STATE OF ORGANIC AND NATURAL FARMING IN INDIA

CHALLENGES AND POSSIBILITIES

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Introduction

INDIAN AGRARIAN CRISIS

India has one of the highest arable land areas in the world.[1] The net sown area is 140.1 million hectares (ha); net irrigated area is 49 per cent of this, which is 68.4 million ha as per 2014–15 land-use statistics.[2]

While the share of Indians working in the agriculture sector is declining, agriculture—along with its allied sectors such as livestock, forestry and fisheries—is still the largest source of livelihood for India. As per the Lok Sabha Standing Committee on Agriculture (2019–20), agriculture and allied sectors employed 54.6 per cent of the total workforce in India.[3] About 70 per cent of rural households still depend primarily on agriculture for their livelihood. As per the Agriculture Census of 2015–16, about 146 million farming families in India have operational landholdings for agriculture use. Around 85 per cent of these farmers are small and marginal, with landholdings of 2 ha or less.[4] The share of agriculture and allied sectors in the Gross Value Added of the country at current prices—the value of goods and services produced in an area, industry or sector of an economy—has declined from 18.2 per cent in 2014–15 to 16.5 per cent in 2019–20.[5]

The country adopted the Green Revolution model—an input- and chemical-intensive model—in the 1960s to increase food production. The focus was on development of new seed varieties and increased use of synthetic fertilizers and irrigation for increasing food production. This approach succeeded in increasing food production but failed the test of sustainability. Issues such as exploitation and degradation of natural resources of land and water, biodiversity loss, and human- and animal-health concerns are evident now. Sustainability of food production systems in India—linked with decline in soil health, loss of productivity, soil infertility, desertification, reduced agro-diversity, pesticide pollution and emerging pest-resistance—have raised serious concerns about the future of the current chemical- and input-intensive model. Problems are bound to grow across the country with the current approach.[6,7]

Indian agriculture has long faced ecological, economical and existential crises. About 0.29 million farmers or farm workers have committed suicide during 2000–18.[8,9] This number was 10,349 in 2018, which suggests that every hour more than one farmer or farm worker committed suicide.[10] Civil society following farm-related suicides suggests that suicide numbers are grossly under-reported.[11]

According to a 2013 National Sample Survey Organisation (NSSO) survey, 52 per cent of the farm households in India are in debt.[12] The disparity between farm incomes and non-farm incomes is high—those who work outside agriculture are progressing much faster than those who work within it.[13] The cost of cultivation has risen much faster than prices of farm produce, and the government's policies push for the low prices of food produce.

As per the survey, net savings of around two-thirds of agricultural households of India is negative, i.e. their expenditure is more than their earnings. The rising cost of cultivation, non-remunerative prices for farm produce, indebtedness, farm-related suicides, lack of interest in agriculture among rural youth, migration of agricultural labour to non-farm jobs and labour shortages have clearly emerged as the main issues. The climate emergency has further aggravated the farm situation due to increased incidence of crop losses related to extreme-weather events.

ORGANIC AND NATURAL FARMING—MAKING INDIAN AGRICULTURE SELF-RELIANT

Globally, comprehensive assessments like the UN-led International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), 2008, and the United Nations Committee on World Food Security's High Level Panel of Experts on Food Security and Nutrition (HLPE), 2019, have raised alarm over the current chemical- and input-intensive models of agriculture.[14,15] They have stressed that business as usual in agriculture is no longer an option. In 2015, the Food and Agriculture Organization (FAO) of the United Nations also indicated that because of soil degradation only 60 harvesting years were left.[16] All these assessments highlighted the strong need for major transformation of food systems and point toward agroecology as the solution.

Agroecology, the application of ecological principles to agricultural systems and practices, is considered a holistic solution to help transition to sustainable food systems—a win-win for people, the planet and livelihoods. Farmer movements across the globe point out that agroecology is the key to food sovereignty. Agroecology also contributes to multiple UN Sustainable Development Goals 2030, such as tackling hunger, poverty and inequality; expanding nutritional choices; responding to climate change; and safeguarding biodiversity.

So far, the organic and natural farming movement in India has largely been led by farmer movements and civil society. In the last few years, Central and state governments have also come forward to promote organic farming and, more recently, natural farming. The Central government has increased efforts towards organic farming by launching Paramparagat Krishi Vikas Yojana (PKVY) in 2015–16. States have also come forward, with varying degrees of focus, over the last few years. Sikkim became India's first 100 per cent organic state. Andhra Pradesh and Himachal Pradesh also aim to become 100 per cent natural farming states by 2027 and 2022 respectively (*see Annexure 1: Climate-resilient zero-budget natural farming [CRZBNF] of Andhra Pradesh*). A few other Northeastern states also intend to transition to 100 per cent organic farming.

In reality, however, the organic and natural farming movement in India is still niche rather than a mass movement. Only 2 per cent of net sown area in India is organically farmed and about 1.3 per cent of farmers in India are registered for organic farming.

Clearly, this half-hearted approach has not helped so far. The status quo cannot continue. Indian agriculture needs transformational change to become self-reliant. For this, organic and natural agriculture must become part of mainstream agriculture.

Agroecological practices—Organic and natural farming

Organic farming and natural farming are forms of agroecological practices.

The terms organic farming and natural farming are sometimes used interchangeably by farmers and civil society members in India. Practically, in organic farming, farmers also use off-farm purchased inputs such as biofertilizers. In natural farming, farm activists emphasize the use of bio-inputs prepared from farm and local ecosystems rather than purchased from outside.

The Food and Agriculture Organization (FAO) states, 'agroecological practices harness, maintain and enhance biological and ecological processes in agricultural production, in order to reduce the use of purchased inputs that include fossil fuels and agrochemicals. Agricultural practices can be classified as more or less agroecological, depending on to the extent to which: they rely on ecological processes as opposed to purchased inputs; they are equitable, environmentally friendly, locally adapted and controlled; and they adopt a systems approach embracing management of interactions among components, rather than focusing only on specific technologies.'[1]

The FAO defines organic agriculture as 'a holistic production management system which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system.'[2]

With regard to natural farming, the Indian Institute of Farming Systems Research (IIFSR), an institute under the Indian Council of Agriculture Research (ICAR), emphasizes efficient use of on-farm biological resources and enrichment of soil with jivamruta to ensure high soil biological activity. Use of bijamruta for seed and planting-material treatment and foliar spray are other important components of natural farming.[3]

This report analyses the current situation, identifies barriers to natural and organic farming, and suggests interventions for driving change that should help farmers earn more money, use less chemicals and pesticides, produce healthy food and conserve natural resources. This change will make the Indian agriculture sustainable and self-reliant, and help India become self-sufficient in the true sense.

SECTION I

ORGANIC AND NATURAL FARMING IN INDIA

Chapter 1: Organic farming in India

Organic farming in India was initially led by civil society and farmer movements. It was promoted at the government level mainly with an export-centric approach, backed by third-party certification system. This was part of the National Programme for Organic Production (NPOP), which started in 2001 under the Agricultural and Processed Food Products Export Development Authority (APEDA) of the Ministry of Commerce and Industry, Government of India. In 2005, the first organic farming policy of India was developed by the then Ministry of Agriculture.[17] Efforts to promote organic farming began only in 2014–15 under the National Mission for Sustainable Agriculture by the Ministry of Agriculture and Farmers' Welfare (MoAFW).

These initiatives and programmes relevant to organic farming included the National Centre of Organic Farming (NCOF), National Project on Organic Farming (NPOF), Paramparagat Krishi Vikas Yojana (PKVY), Mission Organic Value Chain Development for North East Region (MOVCDNER) and a soil health management programme.[18] Out of these, PKVY and MOVCDNER are the flagship programmes though with limited budgets. States also have the option of using a limited part of funds from national schemes such as Rashtriya Krishi Vikas Yojana (RKVY) and the Mission for Integrated Development of Horticulture (MIDH) to promote organic farming in their respective states (see *Fig. 1: Organic farming policies and programmes in India*).

KEY POLICIES AND PROGRAMMES

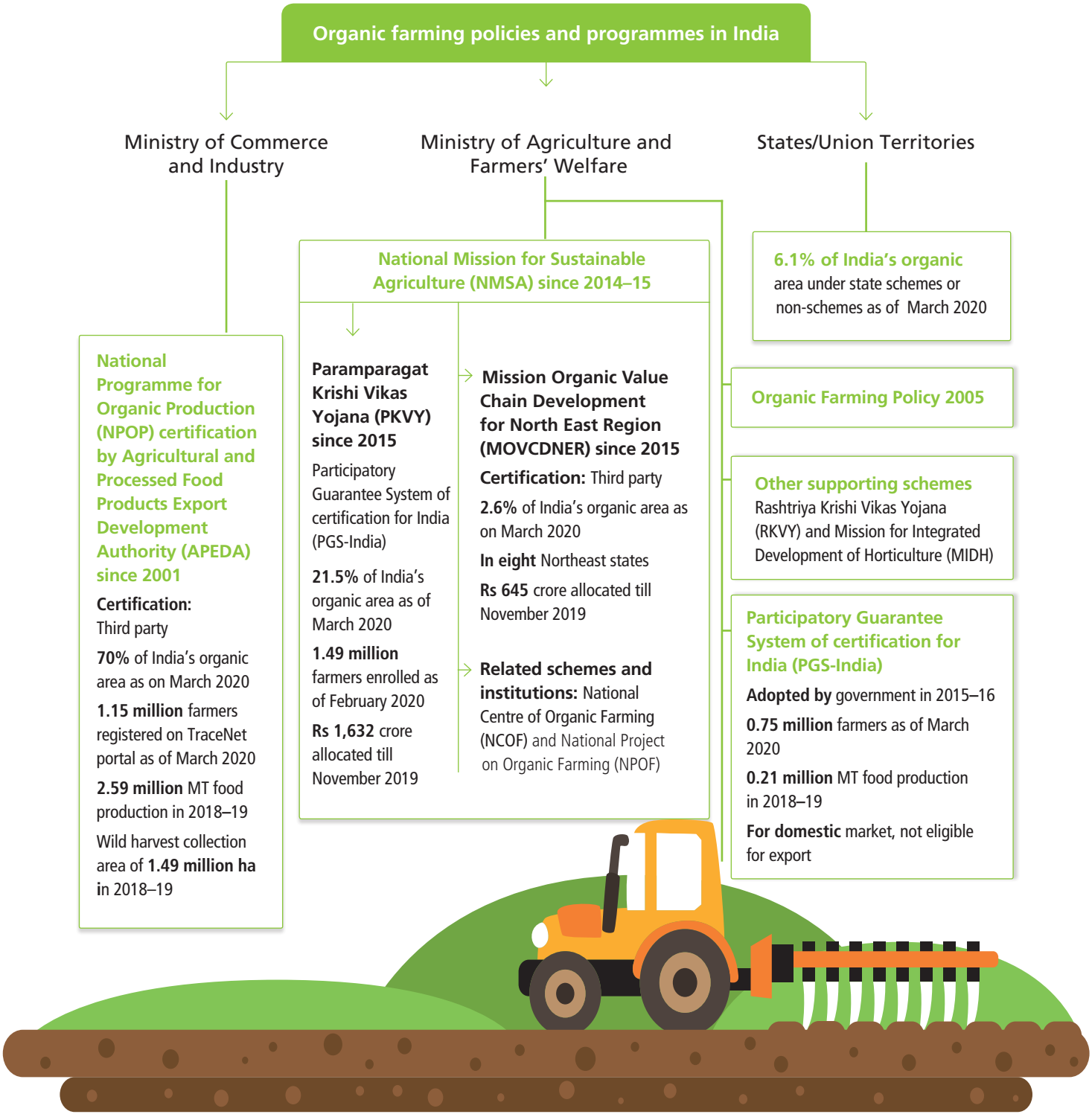
Organic Farming Policy 2005

The Ministry of Agriculture's Organic Farming Policy 2005 sought to promote organic farming, sustain soil fertility, conserve bio-resources, strengthen the rural economy, promote value addition, accelerate growth of agro-businesses and secure a fair standard of living for farmers and workers. Although it was a good initiative, the policy was not successful in bringing necessary attention towards organic farming in the country. It lacked ambition and could not mobilize enough resources. There were no targets and timelines. This policy is barely mentioned now.

