with the market chain. The PPPs must also induce positive effects for all stakeholders, processors, retailers, etc. to ensure a positive feedback and benefit to the whole supply chain. For keeping the system dynamically responsive to new situations with optimum output for all the partners, it may be prudent to undertake research to identify appropriate partners and modalities to scale-up PPPs and as to how can PPPs regulate market failures.

Value Addition and Prevention of Post Harvest Losses

3.7.4.35. Post harvest losses, on an average ranging from 10 to 30 percent depending on commodities, being high in horticulture, livestock and fisheries - all high value products, are colossal, estimated about Rs. 50,000 Crore each year. For instance, in horticulture, serious mismatch between production and consumption continues although there is no reliable data available to estimate the success achieved during the last 10 years in reducing post harvest losses. The estimates of monetary losses being incurred in the country keep rising. The huge investments made not only by the Department of Agriculture and Cooperation, but also by the APEDA, NCDC, NAFED, Ministry of Food Processing etc. have thus not succeeded much in reducing the staggering post harvest losses. No authentic data are available on the reduction in losses, if any, achieved due to the infrastructure created, improved PHM technologies promoted and several policy initiatives taken for streamlining the systems involved. This data gap is a serious hurdle in setting research and technology acquisition priorities, and should be abridged soon.

3.7.4.36. The extension staff, private sector and PRIs can play an important role in educating the farmers in better post harvest management practices. There is a need for introducing a Post Harvest Technology Wing in every Krishi Vigyan Kendra and organize processing and value addition demonstrations throughout the country, as mentioned earlier. Many of the demonstrations should be organized in dry farming areas, where millets, pulses, oilseeds and cotton are grown. The help of the Central Food Technology Research Institute (CFTRI), Mysore should be taken by ICAR while designing the Lab to Land programme. The demonstrations should be so designed that they also serve as training grounds.

3.7.4.37. Further, liberalization has brought focus on technology as a major factor in competitive marketing, which should be duly reflected in new agriculture and science and technology policies. As trade shifts from primary products towards processed and manufactured products, greater emphasis will be needed for agroprocessing and post-harvest technologies that convert primary products into quality products and value-added products. Horizontal and vertical diversification can together proceed to expand options for quality products that meet fast-changing demands of local and foreign markets. Trade - , biosafety - , gene - and legal-literacy should be ensured at all levels, from farmers to policy-makers. These moves will promote farmer-industry linkage, small and medium enterprises (SMEs), rural entrepreneurships, and off-farm rural employment. It will be necessary to generate and transfer low-cost post harvest and agroprocessing technologies and to create marketing infrastructures that pay increased attention to food safety and to minimize post-harvest losses which are particularly large for horticultural, livestock, and fish products.

3.7.4.38. Institutional innovations will have to be explored, e.g. Contract Farming, Nucleus-Estate linkage systems, Small Holders' Estates and Futures Markets. The group dynamics will promote decentralized mass production by masses and benefit from centralized services. Through ensuring backward-forward linkages under an end-to-end approach, the Small Holders' Estates will synergise production-processing-marketing linkage. Commodity-based farmers' organisations should be promoted to facilitate direct farmer-consumer linkage and direct sale by farmers. The

supply chain is long and the intermediaries add their margin with very little/no value addition, leading to increase in the price paid by the ultimate consumer and low share of the producer.

3.7.4.39. Specialty commodities, such as off-season varieties and production systems, new crops, and novel varieties and breeds should be identified to capture new opportunities. With the increasing demand for herbal medicines and botanicals, and for organically produced food, aquaculture and other products, several countries have developed specific production and distribution patterns. Public and private sector support in supplying quality seed, planting materials, processing, procurement and marketing to promote these initiatives is a condition *sine qua non*. Individual countries have developed or are developing policies, strategies and programmes on such diversifications. As several of these initiatives are innovative and diverse, there is good scope for sharing such experiences through information system networks as well as through Technical Cooperation among Developing Countries (TCDC) arrangements promoted by FAO and other UN agencies and international organisations.

Greening the Grey Areas

3.7.4.40. Rainfed and other less favoured areas have the highest concentration of poor and malnourished people; these highly risk prone areas are characterized by low agricultural productivity, high natural resource degradation, limited access to infrastructure and markets, and other socio-economic constraints. In the interests both of improving household food security and lessening socio-economic inequity, and also of raising national agricultural production, research and technology development must give greater attention to soil health, water conservation, livestock for livelihood security, horticulture and agroforestry in the rainfed areas, while maintaining and further increasing the gains made in irrigated areas. Genetic improvement for tolerance to water stresses (both scarce and excessive), salinity, acidity and other abiotic stresses as well as to biotic stresses, water harvesting and enhanced water and fertilizer use efficiency, management of soil erosion, crop-livestock-fish-tree integrated farming systems, participatory research, contingency farming and agro

forestry should be high priority research agendas in rainfed areas. Technology transfer systems, including input and institutional supports should emphasize precision and pace, hence the need for greater skill, alertness and commitment.

3.7.4.41. Yield and productivity gaps are particularly large in rainfed areas. This is attributed mainly to large variability of soil features, negligible control on water, weak technology assessment, refinement and diffusion mechanisms and poor institutional supports. Seed security for crop security is a must in rainfed areas. Therefore seed banks, gene banks, water banks, fodder banks and food banks are essential for achieving and maintaining livelihood security in such areas. There are several successful stories of bridging the gaps at various levels, which should be critically analysed for identifying the underlying drivers of change and their judicious scaling up and adoption for greening the grey areas. A recent IFPRI study had examined the prospects of replicating and sustaining sporadic and isolated instances of technology-triggered success stories of enhanced yields to achieve broad-based aggregate successful growth in rainfed agriculture and suggests that, "where there is participation and individual motivation, where incentives are aligned with improved means to respond to incentives, and where technology plays a pivotal role, success may follow".

3.7.4.42. The Prime Minister in his address to the Nation on the 15th August, 2005 had emphasised special focus on removing the problems of farmers, many of whom are marginalised in dryland areas, and announced setting up a National Rainfed Area Authority for this purpose. Unlocking the rich and diversified production potential of these areas was an imperative at the present juncture of our agricultural development. The National Commission on Farmers and Planning Commission had jointly organised last month a high level meeting involving also Secretaries of the concerned Departments, development planners and NGOs on the structure and function of NRAA. It was agreed that the basic mandate of NRAA should be to help farm families to achieve income and work security by promoting a farming systems approach to foster water harvesting, conservation and sustainable and equitable use of

rainwater to provide livelihood security to rural communities and to ensure the security and productivity of crop and animal husbandry, forestry and fisheries.

3.7.4.43. The NRAA should be a highly professional body whose recommendations and action plans are characterized by high scientific content and economic credibility. Principles of ecology, economics, equity (gender and social) and employment generation should guide the work of NRAA. The NRAA should provide scientific and intellectual support to and fully tap the potential of Panchayati Raj Institutions and participation of NGOs and community-based organisations. The NRAA should be structured somewhat like National Dairy Development Board with clear-cut functions in the areas of policy formulation, resource mobilization, coordination with all concerned Ministries, Centre – State linkages as well as with Bharat Nirman, NREGS, etc. and issues related to sustainable water security in the rainfed areas and mitigating the impact of drought and strengthening the livelihood security systems. In view of the high priority to rainfed dryland agriculture, these recommendations should be duly internalised in the technology policy and acted upon.

Managing the Gene Revolution

3.7.4.44. The global area planted with biotech (GMO) crops has steadily increased during the last ten years. Today, approximately 8.5 million farmers in 21 countries are growing such crops covering about 90 million ha (**Figure 2**). India so far grows only one biotech product, i.e., Bt Cotton, occupying nearly 0.7 million ha under legally-released Bt hybrid varieties and an additional about 0.6 million ha under "illegal" Bt hybrid varieties. A recent study has revealed that, on an average, 30 percent of the illegal seeds are non-Bt, only 27 percent are F_1, rest of 43 percent are only 10-75 percent positive for Bt, indicating F_2 and mixtures. Fake cartons of the legal seeds are increasing. Such huge flows of spurious seeds, fraught with economic and ecological dangers and erosion of confidence of the farmers and the civil society in an otherwise productive and farmer-friendly technology, should be halted forthwith. Bt detection kits are available and should be used judiciously and transparently to confirm truthfulness of the seed and to build up quality control and faith in the technology and the seed chain. The research and regulatory and extension

systems must be effectively aligned to ensure smooth and cost-effective flow of quality seed.

3.7.4.45. The Gene Revolution is primarily propelled by the private sector, which has important implications for the kind of research performed, types of technologies developed and the way the technologies are disseminated. It raises concerns that the small farmers may not benefit. The potential of biotechnology should be approached with a balanced perspective by integrating it within the national research technology and development framework and using it as an adjunct to and not as a substitute for conventional technologies in solving problems identified through national priority setting mechanisms. Priority setting should also take into account national development policies, private sector interests, market possibilities, potential for adoption by farmers, public perceptions of safety, and consumers' views. The technology should be developed by training a couple of women and men members of every Panchayat/ local body in the management of new technologies, such as the establishment of *refugia* in Bt Cotton fields. A Scientist–Panchayat linkage is the need of the hour. Genome Clubs may be organized in village schools and KVKs to spread genetic literacy.

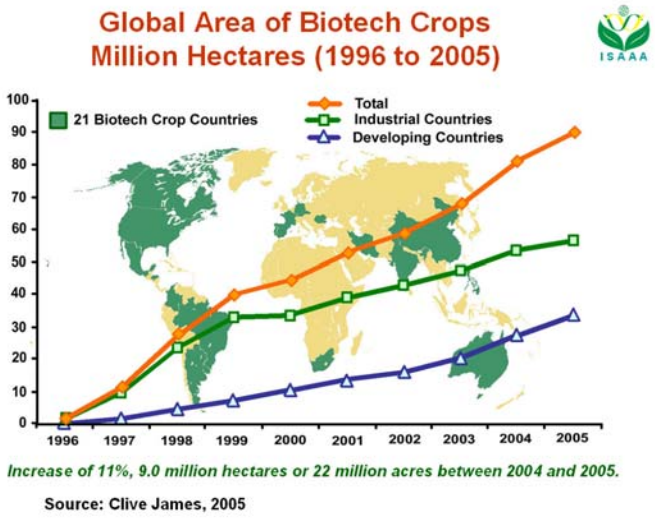


Figure 2. Global Area of Biotech Crops

3.7.4.46. A panel chaired by Prof. M.S. Swaminathan, June 2004, had prepared a National Biotechnology Policy document and suggested the establishment of an autonomous National Biotechnology Regulatory Authority to oversee and harmonise

biotechnological developments in fields of Agriculture and Food, Environment and Medicine and Pharmaceutics. The Department of Biotechnology has also been preparing a document on national policy on biotechnology through a widespread consultative process. The National Commission on Farmers considered these two initiatives and widened the scope of the consultative process by organising a consultation with farmers and farmers' organisations. The NCF recommends that a National Policy on Biotechnology should soon be firmed up and announced. The policy must address the following issues:

- Value, usefulness and appropriateness of biotechnologies and enhanced gene literacy,
- Risk and biosafety aspects and their management,
- Equity and ethical dimensions, overall awareness and promotion of pro-poor features of biotechnologies,
- Control of and access to biotechnologies, the role of public and private sectors, harmonization of IPR, SPS and other regulatory provisions, and
- Investment in research and other institutional supports and partnerships for transparent and balanced harnessing of biotechnologies to address particularly the food insecurity, malnutrition, and poverty issues.

3.7.4.47. Appreciating the fundamental commonness of the genetic thread throughout the living organisms – microbe to man, the NCF recommends that an Agricultural Biotechnology Authority should be established soonest as a major component of the National Biotechnology Regulatory Authority. It should be steered by an Advisory Committee comprising scientists, representatives of public and private sectors, industry, CSOs, NGOs and farmers. The Authority should combine both regulatory and advisory responsibilities and coordinate and harmonise the various socio-economic and other development aspects, regulatory measures and bioethical and biosecurity norms towards harnessing biotechnologies for the good of the common man (*aam adami*).

Managing WTO/ AoA

3.7.4.48. Cost competitiveness and product quality issues are critical to compete in world market. Research and technology development should be geared and focused to increase the overall competitiveness of our major crops and commodities. This calls for enhanced and sustained efficiency of inputs use, thus cutting cost of production, improving quality and reducing post-harvest losses so that the input-output ratio is maximized (without sacrificing the ecological and environmental security). International quality and safety standards for agriculture products are very high. Meeting of their standards involves substantial costs for building technical and physical capability. There is a need for pooling talents and resources available in both public and private sectors to build this capacity. Finally, public research system should shoulder the responsibility to protect small farmers from ill-effects of trade reform process.

3.7.4.49. Along the production-processing-marketing chain, commodity-specific detailed action plan should be prepared with clearly defined goals. India's preparedness in the field of SPS measures is highly inadequate. As a result of which, several of our consignments get regularly rejected. The situation is likely to get still worse in the coming years as Safety Standards and Guidelines developed by international bodies such as Codex Alimentarius, International Plant Protection Convention and the Convention on Biological Diversity (CBD) get more and more stringent, let alone the fast shifting of the goal posts. Thus, the urgency of the launching of quality and food literacy movement at all levels, from farmers to policy-makers, and strengthening of SPS infrastructures can hardly be overemphasized.

3.7.4.50. We must urgently augment and create survey, surveillance and quality literacy programmes. The SPS infrastructure should be brought at par with International Standards and awareness should be generated abroad on steps taken by India to maintain high standards regarding food safety and biosafety. Keeping in mind high prospects of enhancing livestock and poultry exports from India, the food and health safety concerns for livestock and poultry products will particularly be important since livestock economy is the backbone of a large number of marginal

farmers and landless agricultural labourers. But today large parts of livestock and poultry products international trades are restricted because of infectious diseases.

3.7.4.51. The Union Minister for Commerce and Industry and the Government of India have done a commendable job in safeguarding the interests of our farm women and men in the WTO negotiations. As a national self-empowerment measure, we should consider establishing an Indian Trade Organisation (ITO) and our own boxes for domestic agricultural support on the model of WTO's Blue, Green and Amber Boxes, as suggested in the Third Report of the NCF. Only a small proportion (6.2 percent) of our agricultural commodities enters the global market, whereas with a population of over a billion, there is a large home market. Hence, we must segregate the very modest support we extend to our farmers into two groups - those which are of the nature of life and livelihood saving support to small farm families, and those which could be considered as trade distorting in the global market. The Indian Trade Organisation (ITO) can be a virtual organisation, specializing in WTO affairs. It can serve as a brain and information bank for enabling Government to take informed and proactive decisions and should particularly serve as a friend and guide to small farm families in consultation with Land Use Board and should provide proactive advice on land use and crop planning. It should help to save resource poor farm families from the onslaught of the subsidy, technology and capital driven agri-business paradigm of OECD countries, and buttress our debt-ridden farmers against various trade distortions.

Access to Modern Technology and Information for Progressive Farming

3.7.4.52. The huge technology awareness and transfer gaps may be ascribed to: (i) the nonattractiveness of the technology package, (ii) farmers unawareness of the efficacy and power of new technologies, (iii) nonavailability of quality inputs at right time, in right quantity and at right and affordable cost, and (iv) the deteriorating term of trade for agriculture as reflected in the stagnating and declining farmers' income and the rising (often strangulating) indebtedness of the farming households. The main pillars of the Green Revolution have also weakened – decelerated genetic gains and deteriorating flow of quality seed, quantitatively stagnating but increased imbalanced

use of mineral fertilizer, decelerated irrigation growth and highly inefficient use of water, and " opportunistic" political will and dwindling investment in agriculture and in livelihood of farmers. A simultaneous and effective removal of these weaknesses is the *sine qua non* for revitalization of Indian agriculture.

3.7.4.53. The National Sample Survey Organisation (NSSO), Ministry of Statistics and Programme Implementation, in its second of the five reports entitled, "Situation Assessment Survey of Indian Farmers: Access to Modern Technologies for Farming," June 2005, had analysed the extent to which the farmers access various sources for getting information on improved farming techniques and the extent to which they use such information (**Box I**). The survey report shows that only 40 per cent of farmers in the country accessed one or the other source for getting information related to modern farming. While in Andhra Pradesh and West Bengal over 60 per cent of the farmers contacted some source for farm related information only 15 per cent did so in Rajasthan. The most frequently accessed source was 'other progressive farmers' (17 %) followed by the 'dealer providing inputs' and 'radio' (13 %). TV (9 %), newspapers (7 %) and extension workers (6%) were some of the other important sources. While these were the national averages, farmers in different States showed varying preferences.

Box I. Access to Modern Technology for Farming, 2003

- At all-India level, 40% of farmer households accessed various sources of information for Modern Technology for Farming.
- At all-India level, of the sixteen different sources canvassed for accessing information for Modern Technology for Farming, the most popular was 'other progressive farmers' with percentage of farmer households accessing information through the source as 16.7%, followed by input dealer (13.1%) and radio (13.0%).
- Percentage of farmer households accessing information through 'other progressive farmers' was highest in Andhra Pradesh (34%), followed by Gujarat (30%) and West Bengal (25%).
- Percentage of farmer households accessing information through 'input dealers' was highest in West Bengal (36%), followed by Andhra Pradesh (30%) and Gujarat (24%).
- Percentage of farmer households accessing information through 'radio' was highest in Jammu & Kashmir (36%), followed by Kerala (31%) and Assam (29%).
- The two most popular sources, namely 'other progressive farmers' and 'input dealer' were contacted by the farmer households mainly on 'need basis' or 'seasonally'.
- Among the farmer households accessing information for cultivation from 'other progressive farmers', 40% received information on 'improved seed variety', 31% on 'fertiliser application', 15% on 'plant protection' and 14% on 'others'.

Source: NSS Report No. 499: Access to Modern Technology for Farming, 2003

3.7.4.54. Over 50 per cent of farmers who received farming related information from sources like Radio, TV and Newspapers actually 'tried' the information or adopted the recommendations, whereas over 80 % of those who obtained the information from 'input dealers' or 'other progressive farmers' tried or adopted them. About 65 per cent of farmers who accessed information from extension workers or the 'Krishi Vigyan Kendra' actually tried or adopted. The different suggestions for improvement in extension services available to the farmers were: improvement in quality and reliability of information, timeliness of information, increase in frequency of demonstration, improvement of quality of presentation, and improvement of professional competence of information provider.

3.7.4.55. Among the farmers obtaining information from any source, 96 per cent obtained information on cultivation. As for the type of information on cultivation received by farmer households from any source, 60 per cent were on improved seed variety, 49 per cent on fertilizer application, 24 per cent on plant protection measures. Only 5 per cent of farmers obtained information on animal husbandry related topics and just under 3 per cent of farmers obtained information on fisheries. Most of the farmers rated the information received as 'good' or 'satisfactory'. Only a small percentage of farmers rated the information received by them as poor.

3.7.4.56. The above findings call for the following policy changes and strategic alliances for bridging the information and technology transfer and adoption gaps:

- Strengthen information packaging and its transfer and communication for raising awareness of all stakeholders, from farming households to policy and decision-makers, regarding the role of new and emerging technologies in enhancing productivity, income and environmental sustainability.
- Although the low literacy rate prevailing in rural areas may be one of the main reasons behind 60 percent of the farmers being unaware of modern farming, alternative means of communication and demonstrations should be used to

raise the awareness of farming families. Illiteracy need not be equated with lack of intelligence and skill, as amply encountered in the fields of arts and crafts and in textile, agricultural machinery and automobile industries. Technologies that aim at value addition in the products of cottage/small scale industry can play a vital role in improving competitiveness of rural poor, including formally uneducated farmers. S&T can reach there in remotest parts of the country by emphasizing on skill training and on computer literacy, making it accessible even to those not having formal education. The 'problem population' can thus be converted into a valuable 'human resource' through activity-oriented training and skill improvement, helping to develop entrepreneurship and facilitating self-employment by using new technologies.

- Effectively implement the Every Village Knowledge Centre Movement and manage Gyan Chaupals to empower rural men and women by promoting and enhancing literacy and awareness at grassroots level especially on new and appropriate farming systems and season specific technologies, prices and marketing of inputs and agricultural produce and products and on disaster management and mitigation.

- Create virtual networks and partnerships to rapidly share information and knowledge and increase use of mobile phone which could operate in local languages to facilitate information diffusion and awareness–raising. New ICT technologies, such as e-agriculture, whereby agricultural information can be presented in multimedia formats to improve knowledge sharing in local cultural context, should be promoted.

- Recognising that input dealers and suppliers were second most common source of information, regular trainings of the dealers/ suppliers/ retailers should be organised not only to update their knowledge but also to improve their communication skills and attitudes to empower farmers with new information on inputs use and farming operations. "Hariyali Bazar", "e-chaupal" and other such initiatives of the private sector and agriclinics should

be promoted. Innovative participatory extension approaches such as farmer-friendly "contract farming" should be encouraged.

- Since farmer-to-farmer learning and technology transfer was most frequent and was found reliable, as highlighted in our earlier reports, Farm Schools at the farms of and operated by farmer-achievers should be established in large numbers in different agro-climatic zones and farming system regimes.

- Farmer participation and feedback should become on integral part of agricultural research and technology transfer. Lab-to-land and land-to-lab programme should not only be revived but also vigorously pursued and suitably strengthened. Unfortunately, as the Survey revealed, the public sector extension system has become a lowly placed source of information and advice on modern farming systems. Considering that majority of our farmers are small and resource poor and depend heavily on public good technologies and information, the public sector agricultural extension men and women should be empowered and sensitised to meet the demands particularly by forging research – extension – education – farmer – market linkages. Through PPPs, including the synergies with KVKs (KVUKs), ATMAs, SHGs, SFEs etc., and with greater emphasis on facilitating transparent and timely adoption of various regulatory standards and guidelines to enhance access to quality inputs and markets, the public sector extension and ICT system should play a leading role in the Agricultural Renewal Movement.

- Paradoxically, the extension and information gaps in livestock and fisheries are the largest whereas these subsectors have been growing at a high annual growth rate of about 4 to 5 percent against 1 to 1.5 percent in cereals during the last five years or so. Extension and ICT services to these subsectors should be duly strengthened to further accelerate and sustain their growth rates at about 6 to 8 percent which would help step up growth rate of the agriculture sector as a whole to the desired level of about 4 percent. Livestock and fisheries extension cadres comprising adequate numbers of quality staff,

especially trained in disease prevention and management, and comprehensive training facilities should be established.