The National Mission on Sustainable Agriculture

The National Mission on Sustainable Agriculture (NMSA), made operational in 2014–15, was one of the eight missions under the National Action Plan on Climate Change. The Mission aimed to make agriculture more productive, sustainable, remunerative and climate-resilient by promoting location-specific integrated farming systems, soil- and moisture-conservation measures, comprehensive soil-health management and efficient water-management practices as well as mainstreaming rain-fed technologies.

Figure 1: Organic farming policies and programmes in India



This was a good step towards bringing promotional schemes for organic farming into the larger domains of climate change and sustainability but it did not have much success. The conceptualization of schemes such as Paramparagat Krishi Vikas Yojana (PKVY) and Mission Organic Value Chain Development in North East Region (MOVCDNER) were of limited scale and ambition. Besides, the National Mission on Sustainable Agriculture (NMSA) missed the opportunity to adequately build upon and strengthen the 2005 policy, which could have accelerated the Indian organic and natural farming movement.

Paramparagat Krishi Vikas Yojana

Paramparagat Krishi Vikas Yojana (PKVY) is a Centrally sponsored scheme to promote organic farming in all states and Union Territories, especially hilly, tribal and rain-fed areas, through clusters of 500–1000 ha. The fund distribution between the Centre and states is 60 per cent and 40 per cent respectively. In the case of the Northeastern and Himalayan states, the ratio is 90:10, while Central assistance for Union Territories is 100 per cent.

The first phase of PKVY, from 2015–16 to 2017–18, enrolled 0.59 million farmers and covered an area of 0.24 million ha. The second phase of three years will end in 2020–21 and aims to cover 0.4 million ha under organic farming.

Within a cluster, a group of a minimum of 20 farmers with a total area of 20 ha in as far as possible a contiguous patch is considered a PKVY group. In a group, each farmer can get the benefit for a maximum of 2 ha. In total, Rs 50,000 per ha is spent for three years on overall implementation out of which Rs 31,000 is provided to farmers directly for inputs. Year-wise, this works out to Rs 12,000, 10,000 and 9,000 for the first, second and third year respectively.

As of February 2020, in a total of 29,859 clusters, 1.49 million farmers have adopted organic farming, covering an area of 0.59 million ha.[19] PKVY promotes organic farming through PGS certification.

Participatory Guarantee System of certification for India (PGS-India)

PGS-India is a decentralized organic farming certification system. As per the International Federation of Organic Agriculture Movements (IFOAM), PGSs are locally focused quality-assurance systems. PGSs certify producers—with active participation of stakeholders—and are built on a foundation of trust, social networks and knowledge exchange. Inspired by the PGS system run by civil society in India, the Ministry of Agriculture and Farmers' Welfare (MoAFW) adopted PGS-India certification in 2015–16. Now only the government-led PGS-India organic certification is valid. In June 2020, MoAFW released a new PGS-India guideline.

The National Centre of Organic Farming (NCOF) is the secretariat of PGS-India. Regional councils are agencies authorized to coordinate, monitor and approve certification decisions under PGS-India certification. They are appointed by states and can be a district agriculture department, existing NGOs, organic-certification service-providers of Central and state governments or any other agency. A 'PGS-India Organic' certificate is given to farmers who have fulfilled all PGS-India standard requirements, while in-conversion products are labelled 'PGS-India Green'.

While the scheme is more farmer-friendly than third-party certification, farmers have observed concerns and difficulties. First, **parallel or part conversion is not allowed under PGS-India certification.** To get the certification, the crop production processes of the whole farm as well as animal husbandry practices are required to be converted to organic. This becomes difficult for farmers, who might wish to convert only a part of their land for multiple reasons, including larger labour requirements for bigger farm and lack of market availability for the entire produce. Under the new PGS-India guideline, however, regional councils may make exceptions and allow conversion in phases. The previous guideline stipulated a timeline of 24 months to convert the whole farm as well as the animal husbandry practices; no such timeline is mentioned in the new guideline.

Another issue is that as **PGS is a group certification, it cannot be adopted by sole farmers** in an area. A minimum of five farmers are required to form a PGS group in a local area. This could be difficult in various regions, especially where chemical farming is prevalent and few neighbour farmers practise organic cultivation. The new guidelines allow two years for individual farmers to form a group. The previous guidelines did not have this flexibility.

Another concern is the **extensive documentation** that PGS-India requires which is to be uploaded to the PGS-India portal. Farmers as well as regional council staff find the process cumbersome and time consuming. **PGS-India's popularity and credibility is still low** among consumers.

Mission Organic Value Chain Development in North East Region

The Mission Organic Value Chain Development for North East Region (MOVCDNER) became operational in 2015–16. It aimed to link organic growers with consumers and support the development of the entire value chain focusing on creation of facilities for collection, aggregation, processing, marketing and branding. It started with an annual budget of Rs 112 crore and until November 2019, Rs 645 crore had been allocated. Rs 175 crore was planned for 2020–21.

Though the establishment of MOVCDNER was a good step that recognized the logistical constraints of the eight Northeast Indian states, concerns highlighted from the ground include sustainability of farmer–producer companies after completion of the scheme as well as farmers opting to go back to inorganic after facing difficulties in selling produce at fair prices. These concerns are for states other than Sikkim due to relatively little political support. Government reports also suggest that the Northeastern states still lack vital infrastructure facilities related to procurement, processing and packaging of produce, storage facilities and quality-control laboratories.

The National Project on Organic Farming

The National Project on Organic Farming (NPOF), 2004 was conceptualized to encourage the production and use of organic and biological sources of nutrients and alternative bio-pesticides for sustained soil health and fertility. Implemented through the National Centre of Organic Farming (NCOF), the project remains largely under-funded. The budget for 2019–20 was Rs 2 crore and for 2020–21 is Rs 12.5 crore. Availability of standardized organic inputs of good quality at reasonable price remains a key issue.

National Centre of Organic Farming

The National Centre of Organic Farming (NCOF) acts as nodal quality-control laboratory for analysis of biofertilizers and organic fertilizers. It also maintains a national and regional culture collection bank of biofertilizers, biocontrol agents and waste decomposer organisms for supply to production units as well as for development, procurement and efficacy evaluation of biofertilizer strains and mother cultures.[20]

The standards of biofertilizers and organic fertilizers are notified under the Fertilizer (Control) Order, 1985.[21] Issues of available quantity, quality and price of biofertilizers and organic fertilizers are indicated on the ground as well as from experts.

According to the 2015–16 Parliamentary Committee of Estimates, India required 0.43 million MT carrier-based biofertilizers and 710 million MT organic manure. However, against this requirement, India's total production of carrier-based biofertilizers in 2017–18 was 0.12 million MT and total production of organic manure was 338.72 million MT in the same year (see *Table 1: Biofertilizer and organic manure production, 2015–16 to 2017–18*).

The government highlights that it promotes biofertilizers and organic fertilizers through subsidies and support through schemes like Capital Investment Subsidy Scheme (CISS), PKVY, MOVCDNER, National Mission on Oilseeds and Oil Palm (NMOOP) and the National Food Security Mission (NFSM). A 2019 report by the Parliamentary Standing Committee on Commerce noted the reluctance of most states to avail subsidies under CISS to establish manufacturing units.[22] It is also evident that city compost, which is currently just about 3 per cent of the total organic manure, remains underutilized. This is despite the government's policy on promotion of city compost, 2016, which offered market development assistance of Rs 1,500 per MT.[23]

Availability of poor quality of biofertilizers is also reported to lead to rejection of organic certificates of farmers.[24] In 2016–17, NCOF found that 10 per cent of biofertilizer samples and 18 per cent of organic fertilizer samples regulated under the Fertilizer Control Order, 1985 did not meet the notified standards. Price is another concern. Unlike chemical fertilizers, the government does not regulate its price.

Table 1: Biofertilizer and organic manure production, 2015–16 to 2017–18

	Biofertilizer		Organic manures produced/available (in million MT) in India						
Year	Carrier-based (in million MT)	Liquid-based (in KL)	Organic manure*	Farmyard manure	City compost	Vermi-compost	PROM**	Other manure	Total manure
2015–16	0.09	6,241	26.65	151.45	7.95	59.18	–	9.56	254.79
2016–17	0.11	7,526	28.46	171.72	10.03	59.71	0.06	10.32	280.30
2017–18	0.12	9,033	37.74	188.59	11.05	77.50	0.59	23.26	338.72

** Includes rural compost for 2017–18; ** PROM—Phosphate-rich organic manure*

Source: Ministry of Agriculture and Farmers' Welfare, Government of India

The National Programme for Organic Production

The National Programme for Organic Production (NPOP), started in 2001, is a quality-assurance initiative that operationalized certification programmes and provided an institutional framework for accreditation of certification agencies. Under this, third-party certified products can be exported as well as sold in the domestic market. Since the certification is industry-driven, it is expensive for small farmers of India. It has also led to higher-priced products in the market, thereby limiting the popularity of organic products.

Food Safety and Standards (Organic Food) Regulation, 2017

Food Safety and Standards (Organic Food) Regulation, 2017 mandates that no person shall manufacture, pack, sell, offer for sale, market or otherwise distribute or import any organic food unless they comply with the requirements laid down under these regulations. Effectively, any food cannot be sold as organic if it does not have NPOP or PGS-India certification. The law also sets the residue limit of insecticides at 5 per cent of the maximum limit prescribed for corresponding food grown conventionally.

Stakeholders have highlighted concerns, including that the mandatory certification will put farmers who have not opted for any certification but are following organic practices at a disadvantage. The other concern is that this regulation should be limited to testing of residues and tracing for the source rather than making certification mandatory.

ORGANIC FARMING COVERAGE

As per the Ministry of Agriculture and Farmers' Welfare (MoAFW), 2.78 million ha was covered under organic farming in India as of March 2020. This is about 2 per cent of the 140.1 million ha net sown area in the country. Of this, 1.94 million ha is under NPOP, 0.59 million ha under PKVY, 0.07 million ha under MOVCDNER and 0.17 million ha under state schemes or non-schemes. This means that 70 per cent area is under NPOP, 21.5 per cent is part of PKVY, 2.6 per cent is with MOVCDNER and 6.1 per cent is part of state schemes or not part of any scheme. Of the total area, 30 per cent is in conversion under NPOP.[25] Further, in addition to the 2.78 million ha, wild harvest collection area in India is considered separately and was 1.49 million ha in 2018–19.

Over 1.9 million farmers in India, which is 1.3 per cent of 146 million agricultural landholders, were registered under the two certification systems as of March 2020, i.e. NPOP's third-party certification and Participatory Guarantee System for India (PGS-India). With about 1.15 million farmers under NPOP and about 0.75 million farmers with PGS, the break-up of farmers under the two certification schemes is 60:40.[26] The break-up of registered farmers in conversion or fully certified under NPOP and PGS is not available (see *Annexure 2: State-wise number of organic farmers*). As of February 2020, the PKVY scheme had enrolled 1.49 million farmers, comprising 29,859 clusters. This also includes farmers registered under PGS-India. In addition, there would also be farmers not certified by any scheme and hence not counted. This would include by-default organic farmers in hilly, tribal and rain-fed regions as well as practitioners of organic farming in other regions who are not certified. A 2020 survey by the International Federation of Organic Agriculture Movements (IFOAM) placed India foremost with regard to the number of organic farmers in the world. It, however, ranked India ninth with regard to organic land.[27]

Wild harvest collection under organic certification

Wild harvest refers to medicinal and aromatic plants, fruits, nuts, gums, honey as well as sea and aquatic plant products in their natural habitats. Wild harvest collection has been certified under National Programme for Organic Production (NPOP) standards for several years. Recently, the Participatory Guarantee System of India (PGS-India) has also made standards, similar to NPOP standards, for certifying wild harvest areas.

Both NPOP and PGS-India standards focus on the sustainability of the ecosystem while harvesting or gathering products from forest areas. As per the standards, a wild harvest product will be certified organic if it is derived from a stable and sustainable growing environment, and harvesting or gathering does not exceed the sustainable yield of the ecosystem. The collection area has to be clearly defined and should not be exposed to prohibited substances. The area should be at an appropriate distance from conventional farming areas, pollution and contamination sources. Wild harvest collectors have to follow the principles and best practices as per the standard requirements.[1, 2]

Wild harvest collection helps generate income opportunity for tribal communities, who are expected to collect forest produce for their livelihood without disturbing the forest. Under NPOP, wild harvest collection area in India was 1.49 million ha and total production was 37,930 MT in 2018–19 from 21 states of India. Rajasthan, Madhya Pradesh, Himachal Pradesh, Chhattisgarh and Jammu and Kashmir are the top five states in terms of largest certified wild harvest area, and has 80 per cent of the total wild harvest area of the country in 2018–19.[3]

From 2015–16 to 2018–19, 6.79 million metric tonnes (MT) of organic food was produced under NPOP and 0.29 million MT under PGS. This means that during this time, 96 per cent of the total quantity of organic food produced was third-party certified. In a single year—2018–19—about 2.59 million MT of organic food was produced under NPOP. Certified sugar cane was highest, comprising 38 per cent of the total. This was followed by oilseeds at 28 per cent, fibre crops at 12 per cent and cereals and millets at 10.4 per cent. During this time only 0.21 million MT was produced under PGS.[28] In 2018–19, India exported 0.61 million MT of organic products worth Rs 5,151 crore.[29]

From 2015–16 to November 2019, the total allocated amount under PKVY was Rs 1,632 crore. For the year 2019–20, the revised estimate was Rs 299.4 crore. However, only Rs 1,138 crore had been released as of February 2020. Further, a fair amount of the funds remained unspent. For example, in 2018–19, Rs 222.4 crore and in 2017–18, Rs 55.6 crore was unspent.

As of November 2019, Rs 645 crore had been earmarked since 2015–16 under MOVCDNER. In 2018–19, Rs 109.4 crore remained unspent (see *Table 2: Budget of key organic farming schemes* and *Table 3: Allocation, released and unspent amount under PKVY and MOVCDNER*).[30,31]

Table 2: Budget of key organic farming schemes

Organic farming schemes	2019–20 revised estimatess (Rs crore)	2020–21 budget estimates (Rs crore)
Paramparagat Krishi Vikas Yojana (PKVY)*	299.4	500.0
Mision Organic Value Chain Development for North East Region (MOVCDNER)	160.0	175.0
National Project on Organic Farming (NPOF)	2.0	12.5

* Bhartiya Prakritik Krishi Paddhti (BPKP) is a new sub-mission proposed under PKVY to cover 1.2 million ha in five years; clusters are proposed in every block of the country. An amount of Rs 4,371.6 crore is proposed for five years but is still to be approved.

Table 3: Allocation, released and unspent amount under PKVY and MOVCDNER

	2016–17 (Rs crore)			2017–18 (Rs crore)			2018–19 (Rs crore)		
	Allocation	Released	Unspent	Allocation	Released	Unspent	Allocation	Released	Unspent
PKVY	233.1	152.2	14.7	351.0	200.3	55.6	617.2	312.9	222.4
MOVCDNER	100.0	48.7	0.3	100. 0	66.2	9.3	160.0	174.8	109.4

GAPS IN IMPLEMENTATION

Gaps in the implementation of the flagship programme PKVY include the following:

A. Officials responsible for ground-level implementation often lack required expertise

The state-level agricultural extension officials expected to closely work with farmers often have limited understanding of organic farming approaches and are not convinced of the practice. This is because organic farming has not been adequately covered in agriculture educational curricula and most of the professional work of the officials involves handling chemical-based agriculture projects. But, most importantly, they do not receive adequate training on necessary aspects of organic farming and lack practical expertise, which jeopardizes the entire implementation process. Besides, their limited know-how gets reflected in their interaction with farmers and fails to motivate them.

The revised PKVY guidelines of 2018 tried to address this concern by providing the flexibility to rope in professional support agencies with requisite expertise and experience to implement the scheme. However, this option has not been widely utilized.

In the case of organic farming, NCOF, mandated for technical capacity building of all stakeholders, is not able to provide specific training on multiple aspects of organic farming—limited budget has been cited as a reason. According to the December 2019 Parliamentary Standing Committee report on export of organic products, for example, out of the Rs 17 crore allocated against the proposed Rs 84 crore, only Rs 1.5 crore was allocated for training.[32]

B. Careful enrollment and mobilization of farmers a concern

The first big and critical task to be done by the local officials at ground level is the selection of farmers to form a group. This requires identification and sensitization of farmers towards organic farming practices and its benefits followed by detailed discussions about eligibility and interest. Select farmers are then mobilized to form a group based on the required criteria.

But the ground reality is different for multiple reasons. Apart from officials' expertise and farmers' interest, this process requires considerable time and effort by officials, which is often not spent. This leads to farmers getting limited time to weigh the benefits and risks and decide. Often, farmers effectively get lured more by subsidies and enrol for them rather than opting for a transition based on a well-informed decision.

C. Inadequate farmer training and handholding

As local-level officials are not trained enough, knowledge is not transferred to farmers satisfactorily in most cases. Most often it remains superficial, and helps the farmers only in a limited way. Farmers, therefore, do not get to understand detailed aspects of organic farming in their specific contexts. Such training, which should have been part of the orientation and regular handholding for successful transition, includes soil preparation, seed treatment, bio-input preparation and application, knowledge of cropping patterns, non-chemical pest management, complying with certification processes, value addition, and creating and utilizing market linkages. External trainers, if involved during training, are hardly available thereafter to guide farmers as and when needed. Other important training and monitoring tools such as farmer field schools and exposure visits to farms of successful farmers are not satisfactory either. In such a scenario, farmers struggle to appropriately practise organic farming techniques and approaches. They become vulnerable to yield losses due to several factors such as mismanagement of diseases, pest attacks and poor soil-health management practices. They may get demotivated and to prevent losses resort to chemical practices or opt out of transitioning.

D. Certification still not farmer-friendly

PKVY calls for certification as per PGS standards. Though PGS-India certification is cost effective as no certification cost is charged, it requires extensive documentation and uploading of data online. This burden relies heavily on efforts made by the regional council staff and becomes a key priority for them instead of actual work on the ground.

Regional councils are also responsible for supporting farmer groups in capacity building, technology dissemination and data uploading on the PGS portal managed by NCOF.[33]

Key issues of the certification process, such as testing of residues in crop produce and ensuring complete transition in a span of two years, fail to get the necessary attention. Moreover, limited efforts in marketing the PGS certification has led to low popularity and credibility of PGS certification among consumers so far. In recent years, there has been some initial discussion on the need to bring a new alternative system of organic certification that is more farmer friendly.

Limited government effort to provide market linkages

The Central government does not have any separate dedicated programme or provisions for providing market support to organic produce. Limited support is provided by the government through Paramparagat Krishi Vikas Yojana (PKVY) and Mission Organic Value Chain Development for North East Region (MOVCDNER) schemes. PKVY has provision to provide support for direct marketing, post-harvest value addition and processing facilities and brand-building support provided on a case-to-case basis and in the range of Rs 15 lakh–53 lakh per cluster of 1000 ha each. MOVCDNER focuses on value-chain development and Farmer Producer Organizations (FPOs) and support for post-harvest management practices, including infrastructure creation and marketing in a value-chain mode. Support under the scheme is in the range of Rs 15 lakh–Rs 37.5 lakh.[1] The government has also developed a jaivik kheti portal to link organic farmers with consumers, but the success of this initiative remains to be seen.[2,3]

There is no provision for procurement of organic produce by the Central government. A few states such as Karnataka, Odisha and Uttarakhand, however, are providing some market support to organic farmers in the form of procurement, connecting organic produce with government schemes such as the Public Distribution System (PDS) and Integrated Child Development Services (ICDS) and linking with buyers.

The PGS certificate has still not generated enough credibility and popularity in the market. On the other hand, NPOP-certified products sold by companies are generally sold in the market at higher prices, making it a niche market for higher-end consumers only.