- Knowledge Connectivity should become fundamental to physical connectivity under the Bharat Nirman programme. As stated in the revised Bharat Nirman document regarding Knowledge Connectivity, the NCF welcomes the Government's commitment to expanding rural knowledge connectivity. The NCF appreciates the GOI's acceptance of its year 2005 recommendations to support VKCs and urges its urgent widespread operationalization. NCF recommends that Government may review its policy towards Community Radio, since a combination of the Internet/ cell phone and community radio will help to take timely information to farmers even in the remotest parts of the country and judiciously harness "air waves or frequencies which are public property." NCF suggests that the extension and provision of community radio licenses should be streamlined and operationalised so as to reach the target community in the shortest period.

- In order to effectively adopt new technologies, the right inputs should be available at the right time and place at affordable costs. Input supply systems should become farmer-friendly and also controlled by Farmers' Self Help Groups to the extent possible. Regulatory measures such as IPR, SPS, PVPFR etc. should be harmonised and made known to all parties. A National Agricultural Inputs Authority, on the lines of the Drugs Price Control Authority, to ensure flow of quality inputs should be established. The package of technology to be effective must be accompanied by an appropriate package of services in the areas of extension and input supply. Further, the energy sources needed by farm families, both electricity and diesel, should be available in a reliable manner and at affordable price. In addition, solar energy could be tapped where economical.

Partnership in Research and Technology Development

3.7.4.57. Policy measures should synergise three major partnership areas for intensification of generation, refinement and diffusion of modern technologies. These are: (i) public-private (industry)-universities-academia partnership, (ii) research-extension-farmer-market-consumer linkage and (iii) participatory research, technology assessment, refinement and transfer through farmers' field research. Over the past few years, it has been increasingly recognised that greater coordination and cooperation between private sector and industry on the one hand and the R&D/academic institutions on the other is necessary for facing various challenges and taking advantage of the opportunities offered. In India, farming households comprise the largest private sector.

3.7.4.58. Participatory research and knowledge management is the key to promote relevance and effective adoption of technologies and new information by pursuing holistic and system–based approach for converging "global" knowledge to tackle local problems. The unique nature of agriculture makes agricultural R&D different from other sectors and makes extension vital. The context is different and other providers are emerging. A new ball game has been set up and our response has remained outdated. Clear enunciation of the roles of the Centre, States, local bodies, Panchayati Raj Institutions, private sector, and NGOs in a client-centred R&D structure is a critical task. Critical scientific and resource mass and modern management must back the human resources and research – extension – farmer – market – consumer linkage.

3.7.4.59. The awareness of mutual strengths and requirements of different stakeholders would require measures like: joint workshops/seminars and exhibitions; promotion of sandwich programmes involving attachment of students to an industry or to a farm or Farm School during their academic stints; establishment of sustained one-to-one linkages between R&D/academic institutions and the farming hubs, contract farming, SFEs and agro-industries located in a particular region; and setting up of accurate, upto-date, reliable, realistic and user-friendly database on indigenous

technological expertise/infrastructure, S&T personnel, R&D programmes, technological breakthroughs and innovations etc. For upstream agriculture-related industries, encouraging the mobility of S&T personnel between industry and R&D/academic institutions should be promoted. Academic institutions and R&D laboratories also need to organise appropriate training programmes for private sector personnel in order to cater to their specific requirements. Policy, procedures and systems should be reformed to encourage the academic faculty to accept contract/collaborative research for industry.

3.7.4.60. Interaction with the farmers and industry should not end with technology transfer but the agency providing the technology must constantly interact with the users problem solving, technology absorption, and improvement/ upgradation of the technology. The Institute-Village linkage programme of ICAR needs to be revitalized and restructured. Government and industry associations should work together for the establishment of independent test facilities for reliable quality-checks, calibration and also for technology validation. Establishment of Industry S&T Interface Institutions (ISTI), with technology management centres manned by qualified personnel, could also be considered, besides the establishment of S&T entrepreneurship parks, Technology Business Incubators, upgrading R&D infrastructure of the industry through consortia of industry associations. Incentive/support measures would also need to be introduced for promoting the purchase of products developed through indigenous technologies. This approach should particularly be promoted in the areas of organic farming, pharma farming, biofertilizers and biopesticides etc.

3.7.4.61. Special emphasis should be given to identifying, promoting and supporting grass root innovations, adding value to them and disseminating them to ensure that the impact of such innovations is reflected in improved prospects of livelihood of a large number of people. Efforts should be made to design and develop or scout for advanced time and energy-saving tools/machineries and equipment, their adaptation, motivation of entrepreneurs to take up their manufacture and also encourage the innovators of advanced tools and equipments.

3.7.4.62. The developmental strategy with technological-orientation should focus on meeting the needs of the nation, including the majority small and resource-poor farmers and rural-based agroindustries and encompass a wide spectrum of activities, namely, basic research, applied research, technology transfer, design, development, fabrication, tests and trials, manufacturing, marketing, maintenance and product support during the life cycle. Often serious gaps are encountered in the cycle, depressing the overall efficacy of the chain. For instance, poor quality control in micro-irrigation has been the main cause of the sub optimal performance of pressurised irrigation in India. In the present liberalised environment, the increasing independence of corporate sector in agriculture should pay much more attention to external sources and upgrade its technology through radical technology jumps. It should anticipate and take advantage of technological changes, acquire appropriate new technology to develop and produce new products for the competitive markets, consistent with the home realities and needs of mass production by masses and not by machines (to avoid uprooting of livelihood bases without assured alternative employment).

3.7.4.63. Often the situation under which the scientific information is generated is unlikely to be same from those operated by the farmers. The scientific information is to be reviewed in terms of specific needs, opportunities and constraints faced by farmers in different production systems. The typical contrasts in physical conditions under which the farmers operate in terms of topography, soils, plot size, hazards, the facilities of irrigation, size of management unit, farming systems, nature of production stability, production sustainability, and priority for production need to be considered. The Small Farm Production Systems have some typical characteristics which include strong interaction between land and household economy, interlink of on and off farm activity, highly diverse, complex and risk prone activities even within systems, predominance of household inputs, prevalence of traditional practices, multiple enterprises primarily for domestic needs, production systems highly susceptible to stress and perturbations, and dependence on family labour and further sharing. The assessment and refinement of technology thus need to be site specific,

holistic, farmer participatory, and technical solutions to existing problems should be inter-disciplinary, interactive, iterative and gender sensitive.

3.7.4.64. Essentially the assessment and refinement of technology needs discipline to programme mode, piecemeal to system approach, open ended to focused technological intervention, "take it or leave" to demand-led approach, integration of biophysical and socio-economic factors, institute to inter-institute mode of technology assessment and refinement, and overall a strong research-extension to research-extension-farmer-market linkage and overall proper appreciation of distinction between science and technology. Different types of farmers' participation are used for conducting on-farm trials for different purposes. In a truly participatory and collaborative, even collegiatic manner, the farmers must actively participate in on-farm trial process and be involved in regular meetings designed to clarify the logic, their current practices and their demand for new technology. The farmers must participate directly in the planning and execution of trials and analysis of the results and the knowledge should flow both ways.

3.7.4.65. While identifying the solutions from on-farm trial, it must be seen that the technology will function and its profitability, compatibility with the farming system, contribution to reducing risk, need for institutional support and ease of testing by farmers are duly considered. The assessment of trials should be based on net income to the farmer assessed through economic analysis and ability to solve the problem diagnosed through. The results of promising pilot activities should be extrapolated for defined groups of farmers in specific defined areas (clientele). The Farm School approach should be adopted for grassroot level training and technology diffusion, for which the R&D system must provide the needed financial and technical support.

3.7.4.66. Participatory (Farmer) breeding and knowledge sharing for development and diffusion of farmer-selected and scientist-assisted varieties combining proven adaptability to local agro-ecological, social and cultural milieu as well as possessing speciality traits (aroma, medicinal value and tolerance to local biotic and abiotic stresses) has emerged as an important strategy for harnessing treasures of our time-

tested and ever-evolving indigenous knowledge and genetic resources. Several national and international programmes viz. the CGIAR Centres and the Indo-UK (DFID) programme have been promoting this approach. Some of these have been remarkably successful. For instance, the farmer participatory rice improvement programmes of the M.S. Swaminathan Research Foundation on *Kalajeera* (a high quality aromatic rice) in Orissa and *Navara* (a medicinal rice in Kerala) have tremendous potential of enhancing income and livelihood security of farmers in those areas. Such initiatives should be strengthened through additional research and technology dissemination efforts by mentoring and supporting dedicated SHGs and by linking the producers with markets and by creating and capturing niche markets.

3.7.4.67. Participatory Research, Demonstration and Training (RDT) Centres should be farmer-centric and should concentrate on demonstrating how to increase the output and income of farmers with small holdings and artesenal fishermen. Precision farming, hi-tech horticulture, monsoon management and mixed farming will be important components of the training programmes. The proposed National Board for Strategic Research in Agriculture can work out the modalities of establishing such Centres at locations where the work done will have a large extrapolation domain. The concerned State Governments could be requested to provide about 100 ha of land free of cost for establishing RDT Centres. The Centres should be autonomous, and managed jointly by farm/ fisher families and scientists. Panchayati Raj Institutions should be associated with the design and management of RDT Centres. These Centres should be designed to serve as windows into the new world of agrarian prosperity that awaits rural India. They should have strong linkages with the relevant SAUs.

3.7.4.68 The SAUs/ ICAR Institute–KVK-Farm School system of technological and skill upgradation of farming needs continuous feed back and advice from farm men and women. In order to provide a structured opportunity for sustained scientist–farmer dialogue, it is suggested that a National Council of Innovative Farmers may be set up for providing on continuing basis guidance on the technology and public policy requirements for achieving productivity, quality and value-addition revolutions in the over 115 million operational holdings in our country. This Council may be serviced

by ICAR, with DDG (Extension) serving as the Convenor. Members of the Council of Innovative Farmers may be appointed by the President of ICAR in consultation with the National Commission on Farmers. A National S&T Alliance (Consortium) for Rural Livelihood Security with units in each district, may be established to synergise inputs of various concerned Departments and Ministries at grassroot level.

3.7.4.69. The proposed India – US Knowledge Initiative on agricultural research and education is a realization of the tremendous scope to complement the capabilities of the two countries being leaders in different fields of science and technology. The initiative is an effort towards addressing problems such as global warming, new pest-disease complexes - biosecurity, resource depletion and degradation, household nutritional security, slow growing farm profitability, and increased competition. Sharing of recent developments in cutting edge technologies, such as the use of microarrays for diagnostics and risk management, nanotechnology, etc. should be high on the agenda. While preparing the detailed action plan, ICAR and other components of the NARS should insist on accessing or jointly developing strategic and latest technologies as per the needs of India.

3.7.4.70. The IPR and other enabling regulatory measures should be harmonized nationally and internationally to reward the incentives as well as to protect the poor. The International Agricultural Research Centres (IARCs) of the CGIAR have long been interacting with the private sector, and mutually benefiting thereby. Some of the centres have formalized their collaborations through agreements. So far, the CGIAR system has been able to share its technologies and products as international public goods. The CGIAR policy must carve out a system which will allow a continuation of the free flow of technologies to the poor, without jeopardizing their partnership with the private sector. Financial and other supports should be extended to the CGIAR system to enable it to pursue frontline research to generate highly competitive technologies and to leverage benefits from the spillover effects. Linkages should be established among IARCs to build complementary Centres of Excellence and avoid duplication of efforts.

3.7.4.71. Private sector R&D institutions are growing in India, particularly in the areas of biotechnology and crop breeding. It is high time that we develop Codes of Conduct for public-private sector partnerships based on respect for each other's obligations. Not-for profit R&D institutions also exist in the NGO sector which can also adopt the same Codes of Conduct as public-funded institutions in their partnerships with the private sector, where IPR, Breeders' Rights and other forms of proprietary control over technologies and products of commercial significance are important. The Codes of Conduct should be developed through extensive consultation among all partners so that these could be used in the entire national scientific research system. The Commission recommends the following additional measures to further strengthen the partnership:

- Provide tax incentives, including tax holidays, so as to increase private sector's contribution to R & D from 14% to 33%;
- Strengthen national capacities in regulatory matters, especially IPR, SPS and quarantine facilities to promote technology acquisition as well as trade;
- Encourage testing of new varieties bred by private sector and their other technological products in the public sector supported national technology testing programmes; and
- Undertake joint research activities with clearly defined responsibility, accountability and profit sharing.

Technological Empowerment of Women

3.7.4.72. Technology for women requires special attention and the impact of major on-going schemes (and any future schemes) on the knowledge and skills of poor, rural women engaged in farming and allied activities needs to be systematically studied. The lack of tools designed with women in mind is yet another area of concern. With the objective of empowering women in all fields of environmental management, including water harvesting, wasteland development, sustainable agriculture and livestock development, biodiversity conservation and its sustainable and equitable use, ongoing schemes should be "engendered" on priority basis.

3.7.4.73. Countries with lower achievement in the Human Development Index and Gender Development Index have a larger percentage of their economically active population (both male and female) employed in the agriculture industry. Second, these same countries have a higher proportion of economically active women involved in agricultural activities relative to men. The disparities are likely to increase as rural to urban migration continues to change the composition of rural areas putting even greater responsibilities for the growth of the agricultural sector on women than they already have. In aggregate, women in rural areas in the poorer countries will be impacted most heavily as the feminization of agriculture intensifies further. Agricultural technologies specifically designed to improve the efficiency and productivity of the female labour force will thus greatly improve overall agricultural productivity.

3.7.4.74. There is lack of analytical understanding of the gender inequality. Social research must provide disaggregated information on rural woman that can feed into policy formulation, and that can help articulate the strategic gender aspect of demographic transition. Meanwhile the following actions will help improve the situation:

- Promote full participation of women in all S&T activities.
- Encourage entrepreneurship among interested women by drawing up innovative schemes which help in the incubation and scaling up of innovative ideas which address the specific needs of women and establish special venture capital fund for enabling women entrepreneurs to take to a career of self-employment in converting new technologies into market driven products.
- Identify and promote micro enterprises based on assured and remunerative markets, low transaction cost and economic viability, preferably in horticulture, including medicinal and aromatic plants, village level agro-processing and value addition centres, organic farming, etc..
- Draw up well coordinated programmes to reach the rural women through well networked models for technology transfer, demonstration, dissemination and adoption and establish training and mentoring centres for the rural women on

the model of KVKs. Widows of farmers who committed suicide under agricultural debt burden and other related stresses should be trained in market-driven skills and assisted in establishing on-farm (livestock) and non-farm income earning enterprises.

- Establish rural technology parks which will also help in adoption of appropriate technologies, to address local problems like reduction in drudgery and occupational hazards, appropriate tools, identify income generating activities – provide a platform to assess the real needs and feed to S&T institutions as agenda for research.
- Engender the curriculum at the school level and technical education (Medicine/Engineering/Agriculture) level for gender sensitivity among future scientists and development personnel and strengthen S&T education and communication skills among community development workers.
- Engender all technology mission mode programmes and conduct periodic gender audit , the experience will help in preparing guidelines for the inclusion of women in other technology-based or technology-rich programme areas, especially the National Horticulture Mission, Bharat Nirman Programme, Capacity Building & Monitoring Centres for SHGs and revitalization of KVKs.
- Establish a Network of Women Scientists and Institutions interested in engendering the development through S&T based interventions to develop an end to end approach for the various agro-climatic zones. Such a national level action and policy research network should carry out longitudinal studies of women's roles in agriculture and rural livelihoods in the various agro-ecological regions of the country, and also study the impact of S&T on livelihoods of rural women.
- Give greater focus to extension services in all areas of technology and build a strong cadre of women extension workers, who may be given frequent exposure for sharing these ideas with the members in the group. The various Acts, especially the BD, PVP&FR should be engendered and a literacy drive should be launched to understand them.

National Agricultural Biosecurity System

3.7.4.75. The recent and ongoing devastation and health risk due to the Avian Flu strain H5N1 is today's one of the highest concerns not only of the Government and people of India, but of the whole world. Similar threats are around in plants, microbes, animals and aquatic organisms (as also the very humankind). Therefore, each nation must pay priority attention to management of biological risks and establish an effective, and efficient, science-based and transparent National Agricultural Biosecurity System (NABS) to protect the livelihood security of farm and fisher families and the health, food and trade security of the nation. The wheat economy and wheat-based food security of the country is threatened by a highly virulent stem rust race, Ug 99, which is fast spreading in Africa and has perhaps entered Middle East and may enter India sooner than later. ICAR's work on animal and plant diseases and risk management must therefore assume extremely high priority for addressing these concerns.

3.7.4.76. Broadly speaking, Agricultural Biosecurity describes the concept, process and objective of managing – in a holistic manner – biological risks associated with food and agriculture, encompassing both policy and regulatory frameworks. Biosecurity is composed of three main sectors, namely, food safety, plant life and health, and animal life and health. These sectors include food production in relation to food safety, the introduction of plant pests, animal pests and diseases, and zoonoses, the introduction and release of genetically modified organisms (GMOs) and their products, and the introduction and safe management of invasive and alien species and genotypes. Accordingly, the proposed National Biotechnology Regulatory Authority should be a part of the National Agricultural Biosecurity System (NABS).

3.7.4.77. A National Agricultural Biosecurity Council (NABC), chaired by the Union Minister of Agriculture, should be established to provide a platform for convergence and synergy among the ongoing and new programmes of different Ministries and Departments and other national and international programmes. This should be supplemented by establishing a modern and adequately equipped and

staffed National Centre for Agricultural Biosecurity (NCAB) to dynamically provide technological tools and guidance for risk assessment and management. The existing biosecurity capacity of crop, livestock, fisheries and microbes should be strengthened and horizontally linked through a National Agricultural Biosecurity Network (NABN). Consequently, the NABC, NCAB and NABN will be the three mutually reinforcing components of the NABS. Necessary financial and human resources support to strengthen cutting–edge technology, *viz* development and use of micro arrays for diagnostics and drugs, is essential for achieving the goal of a Biosecure India.

Investments in R&D, Institutional Reforms and Revitalising the NARS

3.7.4.78. It is heartening that the Government of India in its 2006-07 budget allocation has provided Rs. 100 Crore to Punjab Agricultural University, Ludhiana, Punjab for its strengthening and modernization. This is a welcomed beginning and is in line with the recommendations of the NCF's Third Report. Reiterating its earlier recommendation, the Commission again recommends that a provision of Rs. 1000 Crore be made as a one–time grant to NARS to bridge the critical gaps in scientific infrastructure in frontier areas of technologies, so as to enable the Nation to enhance its agricultural competitiveness and to benefit from science–led Ever-green Revolution. This additional allocation will particularly strengthen work on conservation and improvement of livestock heritage of the Nation, genomics, bioinformatics, bioremediation and harnessing gene–richness of microorganisms, biomass utilization, value addition and use efficiency of plant nutrients and water. A National Board for Strategic Research in Agriculture may be set up to coordinate and harness advances in basic sciences for agricultural progress.

3.7.4.79 The uncommon opportunities provided by the frontier technologies should be captured for launching an ever-green revolution capable of improving productivity in perpetuity without ecological harm. In order to ensure social inclusion in access to new technologies, public investment in socially relevant agricultural research should be stepped up under the umbrella of the National Agricultural Research System which

comprises large numbers of ICAR institutions, State Agricultural Universities, All India Coordinated Research Projects and National Bureaus. Private sector institutions and NGOs carrying out research should also be encompassed under the NARS umbrella. Fighting the technology fatigue, and technology upgrading of small farm operations are urgent tasks.

3.7.4.80 Climate change leading to adverse changes in temperature, precipitation and sea level is no longer just a theoretical possibility. Most experts agree that we are already beginning to experience the impact of global warming as evident from the melting of glaciers and Antarctic and Arctic ice caps. Based on computer simulation models, contingency plans and alternative land and water use strategies will have to be developed for each major agro-climatic zone. Just as grain reserves are important for food security, seed reserves are important for crop security. Protecting the livelihood security of farm and fisher women and men from adverse climatic changes has to become a priority task of the National Rainfed Area Authority. In drought and flood prone areas, experienced farm women and men can be trained as "Climate Managers".

3.7.4.81. The NARS covers the entire spectrum of crop, fishery, forestry, natural resources and agro processing and agri-business. However, there are gaps in several areas awaiting redressal or are not receiving focused attention. Some of such areas, as listed below, require more intensive and inter-disciplinary attention.

- Climate change and its implications,
- Harnessing space, ICT, nanotechnology and other frontier technologies for precision farming,
- Organic recycling and value addition to biomass, biofuels and bioenergy,
- Crop-livestock-fish integrated production systems,
- Pre-breeding and participatory breeding, and
- Scientific organic farming.

3.7.4.82. The Commission recommends setting up of new National Centres / Institutes in the above areas or mandate existing ones to address those areas

specifically. Such institutions could be set up in existing ICAR institutes or SAUs or institutes of other relevant Ministries but should be functionally and financially autonomous with their own Governing Boards. In the Commission's view, the institutions should be built around outstanding scientists and research leaders of proven capability in these fields. Such committed research leaders should be first identified and involved in the project design process. The National Challenge Programmes (identified by the Task Group and other committees) should likewise be led by scientist–achievers.

3.7.4.83. The premier research institutes, such as IARI, IVRI, should be designated as Institutions of National Importance. The Commission recommends that such institutes should be given special funds and organizational and management supports to empower them to enrich the Indian agricultural knowledge system necessary for enhancing country's competitiveness at the global level on one hand and to serve the majority small and marginal farmers, often inhabiting vast rainfed drylands and other poorly endowed non-congenial agro-climatic regions, on the other. A National Council for Global Leadership in Agricultural Science and Education should be set up under the chairmanship of the Minister for Agriculture to give guidance to these new initiatives and to position India as a leading player in international agricultural R&E system.

3.7.4.84. It is strongly recommended to increase the R&E intensity to 1.0 percent (from current level to 0.34 percent) of AgGDP. The existing serious imbalances in funds allocations to different agro-ecological regimes and commodities should be corrected by allocating larger proportions to eastern region to harness the high untapped agricultural growth potential, as also to rainfed arid and semiarid drylands and to livestock and fisheries subsectors. The resources recently allocated to the National Horticulture Mission need to be aligned to priority areas for technology development for prevention of post–harvest losses, processing, value addition, development of specialty varieties (*viz.* for processing) and production and distribution of quality planting materials.