E. Poor market linkages

Getting remunerative prices for organic produce is a big hurdle for farmers. On the ground the direct market linkages of farmers and consumers are missing. The scheme has no provision to buy back the organic produce farmers are asked to grow. In the absence of direct linkages with processors, retailers and exporters, farmers are dependent on middle men to market their produce. Often their produce is sold at the same price as conventional produce. Only some are able to sell on their own in their local areas because of their personal reputation and efforts. This is a key concern particularly for small and marginal farmers.

To get more price for the product, selling a value-added product helps. But here too, the reality is that the functions of processing, packaging, branding and marketing are still the weakest part of PKVY implementation. For example, organic clusters often lack processing units of their own, which makes it difficult to get certification and sell their product as organic. Despite provision for financial support to clusters, marketing of organic produce remains a big concern.

F. Availability of good quality seeds suitable for organic farming

The PGS-India manual mandates use of seeds and planting material varieties that are suitable for organic management, well adapted to soil and climatic conditions, resistant

to pest and disease, not treated with chemicals and preferably of organic origin. It restricts use of genetically engineered seeds, pollen, transgenic plants or planting material. Farmers, however, struggle to get good-quality local seeds suitable for organic farming. Decrease in agro-biodiversity has led to decreased seed diversity, limiting the availability of seeds of

ICAR's long-term research on organic farming shows encouraging results

The Indian Council of Agricultural Research (ICAR) started a network project on organic farming across 12 states in 2003–04, with Indian Institute of Farming Systems Research (IIFSR), Modipuram, as the nodal institute. This is long-term research, conducted for different crops and cropping systems for comparison of organic and inorganic practices in different agroecological regions of India and is still ongoing.[1]

The research shows that organic yield of many crops increased by 5–20 per cent as compared to inorganic yield. The crops include okra, turmeric, cotton, carrot, black pepper, cowpea, onion, ginger, dolichos (sem phali), green gram, sunflower, garlic, maize, soybean, berseem, brinjal, chilli, capsicum, tomato, sorghum, potato, peas, radish, cauliflower and cowpea. In certain geographical locations, yield was also found to be reduced by 5–20 per cent in the case of potato, cabbage, French beans, lentil, radish, isabgol, mustard, cauliflower, baby corn, rice, chickpea and groundnut. Organic carbon content of soils increased by at least 10–20 per cent in all cropping systems with organic nutrient input systems.[2]

Organic cropping systems that had more than 20 per cent higher net return compared to inorganic systems include the combinations of rice–berseem at Jabalpur, chilli–onion and turmeric and onion at Coimbatore and groundnut–sorghum at Dharwad. Similarly, several other combinations grown at in Ludhiana, Bajuara and Pantnagar showed higher net returns. In Ludhiana, net returns were in the range of 96–153 per cent for the combinations of cotton–wheat and maize–potato–summer moong. Net returns for turmeric and onion reached up to 76 per cent in Coimbatore. A net return higher by 352 per cent was observed at Bajaura for the combination of cabbage–radish–capsicum.

In major crops, including rice, wheat, maize, soybean, chickpea and cotton (desi), yield reduction during transition from inorganic to organic system is not significant and is limited for only the first few years except in the case of wheat. For example, in the case of basmati rice, yield reduced by 3–13 per cent for the first three years but increased subsequently by 2–7 per cent during fourth to seventh year. The yield results were also similar in the case of rice, which decreased by 12–13 per cent for the first two years and increased by up to 5 per cent by year seven. Yield of maize decreased only in the first year by 5 per cent and increased by 3–16 per cent from the second year onwards. Similarly, chickpea yield decreased by 10 per cent in year one and increased by up to 9 per cent subsequently. Importantly, yield of desi cotton and soybean did not decrease at all. It increased by 8–14 per cent for cotton and up to 12 per cent for soybean. Wheat was the only crop whose yield decreased by 3–15 per cent and did not increase even until year seven of the research.

diverse crops and varieties. Seeds available in the market are often chemically treated, more suited for irrigated areas and chemical-based rather than organic farming. There is a strong need for community seed banks. For cotton crop, organic seed is not easily available as the market is flooded with genetically modified seeds.

Apart from the aforementioned, the design of the scheme has several issues. First is the limited ambition, which is linked with an annual budget of just a few hundred crore. Then is the limited allocation of money for critical aspects such as residue analysis, which would fail to generate confidence about PGS-certified products among consumers. For example, only three samples are planned to be tested per 100 ha during the second and third year of the conversion process, which is inadequate.[34] There are also differences in state and Central schemes on key issues. The revised 2018 guidelines allow flexibility in adopting from a wide set of practices such as vermicompost, panchgavya and zero-budget natural farming. However, some states like Rajasthan, in line with the earlier guidelines, continue to rely on vermicompost.

Chapter 2: Organic and natural farming in states

ORGANIC FARMING COVERAGE IN STATES

Agriculture is a state subject in India. State governments implement national schemes as well as take their own initiatives.

Organic farming coverage has not spread uniformly across the states. Some states have taken the lead in improving organic farming coverage, while others are lagging behind (see *Table 4: Organic farming coverage in states and Union Territories*).

Table 4: Organic farming coverage in states and Union Territories

No.	State/Union Territory#	Organic area							Organic farming policy/ Mission/ Act
		Total organic area ('000, ha) in 2019*	Organic area in 2019 as % of net sown area of that state/Union Territory** (%)	Scheme-wise break up of total organic area of state / Union Territory^					
				NPOP		PKVY (%)	MOVC-DNER (%)	State schemes/ non-scheme@ (%)	
				NPOP (%)	In-con-version (%)				
1	Madhya Pradesh	756	4.9	50.2	38.9	10.1	0.0	0.7	Policy, 2010[35]
2	Rajasthan	350	2.0	31.5	32.5	35.2	0.0	0.7	Policy, 2017[36]
3	Maharashtra	284	1.6	55.7	32.7	8.9	0.0	2.7	Policy, 2013;[37] Mission 2018
4	Andhra Pradesh	144+	2.3	9.5	13.0	73.4	0.0	4.1	Draft policy, 2008;[38] CR-ZBNF 2015
5	Uttarakhand	128	18.2	15.7	13.0	70.2	0.0	1.1	Policy, 2000;[39] Act 2019
6	Odisha	118	2.6	62.0	19.2	17.6	0.0	1.2	Policy, 2018[40]
7	Karnataka	111	1.1	51.2	23.4	9.8	0.0	15.6	Policy, 2004 and 2017[41]
8	Gujarat	103	1.0	58.2	32.5	1.9	0.0	7.3	Policy, 2015[42]
9	Uttar Pradesh	79	0.5	56.6	22.8	15.7	0.0	5.0	–
10	Sikkim	155&	100.0	47.6	1.4	1.9	8.0	41.1	Policy, 2004; Mission 2015[43]
11	Chhattisgarh	71	1.5	10.3	19.4	33.6	0.0	36.6	Mission, 2013[44]
12	Meghalaya	56	19.5	2.9	84.0	1.6	11.5	-	Mission, 2015: Mission 2018 for turmeric[45]
13	Kerala	54	2.7	35.5	35.4	22.9	0.0	6.2	Policy, 2010[46]

No.	State/Union Territory#	Organic area							Organic farming policy/ Mission/ Act
		Total organic area ('000, ha) in 2019*	Organic area in 2019 as % of net sown area of that state/Union Territory** (%)	Scheme-wise break up of total organic area of state / Union Territory^					
				NPOP		PKVY (%)	MOVC-DNER (%)	State schemes/ non-scheme@ (%)	
				NPOP (%)	In-con-version (%)				
14	Assam	43	1.5	35.7	30.4	10.3	16.3	7.3	
15	Jharkhand	31	2.2	9.7	69.6	16.3	0.0	4.4	Mission[47]
16	Tamil Nadu	30	0.6	14.4	60.5	20.8	0.0	4.3	Draft policy, 2013[48]
17	Telangana	28	0.6	22.9	8.8	50.0	0.0	18.2	–
18	Jammu and Kashmir	26	3.4	68.3	29.0	2.2	0.0	0.5	–
19	Goa	23	18.1	45.7	11.2	43.1	0.0	-	Promotion scheme, 2018[49]
20	Nagaland	23	6.0	12.0	24.1	2.1	56.9	4.9	Policy, 2019[50]
21	Arunachal Pradesh	22	9.8	2.8	38.9	1.7	38.4	18.1	Policy, 2014; Mission, 2017[51]
22	Manipur	19	5.0	1.3	27.3	3.1	65.4	2.9	Mission, 2016[52]
23	Himachal Pradesh	18	3.3	46.4	24.7	22.8	0.0	6.1	Organic policy; Prakritik Kheti Scheme 2018[53]
24	Punjab	17	0.4	1.9	50.5	29.4	0.0	18.3	–
25	Mizoram	14	10.0	0.0	48.8	4.7	46.1	0.4	Act, 2004; Mission, Cell 2006; Committee 2007[54]
26	Bihar	12	0.2	0.0	28.8	69.9	0.0	1.2	–
27	Delhi	10	45.5	0.0	0.0	99.8	0.0	0.1	–
28	Dadar and Nagar Haveli	10	53[55]	0.0	0.0	100.0	0.0	–	–
29	Andaman and Nicobar	9	60[56]	0.0	84.6	15.4	0.0	–	–
30	West Bengal	9	0.2	56.4	14.8	27.2	0.0	1.6	–
31	Tripura	9	3.4	2.4	27.2	11.7	58.8	-	–
32	Haryana	7	0.2	33.0	53.1	5.8	0.0	8.1	–
33	Lakshadweep	3	~100[57]	24.9	0.0	75.1	0.0	-	–
34	Chandigarh	3	~100[58]	0.0	0.0	39.4	0.0	60.6	–
35	Daman and Diu	1	32[59]	0.0	0.0	98.1	0.0	1.9	–
36	Puducherry	1	8[60]	0.5	0.0	99.5	0.0	–	–
	Total (India)	2,777	–	39.5	30.3	21.5	2.6	6.1	–

States/Union Territories have been put in descending order of organic area coverage in above table;

* Total organic area calculated from state-wise data;

^ State-wise data of schemes is sourced from response to a parliament question of Nov 2019;

\+ Andhra Pradesh is 2.9 per cent of the net sown area as per the most recent data reflected in the case study mentioned in Annexure 1.

& Sikkim is a 100 per cent organic state. Its total area is 76,169 ha.[61] The values mentioned in the source document, however, add up to 154,798 ha due to some double counting. This also suggests that the total organic area in the country is not accurately calculated at 2.78 million ha.

** Net sown area for states is for the year 2014–15 as available;[62] for Union Territories multiple sources are referred to, which give net sown area of different years.

– Indicates that no data could be found in the public domain.

A. Area under organic cultivation is concentrated in a few states

The total area under organic farming for all the states and Union Territories combined is 2.78 million ha. However, a major part of this area is concentrated only in a handful of states.

With 0.76 million ha of area under organic cultivation—i.e. over 27 per cent of India's total organic cultivation area—Madhya Pradesh tops the list. The top three states—Rajasthan and Maharashtra are the other two—account for about half of the area under organic cultiavtion. The top 10 states account for about 80 per cent of the total area under organic cultivation.

B. Only a small fraction of area in states is organic

The majority of states have only a small part of their net sown area under organic farming. Even the top three states that account for the largest area under organic cultivation—i.e. Madhya Pradesh, Rajasthan and Maharashtra—have only 4.9, 2.0 and 1.6 per cent of their net sown area under organic farming respectively. A few states such as Meghalaya, Mizoram, Uttarakhand, Goa and Sikkim have 10 per cent or more of their net sown area under organic. All these states except for Goa are in hilly regions. Union Territories such as Delhi, Dadar and Nagar Haveli, Lakshadweep and Chandigarh also have 10 per cent or more of their net sown area under organic, but their agricultural area is very small.

C. Having policy initiatives early on does not necessarily mean greater organic coverage

At least 20 states have a policy, Mission or Act with regard to organic farming. Some states have had a policy for several years but have not been able to cover much area in absolute terms under organic cultivation. For example, Karnataka and Kerala have had an organic policy since 2004 and 2010 respectively, but have only 1.1 and 2.7 per cent of their net sown area organically cultivated respectively. On the other hand, states such as Rajasthan, which have formulated their policy recently, have covered a significant area. This also indicates that the conversion to organic area in states may have started much before the actual policy enactment.

D. NPOP-certified area and food production far exceeds area covered that of PKVY

The National Programme for Organic Production (NPOP) scheme covers about 70 per cent of the organic area of the country of which 30 per cent is under conversion. Paramparagat Krishi Vikas Yojna (PKVY) and Mission Organic Value Chain Development for North Eastern Regions (MOVCDNER) started in 2015–16 and cover 21.5 per cent and 2.6 per cent of the total organic area in the country. The remaining 6.1 per cent of area under organic cultivation is either under a state scheme or not related to any scheme. During 2015–16 to 2018–19, around 96 per cent of total certified organic food production was under NPOP certification and the remaining 4 per cent was under Participatory Guarantee System (PGS) of certification.[63] The Union Territory of Andaman and Nicobar and states such as Meghalaya, Jharkhand, Tamil Nadu, Punjab and Haryana have more than 50 per cent of their organic area covered by NPOP under conversion.

India's top organic state Madhya Pradesh has about 90 per cent of its organic area under NPOP. The top three states—Madhya Pradesh, Maharashtra and Rajasthan—collectively have over 80 per cent of their organic area under NPOP. These states provided over 66 per cent of the total 2.59 million MT of food certified under NPOP in 2018–19. Collectively, these states produced 97 per cent of the total oilseeds under NPOP in India. They also produced 84.9 per cent of pulses, 64.7 per cent of sugar cane, 58.9 per cent of fibre crops, 51 per cent of spices, and 36.1 per cent of cereals and millets.

In 2018–19, under NPOP, Madhya Pradesh produced the most fibre crops, oilseeds, pulses and spices in the country and Karnataka produced the most flowers and fruits. Uttar Pradesh produced the most cereals and millets as well as medicinal, herbal and aromatic crops. Goa, Jharkhand, West Bengal, Maharashtra, Meghalaya and Rajasthan led in production of dry fruits, fodder, plantation, sugar, tuber and vegetable crops respectively (see *Annexure 3: Quantum of NPOP-certified food products*).

E. Only a few states covered more by PKVY than NPOP

States such as Andhra Pradesh, Uttarakhand, Telangana and Bihar have a higher proportion of their total area under organic cultivation covered by PKVY than NPOP. States such as Rajasthan, Andhra Pradesh, Madhya Pradesh, Uttarakhand have a high number of clusters under PKVY, followed by states such as Maharashtra, Chhattisgarh and Odisha (see *Annexure 2: State-wise number of organic farmers*).

SLOW PROGRESS OF STATES IN INCREASING ORGANIC COVERAGE

At least seven states—including Sikkim, Andhra Pradesh, Himachal Pradesh, Kerala, Mizoram, Nagaland and Arunachal Pradesh—expressed their desire to become fully organic or natural-farming states. Only Sikkim has become fully organic. Andhra Pradesh and Himachal Pradesh plan to become 100 per cent natural-farming states by 2027 and 2022 respectively. Kerala had aimed to become fully organic by 2020. However, all seven states except Sikkim could convert only 2.3–10 per cent of their net sown area under organic as of March 2020 (see *Table 4: Organic farming coverage in states and Union Territories*).[64]

Apart from the states with 100 per cent organic ambition, a few other states have also set specific measurable targets. The majority of these states have converted only a small fraction of net sown area to organic. Uttarakhand, the first state to have an organic farming policy in 2000, has a dedicated Organic Commodity Board and state organic certification agency. It passed the Organic Agriculture Act, 2019, and declared 10 blocks fully organic. This Act criminalizes the sale and/or purchase of chemical fertilizers and pesticides in select blocks notified under organic farming. About 0.13 million ha of the state is under organic cultivation, which is 18.2 per cent of the state's net sown area (as of March 2020). Similarly, Meghalaya had aimed to bring 0.2 million ha under organic by 2020, but failed to achieve the target—about 56,000 ha is under organic (as of March 2020). The state has also launched Mission Lakadong to increase organic turmeric production in the state.[65, 66]

Karnataka planned to cover 10 per cent of the state's net sown area into organic by 2022 but covered only about 1.1 per cent (as of March 2020). Initiatives and announcements by the state include market-based organic cluster development initiatives, formation of

Sikkim has become fully organic but challenges remain

Sikkim's journey to becoming fully organic began in 2003, when the Sikkim Organic Board was constituted. It reduced the subsidy on chemical fertilizers by 10 per cent in a phased manner over the years and banned it completely in 2014. The sale and usage of chemical fertilizers were made punishable by law.

The transition to organic farming for Sikkim was relatively simple as its per hectare fertilizer consumption was among the lowest in country. The entire agricultural area in the state was converted to 'certified organic' in 2015 and Sikkim was formally declared a `100 per cent organic' state in 2016.

In 2016, when CSE conducted a study to know about Sikkim's organic farming work, it observed that about 70 per cent of the fund was spent on third-party organic certification and that farmers lacked training on organic farming and market support. Smooth transition was not ensured for farmers, who grappled with decreased yields and issues in getting remunerative price for organic produce.[1]

Similar concerns related to capacity-building and market support to ensure remunerative prices to farmers were highlighted by several studies conducted during 2016–18.[2,3,4] The studies noted that Sikkim's agriculture sector was constrained by low productivity, high cost of production, lack of post-harvest infrastructure resulting in huge post-harvest losses, inefficient and fragmented supply chain, lack of know-how, and poor market access and linkages.

In these studies specifically, farmers complained about lack of proper training in organic farming resulting in significant yield losses. Owing to ignorance about improved organic packages of practices, farmers still practised traditional farming systems, resulting in low productivity in most crops. Other issues included inadequate availability of inputs, irrigation facilities and storage structures for water. Despite having organic certification, farmers were not able to get fair and remunerative prices.[5,6]

regional federations of organic farmers' associations, introducing millets under PDS, and procurement of organic ragi and jowar at more than 20–25 per cent above the minimum support price (MSP). The state launched the Raitha Siri Scheme in 2019–20, under which all millet growers would get cash incentives of Rs 10,000 per hectare. Although many millet growers are not certified, a significant proportion grow millets organically.[67]

Odisha started a programme to promote millets in tribal areas in 2017, which has so far covered an area of about 23,000 ha. Under this programme, farmers are encouraged to adopt organic farming practices. Millets are procured by the state government and linked with the Public Distribution System (PDS) system, which aims to link it with state nutrition programmes such as Integrated Child Development Services, Mid-Day Meal, and Integrated

Tribal Development Agency welfare hostels. Malkangiri has become Odisha's first district to form a 'committee on agro-ecology and agro-biodiversity' in May 2020. According to the Odisha Organic Farming Policy, 2018, Odisha aims to cover 0.2 million ha of land under organic farming through a combination of activities in agriculture, horticulture, forest and pasturelands within a period of five years. Funding has been planned through convergence of PKVY, RKVY, Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and state budgets.[68]

The Maharashtra government has recently planned to focus on six districts, namely Akola, Buldhana, Washim, Amravati, Yavatamal and Wardha. Only 1.6 per cent of its net sown area has been converted to organic despite a policy of 2013.[69,70] The Gujarat Organic Farming Policy, 2015 aimed to convert 10 times more area under organic with the last five years considered as the baseline. So far only about 1 per cent of the net sown area has been converted.[71] Jharkhand also aimed to become the country's organic hub and wanted to promote organic farming in all of its 24 districts but about 2.2 per cent of its area is under organic.[72] In 2020, Chhattisgarh announced the Godhan Nyay Scheme, under which cow dung would be purchased by the government to promote organic farming.[73] Haryana announced in 2017 its plan to convert 10 per cent of its cultivated area, i.e. 0.7 million acres (0.28 million ha), to organic. In the first phase, a target of 50,000 acres (20,234.28 ha) in 10 districts was planned. But it covered only 0.2 per cent of its net sown area to organic.[74]

Other states have also expressed their intention to increase organic coverage. Goa announced a scheme to promote organic farming in 2018.[75] In 2017, Bihar planned to establish an organic corridor along the Ganga River in 12 cities and make one ideal organic village in each district.[76] The Punjab Agri Export Corporation is supporting organic farmers by purchasing certified organic crops from farmers to sell in India and abroad.[77,78] Jammu and Kashmir planned to promote organic farming in hilly regions of state, particularly the Kashmir Valley and intermediate hilly zones of the Jammu region. Assam planned to set up 100 organic markets to sell organic products and has identified 10 clusters across nine districts.[79] The Telangana state government also plans to open special outlets for organic products.[80]

Currently, at least 12 states—Madhya Pradesh, Gujarat, Telangana, Sikkim, Bihar, Karnataka, Odisha, Rajasthan, Uttarakhand, Chhattisgarh, Tamil Nadu and Uttar Pradesh—have their own state organic certification agencies accredited by APEDA.[81] Some states have either developed or are still in the process of forming organic brands such as MP Organic, Organic Rajasthan, Nasik Organic, Bastar Naturals, Kerala Naturals, Jaivik Jharkhand, Naga Organic, Organic Arunachal, Organic Manipur, Tripura Organic and Five Rivers by Punjab.

These announcements look promising, but successful implementation and results of most of them remain to be seen. States have to take the lead by initiating a wide range of concrete measures, starting from capacity building of farmers to creating basic infrastructure and providing support for market linkages.