3.7.4.85. A package of reforms aimed at enhancing autonomy, improving decentralization and devolution of power, and improved financial management through built-in monitoring and evaluation is required. Both ICAR and SAUs should commit themselves to such reforms. Support of high level policy makers at both the Central government and State government levels is needed to implement this far reaching reform agenda.

3.7.4.86. The following additional policy reforms by Central and State Governments are recommended:

- Balance expenditure per scientist in SAUs at par with ICAR.
- Maintain critical levels of scientific and resource mass in different ICAR Institutes and SAUs.
- Enhance share of operational expenses of scientists.
- Dedicate adequate public funds to promote basic and strategic research as well as to develop human capital.
- Promote competitive funding for networking, institutional reforms, addressing R&D challenges.
- Strengthen project-based funding with clearly defined outlay-outcome matrix on the lines of The Log Frame Options.
- Evolve National Innovation System aligning policy, incentives and regulations to foster innovation and entrepreneurship.
- Establish Genius Awards for young scientists to attract talented youth to agricultural research, technology development and education.
- Strengthen IPR regime for technology transfer, resource generation and evolving competitive market with due provision for social inclusion in access to new technologies.

3.7.4.87. SAUs are generally starved of operating funds and now largely depend on ICAR. The shortage of funding in the SAUs has had adverse effects on human resources development, research infrastructure, and linkages with farmers. There is an urgent need to sensitize policy makers at the State level to the payoffs to investing in

research. At the same time, the Central Government might develop a funding formula that supports the weaker States, but provides incentives to stronger States to increase their funding (e.g., matching grants). A key role of Central research is to generate spillovers to enhance efficiency in State research programmes.

3.7.5.0. Epilogue: Summary Policy Recommendations

3.7.5.1 Technological upgradation of Indian agriculture is a core element of the agricultural development strategy. The Green Revolution, built through synergy of technology, policy, services and farmers, ushered in 1968, resulted in tripling of foodgrains production (80% through yield enhancement), which more than halved percentages of hungry and poor people, enhanced employment and farmers' income, and increased food self-sufficiency and national confidence.

3.7.5.2 Today, however, India's agricultural growth rate (1.5%) has slipped below the population growth rate (1.8%), against the overall GDP growth rate of nearly 8%. While agriculture's contribution to national GDP has decreased to about 20 percent, it employs about 60 percent of the country's workforce. These have serious implications for economic growth, food security, equity and rural welfare. The "champagne glass" has further truncated. Stubbornly high incidence of hunger and poverty, technological fatigue, serious yield gaps, huge post-harvest losses, decreasing net trade intensity, low and stagnant farmers' income, declining holding size and widening rural-urban (Bharat-India) divides are matters of serious concern. Investment and capital formation in agriculture has drastically declined while the dependence on agriculture for livelihood security continues to be extremely high.

3.7.5.3. The "business as usual" will thus not do and agriculture can not be made to wait. The problems of Indian agriculture and farming community should be diagnosed more systematically and critically and disaggregated over the different agro-ecological regions and socio-economic regimes so that effective malady-remedy combinations could be put in place. Policy provisions should support the following thrust areas:

- Protecting yield and productivity gains, extending the gains to new areas, and enhancing yield ceilings and achieving new gains; bridging yield gaps; minimizing post-harvest losses, augmenting value addition and improving productivity and farmers' income; and promoting eco-technologies rooted in the principles of ecology, economics, equity and employment towards an Ever-green Revolution.

- Exploiting the gene revolution (biotechnology); benefiting from information and communication technology revolution, space, nuclear and nanotechnologies; and promoting knowledge-based precision farming systems, intensification and diversification.

- Protecting and improving natural resources (land, water and biodiversity); addressing environmental concerns, ecological security, agricultural biosecurity and sustainability; and managing climate change and natural disasters.

- Seeking congruence of productivity, profitability, sustainability and equity; addressing gender issues and problems of the poor and the excluded, particularly of small and marginal farmers and land-less agricultural labourers; and managing liberalized trade in the globalized world by addressing issues related to global competitiveness in the context of the WTO/ AoA.

3.7.5.4 More specifically, the following aspects will be front runners:

- The accent on horticulture, livestock, fisheries, specialty enterprises, value-added products, precision farming, organic farming, biomass recycling and energy farming and market-driven diversification should further be intensified.
- Rising capital intensity, high premium on quality, food, health and environmental safety and increasing concerns of biosecurity, climate change, gender issues and sustainability must be addressed by research and technology development programmes.

- Yield growth rates of foodgrain crops should be restored to about 2.5 percent and the horticulture, livestock and fisheries production growth rates should be raised to about 6 percent and above so as to achieve the stipulated overall agricultural growth rate of 4 percent.
- The needs and prospects of rainfed dryland and semi-arid areas, hill and mountain agro-eco systems and other noncongenial areas must be addressed on priority basis, including the increased use of participatory breeding and other participatory researches by effective involvement of grass root people.
- Several of the above issues should be designated as National Challenge Programmes and, based on critical gap analysis, should be institutionalised under the leadership of scientist-achievers.

3.7.5.5 Observing that the (first) Green Revolution has run its course, and reiterating his commitment to science- and knowledge-led transformation of the agrarian economy, the Prime Minister , in his call for a Second Green Revolution, in keen to move towards an Ever-green Revolution which must build on but avoid the pitfalls and weaknesses of the First Green Revolution. The move should adopt the following three-pronged approach:

- Prioritise strategic research and technology development programmes, including cutting-edge technologies, geared to meet the technological problems retarding and decelerating agriculture-led growth and development and to achieve desired competitiveness, efficiency, productivity and income growth alongwith desired sustainability and inclusiveness.
- Realize that science and technologies must have a human face and cannot operate in a vacuum. Therefore, it is absolutely necessary to formulate clear cut goals, policies, strategies and programmes and adopt participatory (and proprietary when necessitated in national interest) approach for harnessing the (unlimited) power of science and for synergizing technological and social revolutions by duly enhancing social science research capacities and building bridges and partnerships among policy makers, scientists, development practitioners, farmers and other stakeholders.

- The National Agricultural Research System, the Technology Assessment and Transfer System, the Knowledge System (skill development, re-tooling, indigenous knowledge), the Humanware aspects, Enabling Mechanisms (IPR, SPS) and Services must be synergistically aligned, restructured and revitalized. The perpetuating functional rigidities and lack of responsive institutional support and mechanism should be overcome to impart efficiency, transparency and accountability at various levels.

3.7.5.6 A package of reforms aimed at enhancing autonomy, improving decentralization and devolution of power, and improved financial management through built-in monitoring and evaluation is required. Both ICAR and SAUs should commit themselves to such reforms. Support of high level policy makers at both the Central government and State government levels is needed to implement this far reaching reform agenda.

3.7.5.7. The following additional policy reforms by Central and State Governments are recommended:

- Balance expenditure per scientist in SAUs at par with ICAR.
- Maintain critical levels of scientific and resource mass in different ICAR Institutes and SAUs.
- Enhance share of operational expenses of scientists.
- Dedicate adequate public funds to promote basic and strategic research as well as to develop human capital.
- Promote competitive funding for networking, institutional reforms, addressing R&D challenges.
- Strengthen project-based funding with clearly defined outlay-outcome matrix on the lines of The Log Frame Options.
- Evolve National Innovation System aligning policy, incentives and regulations to foster innovation and entrepreneurship.
- Establish Genius Awards for young scientists to attract talented youth to agricultural research, technology development and education.

- Strengthen IPR regime for technology transfer, resource generation and evolving competitive market with due provision for social inclusion in access to new technologies.

3.7.5.8. Codes of Conduct should be introduced for public-private sector partnerships based on respect for each other's obligations, where IPR, breeders' rights and other forms of proprietary control over technologies and products of commercial significance, are important. The code of conduct should be developed through extensive consultation among all partners and can be used in the entire national scientific research system.

3.7.5.9. In order to promote investment in agricultural research by private sector, the following suggestions may be considered:

- Provide tax concessions and tax holidays to promote private sector's contribution to R&D from 14 percent to 33 percent.
- Strengthen regulatory mechanisms, especially IPR, SPS and quarantine facilities, to promote technology acquisition. In doing so, however, ensure social inclusion in access to technologies and devise mechanisms for timely delivery of the technologies needed by the resource-poor.
- Encourage testing of private sector's new varieties and other technological products by public sector regional and national testing programmes.
- Undertake joint research activities with clearly defined responsibility and accountability of and profit sharing by various partners.

3.7.5.10. SAUs are generally starved of operating funds and now largely depend on ICAR. The shortage of funding in the SAUs has had adverse effects on human resources development, research infrastructure, and linkages with farmers. There is an urgent need to sensitize policy makers at the State level to the payoffs to investing in research. At the same time, the Central Government might develop a funding formula that supports the weaker States, but provides incentives to stronger States to increase

their funding (e.g., matching grants). A key role of Central research is to generate spillovers to enhance efficiency in State research programmes.

3.7.5.11. In order to enhance effective technology transfer and to bridge the yield and other performance gaps at various levels, the Commission recommends the following:

- Convert the Krishi Vigyan Kendras into Krishi and Udyog Vigyan Kendras in order to give concurrent attention to on-farm and off-farm livelihood and to promote end-to-end approach and to link production with marketing and consumption.
- Establish 50,000 Farm Schools in the fields of farmers-achievers to spread proven technologies through farmer-to-farmer learning.
- Integrate the activities of KVKs, ATMAs (Agricultural Technology Management Associations), Lab-to Land and Land-to Lab programmes, Self Help Groups, agricultural cooperatives and other grassroot institutions.
- Establish National Participatory Research, Demonstration and Training Centres to integrate available scientific institutions, extension programmes and grass-root institutions related with agricultural development including the proposed initiatives, namely, Farm Schools, Soil Health Cards, Kisan Credit Cards, Agriclinics and Agribusiness centres.
- Establish a National Council of Innovative Farmers to provide a structured opportunity for sustained scientist-farmer dialogue.
- Establish National and local level Science and Technology Alliances (Consortia) for rural livelihood security.
- Increase the involvement of small holders in public-private partnership in high-value agriculture by integrating the small-holders with the high-value agricultural and supply chain and making necessary provisions for remedying market failures and structuring the SFEs on the NDDB model.

3.7.5.12. The recommendations of the Swaminathan Task Group on Revamping and Refocusing of National Agricultural Research to meet current challenges and those of

the Mashelkar Committee on Reorganization of ICAR should be examined and the accepted ones should be implemented without further delay.

3.7.5.13. The ongoing revolutionary breakthroughs in biological, information and other related sciences and technologies offer great hope for meeting the earlier-mentioned challenges. Fortunately, there is a convergence of political will to capture these breakthroughs for improving livelihood security of farmers and the other 'left outs'. However, the convergence was not duly reflected in the 2006-2007 budget allocation of the Government of India, and the country is way off the track in meeting the Millennium Development Goals. Scientists should actively participate in the policy debate leading to investment decisions. Concrete actions in terms of financial allocations, institutional and infrastructural support, human resources quality and number, and producer-market and backward–forward linkages are urgently needed.

3.7.5.14 Investment in agricultural research and education should be increased from current level of 0.34 percent of the agricultural GDP to at least 1 percent. The Government policy makers, scientists, public sector, private sector, farmers and other partners in agricultural development must strike a new pace and synergy, otherwise we will make little progress towards meeting the daunting challenges of climate change and globalisation, among other challenges, and would not reach the unreached – the one–quarter of the World's hungry and poor who have their homes in India.

3.7.5.15. As highlighted in the Third Report of the NCF, a provision of Rs. 1000 Crore as a one–time grant to NARS is required to bridge the critical gaps in scientific infrastructure in frontier areas of technologies, so as to enable the Nation to enhance its agricultural competitiveness and to benefit from science–led Ever-green Revolution. This additional allocation will particularly strengthen work on conservation and improvement of livestock heritage of the Nation, genomics, bioinformatics, bioremediation and harnessing gene–richness of microorganisms, biomass utilization, value addition and use efficiency of plant nutrients and water. A

National Board for Strategic Research in Agriculture may be set up to coordinate and harness advances in basic science for agricultural progress.

3.7. 5.16. “We have miles to go”. But, we must reach there in time. Already nearly 160 districts have been declared as suffering from Naxalite activities. The existing serious imbalances in funds allocations to different agro-ecological regimes and commodities should be corrected by allocating larger proportions to eastern region to harness the high untapped agricultural growth potential, as also to rainfed arid and semiarid drylands and to livestock and fisheries subsectors. The National Horticulture Mission and other such Missions should be technology- rich and technology-driven and not subsidy-rich and subsidy-driven.

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CHAPTER 3.8

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

CREDIT AND INSURANCE

3.8.1 Credit is a critical input for development of agriculture and activities allied to agriculture. The key task is to ensure a convergence among credit availability, effective credit delivery system and adequate credit absorptive capacity of the farmers. The mere availability of credit does not ensure its productive use and increased production/value addition. The Advisory Committee on flow of credit to Agriculture and Related Activities [2004] appointed by the Reserve Bank of India under the Chairmanship of Prof. V.S. Vyas has rightly observed "credit must reach all its users effectively; it must be on time, in required quantities and addressed to the right activity mix. Raising agriculture to higher thresholds to usher in value added, hi-tech enterprises require strengthening the delivery system. These tasks begin at home of the rural financial institutions: cooperatives, regional rural banks and the rural branches of the commercial banks. Their organisation must allow flexibility of approach, innovations to meet new needs, empathetic treatment of the clientele and responsiveness. All these call for changes in organisational structures, procedures and above all, the mindset of those who manage the system."

3.8.2 The rural banking system in India has adopted a multi agency approach. There are four sets of institutions providing financial services in the rural areas. These institutions are the commercial banks both in public and private sector with a large network of rural branches, cooperative credit structure [three tier federal structure in most of the States i.e., the State Cooperative Bank (SCB) at State level, the affiliated District Central Cooperative Banks (DCCBs) at district level and the Primary Agriculture Credit Societies (PACS) at the village level; in some of the smaller States, the structure has two tier with State Cooperative Bank at State Level and Primary Agriculture Credit Societies at village level affiliated to the SCB], the long term credit under the cooperative system is met through the State Cooperative Agriculture and Rural Development Banks

[SCARDBs] at State level with branches or affiliated Primary Cooperative Agriculture and Rural Development Banks [PCARDBs] at tehsil or block level and finally the Regional Rural Banks [RRBs]. While the cooperative banks lend for agriculture and activities allied to agriculture mainly through the cooperatives, the RRBs were established to focus on small/ marginal farmers, agricultural labourers and artisans etc. The commercial banks in addition to general banking functions are bound by the guidelines issued by the Reserve Bank of India to lend 40% of the aggregate credit to the priority sector. These banks are expected to have at least 18% of the net outstanding credit for agricultural purposes of which 75% has to be for direct agriculture loans.

3.8.3 In the pre-independence period, agricultural credit to farmers was exclusively provided by the cooperative banking system with the exception of plantation finance by the commercial banks and taccavi loans by the Government. This credit system had no explicit relationship with input supply or farm investment and was really seen as an alternative system to village moneylender. The institutional credit was extremely small and formed about 7.2% of total debt outstanding of the rural households in 1951. The most notable developments in the rural credit since independence have been the Report of the Rural Credit Survey [1954], conversion of the Imperial Bank of India into the State Bank of India to extend banking facilities in the countryside, the formation of the Agriculture Refinance Corporation [the forerunner of the Agricultural Refinance and Development Corporation and the National Bank for Agriculture and Rural Development [1982], the introduction of the Banking Regulation Act, 1965 [as applicable to the cooperative banks], nationalisation of private sector banks [1969], the setting up of Regional Rural Banks [1975], the instructions of the Reserve Bank of India to the public sector banks about Credit Deposit Ratio [CDR] in 1980 and achieving the target of 18% of net bank credit for lending to agriculture to be met by March, 1990 [however, only 9 of the 27 public sector Banks had achieved it by end March, 2004][1], introduction of the scheme of linkage of the Self Help Groups [SHGs] with the banking system in 1991-92 for micro finance, introduction of the Rural Infrastructure Development Fund [RIDF] at

[1] Even by end of March 2005, the aggregate credit outstanding to agriculture formed 15.7% of net bank credit in the case of public sector banks and 12.1% in the case of private sector banks. [Source : Trends and Progress of Banking in India: 2004-05]

the National Bank for Agriculture and Rural Development [NABARD] in 1995-96 wherein the banks which failed to meet the target for priority sector/agriculture contributed an amount based on their shortfall to the RIDF, the Kisan Credit Cards [KCC] in 1998 and the announcement of the 'farm credit package' by the Government in June, 2004 which envisaged doubling the flow of credit to agriculture in ensuring three years.

3.8.4 The objective of the agricultural credit policy in India since independence has been gradual replacement of moneylenders initially by credit cooperatives and later on by multi agency approach [including asking commercial banks to open more branches in rural areas and establishment and expansion of the Regional Rural Banks] and lowering of the interest rates. It was hoped that these would relieve the constraints on agricultural growth. This was also considered income - transfer mechanism in favour of the poor farmers. The policy bias in favour of lower interest rates on agriculture credit continues with commercial banks deciding to charge interest not exceeding their Prime Lending Rates [PLR] to agricultural borrowers and the announcements in the Union Budget 2006-07 regarding a 2% rebate on interest in respect of crop loans issued during 2005-06 and also the decision to ensure that the farmer receives short term credit at 7% per annum, with an upper limit of Rs. 3,00,000/- on principal amount [**Government to give subvention to ensure this**].

3.8.5 There is no doubt that agriculture credit has increased considerably and shown more than 14% growth per annum on a decadal basis. The share of institutional credit in total cash borrowings by the cultivator households in rural area increased from 21.7% in 1971-72 to 56.2% in 1981-82, declined to 55% in 1991-92 and again increased to 59.5% in 2002-03. [All India Debt and Investment Survey - NSS 59th Report - Household Borrowings and Repayments in India during 2002-03]. In absolute terms, the total credit flow during 2004-05 was Rs. 1,25,309 crore against the target of Rs. 1, 05,000 crore showing an increase of 44.1% over the previous year. Against the target of Rs 1,41,000 crore for 2005-06, the disbursements by 31st December, 2005 had already reached Rs. 1,17,899 crore [Economic Survey 2005-06]. The flow of institutional credit during the last few years is shown in **Table 1**.

Table 1: Flow of Institutional Credit to Agriculture

Agencies	Year			
	2002-03	**2003-04**	**2004-05**	**2005-06***
Cooperative Banks	23,716	26,959	31,231	28,947
RRB's	6,070	7,581	12,597	11,146
Commercial Banks	39,774	52,441	81,481	77,806
	69,560	**86,981**	**125,309**	**1,17,899**

Source: ***Economic Survey 2004-05 and 2005-06.*** **** Upto 31st Dec, 2005***

Incidentally, the total institutional credit to agriculture during 1997-98 was only Rs 31,958 crore and registered an increase of over 392% between 1997-98 and 2004-05.

The direct agricultural loans outstanding in the case of the scheduled commercial banks had reached Rs. 1,22,370 crore as at the end of 2004-05 as compared to Rs. 90,451 crore as at the end of 2003 - 04.

3.8.6 **However, despite the substantial increase in agriculture credit particularly during the last two years, there are certain issues which deserve attention. The first and the foremost is the question of the outreach of the formal credit institutions in the rural areas**. According to the NSS Report No. 498 –Situation Assessment Survey of Farmers – Indebtedness of Farmer Households - NSS 59th Round - May 2005, the professional moneylenders had the highest percentage of farmer households indebted to them. The position is shown in **Table 2.**

Table 2: Indebtedness of Farmer Households

S. No.	Source	Percentage of farmer households indebted
1	Banks	22.5
2	Cooperative Societies	21.7
3	Government	2.5
4	Professional Money Lenders	24.1
5	Relatives and Friends	15.0
6	Traders	10.0
7	Others	4.2
	Total	**100.0**

Source: ***NSS Report No. 498 –Situation Assessment Survey of Farmers – Indebtedness of Farmer Households- NSS 59th Round - May 2005***

3.8.7 The findings of the Rural Finance Access Survey done by the World Bank and the NCAER in Andhra Pradesh [AP] and Uttar Pradesh [UP] 2003 also reveals that only 24% of the total rural households in AP and 19% in UP had access to formal credit while 56% and 51% of the households in those two States respectively depended on private credit sources. Access to formal credit by types of households is shown in **Table 3**.

Table 3: Access to Formal Credit by Types of Rural Households [Percentage]

State	Marginal Farmers	Small Farmers	Medium Farmers	Large Farmers	Other Households
AP	11.8	33.8	41.9	56.3	20.7
UP	13.5	24.7	30.8	36.1	17.7

Source: ***Rural Finance Access Survey by World Bank and NCAER in A. P. and U. P. - 2003***

3.8.8 **It is disturbing that after nearly 37 years of the nationalization of the private sector banks and over 15 years of credit targeting for agriculture, on all India basis, the banks had a smaller outreach of the Indian farmers as compared to the professional moneylenders**. [NSS 59th Round Report referred earlier] In Andhra Pradesh, Bihar, Manipur, Meghalaya and Rajasthan, the combined outreach of the banks, the cooperative societies and the Government [the entire formal sector put together] was less than the professional moneylenders. In addition, the moneylenders had the largest outreach among all sources in Karnataka and Tamil Nadu. The traders had the best outreach among all agencies in West Bengal, Jammu and Kashmir, Nagaland and Sikkim. The friends and relatives were the most common source of funding to farmer households in Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Mizoram and groups of Union Territories.

3.8.9 The formal credit agencies i.e., the banks had the best outreach only in Jharkhand, Orissa, Tripura, Uttar Pradesh and Uttaranchal; the cooperatives had the best outreach in Chhattisgarh, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra and Punjab. The continued poor financial health of the credit cooperatives is a major issue in improving the outreach of the formal system. Keeping in view that the credit societies had the largest out reach in as many as seven States including agriculturally important States like Punjab, Haryana, Gujarat, Maharashtra, Madhya Pradesh and Kerala the issue

regarding revitalisation of credit cooperatives[2] which is under discussion for well over a decade, needs to be implemented on a priority basis.

3.8.10 **Besides the low outreach another issue is the low Credit Deposit Ratio [CDR] of the rural and semi urban branches and the declining trend observed during the nineties.** The Reserve Bank of India had advised the public sector banks to achieve a CD ratio of 60% in rural and semi-urban branches separately, across India. In a circular dated June 18, 1980 issued to the public sector banks, the RBI advised that, "While it is not necessary that this ratio should be achieved separately branch-wise, district-wise or region-wise, the banks should, nevertheless, ensure that wide disparity in the ratio is avoided in order to minimize regional imbalances in credit deployment". The instructions were reiterated to public sector banks in 1995. However, the CD Ratio for rural offices of the Scheduled Commercial Banks showed a continuous decline between 1991 to 2001 is shown in **Table 4**.

Table 4: Credit-Deposit Ratio of Rural Offices of Scheduled Commercial Banks

[Rs in Crore]

Year	Deposits Amount	Credit Amount	CD Ratio
1991	31,010	18,599	60.0
1992	35,750	20,692	57.9
1993	41,410	22,906	53.3
1994	49,331	24,670	50.0
1995	51,820	25,174	48.6
1996	61,313	29,012	47.3
1997	73,770	32,525	44.1
1998	86,706	37,598	43.4
1999	1,02,697	42,091	41.0
2000	1,20,539	48,753	40.4
2001	1,39,431	54,431	39.0

Source: ***Rural Economy – An Economic Times Intelligence Group Report***

[2] A number of Committees/Groups have examined this issue including Shri Jagdish Capoor Committee, State Minister's Group under Shri Bhikhe Patil and Shri Vaidyanathan Committee in the last about 10 years.

3.8.11 While the number of deposit accounts with rural offices of the Scheduled Commercial Banks increased by nearly 21% between 1991 and 2001 the number of credit accounts [borrowals] declined by 30.12% [from 322.82 lakh to 224.58 lakh] in the same period and the credit deposit ratio continuously declined. Further, while, the decline in credit-deposit ratio of the rural branches is in line with the overall decline in CD Ratio, the decline in the case of rural branches has been steeper as shown in **Table 5**.

Table 5: Population Group-Wise Position of Credit Deposit Ratio

Population Group	1990	2000	2004
Rural	63.9	39.4	43.7
Semi-Urban	51.6	34.4	37.9
Urban-Metro	70.8	67.7	66.8

Source: ***Report of the Export Group on CD Ratio 2004 – Para 3.8***

3.8.12 **Besides the low outreach, low credit deposit ratio, the other issue is that the proportion of small and marginal farmers accessing formal credit is much lower than the comparatively bigger farmers.** This has been revealed by the RFAS - 2003 referred to earlier. The NSS Report No.498: Indebtedness of Farmer Households - 2003 also reveals that the smaller land holders primarily rely on informal sources for their credit needs as shown in **Table 6**.

Table 6: Distribution of Outstanding Loans among Farmer Households according to Land possessed

Land in hectares	Formal				Informal				
Size of Land Possessed	Govt.	Cooperative Societies	Banks	Total	Money Lenders	Traders	Relatives and Friends	Others	Total
Less than 0.01	1.9	5.3	15.4	**22.6**	47.3	4.0	23.1	3.0	**77.4**
0.01 to 0.40	4.0	14.5	24.8	**43.3**	31.8	4.9	14.9	5.1	**56.7**
0.41 to 1.00	3.8	17.0	32.0	**52.8**	30.8	4.6	9.1	2.7	**47.2**
1.01 to 2.00	1.7	20.5	35.4	**57.6**	25.9	4.2	8.8	3.5	**42.4**
2.01 to 4.00	1.5	22.5	41.0	**65.0**	23.4	4.7	5.1	1.8	**35.0**
4.01 to 10.00	1.3	23.0	44.5	**68.8**	16.7	6.1	5.6	2.8	**31.2**
Above 10.00	1.7	23.2	42.7	**67.6**	17.2	10.6	4.0	0.6	**32.4**

Source: ***NSS Report No. 498 –Situation Assessment Survey of Farmers – Indebtedness of Farmer Households- NSS 59th Round - May 2005***

The above data clearly presents that the informal sector had provided 77.4% of the debt outstanding from the farmers owing less than 0.01 hectare land and similarly 56.7% from farmers owing upto 1 acre land [0.40 hectare]. The moneylenders were the largest suppliers of credit to these categories of borrowers. As the land owned increased, the access to formal agencies for credit improved and it was 65% and above in case of all land owners possessing more than 2 hectare. The traders had met 10.6% of the credit outstanding of farmers possessing more than 10 hectare. In case of most other farmers it was around 4 to 6%. **However, in no category of landowners, the share of informal agencies fell below 31.2% and moneylenders share below 16.7% indicating that the informal agencies and particularly the moneylenders are still an integral part of the rural financial system and even the bigger cultivators borrow from them.**

3.8.13 Extremely low coverage of marginal and small farmers by the formal institution is a serious issue both from the borrower's and lender's view point as also from equity considerations. From the demand side, the small/marginal farmers generally do not have easy access to credit and a substantial part of credit they obtain is from informal agencies where the loan terms are often exploitative. This is despite credit targeting for commercial banks for agriculture/ weaker section etc. As per the current guidelines, the commercial banks are required to extend not less than 10% of the net bank credit to weaker sections comprising small/marginal farmers, landless labourers, artisans and borrowers under the Government sponsored poverty alleviation programme etc. However, as on 31st March, 2003 public sector banks had extended only 6.8% of the net bank credit to weaker sections. Only six out of 27 public sector banks had achieved the 10% target, with the rest ranging between 2% and 9.4%. The position has marginally improved by the end of March 2004, when 7 public sector banks had achieved the target and the overall achievement had reached 7.44% but was still lower than the target.

3.8.14 **An important connected issue is that the credit requirements of the rural people are varied in nature. They not only require credit for agriculture operations and other income generating activities but also for consumption purposes and for meeting medical/educational/other social expenses**. As a matter of fact the small and marginal farmers' borrowing for consumption and other purposes far exceeds the loans

for income generation activities. **Table 7** indicates the purpose wise break up of loan outstanding according to land possessed by farmer households in India.

Table 7: Distribution of Outstanding Loans on the Basis of Land Possessed by Farmer Households in India

Income Generating Purposes					Other Purposes					
Land Possessed [in hectare]	**Capital Expenditure In Farm Business**	**Current Expenditure in Farm Business**	**Non-Farm Business**	**Total**	**Consumption**	**Marriages and other Ceremonies**	**Education**	**Medical**	**Other**	**Total**
Less than 0.01	15.1	5.7	7.7	28.5	21.2	22.4	0.3	13.0	14.6	71.5
Between 0.01 to 0.40	13.3	9.5	12.3	35.1	14.6	20.1	1.0	7.2	22.0	64.9
Between 0.41 to 1.00	24.1	22.7	10.3	57.1	10.5	13.3	1.3	4.1	13.7	42.9
Between 1.01 to 2.00	32.6	32.0	4.6	69.2	8.7	9.9	0.5	2.4	9.3	30.8
Between 2.01 to 4.00	38.8	34.7	4.7	78.2	5.0	8.9	0.7	1.3	5.9	21.8
Between 4.01 to 10.00	41.1	39.8	2.3	83.2	5.9	5.0	0.5	1.2	4.2	16.8
Above 10.01	45.7	32.5	3.2	81.4	4.8	2.9	1.5	3.7	5.7	18.6
All India All sizes	30.6	27.8	6.7	65.1	8.8	11.1	0.8	3.3	10.9	34.9

Source: ***NSS Report No. 498 –Situation Assessment Survey of Farmers – Indebtedness of Farmer Households- NSS 59th Round - May 2005***

3.8.15 As the size of the land possessed increases [upto 10 hectare] the proportion of loan outstanding for production purposes show a continuous increase and loans for other purposes a decline. The proportion of loans for purposes other than income generation is as high as 71.5% and 64.9% in case of farmer household possessing less than 0.01 hectare and between 0.01 hectare to 0.40 hectare respectively. Loans for purposes other than income generating were lowest at 16.8% [for farmer households possessing 4 to 10 hectare land]. This shows that if the formal credit system continues to fail in meeting all credit needs of the farmers, the reliance on moneylenders and other informal agencies would continue and there would also be chances of diversion of money from the purpose for which credit was approved to other purposes. Greater flexibility in approach from the formal credit agencies and introduction of different credit products are needed. The

purpose wise loan outstanding of farmers possessing land upto 1.0 acre [0.4 hectare] needs a closer look. The loans outstanding for consumption and medical purposes for farmers possessing less than 0.01 hectare and upto 0.40 hectare land at 34.2% and 21.8% respectively of the total debt outstanding are very high. Bulk of these is also likely to be from the moneylenders and other informal agencies on unfavourable terms compounding the problem. A high percentage of loans for consumption and medical purposes could mainly be due to [a] uneven income streams and volatile nature of expenses, necessitating loans for smoothening funds inflow or [b] non-viable nature of the employment/profession of the borrowers. In the case of [a] the banking system could make efforts to find solutions and assume that the savings [uneven income flow] could be collected and in time of need loans could be provided. The strategies of the financial system for the situation could be to expand the micro finance programme and the banks introducing greater flexibility and new credit products suiting the needs of small/marginal farmers. It is important that the micro finance institutions including the Self Help Groups [SHGs] complement the efforts of the formal institutions. While the banks and other formal credit institutions are better placed [both resource and capacity wise] to meet the larger credit requirements and also long term loans, the micro finance institutions could meet the short term and emergent requirements of smaller amounts. The stronger linkage between the Self Help Groups [SHGs]/other financial institutions is needed. The SHGs/MFI's could recommend their members who have good credit history for need based larger loans from the banks and also do some monitoring/keeping an eye over such borrowers which would help in reducing the transaction/supervision cost of the banks. Under the SHG - Bank Linkage Programme, the emphasis so far has been on 'outreach'. The complementarities between the informal structures and formal banking system need greater emphasis. The approach can not be credit from formal institution or credit from micro finance institutions. The micro system has developed in our country with almost exclusive reliance on SHG - Bank Linkage Programme. This outreach programme in no way could be considered a substitute for the whole range of financial services which the farmers need from the banks. The question is that of financial exclusion of a large part of rural population which needs attention. However, the situation at [b] can not be handled by the financial system and requires relief, development of human capital, increasing

incomes and creation of more gainful employment opportunities. Development of land lease markets or land markets in due course could also help.

3.8.16 The SHG - Bank linkage Programme has already become the largest and fastest growing micro finance outreach programme in the world [nearly 2 million SHGs have been linked to the banks and the credit flow through the SHGs is nearly Rs. 4000 crore per year], efforts are now needed to further expand this programme particularly in Eastern and North East Region, U.P., M.P., Maharashtra, Rajasthan and Gujarat where the growth of this programme is much lower as compared to southern States. The programme is also attracting criticism such as:

- It has become a numbers game without adequate emphasis on quality of SHGs.
- Credit extended through the SHGs is not adequate to improve the member's income substantially.
- The poor require 'livelihood finance' rather than mere micro finance.
- By showing micro finance as a very successful programme and emphasising about its expansion both the banks and the State are not giving adequate attention to making qualitative improvements in delivery of agricultural credit.

3.8.17 While the constraints in the agricultural credit are discussed subsequently, the issue of the outreach which is extremely important particularly for the sub-marginal/marginal farmers, landless agriculture labour etc. has been discussed both from the supply side and the demand side in the following paragraphs.

3.8.17.1.0 Inadequate Access of Rural Poor – Supply Side Issues

The Transaction Cost

3.8.17.1.1 The transaction cost of rural lending in India is high primarily due to small loan size, large geographical spread and heterogeneity of borrowers. As the loan size increases, the transaction cost per unit of rupee lent comes down. Since agricultural loans are small and frequent the transaction cost is high. The lack of literacy and familiarity with documentation requirements among the rural borrowers adds to the problem. Really

speaking, the modern banking system/procedures/documentation requirements were not exactly designed for very small borrowers seeking small loans. Lot of innovation and investments in ATMs, IT etc. are needed to reduce the transaction costs The supervision cost of small rural loans is also quite high due to low density of borrowers/credit

The Risk Cost

3.8.17.1.2 From the bank's view point, in the case of rural poor there is greater uncertainty about their repayment capacity, their irregular and volatile income and expenditure pattern, possibilities of diversion of production loans towards meeting consumption requirements and consequently higher default risks. These problems are compounded by the non availability of suitable collaterals with the poor and the difficulties in contract enforcement in case of default. The poor credit discipline is also not conducive to aggressively expanding the outreach by banks. Due to extremely low incomes and non viable nature of their profession, there is always the risk of diversion of loan money if any emergency expenses have to be made leading to consequential repayment difficulties.

Lack of credit information

3.8.17.1.3 The formal agencies find it extremely difficult to obtain credit information about rural clients as they primarily rely on money lenders, traders and other informal lenders and it is most unlikely that they would be willing to part with any client information to formal agencies. The recent policy decision of the Reserve Bank of India regarding appointment of Credit Facilitators and Correspondents has the potential of becoming a useful arrangement to collect credit history/information regarding rural clients. The close relationship that is needed between the client and the rural branch is completely missing which is a serious constraint for the banks.

Branch Network

3.8.17. 1.4 The branch network of the scheduled commercial banks in rural areas expanded quickly after the nationalization of the private sector banks. The rural offices

of the scheduled commercial banks increased from 1860 in 1969 to 35,396 in 1994 and thereafter declined continuously as shown in **Table 8**.

Table 8: Branch Network of Scheduled Commercial Banks in Rural Areas

Year	1994	1995	1996	1997	1998	1999	2000	2001	2005*
Number of Rural Offices	35,396	33,017	32,981	32,909	32,854	32,840	32,673	32,640	32091
Percentage of Rural Offices to total Offices	55.9	51.7	51.2	50.5	49.9	49.2	48.7	48.3	47.0

Source: ***Rural Economy – An Economic Times Intelligence Group Report and Trends and Progress of Banking in India 2004 - 05.*** ****End June***

The decline in the number of rural offices could perhaps be explained by [a] Liberalisation of branch licensing policy [April, 92]. [b] Freedom given to banks to relocate the branches etc. [c] Allowing the banks to exit on mutual consideration wherever they had loss making branches at rural centres served by two commercial banks [August, 93] and [d] Graduation of rural centres to semi-urban centres due to change in population etc. However, we need to keep in mind that the physical presence of a branch and personal interface with the branch staff are crucial psychological elements in rural banking in India where the literacy levels are low and technology use and awareness level even lower. Closing down of a large number of rural branches when the scheduled commercial banks had failed to achieve the agriculture lending/weaker section lending targets and the other institutions in the multi-agency approach i.e., the cooperative banks and RRBs had serious financial weaknesses, was perhaps not an appropriate strategy. Liberalisation in branch licensing policy could have been restricted to the banks which had achieved the rural lending targets.

3.8.17.1.5 The private sector banks which have a very small network of rural branches face serious problems in rural lending.

3.8.17.2.0 Problem of Access - Demand Side Issues

The collateral

3.8.17.2.1 Providing suitable collateral to the bank is the single most important constraint faced by the rural poor. Most of the rural poor have virtually no collateral which could be offered by them to secure their loans. Most of them may have only a

small plot of land which may not be easy to mortgage. Even the title documents may not be readily available. The entire process of registration of mortgage would be time consuming and expensive. Absence of collateral acceptable to the bank is a major hurdle for the rural poor in accessing credit from formal credit institutions. In spite of the instructions of the Reserve Bank of India, the RFAS-2003 referred to earlier, indicates that 87% of households who borrowed from RRBs and 89% households who borrowed from the commercial banks had to provide collateral for their loans. This means lack of collateral in practice leads to nearly financial exclusion as far as credit from banks is concerned. The informal agencies take recourse to more unorthodox approaches and are able to secure their loans and are to that extent more users friendly.

Absence of Flexible Credit Products

3.8.17.2.2 **The formal credit institutions do not provide flexible products and services to meet the income and expenditure pattern of small borrowers in the rural areas.** The rural poor need to borrow frequently as their wage income [which is a very large source of income even for the marginal farmers] in very irregular. They also have irregular expenditure pattern for which they are unable to borrow from formal sources. A major reason for the success of the SHG –Bank Linkage Programme has been the flexibility provided to the SHGs to decide the quantum of loan and the terms and conditions. The distinction between the consumption loan and production loan in the case of very poor is also rather blurred. The formal institutions lack flexibility and try to provide the rural poor, loans with terms which are not at all suitable to them as they do not match the income - expenditure pattern of the rural poor. The unit cost, period of loan, down payment, collateral etc. in many cases are standardized and decided on an all India basis/Regional basis leading to serious mismatch between what the borrower wants and could afford and what is offered to him. The result is that when an emergency expenditure has to be made, the rural poor find the moneylender, traders and relatives more dependable than the banks. **The need is to develop different credit products innovatively at branch level to respond to farmers needs who have the requisite repayment capacity.**

Documentation/Procedural Delays

3.8.17.2.3 Documentation and procedures for taking a loan [even for opening a saving bank account] are time consuming and cumbersome. Most of the rural poor do require the services of 'other people' [including some kind of middle men] to help in completion of the documents etc., which costs money. The RFAS-2003 referred to earlier revealed that loan approval took an average of 33 weeks in the case of the commercial banks. The survey also revealed that 'hefty' bribe amounts had to be paid by the borrowers and the sanction were often of smaller amounts than those applied by the borrowers as shown in **Table 9**.

Table 9: Some Aspects of Borrowing from Formal Sources and Costs

S. No.	Particulars	Commercial Banks	RRBs	Co-operatives
1.	Loan amount received as a percentage of loan applied	91.8	88.2	83.5
2.	Percentage of household reporting bribes	26.8	27.0	9.7
3.	Bribe as percentage of loan approved*	10.1	18.2	19.9
4.	Time taken to process a loan application [weeks]	33	28.5	24.0

Source: ***RFAS - 2003***

*** About 27% of those sample farmers who borrowed from RRBs/Commercial banks and about 10% who borrowed from the cooperatives paid bribes.***

Distance of the Bank Branch

3.8.17.2.4 Another factor which adds to the cost of taking loan or the time spent in taking a loan from the banks is the distance from the village and the money/time required to be spent for each visit. According to the RFAS - 2003 [referred to earlier], the median distance to the nearest bank branch was 5 km. Keeping in view, the average time taken for a loan decision [28.5 weeks to 33 weeks in case of commercial banks and RRB respectively] it may result in at least 6 to 7 visits to the branch [one visit on a monthly basis and each visit would cost money] as against on the spot decision taken by informal agencies generally located in the village itself.

3.8.17.2.5 Sometimes these costs become so high that in spite of comparatively lower interest rates charged by the formal institutions, it works out more or less equal to the rate of interest charged by the informal agencies. A paper published in Economic and Political Weekly [14-20 August 2004] by Anita Gill based on experience in Punjab States as under: **"Then there are additional costs involved like frequent visits to the bank, fee, submission of documents [which more often than not require payment for services to someone who can fill the forms of the illiterate farmers] etc. All expenses can be added up in the rate of interest and the institutional rate of interest then is almost at par with the informal rate of interest".** This aspect can not be ignored and reveals that the stipulated rate of interest on formal credit constitutes only a part of the total cost which a farmer incurs in taking a loan. **The need is to reduce the total cost of the borrowers by simplification of loan procedures/documentation, reducing the sanction time and generally toning up the working of the branches. Extension of mobile banking facilities in certain far off areas, use of Facilitators and Correspondents etc. could also help.**

3.8.17.2.6 It may also not be out of place to mention that for an average small/marginal farmer the banks appear to be mainly for the rural elite who are educated and could deal with the bank staff.

3.8.18.0 General Constraints in Agriculture Credit

High Risks in Agriculture Credit

3.8.18.1 The minimization of lending risks is important for the banking institutions. The risks emanate from a host of factors including failure of investment, inadequate returns due to production/ market risks, defaults due to inadequate/improper appraisal of loans, diversion of loans, poor follow up and inability to realize the securities available to the bank. These risks are common to all investments. However, in the case of agriculture credit, these risks are more pronounced, due to the sector itself and certain aspects of Indian agriculture. Any agriculture investment could be affected by weather induced risks more so in the Indian conditions where over 60% agriculture is rainfed. Similarly, the market risks are normal to any business enterprise, but in Indian

agriculture, the risks are accentuated due to extremely small size of holdings [weak bargaining power of the grower], absence of transparency in auctions at the Regulated Markets, distress sales, huge post harvest losses, lack of value addition, absence of a well established godown network, nascent Commodity Future's market etc. **Some of these risks could be minimized by financial products/arrangements like rain insurance, crop insurance, medical/accident insurance, and more effective implementation of the Minimum Support Price across the country, use of commodity future market etc. However, some of these instruments are yet to fully developed and adequately used in rural India.** In absence of an effective risk mitigation system, the dryland farmers often become defaulter to the bank when the rains are not adequate and the yield declines. The defaulters are ineligible for fresh finance. NABARD had earlier tried 'Cyclical Credit' for the dryland agriculture. The need is to try the same approach with necessary modifications on a larger scale to test the idea and improve it so that it could be developed into a system of financing in these areas.

Weak Legal Framework and Constraints in Enforcement

3.8.18.2 The state of affairs regarding the land records, the difficulties in getting up to date information and registration of charge/mortgage etc. [land titling and registration system] and transfer of land are difficult under the present legal system which act as constraints to agricultural lending. The stringent tenancy laws which prohibit in some States tenancy arrangements or are very restrictive in nature has resulted in unrecorded and unofficial year to year oral lease practice [nearly 10.4 million hectare land forming about 8.2% of the total cultivated land was leased in 1991-92] which makes it nearly impossible for the tenant to raise formal credit on leased in land. The enforcement of contract by realizing moneys from execution of charged collateral is also extremely weak, time consuming and expensive.

Identification of Rural Credit with State

3.8.18.3 The Government's domination of rural financial institutions, announcement of waivers, write offs, interference in recovery procedures, cap on interest rates, use of credit cooperative for Public Distribution System etc and even conversion or

reschedulement of loans in case of natural calamities are provided in such a manner as appearing to be induced by the State. All this has resulted in close identification of rural and agricultural credit with State. The State is seen by most rural people as 'Mai Baap' who are always to give rather than to take back given amounts leading to poor credit discipline in rural lending. The percentage recovery of dues against demand in the case of District Central Cooperative Banks [DCCBs] at the end of March during the last three years was quite low and ranged between 61 to 67%, in case of SCARDBs between 49 to 58%, in case of PCARDBs between 44 to 53% and for RRBs around 70%. The loan portfolio of RRBs is however different from that of the DCCBs/PCARDBs which mainly lend for agriculture purposes in rural areas.