CSE's experience of organic farming work in four villages in Alwar, Rajasthan

During April 2018–November 2019, CSE worked with farmers of four villages of Tijara, Alwar, Rajasthan, to enable their transition from chemical-based farming to organic cultivation.

The barriers for conversion to organic farming included lack of technical know-how, limited confidence in organic farming techniques, fear of decrease in yield and resultant economic losses. Farmers were not confident about market linkages and assured remunerative prices for organic produce. The labour-intensive and time-consuming nature of organic farming was an issue. Organic farming is full-time work and cannot be done in part time—but small farmers have to do additional work on the side to survive. Lack of family support for aspiring organic farmers was another hindrance. Upscaling organic was a challenge, as farmers were inclined to do organic cultivation in small lands rather than on big farms due to labour issues.

The key motivations for organic conversion included growing healthy food, having healthy soil, and increased income through reduction in cost of cultivation or higher prices fetched for organic produce.

Farmers felt that organic yield of various crops, including vegetables, could be made comparable to the yield in chemical-based farms if the package of organic practices was followed properly. CSE observed that the stated barriers could be addressed if the farmers were provided proper support. Farmers needed to be provided trainings through farmer field schools, regular handholding and market linkages to overcome these barriers. Farmers were ready to walk the extra mile if they were assured fair and remunerative prices for their organic produce.

ZBNF-RELATED INITIATIVES OF STATES

The Ministry of Agriculture and Farmers' Welfare defined zero-budget natural farming (ZBNF) as a chemical-free natural-farming system wherein use of low-cost inputs (cow dung/urine and plant extract based) coupled with recommended agronomic practices like mulching and intercropping are promoted.[82] In July 2018, the National Institution for Transforming India (NITI Aayog) discussed the scope for promoting ZBNF in the entire country along the lines of that in Andhra Pradesh. Himachal Pradesh, Gujarat, Haryana, Karnataka and Kerala have also initiated ZBNF work. For example, Karnataka has initiated implementation of ZBNF on a pilot basis in an area of 2,000 ha in each of the 10 agro-climatic zones of the state through the respective state agriculture or horticulture universities. Himachal Pradesh has been implementing the state-funded scheme Prakritik Kheti Khushal Kisan since May 2018. Kerala, Gujarat and Haryana have conducted awareness programmes, trainings and workshops to draw the interest of farmers towards ZBNF.[83]

The Central Ministry of Agriculture and Farmers Welfare has recently used the term Bhartiya Prakritik Krishi Paddhti (BPKP) for promotion of natural farming. BPKP has been proposed to be added as a new sub-mission under PKVY scheme. Under PKVY, the Centre has given states the flexibility to adopt any model of traditional or organic farming.[84] BPKP aims

to promote natural farming practices in every block of the country. A proposal has been prepared for implementation of the BPKP sub-mission under PKVY with a total budget of Rs 4371.7 crore for an area of 1.2 million ha, or Rs 36,430 per ha for five years. The major thrust under the programme is proposed to be on capacity building of farmers through continuous handholding, input support, certification, value addition and innovations.

Andhra Pradesh is the frontrunner among all states in implementing the zero-budget natural-farming programme at a mass scale. It has been using the term 'climate-resilient zero-budget natural farming' and has recently named it 'community-managed natural farming' (see *Annexure 1: Climate-resilient zero-budget natural farming of Andhra Pradesh*).

Research and perspective on ZBNF performance across the country

Some research institutions indicated that performance of zero-budget natural farming (ZBNF) is better than that of chemical-based farms.

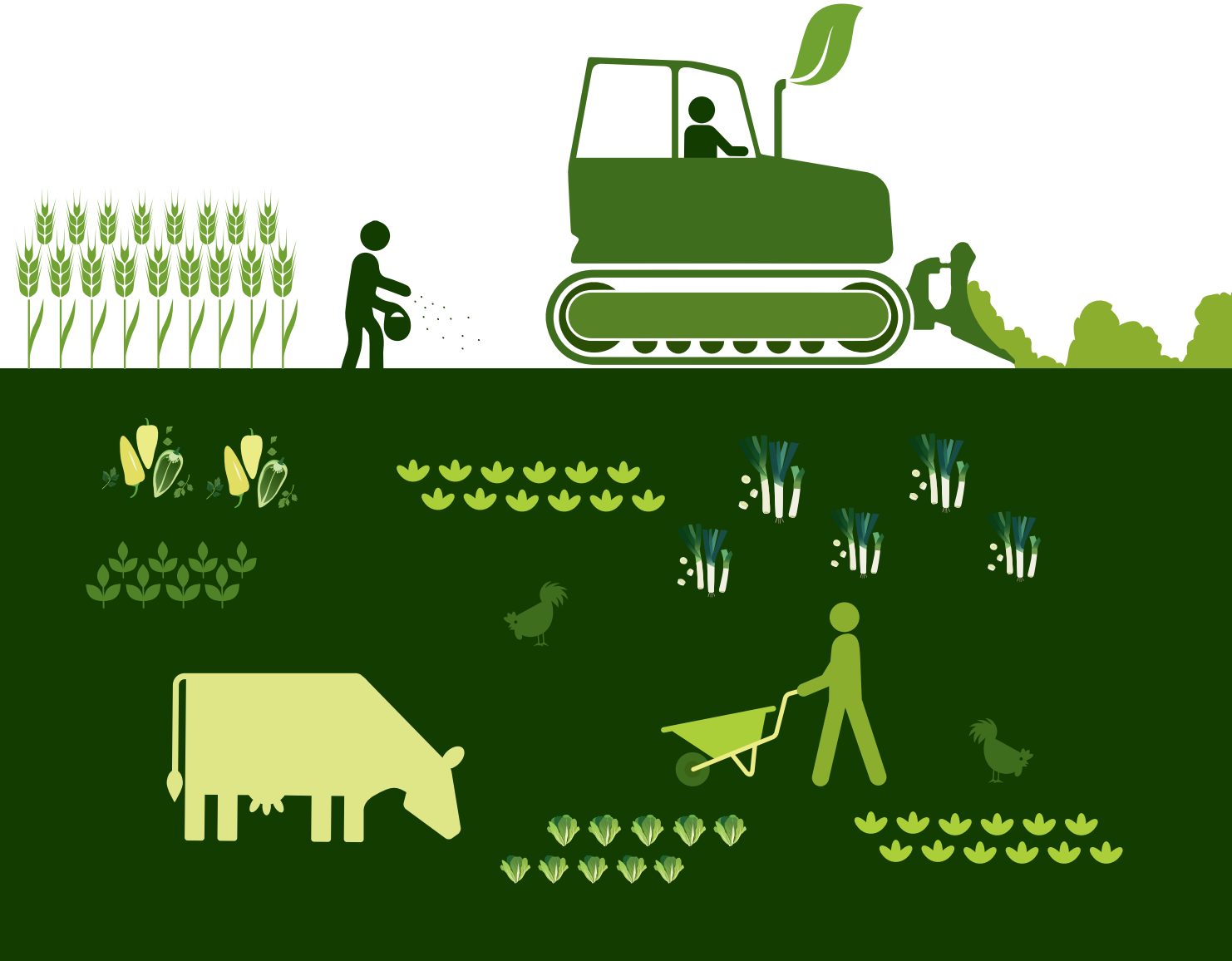
- A survey of ICAR's National Academy of Agricultural Research Management, Hyderabad, of ZBNF in Karnataka and Andhra Pradesh, found that ZBNF reduces farming cost, increases farmer income and has ecological and social benefits. ZBNF yield results were mixed, i.e. some crops showed higher ZBNF yield while others showed a decrease.[1]
- Research by Chaudhary Sarwan Kumar Himachal Pradesh Agriculture University, Palampur, presented at a National Academy of Agriculture Science (NAAS) meeting in August 2019, indicated that in 2017 ZBNF yield increased by up to 22 per cent for crops such as gram, lentil, soybean, black gram and red mash and decreased by up to 2 per cent for crops such as wheat, paddy, ogla and ragi as compared to inorganic farming.
- Research survey by Abdul Nazir Sab State Institute of Rural Development, Mysore, Karnataka, found positive impacts of ZBNF on farmers. ZBNF was farmer-friendly and extremely cost-effective, and gave optimal yield, with no decline over time. It also did not require farmers to take crop loans because of reduced input costs, freed farmers from the debt trap and instilled confidence in them.[2]
- A research survey of ZBNF farmers by Amrita Bhoomi Centre, Karnataka, and El Colegio de la Frontera Sur, Mexico, showed positive results with regard to yield, soil conservation, seed diversity, pest attacks, quality of farm produce, seed autonomy, household food autonomy, income, production cost and health, ending debt cycles and stopping farmer suicides in Karnataka.[3]
- Chaudhary Charan Singh Haryana Agriculture University (CCS-HAU), Hisar, found improvement in soil health in ZBNF farms.[4]

Other research institutions indicated that ZBNF yield is less than that of chemical-based farms.

- Research by ICAR-IIFSR, Modipuram for Subhash Palekar's ZBNF in the rice–wheat system in north India shows reduction in ZBNF yield by up to 40 per cent in the initial years as compared to chemical-based integrated crop management. This study was presented at an NAAS meeting in August 2019.[5]
- The National Academy of Agriculture Sciences (NAAS), a think-tank of agriculture scientists in India, said through a policy brief that ZBNF is an unproven technology and no verifiable data or authenticated result from any experiment is available so far.[6]

SECTION II

DRIVING CHANGE—BARRIERS AND INTERVENTIONS



Chapter 3: Barriers in the growth of organic and natural farming

The Indian organic movement is far from being a mass movement even 15 years after the national organic farming policy. It is, unfortunately, no more than a niche movement led by and dependent on farmers and civil society groups. Promotion of natural-farming practices by governments is a recent phenomenon limited to only select few states.

Chemical-free farming is still struggling to be part of mainstream agriculture interventions. Each of the three major stakeholder groups—government, farmers and consumers—has multiple concerns that act as barriers to the growth of organic and natural farming movement in the country (see *Table 5: Barriers in the growth of organic and natural farming*).

The problem worsens due to the high interdependence of certain barriers. For example, if a farmer wishes to earn extra money on organic produce for the additional effort or risk, the consumer has to be ready or able to afford to pay that extra money. On the other hand, if the consumer wishes to buy organic produce at the same price as conventional produce, the farmer may not be motivated enough. This creates a feedback loop and the problem is likely to continue unless a third stakeholder like the government addresses any one concern. But this too may not happen if the government has its own reasons that prevent it from stepping in.