Personnel Policies of the Banks

3.8.18.4 Manning of the rural branches is an issue. There is a shortage of staff. The right type of orientation is not there. The branch manager rarely lives in the village where the branch is located or even in the surrounding area. The banks find it difficult to find enough 'volunteers' to work in rural branches. Most of the officers have to undergo a fixed duration rural posting during which they get lower perks like housing and transport allowance leading to a lower carry home salary, while their expenses go up as most of them maintain two establishments; one in the city mainly for securing a better medical and schooling environment for their family members and the other for themselves. Inadequate staff is a definite constraint in developing 'relationship banking' which is at the core of all banking activities. One man rural branches or branches being run by 2-3 persons including a gun-man are not uncommon. It is somewhat encouraging to observe that the banks have now again decided to recruit agricultural graduates as was done in the Seventies and was later on given up in the late Eighties. These graduates with requisite knowledge and experience could provide needed support for expanding agriculture credit. **The need is for further relook at the personnel policies of the bank including the career aspirations and provision of incentives etc. to develop and retain adequate number of committed staff in agriculture credit related departments/divisions in the banks.**

3.8.18.5.0 Weaknesses of the Specialized Rural Credit Institutions

Cooperative Credit System

3.8.18.5.1 The promotion of the cooperatives credit system in the present day form was an attempt by the Government to institutionalize credit in the rural area. The cooperative credit system was designed to serve the rural population primarily for agriculture development. The area of operation and functions at each level of the structure were predefined and limited. It was service as the main concern rather the returns/profitability to the contributors of the capital funds. State partnership in credit cooperatives was introduced on the recommendation of the All Indian Rural Credit Survey Committee. Besides, the State Partnership, a very substantial part of their resources were from the Reserve Bank of India and later NABARD. There were few implications of these [a] these institutions did not pay adequate attention to mobilization of rural savings particularly at the Primary Cooperative Societies at the village level [b] they lacked professionalism in management and developed as a lending arm of the State rather than true cooperatives [c] the Registrar of the cooperative became all powerful and decided most of the matters. The autonomy of these structures was compromised. At the primary agriculture credit society level, the Government appointed Secretary virtually run these organizations and the elected office bearers [the board of directors] had very limited say. The interference with the functioning of the cooperative structures, sometimes led to compromising the norms for credit worthiness. In due course, political expediency also led to laxity in quality of credit and its repayments. The Government of India's loan waiver scheme [1989] greatly aggravated the weak credit discipline and erosion in financial health. The State Governments have also been announcing waivers [sometimes interest wavier and some time partial loan write offs] which further undermines the credit discipline. Sometimes informal instructions are also conveyed to go slow on recovery [d] inadequate interest taken by the members who had only share capital with very low linkage with loan amount [e] since substantial part of the resources of the credit cooperatives were from RBI, the instructions were that this money had to be used for so called 'productive purposes'. The lending became rather straight jacketed and amounted to mainly distribution of moneys received from the higher tier. Timeliness, adequacy and

members needs for loans became secondary. Generally the members of the credit cooperatives had to approach money lenders and other informal agencies for much of their credit requirements leading to repayment problems as the informal system with stiffer terms of sanction and more effective monitoring [day to day contact] were able to get priority in repayment. It is not an uncommon that the members of the cooperatives borrow eligible amount from the cooperatives and maintain account with moneylender, Commission Agent etc. for balance of credit needs [f] the credit societies were also used for Public Distribution Scheme which often provided negative margins.

Deteriorating Financial Health

3.8.18.5.2 The cumulative impact of political interference, write offs, poor credit discipline, lack of professionalism in management, heavy dependence on higher financing agency for resources, certain sectoral issues and operational constraints has resulted in most of the primary credit societies running into loss and the financial health of a large number of district central cooperative banks, State Cooperative Banks and the Agriculture and Rural Development Banking System has become very weak as shown in **Table 10.**

Table 10: Financial Results of the Credit Cooperatives

Tier	**2000-01**	**2001-02**	**2002-03**
No. of State Cooperative Banks	29	30	30
Number in Profit	24	24	25
Number that have eroded net worth	6	9	8
Total accumulated losses [Rs in crore]	492	567	281
No. of District Central Cooperative Banks	367	368	367
No. of profit	247	243	237
No. that have eroded their net worth	139	139	144
Total accumulated loss [Rs in crore]	3177	3770	4401
Primary Cooperative Societies [approximately 1 lakh]			
Number in profit	46,807	45,292	58,683
Number in loss	41,991	43,511	53,626
Total accumulated loss [in crore]	2112	NA	4595

Source: Vaidyanathan Committee Report

Further, the District Central Cooperative Banks and the State Cooperative Banks have also eroded their deposits to the time of Rs. 3,100 crore and Rs. 142 crore respectively.

Table 11: Poor Recoveries and High Level of NPA of the System

	2000-01	2001-02	2002-03
State Cooperative Bank Recovery %	82	82	79
NPA%	13	13	18
District Central Cooperative Banks Recovery %	67	66	61
NPA%	28	22	20

Source: ***NABARD Annual Report 2003 - 04***

The overall financial performance of the District central Cooperative Banks was also quite unsatisfactory as shown in **Table 12**.

Table 12: Financial Performance of the District Central Cooperative Banks

	2002-03	2003-04
Total Assets [Rs in crore]	1,171506	1,25,685
Net Profit [Rs in crore]	-268	108

Source: ***Report on Trends and Progress of Banking in India 2004-05.***

Impairment of Governance

3.8.18.5.3 Another important aspect is that in the case a very large number of cooperative institutions their elected Board of Directors is under supercession as shown in **Table 13**.

Table 13: Elected Board of Directors of Cooperative Banks under Supercession 31st March, 04

Sl. No.	Particulars	SCB	DCCB	SCARDB	PCARDBs	Total
1.	Total number of institutions	31	365	20	768	1,184
2.	No. of Institutions where Boards are under Supercession	12	186	11	416	625
3.	%age of [2] over [1]	38.7	51	55	54.2	52.8

Source: ***Report on Trends and Progress of Banking in India: 2004-05***

Incidentally, it is also not uncommon that change in political set up in a State leads to supercession of the elected Board as the cooperatives are also an important conduit of distributing political patronage.

Higher Risk Profile of Credit Cooperatives

3.8.18.5.4 The credit cooperatives are local financial institution, with the mandate of working in a limited geographical area and also with limited client groups and sectors. This adds to the overall risk profile of these institutions. A District Central Cooperative Bank [DCCB] or a Primary cooperative Agriculture and Rural Development Bank [PCARDB] is likely to have nearly entire lending for agriculture and may be for two/three specific crops or investment activities popular in that area. Any climate aberration or adverse market swing could land this bank into serious financial difficulties. Due to the high risk profile, these institutions need different dispensation. If these are also treated at par with Commercial banks [with nation wide area of operation and lending in different sectors] they may require recapitalization support at regular intervals. For example, nearly 85% of the resources of the long term cooperative credit structure [SCARDB/PCARDBs] are provided by NABARD as they are not fund based institutions [they can mobilize only term deposits from members]. However, the rate of interest charged by NABARD to these banks is the same which is charged to the nationalized banks with much lower risk profile, and a large resource base with lower average cost of funds. However, inspite of the problem of higher cost higher risk the PSCARDBs/ SCARBs have to lend at more or less same interest rates as charged by the Commerce Banks. Obviously, many of these banks are non-viable and have also accumulated high NPAs as shown in **Table 14 and Table 15**.

Table 14: Financial Performance of the State Cooperative Agriculture and Rural Development Banks [SCARDBs] and Primary Co-operatives Agriculture and Rural Development Banks [PCARDBs] [Rs. in Crore]

Agency/ Year	Total Number	Profit making		Loss making		Overall Profit/Loss
		No.	Amount	No.	Amount	
SCARDBs						
2001-02	20	9	85	11	182	-97
2002-03	20	8	62	11	164	-102
2003-04*	20	10	97	9	210	-113
PCARDBs						
2001-02	768	196	47	572	323	-276
2002-03	768	208	52	560	369	-317
2003-04*	768	281	76	430	326	-250

Source: ***Report on Trends and Progress Banking in India: 2004-05.***

****Data in respect of ISCARDB and 57 PCARDBs not available. Both the SCARDBs and PCARDBs as a whole had non-viable operations during the last three years.***

Table 15: Non Performing Assets and Recovery Rates of SCARDBs and PCARDBs

Year	SCARDBs		PCARDB	
	NPA%	Recovery %	NPA %	Recovery %
31 march, 2002	18.5	55.0	30.2	48.0
31 march, 2003	21.0	49.0	33.0	44.0
31 march, 2004	26.7	44.0	35.5	44.0

Source: ***Report on Trends and Progress of Bankings in India: 2004-05***

While such high levels of NPAs and poor recovery position may not be justified, it should be carefully examined whether there is a need for a more diversified loan portfolio for these banks and also a different dispensation for resource raising including refinance from NABARD to these banks.

3.8.18.5.5 The financial impairment of the cooperative credit system has serious consequences for the rural poor/weaker section. The very fact that 144 District Central Cooperative Banks have eroded their net worth and do not comply with the requirements of section 11 of the Banking Regulation Act, 1965 [as applicable to the cooperative

societies] and their real net worth is not even Rs. 1 lakh makes them ineligible for NABARD refinance in the normal circumstances. Keeping in view that the cooperatives have the largest outreach among all formal and informal rural credit agencies in Maharashtra, Gujarat, Punjab, Haryana, Kerala, Madhya Pradesh and Chattisgarh their weak financial position and consequent reduction in lending has serious consequences in credit flow for agriculture. [Against a total membership of 13.541 crore at the Primary Agriculture Cooperative Societies level, nearly 31.38% [4.25 crore] belonged to scheduled castes/scheduled tribes]. **The deteriorating financial health of the cooperative banks has created a vaccume in agricultural credit flow in certain states/regions and it has also been very harsh for weaker section of the rural population.** Over time the share of the cooperative system in total lending for agriculture purposes has continuously declined as shown in **Table 16**.

Table 16: Flow of Ground Level Credit to Agriculture [short-term and long term] Agency wise. [Rs in Crore]

Agency	1992-93	1997-98	2000-01	2001-02	2002-03	2003-04	2004-05`
Cooperative Banks	9,378	13,975	20,718	23,524	23,716	26,959	31,231
Percentage of share	62%	44%	39%	38%	34%	31%	25%
Regional Rural Banks	831	2,040	4,219	4,854	6,070	7,581	12,597
Percentage of Share	5%	6%	8%	8%	9%	9%	10%
Commercial Banks	4,960	15,831	27,807	33,587	39,774	72,886	81,481
Percentage of Share	33%	50%	53%	54%	57%	60%	65%

Source: ***Vaidyanathan Committee Report and Economic Survey 2005-06***

In just 12 years i.e., between 1992-93 and 2004-05, the share of cooperatives in total agriculture credit has come down from 62% to 25%. This is mainly due to deterioration in financial health of the cooperatives, their inability to mobilize more deposits and stagnation in support provided by NABARD to the Cooperative Banks as the General

Line of Credit [which was used for this purpose by NABARD] from the Reserve Bank of India is being phased out.

3.8.18.5.6 An impact of the impairment of deposits [total erosion of deposits of DCCBs were Rs. 3100 crore and the SCBs Rs 142 crore] is that deposits of members of the cooperatives and public are at risk. Incidentally, the deposits of one SCB and 15 DCCB have been fully eroded.

This problem was well analyzed by Vaidyanathan Committee which stated as under:
"Thirty eight percent of the deposits of the DCCBs were from the 'cooperatives' including Primary Agriculture Credit Societies [PACS]. As statutory liquidity ratio [SLR] requirements of the urban cooperative banks and other banking institutions in the area could be placed in the DCCS [and in turn DCCBs place their SLR deposits with the State Cooperative Bank [SCB]], the deposits under the head "Cooperatives" may have a significant component of SLR related deposits. This adds to the overall risks to the cooperative banking sector, taking to much beyond the exposure of individual deposits in the district and state level banks. Erosion in the deposits of DCCBs/SCBs, therefore, could have a 'domino' effect on the banking system in the area".

Incidentally, the institutional deposits with higher tier are not covered by the insurance under the Deposit Insurance and Credit Guarantee Corporation of India [DICGC] and further even individual deposits are covered only upto Rs. 1 lakh. Further, deposits at the level of the Primary Agriculture Credit Societies [PACS] which as on 31st March, 2003 amounted to Rs 19,120 crore are not covered by the DICGC adding to the problem.

3.8.18.5.7 The multi agency approach in our country is a reflection of the need for different players in the field of agricultural credit. The refrain of all Committees and working groups which have looked into the performance of the cooperative credit system has been that the cooperatives have not done as well as they should have, but there is no question of getting away from the cooperatives in the long run. Experience reveals that the commercial banks have also shown some similar weakness in their rural lending operations that afflicted the cooperative system. **It may not be wrong to believe that**

some of the perceived weaknesses of the cooperatives are in fact not the weakness of the cooperatives but are associated with the clientele and the sector in which they operate. The problems of Indian agriculture do get reflected in the performance of the credit cooperatives as they primarily serve the agriculture sector. While the commercial banks have an important role in rural credit, in Indian conditions there is perhaps no alternative to the cooperatives at village level for provision of agriculture credit. The historic statement made in the All India Rural Credit Survey Committee Report in 1954 "the cooperatives have failed, but the cooperatives must succeed" perhaps holds well even today. **The need is to make a serious attempt to revitalise the cooperative system and devise strategies to ensure that these institutions work as autonomous/ responsible bodies and in a very professional manner. The NABARD/ RBI would also have to introduce special dispensations for them to counter their design deficiencies.** Unfortunately all support measures are sometimes wrongly described as concessions. **Need based support measures are essential to ensure that the specialised institutions are able to serve the less privileged people in the society.**

3.8.18.6.0 Regional Rural Banks [RRBs]

3.8.18.6.1 The Regional Rural Banks [RRBs] form an integral part of the Indian banking system with focus on serving the rural sector particularly the weaker section, i.e., the small and marginal farmers, agricultural labourers, artisans and small entrepreneurs for development of agriculture, trade and other productive activities. There are 196 RRBs operating in 26 States across 518 districts with a network of 14,446 branches [31-03-2004]. As per their organisation design, the RRBs combine the local feel and familiarity with rural problems, which the cooperative possess, and a degree of business organization as well as the ability to mobilize deposits, which the commercial banks possess. They are State-sponsored and partnered rural oriented commercial banks. These banks were expected to constitute a low cost banking system. The commercial banks not only contributed to their capital along with the union and the State Government but also provided crucial manpower and guidance. These banks were to be manned by rural based staff who were expected to be better suited to look after the needs of the rural population and also remain low cost. However, hopes of both low cost operations and

better attention to the needs of the rural population remained elusive mainly due to the unionized staff insisting on salaries comparable to commercial banks and the RRBs adopting 'narrow banking' and developed reluctance to lending. The investments in Government securities and banks had been exceeding the loan out standing as shown in **Table 17**.

Table 17: Some Financial Indications of RRBs [as on 31st March]

[Rs in Crore]

Particulars	2001	2002	2003	2004*	2005
Total Deposits	38,272	44,539	50,098	57,010	62,143
Loans outstanding	15,816	18,629	22,158	25,481	31,803
Investments [including assets with banking systems]	27,636	30,532	33,063	30,437	45,097

Source: ***Trends and Progress of Banking 2005*** **** 26 March, 2004***

The investments of the RRBs far exceeded their loans outstanding. As on 31st March 2005, the investments exceeded the loan outstanding by Rs. 13, 294 crore [42%].

3.8.18.6.2 The outstanding agricultural loans of the RRBs increased from Rs. 10,261 crore at the end of March 2003 to Rs 16,710 crore by end March 2005. However, keeping in view their mandate, existence of 14,446 branches [which are nearly 45% of the total number of rural offices of scheduled commercial banks] and refinance facilities from NABARD, these banks need to focus more on loans to farmers and rural artisans etc. Their share in agriculture lending at about 10% is very small as compared to their branch network. **With 167 out of 196 RRBs making current profits, the approach should quickly change from 'narrow banking' to a more aggressive lending based banking. With their rural based staff and a huge unmet demand for financial services in their operational areas these banks are yet to perform to their potential.**

3.8.18.7 There is a need for clear visualisation of the expected developments in the field of rural credit and particularly agriculture credit and the role expected from the Reserve Bank of India, NABARD, different types of banks i.e., the commercial banks, RRBs and the cooperative banks in the next 10-20 years to give it a firm direction. Based on the above, there has to be a road map for strengthening/improving those credit agencies which are weak and require support for enabling them to perform as per the

future role decided for them. It is expected that these institutions would continue evolving to meet the constantly changing requirements of the sector and hence require a closer watch for orderly growth. Similarly there is also a need to decide our role expectations from the micro credit system. The Government of India and the Reserve Bank of India may take a lead in the matter.

Regional Imbalance

3.8.18.8 There are wide disparities in the disbursement of agriculture credit in different regions. Though these could be partly attributed to differences in credit requirements, absorption capacity of borrowers etc in different regions but the disparities are too large to be explained by the above. In the case of the Scheduled Commercial Banks, against on an all India per capita credit of Rs. 128 [1996-2001], the per capita credit was very low in North Eastern region [Rs 17], Eastern Region [Rs 42] and Central Region [Rs 86]. The per capita credit in Southern Region [Rs 280] was the highest followed by Northern Region [Rs 153] and Western Region [Rs134]. The problem is compounded by the fact that the specialized rural credit institution i.e., the credit cooperatives are extremely weak in the North Eastern and the Eastern Region in particular. The long-term co-operative credit system [the SCARDBs and the PCARDBs] are virtually non-functioning in the entire North East Region and extremely weak in Bihar, Orissa, Jharkhand etc. Similarly the short term cooperative credit structure is also by and large in poor financial health in North East & Eastern Region. According to the Vaidyanathan Committee Report, forty three out of Sixty nine District Central Cooperative Banks in Eastern Region were loss making and thirty had NPA levels exceeding 40%. In the North East, the situation was worse as the percentage of recovery to demand at State Cooperative Bank Level on 30th June 2003 in the case of Arunachal Pradesh and Manipur was less than 20%, Assam and Nagaland between 20% and 30%, Tripura and Meghalaya between 30% and 40% and Mizoram about 48%. In a multi agency system, where one agency is weak, the others are expected to step in. However, the financially strong commercial banks including the public sector banks have failed to play this role. It is necessary that the credit policy should provide that where the localised institutions are weakened due to local problems,

greater risk profile or any other reason, the commercial banks must step in and shoulder greater responsibility in meeting the banking needs of the population.

19.0 Additional Suggestions - For Improving the Outreach and Agriculture Credit

Out Sourcing

3.8.19.1 One of the measures for improving outreach could be outsourcing. The Self Help Groups Linking with Banking System relied on outsourcing for credit decision making, monitoring and recovery of loans by the formal system to the informal system i.e., the Self Help Groups to reduce costs. Similarly the 'Facilitators and Correspondents' could be used by banks to reduce the costs and improve outreach. Similarly simplification of procedures and introduction of innovative schemes under which the poor could borrow and repay frequently as per their funds flow/position could be of help. Innovative arrangements need to be developed for collecting credit information regarding clients. There is a need to build up further on the SHG Bank Linkage Programme. The SHG members who are able to build up a good credit history and could use larger amount of credit may be identified and supported by the banking system. The SHGs are better suited to provide small credit for emergency needs or for tiding over temporary cash shortages but can not provide full financial services like the formal system. It would not be correct to expect the SHGs to substitute formal financial system; they can at best complement the formal system.

Land Leasing

3.8.19.2 Another aspect to be noted is that the small /marginal farmers are quite active in land lease market. In absence of supporting legal provisions they do not get adequate rent while leasing out land and are unable to raise credit on leased in land. Tenancy laws should encourage all sections of rural population to participate in the land lease market as per their needs. A well organised land lease market where leasing is logically permitted, would enable the small/marginal farmers and the land less who lease in land to raise loans from the formal agencies. Till such time, suitable amendments in land laws take

place, the banks need to finance oral lessees under joint liability groups and the State and Revenue authorities may give special support to the banks in recovering such dues.

Insurance for Covering Risks

3.8.19.3 An effective crop insurance system could minimize production risks. However, the present crop insurance under the National Agriculture Insurance Scheme [NAIS] is neither farmer friendly nor very effective. Certain changes in development of insurance as a financial risk mitigation arrangement are discussed subsequently. There is also a need for an integrated insurance cover for accident, natural death, medical and loss of hut by fire etc. The data given at para 14 shows that 13% and 7.23% of the outstanding debts of farmers owing less than 0.01 hectare and between 0.01 hectare to 0.40 hectare respectively were for medical purposes. In events of such needs, the farmers are quite likely to divert loan money and even default in payment if there were not financial products covering such emergencies or the rural public health system continued to be inefficient. In the first report of the National Commission on Farmers 'Serving Farmers and Saving Farming' has suggested a low cost Integrated Insurance Policy covering medical, accident, loss of dwelling unit, natural death etc. The proposal needs to be considered.

Agriculture Risk Fund

3.8.19.4 In event of successive droughts/floods etc the conversion /reschedulement of loans are not enough to provide adequate relief to the farmers. The successive loss of income would mean that the postponed debt burden plus the obligations for current loans would be beyond the capacity of the borrower to repay. The need therefore is for 'relief' by way of interest/principal write off which would need State support. An Agriculture Risk Fund with contribution from the Centre/State Government /Banks is needed to meet such situations. The bank could contribute say about 2% of the net profit [which could be given tax concession/exemption] towards the Fund on an annual basis. The localized financial institutions i.e., cooperatives/RRBs with limited geographical area, lack of diversification in lending and low volumes would require strong support from such a Fund to relieve the hardship of the farmers.

Fixing Proper Repayment Period

3.8.19.5 Fixation of shorter maturities than what is justified by increased income stream makes repayment difficult. Routinised fixation of repayment period instead of working out a mutually acceptable loan period based on carefully worked out future income flows could be the first step to check default in payment. The tendency on the part of the commercial banks to fix shorter maturities for loans is counter productive. As the commercial banks are constrained for long term resources, they should avail need based refinance from NABARD for long term funds or devise suitable systems under which longer end of maturities are held by institutions having large long term funds and commercial banks hold medium to short term maturities.

Credit Quality and Response to Development Needs

3.8.20 Agriculture credit quality could be significantly enhanced if the timeliness and adequacy is assured. The need is to fix realistic scale of finance for different crops and adjust it on a regular basis to take-care of the price changes and requirements of inputs based on new technologies and developments. Timeliness is crucial. Coverage of all agricultural borrowers by Kisan Credit Cards [KCC] with in a fixed time frame expeditiously is called for. Both in North East Region and hill areas, most of the agricultural operations are carried out by women farmers. However, there has been a general reluctance on the part of the banks to issue KCC to women farmers. This aspect needs to be examined. Even where land is in the name of the husband who has moved out of the village for job, the banks with proper documentation could issue KCC to the wife who is handling the agricultural operations. Further, the unit cost for different investments should be flexible and be used primarily as a general norm and not to be rigidly used irrespective of the need for higher amount of finance. The linkage between credit and marketing needs strengthening by increasing pledge finance, credit for marketing activities, developing storage facilities and lending against Warehouse Receipts. The banks need to explore the possibilities of providing loans to farmers against produce stored in their homes/godowns to minimise distress sale. 'Contract Farming' or other arrangements where the marketing risks are shifted to the processing

company or purchase of produce, facilitate flow of formal credit. The need is to develop farmer centric contract farming rules to encourage such developments. There has been remarkable growth of poultry and dairy in India. Development of commercial poultry/dairy farms requires bank credit. The banks need to meet credit requirements not only in traditional projects but also in new business enterprises for value addition/marketing which could create additional employment and provide linkages. It is expected that as the rural economy develops, there would be closer linkages between the farmers, trade intermediaries, food processing industry and the marketing units. These developments would need strong credit support. Farmers in dryland agriculture try to spread their risks by taking up different investments like animal husbandry, a micro non-farm activity and sometimes mix crop cultivation and horticulture etc. The banks need to look at their credit requirements differently and try to finance the basket of investments which would yield them a steady income.

3.8.21.0 Investment Credit – Crucial for Growth

3.8.21.1 Investment credit is used for realising long term potential of the agricultural farm by acquiring and using additional physical assets, improving the efficiency of existing assets [land improvement, land reclamation, using water lifting devices, water conservation devices etc.] and generating value addition etc. Long term investments in agriculture helps in improving the stock of equipments, tools and productivity of resources, which in turn enables the farmers to use their resources, particularly labour and capital more productively and realise the long term growth potential.

3.8.21.2 Though the long term credit has been increasing in absolute terms, as a percentage of total credit it has declined overtime. In 1999-00 the investment credit at Rs. 17,303 crore had formed 37.1% of the total institutional credit flow. Though the investment credit flow increased to Rs. 23,974 crore in 2002-03, it formed only 34.5% of the total. During 2004-05, the share of investment credit in the case of commercial banks was 27% where as in the cases of cooperative banks and RRBs it was only 16%.

3.8.21.3 The decline in growth of investment credit is mainly due to collapse/near collapse of the long term cooperative credit structure [SCLDBs and PCARDBs] in many

States like Maharashtra, Bihar, Orissa, the entire N.E. Region, Karnataka etc. The disbursements by this structure declined from Rs. 4776 crore in 2001-02 to Rs. 3956 crore in 2002-03. Further, as long term loans have to be invariably backed by mortgage of land etc., the need is for reduction of stamp duty and registration charges on mortgage, introduction of simple procedures for creation of charge, issuance of notification naming the Panchayat Headquarters for creation of equitable charge, improvement in availability of information regarding land records, etc. Land consolidation, more secure tenancy system, arrangement of long term leasing of water bodies would help in increasing investment credit. Strengthening of various development corporations such as State Irrigation Development Corporation, Forest Development Corporation and Agro Industries Development Corporations would also attract investment credit from banks for various development projects. The banks could also focus on providing group loans for tractors and other costly machines, development of water markets etc to avoid over capitalisation, encourage better use of capital assets and help in creation of employment opportunities in the form of encouraging youth to take up custom hiring etc. Development of rural infrastructure particularly roads, power, backward and forward linkages would also help in growth of term credit. High value agricultural activities require term credit support. **Bank could identify areas where farmers are moving towards high value agriculture and upgrade those branches by posting trained and technically qualified staff who could appraise such projects and commit necessary credit support.** Further, the marketing infrastructure, storages, cold chains, investments for value addition, agro-processing and agro-business are likely to be new investment areas in the years to come. The banks will be required to respond in a proactive manner to facilitate these developments.

3.8.21.4 There are also very large variations in per hectare average investment of term-credit between States. While for 2001-02 the per hectare average investment on all Indian basis was Rs. 456, in Orissa [Rs.205], Rajasthan [Rs. 324], Bihar and Jharkhand [Rs. 326], Chhattisgarh [Rs. 191], Maharashtra [Rs. 164], Jammu and Kashmir [Rs. 322] and in entire N.E. Region it was less than Rs 100. Increasing public sector investment in infrastructure, improving extension services, land records and land rights are some of the

issues which may require special focus for improvement considering the importance of increasing investments in agriculture for improving productivity. These States could also organise special studies to identify factors which could help in increasing investment credit flow. In the North-East Region, where land is owned by the Government or the community, the farmers are unable to offer land as collateral to the banks. This issue needs special attention and the banks and State Government need to reach a mutually acceptable arrangement in the matter.

Insurance Support

3.8.22 Insurance provides financial instruments to cover risks which are assessed in money terms. The National Agriculture Insurance Scheme [NAIS] was introduced from Rabi 1999-00 substituting the Comprehensive Crop Insurance Scheme [CCIS] which was operational between 1985 and 1999. Despite heavy subsidization by the Government [to the extent of nearly 75% of the scheme cost in the form of subsidizing the premium and meeting deficit cost] the coverage of NAIS has been hardly 10% of the Indian farmers. The National Agriculture Policy [2000] had stated "National Agriculture Insurance Scheme covering all farmers and all crops throughout the country with built in provision for insulating farmers from financial distress caused by natural disasters and making agriculture financially viable will be made more farmer specific and effective. Endeavour will be made to provide a package insurance policy for the farmers, right from sowing of the crop to post harvest operations including market fluctuation in the prices of agricultural produce".

3.8.23 The NAIS, at present covers 23 states and 2 Union Territories. Between 1999 and 2003-04 Rabi, the NAIS had cumulatively covered nearly 4.62 crore farmers and provided relief to 1.58 crore farmers for an aggregate amount of Rs. 4752 crore against premium collection of Rs 1242 crore. About 75 million hectare of cultivated area was covered. Though the NAIS mainly covered the loanee farmers, the coverage of non-loanee farmers was increasing. Incidentally, the claim experience of non-loanee farmers till 2003-04 was about three times higher than the loanee farmers which was rather unusual and needed to be looked at closely.

3.8.24 Under the NAIS, the loss assessment is based on an area approach, the 'Threshold Yield' and 'level of indemnity'. The Threshold Yield [TY] is the moving average yield based on past three years in case of rice and wheat as past three years and last five years in case of other crops. The unit area for assessing the actual yield has been Block/Taluka and the indemnity levels fixed at 90%, 80% and 60% for the compensation under the scheme based on crop cutting experiments. The Scheme also provided a 50% subsidy in premium to be paid by the small/marginal farmers [shared equally by the Government of India and the State Governments] which is to be phased out in a period of five years

3.8.25 The main criticism of NAIS has been on following grounds:

- Large insurance unit [Taluka/Block] not reflecting individual farmers yield experience
- Guaranteed yield based on last 3 to 5 years needed change particularly in areas where last few years have not been good.
- Inordinate delay [6 months to 12 months] for settlement of claims.
- Insurance coverage not available for all crops notably fruits/vegetables.
- Loss of farmers where the sowing does not take place not covered.
- Indemnity level of 60% is very low and needs to be increased.

3.8.26 On directions of the Hon'ble Prime Minister, the Ministry of Agriculture, Government of India appointed a Joint Group of to study the improvements required in the crop insurance programme in August, 2004. The Group submitted its Report in December 2004. However, the Hon'ble Union Finance Minister during his budget speech declared that the NAIS would be continued in its present form for Kharif and Rabi 2006 - 07.

3.8.27 The Situation Assessment Survey of Farmers done by NSSO [NSS Report No 496: Some Aspects of Farming-2003] revealed that at the all India level, only 4% farmer households reported ever having insured their crop. Among those who had never insured their crop, a very large percentage [57%] were unaware of the practice of crop insurance. Out of the remaining 43%, as many as 16% were not interested, 24% said that the facility

was not available to them and 3% said that they could not pay the premium. Lack of awareness and interest of such a large percentage of the population in a Scheme, which is in operation for nearly 20 years [in one form or the other], is a sad commentary on the developmental/promotional efforts made and also the user's perception about the usefulness of the Scheme.

3.8.28 Besides the need to make the NAIS more user friendly, by eventually making it individual based and reducing the time in settlement of claims it would also be useful to experiment with 'Weather Insurance'[Rain Insurance] at a larger scale. Instead of using the crop cutting experiments to assess the actual yield, serious thought needs to be given to using 'Surveyors' for loss assessment. Let us not forget that the claims under cattle insurance, tractor, poultry and certain horticulture crops is settled on the basis of assessment of damage/loss made by the surveyors. It would be worthwhile to make an attempt. The National Agriculture Insurance Company [NAIC] could consider opening one/two men district offices who could have a number of surveyors as retainers and could be allotted the work as per the claims etc. Till such time, the NAIS switches over to individual basis as indicated above, the unit area may at least be reduced to 'Gram Panchayat. Further, the delays in settlement of claims [6 - 12 months] defeat to a certain extent the very purpose of insurance. So long as the settlement of claims is continued to be based on crop cutting experiments, prompt settlement of claims is difficult to achieve.

3.8.29 It is also worth considering whether the NAIC may continue as a 'one risk' insurance company or be encouraged to grow into an organization to meet various insurance requirements [other that the life insurance] in the rural areas. A more diversified insurance port folio would help in reducing the risk, increasing volume of business, improve its visibility and help in developing rural insurance as a financial product. It may also be worthwhile to allocate about Rs. 100 crore to NAIC as Rural Insurance Development Fund to take up promotional and developmental work regarding rural insurance.

CHAPTER 3.9

GUIDING PRINCIPLES UNDERLYING THE DRAFT NATIONAL POLICY FOR FARMERS

MARKET*

3.9.1 An efficient marketing system is essential for the development of the agriculture sector, providing incentives to the farmers for commercialization, increasing production and giving appropriate signals for production planning and research activities. **At the time of independence, there was shortage of production against demand and the immediate concern was to save the farmers and consumers from the malpractices of traders and facilitate growth and development of an orderly marketing arrangement.** Some of the characteristic features of the agriculture produce marketing in India at the time were **[a] sales immediately after harvest mainly for meeting the cash needs-mostly distress sale at discounted prices, sale of upgraded produce, loose carrying of produce [b] predominant role of village trader and interlocking of credit and commodity market [c] use of unstandardarised weights measures by traders and high market charges which included charges like 'mudat', 'dharamda', 'arahat' etc. [d] direct sale by farmers and absence of farmer's organisation to reach volumes and protect the interest of the small producers**. In view of the above circumstances, the Government developed orgainsed marketing of agricultural produce through the regulated markets. The States and the Union Territories passed the APMC Act. A massive programme for creation of marketing network was taken up. As on 31March, 2004, as many as 7418 markets had been brought under the ambit of regulated markets. In addition, out of 27,294 rural periodic markets [village haats, shanties etc.], nearly 15% function under the regulated framework. The basic

* The subject of Agriculture Market Reforms was covered in detail in NCF, Second Report - Serving Farmers and Saving Farming - Crises to Confidence. Similarly, 'Towards an Indian Single Market' was covered in the Third Report of the NCF, titled Serving Farmers and Saving Faming - 2006: Year of Agricultural Renewal.

objective of setting up the above network of markets was to protect the interest of the farmers and eliminate various malpractices of the traders.

3.9.2 In view of the serious supply side constraints, apart from market regulatory programme, various legal enactments were also promulgated and orders covering specific products issued by the Government. These included the Essential Commodities Act, 1955, Standards of Weights and Measurement Act, 1976, Prevention of Black Marketing and Maintenance of Supply of Essential Commodities Act, 1980, Agriculture Produce [Grading and Marketing] Act, 1986 and Consumer Protection Act 1986 and Bureau of Indian Standards Act, 1986. In addition, there were also specific orders covering various products like meat, vegetable oils, milk and milk products, fruit and fruit products, pulses, edible oil seeds, edible oil, solvent extracted oil, deoiled meals etc. The recourse to the provision under these orders etc. is mainly intended to be taken during periods of scarcity and stop the malpractices. Some of these orders also covered activities like storing, packing, quality, blending, processing etc.

3.9.3 The regulated markets achieved certain amount of success in providing transparent transactional methods/marketing practices, basic amenities and services conducive to an efficient marketing system. Some of the developments in the marketing system at the primary market level and farmers marketing practices are [a] the marketed surplus per farm has grown up. The overall marketed surplus-output ratio is estimated to have improved from 13% in 1950-51 to 64.1% in 1999-2000 [b] there has been some standardization of market charges resulting in their reduction and the liability has generally shifted to the buyers [c] the quality of market information available is much better than what it was during the 'fifties' and the 'sixties' [d] the market sales have increased [e] there are sectors where the sales through the cooperatives are substantial [f] inspite of the restrictive features, the system has made space for 'contract farming/direct marketing/other innovative practices like the ITC's e-chaupal etc.

3.9.4 Inspite of the development of the regulated agricultural produce marketing system, several weaknesses such as distress sales immediately after harvest, absence of grading and packaging at the farm level, inter-locking of credit and markets continued.

Further, the Regulated Marketing System did not offer the farmers virtually any option/ choices; the farmers also complain about lack of transparency in weighing and auctions, considerable delay in effecting sales, unauthorized deductions and poor treatment given to them at the market yards. The other weaknesses of the system are [a] poor spread of regulated markets in certain States [b] inadequate development of the rural periodic markets which are the first contact point for the growers [c] inadequate infrastructural facilities at the regulated markets [d] large variations in the market fee/charges across districts/States [e] failure to develop common trade language and [f] inefficient working environment, etc.

3.9.5 A recent study done by the Karnataka State Agriculture Prices Commission [2002] in respect of 3408 farmers revealed that only about 29% of the sample farmers sold their produce through the regulated markets. The remaining 71% farmers not using the regulated markets cited distance [31.2%], good price at the local market [18.4%], small quantity [12.7%], advance already taken [9%], no knowledge about the regulated market [8%], delay in payment [7.8%], no provision of paddy sales [5.4%], cheating in weighment/removing 4-5 kgs of the produce and harassment by Hamals/ Coolies [3.1%], long wait for weighing [1.4%], others [3%]. The above findings clearly reflect that the majority of farmers do not sell their produce at the regulated markets. These markets are neither farmer friendly nor there has been adequate effort on the part of the regulated markets to attract the farmers and build the business.

3.9.6 The Government monopoly in setting up agriculture produce markets under the State specific Acts [Agriculture Produce Markets Committee Act] has prevented the private sector from taking initiatives in development of agricultural marketing. Further, the lack of competition and the regulatory focus under the APMC Act has meant that these organisations have played little role in development of markets or encouraging grading processing, value addition at the farmer's level. For improving the management of existing regulated markets and making them farmer friendly, holding of regular elections of the marketing committees and State Agricultural Marketing Boards/ SAMBs should be made mandatory and the emphasis should be on promotion of grading, binding and packaging of farm products and promoting new markets for the local products. The

system of issue of licenses for trading and functioning in the regulated markets needs to be changed to counter the oligoponistic powers of established traders and other 'market functionaries.'

3.9.7 As regards the Essential Commodity Act,1955 and other Acts/ orders etc., the Task Force on Employment Opportunities [Planning Commission] had observed 'The Essential Commodities Act is a Central Legislation which provides umbrella under which the States are enabled to impose all kinds of restrictions on storage, transport, processing of agricultural produce. These controls were traditionally justified on the ground they were necessary to control hoarding and other type of speculative activity, but the fact is that they do not work in time of genuine scarcity and they are not needed in normal times. Besides, they are typically misused by lower level of administration and become an instrument of harassment and corruption.' Some of the other Acts/orders [some of which are mentioned in paragraph [2] also need a revisit in view of the changed circumstances.

3.9.8 The farmer wants different options for marketing his produce. The State APMC Acts need to be amended to provide for among others, encouraging the private sector or cooperatives to establish markets, develop marketing infrastructure and supporting services, collect charges, allowing marketing without the necessity of going through APMC/ licensed traders etc.

3.9.9 The supply chain in agricultural marketing is long and has increased the margin between the price received by the farmer and the price paid by the consumer. Tightening of the supply chain is called for and the role of the farmer's organisations [cooperatives/Self Help Groups] needs to be expanded. To begin with these organisations could aggregate the farmer's produce and improve post harvest handling. Direct marketing by farmers needs encouragement by providing them opportunities for direct sale to consumers in the regulated markets and also by developing special markets/bazaars for the purpose. Sale of graded produce could fetch better price to the farmer, reduce the time taken in effecting sale at the Market Yard and lead to greater transparency in auctions etc. There is a need for fixing quality standards for all

agricultural commodities and introducing compulsory grading for sale in the regulated market in a phased manner.

3.9.10 'Contract Farming' eliminates market risks for the farmer and could encourage diversification and commercialization of agriculture. However, it is necessary to develop farmer centric 'Code of Conduct' for contract farming and also building effective farmer's groups/organisations to negotiate with the purchasers to help in orderly development of these arrangements and protect farmer's interest.

3.9.11 Distress sale by small and marginal farmers at discounted prices for immediate cash continues to be a serious problem which could be countered to some extent by liberalising pledge loans against produce stored in godowns/farmer's own home. There is need for considerable expansion of storage [including cold storage] facilities, improving warehousing system, facilitating loans against Warehouse Receipts and generally making Commodity Futures Markets more useful to the farmers.

3.9.12 Farmers all over the country consider 'market' as the most crucial aspect in the entire agricultural operations which impact their income and welfare as also a major constraint for further diversification and commercialization. They want much greater support from the State in getting reasonable prices for their produce. Many farmers are not satisfied with the level of Minimum Support Prices and believe that these have not kept pace with the increase in prices of inputs and the prices of other products. The Minimum Support Price [MSP] needs protection across different regions of the country. In absence of procurement operations all over the country, the benefits of MSP are mainly limited to Punjab, Haryana, U.P. and to some extent A.P. The prices of crops covered under the MSP remain below the MSP level in many parts of the country particularly after the harvest. Further, the prices of sensitive commodities [not covered by MSP] have to be watched particularly during glut period for quick intervention under an effective Market Intervention Scheme.

3.9.13 Farmers require authentic information based on meteorological, marketing and management information for land use decisions/investments etc. The need for such

advice would become more acute in future with new growth areas of agriculture being characterised by greater heterogeneity, unlike traditional crop cultivation etc. The production may be highly concentrated and markets could be quite different from the present. For rendering advice to the farmers the Government could restructure the Land Use Boards supported by team of technical experts/agencies etc. Besides promoting diversification, there is need for value addition in agricultural production for increasing incomes and rural employment. Post harvest losses are a serious drain on farmer's income and need attention.

3.9.14 There is a need for early consideration of the proposal made in the Third Report of the National Commission on Farmers [Serving Farmers and Saving Farming - 2006: Year of Agricultural Revival] for establishing an Indian Trade Organisation [ITO] and our own boxes for domestic agricultural support on the models of the WTO's Blue, Green and Amber boxes. We need to segregate the support extended to farmers into two groups - those which are of the nature of life and livelihood support to small farm families and those which could be considered as trade distorting in the international market. The first group of support measures needs to be strengthened for protecting the food and livelihood security of our farmers.

3.9.15 The Union Ministry of Agriculture have already initiated the reform process in agricultural marketing. The Ministry has been proactive and has circulated a draft for the revised APMC Act to all the States. The State Governments will have to undertake such reforms speedily in order to remove bottlenecks and scope for corruption and harassment. Both quality and trade literacy programmes should be initiated all over the country. In relation to commodities, which are exported, it will be essential to conform to WTO Regulations. At present, such commodities constitute about 7% of total agricultural production in the country. Farmers' Associations and SHGs should be helped to export on competitive terms by spreading awareness of the opportunities available for external agricultural trade. In such cases, cost, quality and reliability of supply will determine long term trade relationships. The agri-export zones should be further strengthened and should become places where farmers will get the best possible price for their produce. The establishment of Community Grain and Food Banks could

help in the marketing of under utilized crops. Indian farmers can produce a wide range of health foods and herbal medicines and market them under strict quality control and certification procedures.

3.9.16 Internal trade in India faces many problems due to the diversity of controls exercised by multiple authorities at different levels, restrictions of inter-state and inter-district movement of goods, lack of uniformity of standards laid down by different authorities and agencies and in taxes. All this has led to breaking up of the vast Indian Market into a large number of smaller regional markets to the detriment of the farmer. The Hon'ble Prime Minister of India, Dr. Man Mohan Singh in his address at the Agriculture Summit-2005 observed as under, "An important commitment of our Government is to integrate the domestic market to all goods and services. The time has come for us to consider the entire country as common or single market for agricultural products. We have to systematically remove all controls and restrictions, we should enable direct marketing between farmers and NGOs, Cooperatives and Private Companies."

3.9.17 The paper work involved in complying with various controls, regulations and licenses, the costs involved in terms of time and resources and the inevitable corruption and malpractices that this leads to, have served as a big drag on the efficiency of trading operations in the country. All these costs are ultimately passed on to the producer and the consumer. The barriers to internal trade could be grouped into [a] restrictions imposed by the Essential Commodities Act, 1955/ Prevention of Food Adulteration Act, 1954 and other legal enactments and orders [b] fiscal issues [c] transport issues and [d] agriculture trade related issues.

3.9.18 While India is nearly a 'Common Market' as there are no customs duties and no quantitative restriction in movement of goods from one State to another however, many steps particularly in the matters relating to transport [replacing annual road tax and removal of fitness certificate by a life time payment/system, introducing a National Permit for plying commercial vehicle anywhere in India etc.], fiscal matters [introduction of State VAT, uniformity in taxes on commodities, withdrawal of *Octroi* and local taxes],

tax administration [avoid using the border posts for collection/verification of payment of taxes], agriculture trade related issues [amendment to APMC Act to allow private parties/cooperatives to establish markets and relook on various Acts/orders leading to some very restrictive features in matters concerning movement, storing, stocking, processing of agriculture produce] are some of the further steps needed for making India a 'Single Market'. The above changes would need building a consensus/constant persuation and sharing/compensation for loss of revenues to the State Governments. The financial matters including loss of revenues for the States could be a major issue in moving towards a Single Indian Market. This could be referred to the Finance Commission for suggesting methods, allocations etc. by which the Indian Single Market may become a win-win situation for all.