Actual or perceived, these barriers have led to the following situation in the Indian organic- and natural-farming movement:

- Reluctant and sporadic political buy-in and support for the organic or natural agricultural system;
- An obsolete national organic policy with no ambition, targets and timelines;
- No national-level mission or action plan to promote organic and natural farming;
- Minuscule budgetary allocations to promote organic farming compared to subsidies given to chemical fertilizers (a few hundred crore rupees as compared to Rs 70,000–80,000 crore per annum);
- Multiple initiatives under different ministries or departments with no effective integration;
- Low-scale flagship programmes finding it difficult to bring sustainable on-the-ground change;
- Absence of holistic perspective and inadequate understanding of the multiple benefits of organic and/or natural farming, leading to a weak 'case for change', limited

Table 5: Barriers in the growth of organic and natural farming

Why governments at the Centre and states not adequately pushing for organic or natural farming	Why farmers are reluctant to adopt organic or natural farming practices	Why the majority of consumers are not buying organic or natural foods
• Mindset of chemical farming; • Scientific community not oriented towards organic or natural farming; • Issues of low yield and food security; • Influence of agro-chemical industry; • Organic and/or natural produce not considered a holistic solution beyond pesticide-free food; • Lack of documentation on holistic linkages; • Limited attention to disadvantages of current chemical-based model; • Lack of conviction about benefits; • Extension machinery lacks expertise; not trained, not practised; • State-level 'political will' not adequately displayed other than in a few states such as Sikkim and Andhra Pradesh.	• Prevailing mindset for chemical farming; • Lack of knowledge of organic and/or natural approaches; • Lack of confidence in organic and/or natural practices and fear of low yield; • Lack of risk-taking capacity to bear yield losses; • Absence of handholding support during transition to organic and/or natural farming; • Lack of support and risk coverage during transition to organic cultivation; • Lack of assured market offering remunerative prices; • Inadequate availability of quality organic inputs like seeds, bio-inputs and technology; • Concerns about pest management; • Certification involves extensive paper work, which is cumbersome and expensive for small farmers; • Dependence on livestock; • Natural and organic farming are labour-intensive and require time; • Rural youth's declining interest in agriculture; reducing joint family support system.	• Organic produce often priced higher than conventional—most consumers not ready or cannot afford to pay higher prices; • Organic produce not easily available and accessible everywhere; • Concerns about credibility of organic food in market, i.e. whether produce is fake organic; • Lack of awareness or convinction about health linkages (e.g. cancer and pesticides have a more complex link than sugar and diabetes—this link is less direct, less seen and less believed); • Limited awareness on linkages of organic and/or natural farming with sustainability, environment etc.; • Consumers may lack awareness of chemical-dependent food systems and food producers.

interventions and investments and no documentation on tangible linkages. The current limited view does not effectively take into account:

- Ecological aspects such as soil health, water conservation, biodiversity, climate resilience and preventing desertification;
- Economic aspects such as farmer income, debt reduction, livelihood generation;
- Social aspects such as reducing rural to urban migration, mitigating farmer's suicide and agrarian distress, building resilient food systems;
- Nutrition security and human and livestock health;
- Multiple sustainable development goals (SDGs) that could be attained.

- A large part of the scientific community is oriented towards chemical-based agriculture and is still to be ready to lead and support a transformational change at a large scale;
- An agriculture extension system not trained in organic approaches which struggles to effectively implement schemes at the local level;
- Huge dependence on the two certification systems that are expensive and/or difficult to adopt by the majority of the farmers in the country, who are small-scale farmers;
- Market linkages almost missing, farmers not connected to consumers, remunerative price remains a concern;
- Development of organic value chain still in nascent stages;
- Poor availability of quality organic seeds and bio-inputs at a reasonable price;
- Limited action by states reflected in low coverage of organic area; and
- Several states and Union Territories have no organic policies. Where policies exist, many are outdated.

Chapter 4: Intervention for driving change

For India to become truly self-reliant, the Indian agriculture sector will need to change. It must wholeheartedly move towards an approach that helps farmers earn more money, use less chemicals and pesticides, and produce healthy food for the country while conserving natural resources.

Indian agriculture can become sustainable if organic and natural farming becomes a mass movement, i.e. more and more farmers successfully adopt organic and natural farming practices. For this, the governments at the Centre and the states will have to ignite and lead the change at a much larger scale than the ongoing efforts. These measures will have to be aggressive and well-coordinated, reflect the commitment of political leadership and be supported by adequate budgets.

Key measures that should be taken up by the governments include:

- **A targeted, ambitious and well-funded nation-wide programme developed to drive the change towards organic and natural farming:** This includes bringing together different ministries and several programmes and outlines the Centre–state relationship in terms of funds, accountability and coordination. It must also establish strong drivers such as a vibrant market that benefits farmers while addressing existing barriers.

- **Promotion of organic and biofertilizers instead of chemical fertilizers:** Necessary measures to adequately produce and make available quality organic fertilizers and biofertilizers at low cost should be the priority. This includes coordinated action to promote and make available city compost as an organic fertilizer as well as locally produced bio-inputs. Farmers should also be enabled to choose between chemical and organic fertilizers through transfer of the huge ongoing subsidies allocated for chemical fertilizers to chemical-free farming.

- **Build rigorous scientific data on the benefits of organic and natural farming:** A comprehensive research agenda should be developed and implemented with multiple sectors and stakeholders to understand the complete set of benefits including those related to biodiversity, water conservation, climate resilience, soil health and preventing desertification in addition to increasing yield, incomes and health. Best practices of practitioners should also be collated and documented.

- **Agriculture extension system to be enabled to lead and support the transition on the ground:** A systematic approach is required to build capacity among extension officials and enable them to be change-makers. Leveraging technology to bridge gaps in information exchange and last-mile connectivity as well as integrating practitioners in

the community should be fundamental to the extension process. Organic and natural farming should be mainstreamed in agriculture education and research systems.

- **Organic certification process should be improved to make it farmer-friendly and low-cost:** Measures should be taken to address concerns about the PGS-India certification system to make it more farmer-friendly. An alternative certification that is simpler for farmers and trustworthy for consumers could be explored for well-connected local markets.Implementing measures to increase the credibility and popularity of PGS certification among consumers is the need of the hour.

- **States should step up their action in a concerted way to promote organic and natural farming:** This should be done through a series of measures such as those related to organic seeds, bio-inputs, capacity building of farmers and providing market linkages. States can play an instrumental role in helping farmers sell their organic and natural produce by developing organic value chains, procuring organic produce and helping farmers get remunerative prices.

Annexures

ANNEXURE 1: CASE STUDY—CLIMATE-RESILIENT ZERO-BUDGET NATURAL FARMING (CRZBNF) OF ANDHRA PRADESH*

CRZBNF programme in Andhra Pradesh

Andhra Pradesh has two distinct geographical regions—coastal Andhra Pradesh and Rayalaseema—divided into six agro-climatic zones.

Andhra Pradesh is known as rice bowl of India. It is also one of the largest producers of fruits, eggs and aquaculture. Some of the major crops include—aside from rice—groundnut, jowar, maize, black gram, green gram, Bengal gram, red gram, cotton and sugar cane. Horticultural crops include chillies, tomato, mango, papaya, banana, flowers, coconut etc. Under animal husbandry, it produces fish and poultry products. Around 62 per cent of its population depends on agriculture and allied activities. Around 85 per cent of its farmers are marginal and small. According to the National Sample Survey Organisation, Andhra Pradesh has the highest share of indebted agricultural households in the country, i.e. 92.9 per cent of agricultural households.[85]

The government of Andhra Pradesh (GoAP) initiated the Climate-Resilient Zero-Budget Natural Farming (CRZBNF) programme in kharif 2016. The programme is now also called Andhra Pradesh Community Managed Natural Farming (CMNF). A GoAP non-profit organization Rythu Sadhikara Samstha (RySS) has been given the responsibility of implementation. The programme was built upon Andhra Pradesh's past experience of Non-Pesticide Management and Community Managed Sustainable Agriculture (CMSA) programmes implemented from 2005–06 to 2012–13.[86] Some of the current leadership, officials, self-help groups, NGOs and other institutions involved in implementation of CRZBNF programme were also part of CMSA. CRZBNF enjoys strong support from the top leadership of the state—current and previous chief minister of Andhra Pradesh.

CRZBNF is promoted as a low-cost holistic alternative to the present paradigm of high-cost chemical inputs-based agriculture to alleviate the indebtedness of farmers. The programme's stated objective includes ensuring livelihood security, nutrition security, improved human and soil health and environmental sustainability. Agroecological principles being adopted to generate inputs in situ on farm are claimed to rejuvenate soil and restore ecosystem health, biodiversity and climate resilience through diverse, multilayered cropping systems. Increase in farmer's net income and yield is also claimed.

Coverage under CRZBNF

Field-level implementation of CRZBNF started with kharif 2016. Subsequently, in June 2018, GoAP officially launched a scale-up of the programme to all its 5.9 million farmers and total agriculture area of 8.03 million ha by 2027. Andhra Pradesh's net sown area is

* *We would like to thank Sonam Taneja for her contribution to CRZBNF-related field research.*

6.33 million ha. According to GoAP, as of March 2020, 0.62 million farmers—i.e. 10.5 per cent of Andhra Pradesh's farmers—were enrolled in the programme. Of the enrolled farmers, 0.44 million farmers, i.e. 7.5 per cent of Andhra Pradesh's farmers, were actually practising natural farming on an area of 0.45 million acres (0.18 million ha)—which works out to 2.9 per cent of the net sown area across 3,011 gram panchayats. District-wise, farmers practising CRZBNF varied from 4.8 per cent to 12.4 per cent and CRZBNF land varied from 1.5 per cent to 6.6 per cent. As per GoAP, in addition to the practising farmers, 0.22 million poor landless farmers have started natural farming in their kitchen gardens. It plans to expand coverage to 0.9 million farmers by increasing enrollment during the 2020 kharif season (see *Table 1: CRZBNF coverage in Andhra Pradesh as of March 2020*).