3.9.19 Until recently, Indian agriculture was described as a gamble in the monsoon. Now, it is also becoming a gamble in the market. Market security is becoming vital for further agricultural progress. Hence, steps to bring about a Single Indian Market have become urgent.

CHAPTER 4

TOWARDS A BIOSECURE AGRICULTURE

4.1.0 A National Agricultural Biosecurity System: An Urgent Necessity

4.1.1 Our national preparedness and capability in the area of Biosecurity are currently issues of widespread debate following the detection of the H5N1 strain of avian influenza virus in a few pockets in Maharashtra and Gujarat. Biosecurity has wider implications in biological warfare and bio-terrorism. This area is obviously a matter of serious concern to the National Security Council. In our country, agricultural Biosecurity covering crops, trees, and farm and aquatic animals is of even greater importance since it relates to the livelihood security of nearly 70 per cent of the population, and the food, health, and trade security of the nation.

4.1.2 The world is truly becoming a global village with reference to communication and transport. Disease causing organisms can spread fast through aeroplanes and farm trade. India is the transitory home for many migratory birds. Our country is also becoming a national village with reference to communication, transportation, and trade. Therefore, home quarantine assumes as much importance as international quarantine. Cross-border movement of farm goods and animals with neighbouring countries is another area of Biosecurity significance.

4.1.3 The National Commission on Farmers (NCF) is concerned with the impact of invasive alien species on the livelihood security of farm women and men. Therefore, it stressed in its very first report submitted in December 2004, the need for a thorough review of the present infrastructure and institutional framework in the area of agricultural Biosecurity, including the World Trade Organisation specifications of sanitary and phytosanitary measures.

4.1.4 The National Bureau of Plant Genetic Resources has been intercepting many alien invasive pests in imported agricultural commodities. There is also the threat of new

strains of wheat rusts. Hence, the NCF has been holding consultations on developing a National Agricultural Biosecurity System characterised by high professional, public, and political credibility. The major conclusion is that we urgently need a National Agricultural Biosecurity System with the following principal goals:

(a) To safeguard the income and livelihood security of farm and fisher families as well as the food, health, and trade security of the nation. This through effective and integrated surveillance, vigilance, prevention, and control mechanisms designed to protect the productivity and safety of crops, farm animals, fish, and forest trees.

(b) To enhance national and local level capacity in initiating proactive measures in the areas of monitoring, early warning, education, research, and international cooperation. And, to introduce an integrated Biosecurity package comprising regulatory measures, education, and social mobilisation.

(c) To organise a coordinated National Agricultural Biosecurity Programme on a hub and spokes model with effective home and regional quarantine facilities. This should be capable of insulating the major agro-ecological and farming zones of the country from invasive alien species of pests, pathogens, and weeds.

4.2.0 Scope of Biosecurity

4.2.1 Biosecurity is a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyse and manage risks in the sectors of food safety, animal life and health, and plant life and health, including associated environmental risk. Biosecurity covers the introduction of plant pests, animal pests and diseases, and zoonoses, the introduction and release of genetically modified organisms (GMOs) and their products, and the introduction and management of invasive alien species and genotypes. Biosecurity is a holistic concept of direct relevance to the sustainability of agriculture, food safety, and the protection of the environment, including biodiversity.

4.2.2 Biosecurity is a process of managing biological risks associated with food and agriculture in a holistic manner. Besides enhanced productivity, sustainability and profitability, interest in Biosecurity is increasing as national regulatory and export certification systems are being challenged by large increases in the volume of food and agricultural products being traded internationally, by the expanding variety of imported products and by the growing number of countries from which these imports are originating. Increased travel is also creating more pathways to spread pests, diseases and other hazards that are moving faster and farther than ever before. Improved coordination is being sought among national bodies responsible for enforcing sanitary, phytosanitary and zoosanitary measures to better protect human, animal and plant life and health without creating unnecessary technical barriers to trade.

4.2.3 The strengthening of policy and regulatory frameworks for Biosecurity in food and agriculture must be among the highest priorities. These policy and legislative frameworks need to be extended to include biosafety needs within the overall framework of Biosecurity. This will provide: (i) optimization of scarce human and financial resources, (ii) improving the cohesiveness of advice on all aspects of Biosecurity, including biosafety, (iii) recognition of the special importance of biosafety to food and agriculture as well as the special impacts of food and agriculture on biosafety. Further, this will seek the development of appropriate standards, guidelines, and other recommendations for food safety and the protection of plant, animal and aquatic life and health based on risk assessment and taking into account relevant aspects of biosafety, including environmental health.

4.2.4 Thus, risk analysis and management as a framework for Biosecurity becomes the central binding force across various sectors. It provides an opportunity to harmonize terminology and methodology, while respecting the need for individual sectors to tailor risk analysis procedures to the characteristics of the risks involved. It should be recognized that risk analysis procedures should provide an appropriate science-based and transparent basis for Biosecurity. Fast expanding trade has intensified the need for effective risk analysis capacities and for bilaterally and multilaterally agreed standards.

4.2.5 There are several commonalities in risk assessment and management across the subsectors and organisms which must ideally be addressed by the National Agricultural Biosecurity System. And, in time to come, since Risk Analysis and Management will constitute bulk of the animal, plant, fish health management, Biosecurity would automatically occupy the centre stage in this field.

4.2.6 The various international standards issued through several international conventions and agreements notwithstanding, in the wake of implementation of WTO-SPS Agreement and to meet TRIPS and TBT, the country is required to undertake following actions:

i. Designating a single Central Government authority as responsible for implementation of SPS measures.
ii. Reviewing and updating of legislation and regulations related to SPS to give effect to international agreement and establishing a nodal point for enquiries and information exchange,
iii. Establishing national standards on SPS measures in line with international standards,
iv. Establishing a notification procedure,
v. Undertaking pest risk analysis and identifying and maintaining pest-free areas for plants and animals as per international standards and safety assessment for food,
vi. Providing scientific justification of high level protection in the absence of pest risk assessment,
vii. Recognising of equivalence of specific measures through bilateral or multilateral agreements,
viii. Identifying researchable issues and strengthening back-up research,
ix. Capacity building in terms of infrastructure and expertise,
x. Awareness building and catalyzing attitude change, and
xi. Developing functional public-private-NGO partnerships.

4.2.7 Requirements of several of the other international, regional and bilateral agreements and of national regulations on various agricultural commodities and ago-

ecological and socio-economic regimes, whether on plants or animals or fisheries or microbes, are analogous. Establishing and operationalising separate facilities for each of the requirements amounts to not only gross duplication of scarce resources and efforts but also erosion of effectiveness, efficacy and synergy which are essential for achieving sustainable, sound and competitive outcomes. A National Agricultural Biosecurity System, which involves the management of biological risks in a comprehensive and synergistic manner, is a strong force of convergence of the various paths of sustainable development – a win-win situation for all partners of development.

4.3.0 Status and Prospects of the National System

4.3.1 India has been striving to become a Biosecure nation. But our facilities for sanitary, phytosanitary and zoosanitary measures are inadeaquate. The Avian Flu menace notwithstanding, India's consignments of farm exports are rejected in hundreds (often being on the top of the list of rejections) every year on grounds of mycotoxin, salmonella, pesticide residues, etc. The situation is likely to worsen in the coming years since health safety standards as presented by Codex Alimentarius are getting increasingly stringent and the goal posts in developed countries have been shifting fast. Food safety standards will become the most important non-tariff barrier. Therefore, we must not lose any further time in rendering India Biosecure, both from within and outside. A quality food safety and Biosecurity literacy campaign must be launched at all levels – from farmers to policy makers.

4.3.2 Our Biosecurity infrastructure needs to be vastly strengthened. As regards plants, according to the National Bureau of Plant Genetic Resources (NBPGR), several invasive alien species have been introduced into the country along with grain, seed and planting material imports. These introduced pests include bunchy top of banana, banana bract and streak viruses, vegetable/pea leaf miner, spiraling white fly, American serpentine leaf miner, peanut stripe virus, cotton leaf curl, potato wart, sunflower downy mildew, coffee pod borer, apple San. Jose scale, Biotype B of white fly and invasive weeds like *Lantana camara* and *Phalaris minor*. Six of these were introduced in 1990s. With the increasing intensification of agricultural production, productivity and trade, such

invasive alien species will further threaten our crops. A new wheat stem rust pathotype Ug 99 is causing serious damage in Uganda, Kenya and a few other countries, and threatens to reach India. Wheat being our main pillar of national food security and rural economy, India must take proactive steps to prevent entry and establishment of this race in India **(see Box I)**.

Box I. Sounding the Alarm on Global Stem Rust

Stem rust is a catastrophic disease because of its ability to cause complete annihilation of wheat crops over wide areas. The widespread use of PBW 343 wheat variety possessing 1BL.1RS translocation with *Sr31* and its continuing stem rust protection over about 6 million ha in India alone had led to complacency throughout the wheat community. The discovery of race Ug99 with virulence for *Sr31* and other important genes in Uganda in 1999, and possibly earlier in Kenya, was a reminder of the pathogen's ability to respond, but little seems to have happened in breeding programs until the emergence of current concerns following the continued incidence and spread of race Ug99 in Eastern Africa. The prospect of a stem rust epidemic in wheat in Africa, Asia and the Americas is real and must be stopped before it causes untold damage and human suffering. Fortunately, resistant sources against Ug 99 have been identified and the desirable agronomic bases are being used for developing resistant strains in collaboration with Kenya and CIMMYT.

Another disease of wheat that can be very important is Blast on wheat. This strain of blast was first found in Brazil and is now spread up to Bolivia. Very little is known about its likely effect to wheat crop in rice-wheat belt of India. If germplasm enhancement is initiated now (obviously selection will have to be done in Brazil or Bolivia), perhaps by the time diseases reaches India we may have resistant cultivars.

An Expert panel on "Global Rust Initiative", 2005 recommended that diverse genetic resistance be identified in global wheat germplasm by testing in Kenya and Ethiopia. Because modern cultivars currently grown in Northern Africa and Asia are susceptible to race Ug99, a breeding strategy be implemented to incorporate diverse genetic resistance to Ug99 into such germplasm before the race migrates to those areas. DNA-marker assisted selection should be utilized where feasible. The seed multiplication agencies and community-based organizations be encouraged to produce commercial seed of newly developed stem rust resistant varieties with stipulations that (1) farmers and other stakeholders play a leading role; (2) breeding programmes be supported in the maintenance and multiplication of Breeder's and Foundation seed; (3) commercial seed be readily available to farmers; and (4) on-farm demonstrations of elite varieties be conducted. The ex-ante and ex-post impact assessments should be undertaken, taking into account alternative crops and livelihood systems.

Source: Various CIMMYT Publications, and R.P.singh of CIMMYT (personal communication).

4.3.3 Five major quarantine stations at New Delhi, Mumbai, Kolkata, Chennai and Amritsar have been modernized with sophisticated equipment and Post Entry Quarantine facilities under a UNDP/FAO project. However, there are other 24 plant quarantine

stations for the upgrading of which an initial effort has been made for need assessment in terms of laboratory and green house facilities required under a FAO-TCP proposal. The 24 stations were classified into three broad categories in the said project based on nature and volume of material received in each of the stations. The output of the project can be a starting point to initiate upgrading of these stations. It may however, be noted that apart from equipping these stations with modern instruments and facilities, the means of communication (telephone, fax, e-mail, vehicle) need special attention for efficient functioning of these stations.

4.3.4 The establishment of national standards on sanitary and phytosanitary measures in line with the international standards is of critical concern to meet the stiff challenges under the international agreements. During 1995 to 2005, 24 international standards have been developed (**see Box II)**. During the past 15 years or so, India has developed the following eight National Standards, some of which conform to some of the International Standards but a lot more work is needed in this direction:

- National Standard for Pest Risk Analysis.
- Guidelines for certification of forced hot-air treatment facilities for wood packaging material.
- Quarantine treatments and application procedures: I. methyl bromide fumigation.
- Guidelines for assessment, audit and accreditation of fumination agencies for undertaking methyl bromide fumigation.
- Requirements for estabhlishment of pest free areas for mango nut (seed) weevil (*Sternochaetus mangiferae*) and pulp weevil (*S. frigidus*).
- Requirement for establishment of pest free areas for tephritid fruit flies.
- Guidelines on certification of hot water immersion treatment facilities for mango fruits.
- Accredition treatment for ISPM-15 Compliance.

The National Agricultural Biosecurity System may constitute a National Committee on SPS Standards and a suitable standard setting procedure needs to be developed and adapted at the Central and State levels.

Box II. International Standards for Phytosanitary Measures

▪ **ISPM 1**	Principles of plant quarantine as related to international trade	1995
▪ **ISPM 2**	Guidelines for pest risk analysis	1996
▪ **ISPM 3**	Code of conduct for the import and release of exotic biological control agents	1996
▪ **ISPM 4**	Requirements for the establishment of pest free areas	1996
▪ **ISPM 5**	Glossary of Phytosanitary terms	2001
▪ **ISPM 6**	Guidelines for surveillance	1997
▪ **ISPM 7**	Export certification system	1997
▪ **ISPM 8**	Determination of pest status in an area	1998
▪ **ISPM 9**	Guidelines for pest eradication programmes	1998
▪ **ISPM 10**	Requirements for the establishment of pest free places of production and pest free production sites	1999
▪ **ISPM 11**	Pest risk analysis for quarantine pests including environmental risks and LMOs	2001
▪ **ISPM 12**	Guidelines for Phytosanitary certificates	2001
▪ **ISPM 13**	Guidelines for the notification of non-compliance and emergency action	2001
▪ **ISPM 14**	The use of integrated measure in a systems approach for pest risk management	2002
▪ **ISPM 15**	Guidelines for regulating wood packaging material in international trade	2002
▪ **ISPM 16**	Regulated non-quarantine pests: Concept and Application	2002
▪ **ISPM 17**	Pest reporting	2002
▪ **ISPM 18**	Guidelines for the use of irradiation as a Phytosanitary measure	2003
▪ **ISPM 19**	Guidelines on list of regulated pests	2003
▪ **ISPM 20**	Guidelines for Phytosanitary import regulatory system	2004
▪ **ISPM 21**	Pest risk analysis for regulated non-quarantine pests	2004
▪ **ISPM 22**	Requirements for the establishment of areas of low pest prevalence	2005
▪ **ISPM 23**	Guidelines for inspection	2005
▪ **ISPM 24**	Guidelines for the determination and recognition of Equivalence of Phytosanitary Measures	2005

Source: Interim Commission on Phytosanitary Measures

endemic pests, of new and emerging pests and of the exotic pests which have been introduced and are spreading. An effective integrated pest surveillance system and

organization devoted to performing field inspection and pest survey activities for the detection, delimitation or monitoring of established pests as well as system and organization devoted to the detection of new pests needs to be introduced. Specific systems may be required for identification, establishment and maintenance of pest-free areas as per the international standards. Similarly, systematically designed survey, surveillance and monitoring studies for the toxin incidence in food and agricultural commodities are required to identify less risk-prone areas for export and domestic use. For this, need-based additional support is needed to strengthen containment facilities, pest risk analysis capacity, pest diagnostic laboratories, residue and toxic laboratories, referral laboratories, emergency control and treatment facilities and accreditation laboratories.

4.3.6 In fisheries and aquaculture, alien species and genotypes (also known as introduced species and genetically altered species) both have a major role in increasing production. They are recognized as one of the most significant threats to natural aquatic ecosystems, and thus to those who depend upon them.

4.3.7 Alien species are a valid means to improve production and the economic benefit from fisheries and aquaculture. About 17% of the world's finfish production comes from alien species. Asia produces more of the African cichlid tilapia (>700 000 t) than Africa itself (39 245 t). In Chile, introduced salmonids provide about 20% of the world's farmed salmon, in an industry directly employing some 30 000 people.

4.3.8 The issue is neither to ban alien species, nor to abandon regulation of their movement, but to assess the risks and benefits associated with their use and, if appropriate, develop and implement plans for their responsible use. A lack of adequate information is often a major constraint: without such information it is difficult to determine the possible impact of a proposed introduction into a complex and dynamic aquatic ecosystem.

4.3.9 Internationally recognized treaties have recently been established to address the issue, calling for accurate assessments of the risks of introducing exotic species, and promoting the creation of information sources and exchange of information on exotic species, including their biological and ecological attributes, and possible positive and negative impacts. These include the FAO Code of Conduct for Responsible Fisheries, and CBD Article 8h and decision V/8 on "alien species that threaten ecosystems, habitats or species". The International Council for the Exploration of the Seas (ICES) and the European Inland Fisheries Advisory Commission (EIFAC) have both created specific guidelines and procedures for dealing with alien species and GMOs.

4.3.10 As regards aquatic life forms, surprisingly, there are no quarantine facilities in this huge country of tremendous aquatic resources. A National Strategic Plan for Aquatic Exotics and Quarantine has been prepared. It addresses the following key issues:

(i) Risk of introducing exotic species;

(ii) Criteria to finalise list of potential, approved and prohibited exotic species and criteria to finalise diseases of concern;

(iii) Evaluation of proposals for introduction in an objective manner;

(iv) Management of exotics already present in India; and

(v) Surveilliance and Disease Reporting and establishment of a network of diagnostic laboratories.

Necessary infrastructure and human resources should be urgently provided for effective implementation of the above Plan.

4.3.11 The problem is most acute in livestock. The greatly accentuated livestock Biosecurity problems are generally linked with unmindful industrialised productions located within or close to cities using infected water, feed and other inputs, flouting all the norms, standards and guidelines. Little heed is paid to the instructions and guidelines, underlining the lack of awareness and sensitivity. For instance, the Ministry of Agriculture had communicated Biosecurity Measures to all the States, but these have hardly been adopted at the ground level. The recurrence of Avian Flu in certain pockets in the country points to this apathy.

4.3.12 Infectious diseases cause an annual loss of about Rs 50 billion, besides the losses due to export restrictions and the impending danger of public health hazards. In case of epidemic outbreaks the losses are much more colossal. A case study in Canada (2004) has brought out the seriousness of this problem in an extremely lucid manner (**see Box III**). Unfortunately, the recent outbreak of Avian Influenza caused by strain H5N1 threatens total collapse of the Indian poultry industry **(see Box IV).**

Box III. Livestock Revolution Threatened

One of the most spectacular event in Canadian biosafety history was certainly the rapid spread and responsive cull of the avian flu H7N3 in 2004 in BC's Fraser Valley, where 84 percent of BC's poultry industry is located. The disease, less deadly to humans than the H5N1 strain found in Asia, was first found in geese and ducks on February 18 near Abbotsford, and was diagnosed over a large cluster of commercial poultry farms by March 22. Over the next eight weeks, an astonishing 42 farms were infected, and approximately 19 million chickens, turkeys and ducks were slaughtered. "Depopulation" procedures were stopped on June 4, 2004, but strains of bird flu continue to be detected across the country.

More ominously, in late 2004 influenza experts warned of a possible "perfect storm" of infection that could easily kill millions. Certainly the experience of the so-called Spanish flu, which killed some 40-50 million people during and following the First World War, suggests that another such catastrophe is possible. As of August 2005, the H5N1 avian influenza virus had killed over 50 people in Asia, and it has been discovered in places as distant as Russia, Greece, Kuwait and Israel. Epidemiologists worry that the flu could mutate into a strain that can spread rapidly among humans, let alone the hundreds of thousands of poultry birds culled currently in certain pockets of India.

Source :Stoett Peter, 2006, Biosecurity: The next public policy imperative for Canada and the World

4.3.13 Besides the above mentioned incidence of Avian Influenza, transboundary transmissions of exotic diseases in the past also have inflicted severe losses to our livestock and poultry industry. Notable examples of such transmissions into India are listed below:

- Bluetongue in sheep
- Peste des petits ruminants (PPR) of goats
- Caprine arthritis encephalitis in goats
- Equine Influenza & EIA in horses
- Canine parvovirus infections in dogs
- Marek's disease, Gumboro disease, egg drop syndrome, chicken infectious anaemia
- Swine fever, recognized for the first time in India in 1962 caused mortality of 3500 pigs

- Outbreak of African horse sickness in 1960 resulted in death of over 22, 000 equines between 1960-1963.
- Introduction of bluetongue disease in sheep resulted from the import of exotic breed of sheep into the country.
- PPR first detected in 1989 from Tamil Nadu is widely spread in the country.
- Introduction of infectious hydro-pericardium (Lichi disease) of poultry through cross–border transmission.

Box IV. India's Poultry Industry Faces Unprecedented Crisis

India's Poultry Industry, which contributes Rs. 35,000 crores to the GNP and provides employment to over 3 million persons - the only segment of our agriculture economy which has been growing consistently at about 17% per annum – is facing the worst ever crisis in its history, and a situation of total breakdown and collapse, due to the recent outbreak of Avian Influenza caused by H5N1. This has dealt a severe blow, not only to the farmers but practically to every input industry related to poultry farming, such as hatcheries, breeder–integrators, feed mills etc.

If the breeders decided not to continue in the business (due to the setback from the outbreak), it will have an extremely adverse impact on the indigenous pure-line research and breeding activity and the country will be exposed to total dependence on imported breeding stock – which will be nothing short of a negation of all the good work done by indigenous genetic research for the past 3 decades. More than 1,000 hatcheries in the country will face total closure.

Study by a renowned economist from USA has revealed that in terms of competitiveness, India ranks no. 1 in the world : USA was placed at No. 4, China at No. 15 and Netherlands at No. 36. The study has further shown that India – which presently ranks No. 2 in the cost of chicken production will soon become the cheapest source of chicken production in the world, and this will even overtake Brazil.

It is projected that if the present rate of growth in the industry is sustained, in the next 5 years, poultry can be second largest industry in our country, next only to the automobile industry. It will be very unfortunate if this industry, which has been painstakingly built based on indigenous research over 3 decades, is destroyed (by the H5N1) and the country is forced to depend on import of eggs and chicken. An all out effort, including interim relief measures by the Government to the affected parties, should urgently be made to save this vital industry and put it back on the track.

Source: Anuradha J. Desai, Chairperson, National Egg Coordination Committee, April, 2006

4.3.14 Nearly 40 exotic animal diseases of economic importance are known. All effort, proactive and preventive, must be made to keep them away from the country. These exotic diseases as a matter of principle should not be handled in any of the existing open laboratories without containment facilities. The recently established High Security Animal Disease Laboratory (HSADL), IVRI, Bhopal in 1998 has BL-4 facility to safely handle high-risk pathogens/List "A" diseases of OIE and authorized by Govt. of India to handle exotic animal pathogens.

4.3.15 Recently, the Dept. of Animal Husbandry and Dairying (DAH&D) has designated one central and four regional disease diagnostic referral laboratories under the Animal Disease Management and Regulatory Medicine Scheme at Pune, Kolkata, Bangalore and Jalandhar. The Centre for Animal Disease Research & Diagnosis (CADRAD) of the Indian Veterinary Research Institute, Izatnagar has been identified as the referral apex laboratory There are about 100-district level diagnostic laboratories in the country.

4.3.16 Four Animal Quarantine Certification Stations (AQCS) are functioning at Delhi, Mumbai, Chennai and Kolkata. The DAH&D is contemplating setting up two more Quarantine Stations at Bangalore and Hyderabad, as these are now international airports at which requests for imports are frequently received. There are no facilities available at the seaports, which are very important imports points.

4.3.17 India is also establishing Diseases Free Zones for selected diseases by zoning and buffer zoning keeping international view of OIE and WTO, with strict enforcement of phytosanitary and zoosanitary requirements, yet another new initiative. But, effective surveillance and survey facilities are essential for this purpose. Further, surveillance is critical not only for detecting outbreaks, but also for improving veterinary practices and treatments. The country is not well equipped to do this job. The requisite infrastructures for diagnosis, surveillance, reporting etc. are not in place in many States.

4.3.18 There are several other points which should be considered while adopting the quarantine practices. These include:

- What is the probability that vaccinated animal will not spread any infection when they are permitted to move?
- Should there not be a decontamination policy?
- Will the government (Central/State) allow import of any vaccinated animal in the country without quarantine? If not, how is it proposed to meet the contradiction between the international and intra-national policies in this regard, especially if it

is raised in international forums? If allowed, what will be the role of all the Quarantine Stations established by the Government.

- As detention of animal or animal products would affect the economic conditions as well as livelihood of the owner/livestock farms adversely, it is desirable that the executive order for slaughtering of infected/suspected animals is issued by the highest authority like the President of India or the Governor of the State only for some selected diseases.
- There is considerable migratory or nomadic livestock activity that still exists in the country which requires a different approach and strategy, and the provisions of the Act need to be suitably amended to recognize this reality.
- Interplay between Central and State/Local Laws and clarity about the role of Central, State, and Local authorities, which would simultaneously have separate but concurrent legal quarantine power in a particular situation.
- The consistent production of high quality, safe, potent and efficacious vaccines requires quality assurance procedures to ensure the uniformity and consistency of the production process.
- Vaccine quality, safety, potency, and efficacy must be ensured by consistency in the production process; Control procedures selected should be those that best fit the conditions under which vaccines are produced and should comply with good manufacturing practices.
- Worldwide harmonization of standards for veterinary biologicals will be of help to chief veterinary officers who must follow the instructions given in the OIE International Animal Health Code, as they apply to all biological products for use in international trade; worldwide harmonization of registration rules should be ensured to simplify and facilitate international marketing of the products.

4.4.0. Global Convergence Towards Biosecurity

4.4.1 There is a growing global recognition that Biosecurity will profit from a more integrated approach. Closer cooperation among institutions responsible for implementing and the rationalisation of infrastructures, where appropriate, will be synergistically beneficial. Models to rationalise regulatory functions among sectors in the quest for

improved effectiveness and efficiency have appeared in a number of countries. For example, New Zealand has had a Biosecurity Act since 1993 and a Biosecurity Minister and Council since 1999. In Belize, food safety, animal and plant quarantine and environmental issues are dealt with by a single authority, the Belize Agricultural and Health Authority. USA, China and Australia have also followed this path.

4.4.2 The Australian government, State and Territory governments, industry and other key stakeholders are describing and reviewing the Australian Biosecurity System (ABS) with a view to further improvements and integration. The development of a consistent national framework of policy and processes within which to approach national Biosecurity issues is of major importance. Primary Industries Ministerial Council commenced development of an ABS to address the broader, longer term Biosecurity issues with regard to terrestrial animal pests and disesses, terrestrial plant pests and diseases, aquatic animal pests and disesses and terrestrial and aquatic weeds. The ABS will assist in identifying gaps in Biosecurity arrangements as to strengthen the country's approaches, minimise pest, weed and disease impacts and demonstrate, nationally and internationally, Australia's commitment to Biosecurity. The ABS aims to:

- Prevent pests entering and establishing in Australia;
- Ensure appropriate preparedness and response capacity which is internationally recognised and meets Australia's trading obligations and international treaties; and
- Maintain or improve the status of Australia's Biosecurity system.

4.4.3 The ABS provides a description of the roles of the various contributors and aims to improve the efficiency of investments in the system. While the same model will not fit everywhere, and each country should institutionalise its synergy path as per its capacity, need and goal, the Australian model appears closest to the proposed Indian approach. Thus, along with other partners, India may wish to work closely with Australia to share relevant experiences and expertise.

4.4.4 Several initiatives of the United Nations' Organisations and other international organisations and institutions are actively promoting Biosecurity as per their mandates. The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) of the World Trade Organization disciplines SPS measures in relation to international trade. The Codex Alimentarius Commission (Codex), the International Plant Protection Convention (IPPC) and the Office International des Epizooties (OIE) provide international standards for food safety, plant health, and animal health, respectively. A further relevant instrument is the Cartagena Protocol of the Convention on Biological Diversity (CBD) which applies to the transboundary movement, transit, handling and use of Living Genetically Modified Organisms (LMOs). Guidelines on the management of invasive alien species have been developed under the CBD. These international agreements, standards and programmes are parts of a loose international framework for Biosecurity, and reflect the historically sectorial approach to regulation in this area.

4.4.5 The Food and Agriculture Organisation of the United Nations (FAO), recognizing the growing importance of Biosecurity, has made this area as one of its sixteen Priority Areas for Inter-disciplinary Action (PAIAs) which aims at "promoting, developing and reinforcing (Biosecurity) policy and regulatory frameworks for food, agriculture, fisheries and forestry." The FAO programme clearly sees the advantages of a more coherent, holistic approach to Biosecurity that sought synergies between the sectors at national and international levels, without creating new or centralised, unified and rigid structures. The traditional focus on regulating individual production systems was shifting to one of ensuring confidence in the overall regulatory framework which would automatically seek interdisciplinarity, partnership and convergence. Many countries were revising their Biosecurity arrangements to take into account the SPS Agreement, at the same time seeking greater efficiencies.

4.4.6 FAO /Norway project on strengthening countries capacity to implement Biosecurity measures has recently been launched. Its main objective is to improve Biosecurity and strengthen national capacities to meet domestic and international marketing requirements, reduce risks of and increase preparedness for food system

shocks associated with disease and related outbreaks that increase the risk of food insecurity and market collapse. Eight Core Partner Countries, namely, Ethiopia, Ghana, India, Kenya, Nicaragua , Senegal, Uganda and Vietnam are participating. The Donors' contribution is US$ 1 million per year, with a maximum of US$ 5 million over five years. The first phase starts this year. The project will address food safety, animal health, plant health, fish product safety, socio economic analysis, policy development and law and regulations. India should urgently avail of this opportunity by completing the necessary formalities and launch the project without losing any time.

4.4.7 The programme elements of the project are:

1. Biosecurity capacity needs assessment using existing tools.
2. Developing new tools to assess:
3. Baseline ability to implement international agreements;
4. Assessment of legal framework;
5. Animal health emergency response capacity analysis; and Plant health emergency response capacity analysis.

6. Socio-economic studies on interaction of disease, livelihoods and markets and development of policy guidelines.
7. 4. Studies on mitigating the impact of (or preventing) market collapse, and development of policy guidelines.

5. Development of guidelines in fish product handling incorporating the FAO code on responsible fisheries and other internationally agreed codes of practices.

4.4.8 Fortunately, India is participating in the FAO/Norway Project. As this Project is encouraging the development of methodologies and economic analysis in relation to Biosecurity, India may select cases where pest eradication campaigns, or the implementation of improved food standards, had resulted in quantifiable export increases, thus suggesting the way to replicate the success stories. One possible methodology could be developed around an analysis of the values of goods transiting through control and inspection systems, in relation to the costs of such systems. These could be extended to regional Biosecurity standards and procedures. Methodologies were required to document

the economic advantages flowing from cross-sectorial cooperation, and of documenting and analysing the costs and the benefits of public-private sector cooperation, as well as where investments in Biosecurity measures had been most successful. A further methodology could consider market opportunities in relation to the Biosecurity investments that would be required to realize them. This effort will provide India a greater visibility in the international era in the field of Biosecurity.

4.5.0 Functions, Organisational Structure and Management of the National Agricultural Biosecurity System

Functions

4.5.1 The NABS should determine the potential for synergies and harmonization within the national and sub-national regulatory frameworks that would result from a holistic and coordinated approach to Biosecurity. Policy-makers should recognize the importance of Biosecurity as a key element of sustainable development, and the benefits, including in trade, that can be gained from comprehensive approaches to Biosecurity. They should also appreciate the cost of not fully recognising the role of Biosecurity. Full awareness on part of all stakeholders is essential for sustaining and further strengthening this national movement.

4.5.2 Strategy of the NABS should be to synergise linkages among science and technology, education and training and commercialization and utilization in the different subsectors capturing both commonalities and specialities for synergistically addressing the four main Biosecurity components, namely, Preparedness and Prevention, Diagnostics, Surviellance and Input Management **(Figure 1).**

4.5.3 In a large country like India, NABS should recognize the efficiencies that may emanate from regional and sub-regional approaches to risk analysis, particularly in relation to animal and plant life and health, and living modified organisms, and reorganise or establish agro-eco-regional facilities as per specific challenges and opportunities. The various quarantine, SPS and zoosanitary facilities should be updated

and adequately staffed to be in an ever-ready condition. The Plant Protection staff should be duly rewarded with befitting incentives.

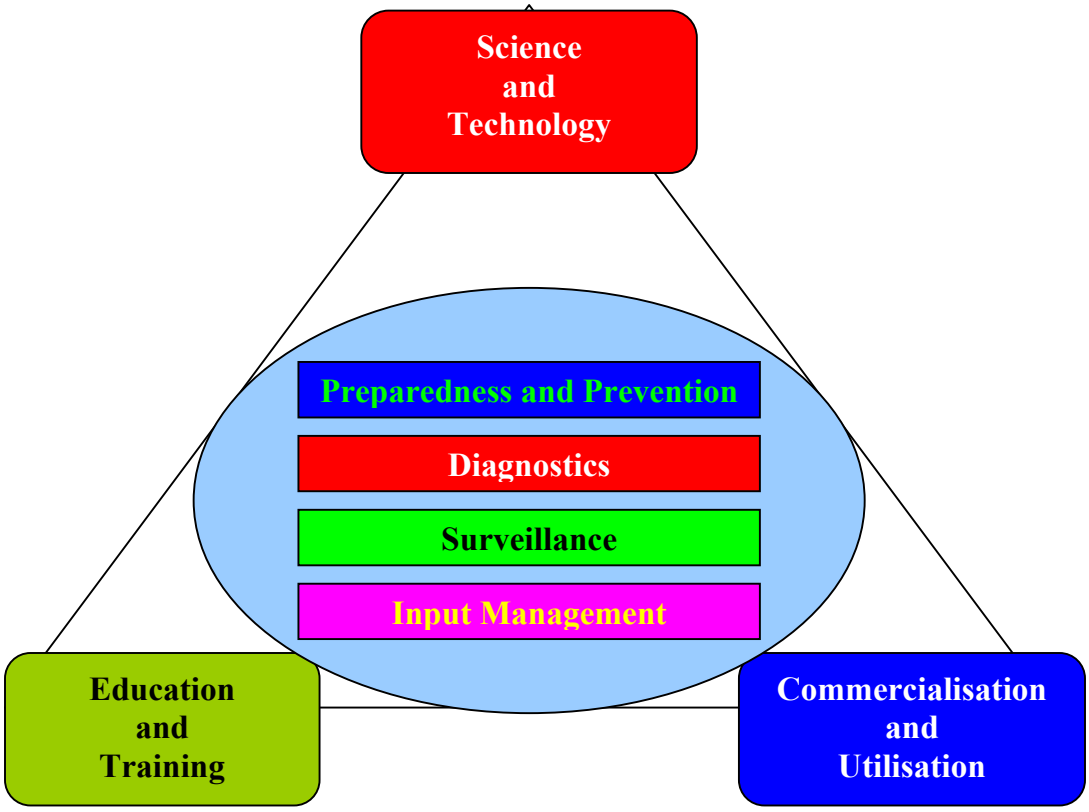

Figure 1. Programme Strategies and Linkages

4.5.4 Risk analysis and management frameworks are essential to achieve Biosecurity. In the past, such frameworks have been mostly sectorial or used to address specific technical issues. In future, such frameworks should seek to improve collaboration among diverse interests and institutions (particularly agriculture, public health, environment, trade, and their associated stakeholders) to achieve Biosecurity in a mutually supportive manner, thus avoiding duplication and possible inconsistencies. There are several such opportunities which should be grabbed.

4.5.5 General principles for biological risk analysis in food and agriculture are the same, although procedures may differ depending on the hazards addressed. The IPPC, the Codex Alimentarius, the OIE, the CBD and its Cartagena Protocol, where appropriate, should apply coherent risk analysis methodologies in different sectors by jointly

analysing differences and commonalities in approaches, and use of terms in risk analysis. FAO may play an archestrating role in this area and help develop tools, including tools to extend the Phytosanitary Capacity Evaluation to other sectors, to assist the country to analyse her capacity-building needs that take account of the full scope of Biosecurity, including the communicational, legal, institutional, scientific and technical aspects.

4.5.6 The roles and responsibilities of both the public and private sectors should be considered in planning Biosecurity capacity-building initiatives. In India, agriculture related industries should play greater positive role in strengthening the national Biosecurity umbrella. The System should devise innovative measures to build partnerships involving all stake-holders.

4.5.7 Appropriate linkages and coordination mechanisms among existing and planned Biosecurity capacity-building initiatives should be established to enhance complementarity and avoid duplication of efforts, and to ensure that capacity building is directed at identified priorities.

4.5.8 The System should give highest attention to obviate the serious shortcomings in quantity and quality of necessary databases. The need to share information and to ensure better understanding of the requirements for achieving Biosecurity can hardly be overemphasised. The need for an Internet-based Biosecurity Portal to facilitate information exchange on Biosecurity is a priority. The importance of information access and exchange in developing Biosecurity capacity should also be recognised. India can play a leading role in .developing appropriate mechanisms for information exchange in Biosecurity, and to participate in the development of information Portals.

4.5.9 In order to lead from the front, the NABS should develop a specific methodology or adopt the ones already used by other national and international programmes for identification, establishment and maintenance of a given strategic area and render it pest free as per the international standards. Such a project could be initiated involving State Governments, Farmers, Traders and other Stakeholders to " sanitise" and

declare all areas under identified leading varieties of mangoes as pest free for export to USA under the recent Indo-USA agreement and also highlighted under the Indo-USA Knowledge Initiative.

4.5.10 NABS may initiate projects in a few hot - spots in a highly scientific andprofessional manner - collection of ground facts and creation of database and benchmark information, undertaking detailed risk analysis and eradication of the risk (pathogen and pest) and monitoring the freedom of the eradicated area from the eradicated pest. It should also analyse impact of socio-economic and of agro-ecological and climate change on overall Biosecurity situation in the area.

Organisational Structure

4.5.11 Necessary capacity must be put in place to establish and sustain the National Agricultural Biosecurity System and harmonised with international Biosecurity standards for food and agriculture to take advantage of trade opportunities and technology sharing for enhanced and sustained agricultural production and farmers' income. Achieving Biosecurity requires an understanding of, and the ability to analyse diverse and complex risks, and determine and apply measures in a coherent manner while respecting differences among sectors and organizations. Risk analysis and management, as mentioned earlier, is the most important unifying concept across different Biosecurity sectors.

4.5.12 In order to achieve its goal of rendering Indian agriculture biosecure, the NABS should have the following three mutually reinforcing components:

- **National Agricultural Biosecurity Council (NABC):** Chaired by the Union Minister of Agriculture, NABC will serve as a platform for convergence and synergy among the on-going and new programmes of different Ministries and Departments of the Government of India, as well as appropriate international and State Government Agencies and Private Sector Organisations. NABC will serve

as an apex policy making and coordinating body and will pay particular attention to strengthening the national capacity in agricultural Biosecurity as related to crops, farm animals, forestry and aquatic organisms. The existing infrastructure for sanitary and phytosanitary measures will be reviewed and major gaps filled. Such a multistakeholder apex level NABC would be essential to ensure the livelihood security of nearly 70 crores of our population engaged in agriculture, animal husbandry, fisheries, forestry and agro-processing. While in developed countries, any disaster arising from invasive alien species like H5N1 strain of the Avian Flu may be more of a human health problem, since hardly 2 to 3% of population is engaged in farming, agriculture is the backbone of the livelihood security system in rural India.

- **National Centre for Agricultural Biosecurity (NCAB):** This National Centre should have four wings dealing with crops, farm animals, living aquatic resources and agriculturally important micro-organisms. The major purpose of this Centre will be the analysis, aversion and management of risks, as well as the operation of an early warning system. NCAB will maintain databases relating to potential threats to Indian agriculture and human health security from alien invasive species. It will also serve as a watch dog agency helping to initiate pro-active action in the case of impending Biosecurity threats. NCAB will provide the Secretariat for the National Agricultural Biosecurity Council. Further, it will work on the standardization of surveillance and control methods and help to introduce the latest molecular techniques like micro-arrays for disease diagnosis. NCAB will be largely a virtual organization with considerable capacity in computer aided monitoring and early warning systems. The four different divisions of NCAB could be located in appropriate existing ICAR Institutes / Agricultural / Animal Husbandry and Fisheries Universities, such as the High Security Animal Diseases Laboratory of ICAR at Bhopal

- **National Agricultural Biosecurity Network (NABN):** NCAB will serve as the coordinating and facilitating center for a National Agricultural Biosecurity Network designed to facilitate scientific partnerships among the many existing

institutions in the public, private, academic and civil society sectors engaged in biomonitoring, biosafety, quarantine, and other Biosecurity programmes. This will help to maximize the benefits from the already existing scientific expertise and institutional strengths. The National Agricultural Biosecurity Network could have four mini-networks relating to crops and forestry, animals including migratory birds, living aquatic organisms and agriculturally important microbes.

4.5.13 The establishment of a National Biosecurity Council, National Centre for Agricultural Biosecurity and a National Agricultural Biosecurity Network will help us to strengthen considerably our ability to undertake pro-active measures to prevent the outbreak of pandemics and the introduction of invasive alien species. Such an Agricultural Biosecurity Compact is an urgent national need since prevention is always better than cure.

Agricultural Biosecurity Compact

4.5.14 Among other areas which require urgent attention from the proposed National Agricultural Biosecurity Council, the following deserve priority.

a. Review all existing Acts relating to Biosecurity and identify and fill gaps in the existing regulatory framework. Based on such a review, develop a **National Agricultural Biosecurity Policy** for being placed before Parliament and the National Development Council.

b. Education: Education holds the key to prevent unconscious and ill-informed introductions of invasive alien species. There is need for launching a **Biosecurity Literacy Movement** in the country. Human resource development is also exceedingly important. **A course may be introduced in all Agricultural, Veterinary and Fisheries Universities on Agricultural Biosecurity**. This should be done at the basic degree level. A Media Resource Centre should be established by the proposed National Centre for Agricultural Biosecurity to give

authentic information to mass media, so that unnecessary panic is not created. The media require authentic and credible information from time to time.

c. Social Mobilisation: Agricultural Biosecurity should be everybody's business and not merely that of a few government departments or academic institutions. It would be useful to train **Grassroot Biosecurity Managers** (atleast one woman and one male) in every Gram Panchayat and Nagarpalika. Towns and Cities require equal attention to enlist urban populations in the fight against biologically dangerous introductions and to create a well-informed public opinion in relation to agricultural risks and human health hazards.

Administrative Management

4.5.15 The three components of NABS, namely, NABC, NCAB and NABN should be professionally-led bodies, capable of providing scientific and intellectual leadership and strategic guidance. These should be lean and virtual bodies, having effective structures suiting to the mandate of NABC as an apex integrating force in the area of Biosecurity. In order to be productive, these should have the necessary functional and financial autonomy and authority coupled with accountability. Also, the **Chief Executives and other Staff should be eminent professionals and should work on a long tenure, without frequent changes.**

National Agricultural Biosecurity Fund

4.5.16 NCF recommends the establishment of a National Agricultural Biosecurity Fund of Rs. 1,000 crores with an initial contribution by the Government of India and appropriate international and bilateral donors as well as private sector companies. Such a Fund is urgently needed for the following purposes.

- Strengthening infrastructure for sanitary and phytosanitary measures.
- Upgrading facilities for plant, animal and fish quarantine and certification.

- Establishing an off-shore genetic screening center for animals for the purpose of identifying genes for resistance to serious disease epidemics arising from invasive alien species, such as the H5N1 strain of the Avian Flu in poultry. Fortunately, there are unmanned islands in Lakshadweep which can be developed as off-shore Genetic Screening Centres. The present policy of killing indiscriminately all native breeds of poultry will be harmful and we may lose the opportunity of identifying genetic resistance to serious diseases. At the same time, off-shore screening in isolated areas will help to avoid risks within the country.

4.6.0 Epilogue

4.6.1 The National Commission on Farmers urges the Government of India to take immediate action in setting up a National Agricultural Biosecurity Council, National Centre for Agricultural Biosecurity and a National Agricultural Biosecurity Network. The recommendations made above relating to strategic interventions and strategic partnerships also need immediate attention. Above all, a National Agricultural Biosecurity Fund will help to strengthen our infrastructure, introduce new molecular techniques of identification and verification, derive benefits from our animal genetic resources, and provide needed and timely help to the affected families.

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