Table 1: CRZBNF coverage in Andhra Pradesh as of March 2020[87]

District	Total no. of farmers	No. of enrolled farmers under CRZBNF	Enrolled farmers as % of total farmers	No. of CRZBNF practising farmers	CRZBNF practising farmers as % of total farmers	CRZBNF area (in ha)	Net sown area in 2019–20 (in '000 ha)	CRZBNF area as % of net sown area
Anantapur	659,136	45,393	6.9	31,573	4.8	17,027	1,113	1.5
Chittoor	434,230	48,560	11.2	23,329	5.4	9,190	319	2.9
East Godavari	613,288	56,873	9.3	54,264	8.8	21,511	418	5.1
Guntur	501,861	40,360	8.0	39,904	8.0	14,367	597	2.4
Krishna	436,047	53,222	12.2	29,704	6.8	8,935	463	1.9
Kurnool	505,388	57,768	11.4	43,054	8.5	20,804	862	2.4
Prakasam	490,717	43,732	8.9	28,424	5.8	13,050	548	2.4
Nellore	345,025	42,265	12.2	23,250	6.7	9,225	331	2.8
Srikakulam	399,122	44,467	11.1	29,752	7.5	8,553	322	2.7
Visakhapatnam	353,186	51,910	14.7	29,338	8.3	9,563	304	3.1
Vizianagaram	326,134	40,016	12.3	35,712	11.0	18,324	312	5.9
West Godavari	490,134	44,464	9.1	29,520	6.0	10,407	432	2.4
Kadapa	355,003	54,253	15.3	44,129	12.4	20,660	313	6.6
Total (Andhra Pradesh)	5,909,271	623,283	10.5	441,953	7.5	181,617	6,334	2.9

Coverage of CRZBNF is rising steeply (see *Table 2: CRZBNF growth*)

Table 2: CRZBNF growth

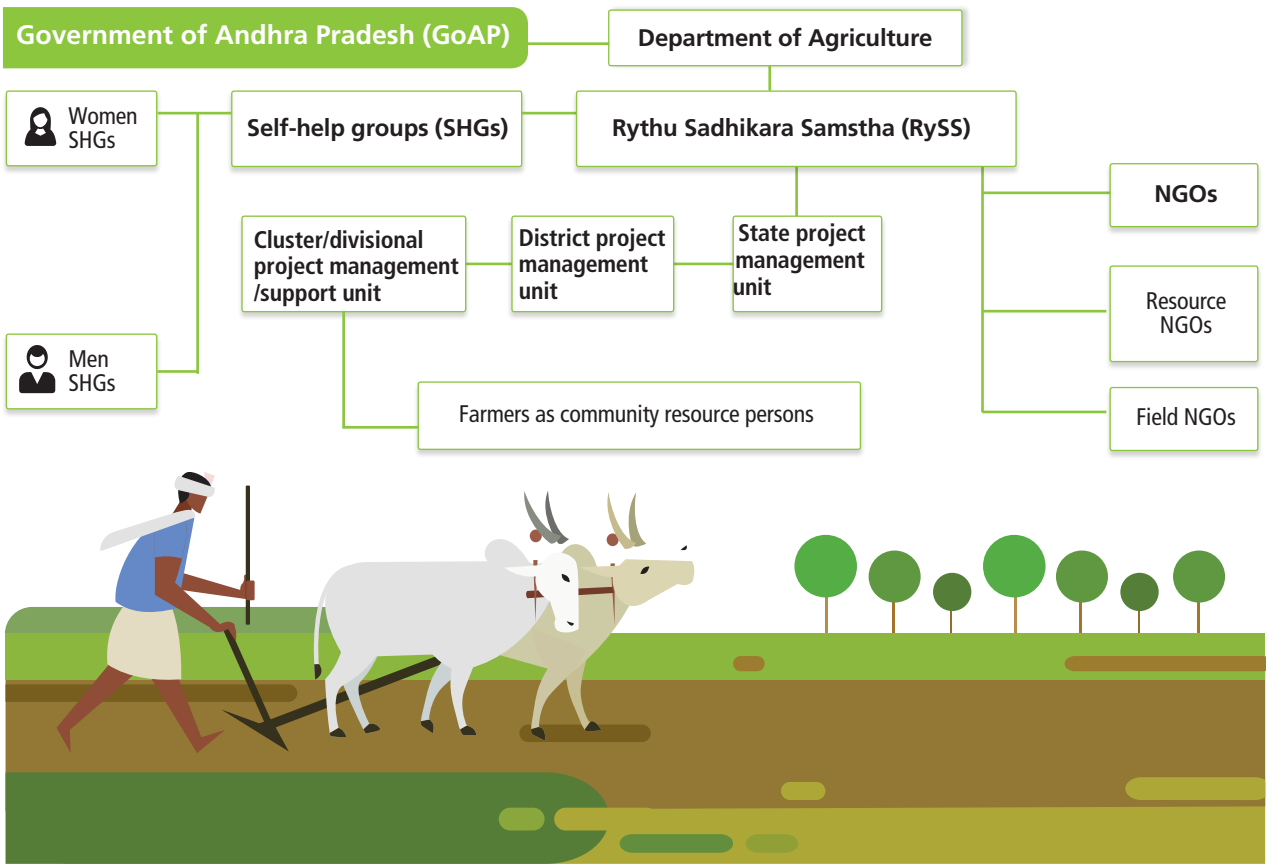
Year	2016–17	2017–18	2018–19	2019–20
No. of enrolled ZBNF farmers (in millions)	0.04	0.16	0.52	0.62
No. of gram panchayats	704	972	3,011	3,011

Source: Rythu Sadhikara Samstha, Government of Andhra Pradesh.

Operational structure of CRZBNF

RySS is implementing the CRZBNF programme through select agriculture department officials, NGOs, women and men self-help groups, master farmers known as community resource persons, and natural-farming fellows (fresh agriculture graduates). There are around five resource NGOs and 30 field NGOs to support the implementation (see *Fig. 1: Operational structure of CRZBNF*).

Figure 1: Operational structure of CRZBNF

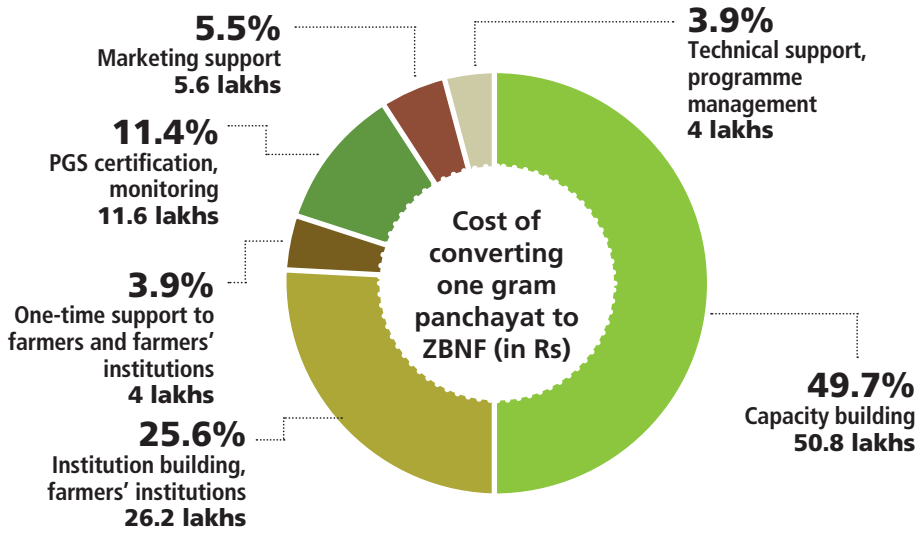


Source: Rythu Sadhikara Samstha, Government of Andhra Pradesh.

Cost of conversion and funding

The estimated cost of converting each farmer household to CRZBNF is Rs 25,550. The average cost of transition of one gram panchayat to ZBNF works out to Rs 1.02 crore (see *Fig. 2: Distribution of conversion cost*).

Figure 2: Distribution of conversion cost



Source: Rythu Sadhikara Samstha, Government of Andhra Pradesh.

GoAP seeks to convert to ZBNF all of its 5.9 million farmers in 12,924 gram panchayats by 2027 in a phased manner. The total fund requirement stated by GoAP is Rs 16,452 crore. The programme is currently utilizing funds from Rashtriya Krishi Vikas Yojana (RKVY) and Paramparagat Krishi Vikas Yojana (PKVY) schemes. Rs 221.36 crore from RKVY and Rs 160.39 crore from PKVY have been utilized from 2015–16 to 2019–20. In addition, Azim Premji Philanthropic Initiatives (APPI) has committed a grant of Rs 100 crore for five years and released Rs 22.88 crore from 2017–18 to 2018–19. German state-owned development bank KfW has signed an MoU with GoAP to provide loan support of Rs 1,015 crore (Rs 711 crore as loan from KfW and rest is GoAP contribution) in 2020. GoAP is also exploring the utilization of funds from existing state programmes such as World Bank-funded AP Integrated Irrigation and Agriculture Transformation Project and International Fund for Agricultural Development (IFAD)-funded AP Drought Mitigation Project. To get funding, GoAP had entered into a formal partnership with Sustainable India Finance Facility, which in turn is a collaboration between the United Nations Environment Programme, World Agroforestry Centre and BNP Paribas.

Research methodology

The objective of the CSE study is to understand the farmers' perspective on CRZBNF. CSE researchers travelled to Andhra Pradesh in June 2019. They conducted primary research through focused group discussions (FGDs) with 142 farmers and in-depth interviews with 40 farmers from about 35 villages of 24 mandals from 10 districts of Andhra Pradesh (see

Table 3: Details of FGDs and interviews

District	Number of focused group discussions (FGDs)/ interviews (no. of farmers)	Villages (mandal)
Vizianagram	2 FGDs (19)	S. Kotaseetharamapuram (Vepada); Kukkidi, Jongarapadu, G. Sivada, Podi, Pedagottili, Yegulavada villages (Gummalakshmipuram, Kurupammandals)
	Interviews (3)	Kahdgavalasa (Guruguballi)
Vishakhapatnam	1 FGD (26)	Chettupalli (Cheedikada)
	Interviews (2)	Pinakota, Belagalapadu (Ananthagiri)
Guntur	2 FGDs (11)	Chunduru (Chunduru); Nandivelugu (Tenali)
	Interviews (5)	Tungaparu (Rumpacharela); Veldurthi (Veldurthi); Narasingpadu (Nakerikallu); Chunduru (Chunduru); Ameenabad (Firangipuram)
Kadapa	3 FGDs (67)	Chinnamandyam (Chinnamandyam); Racgagudipalli (Ontimitta); Kadapa city
	Interviews (3)	Chinnamandyam, Chinnarupali, Mullur (Chinnamandyam)
Prakasam	2 FGDs (19)	Kothapathnam, Padarthi (Kotapathnam)
	Interviews (12)	Kothapatnam, Padarthi, Ethemukula (Kothapatnam); Gonevaripalem (Chemakurthi)
West Godavari	Interviews (7)	Valluru, Achanta (Achanta); Nachugunta (Unguturu); Tamarada (Punugonda)
East Godavari	Interviews (2)	G. Kothapalli (Gokavarnam); Velicheru (Atreyapuram)
Srikakulam	Interviews (1)	Gullapadu (RA Vallappa)
Kurnool	Interviews (1)	Balapnur (Panoam)
Anantapur	Interviews (4)	Gollapalli, Krishnapuram (Rapthadu)
Total 10 districts	Total 10 FGDs (142 farmers), interviews (40 farmers) from 35 villages of 24 mandals, 10 districts	

Table 3: Details of FGDs and interviews). In addition, discussions were also conducted with RySS, state and district agriculture department officials, NGOs, self-help groups, agriculture scientists of state agriculture universities and ICAR institutions, and civil society. Additional discussions were also undertaken with other farmers from across the state.

Profile of farmers in FGDs and individually interviewed

About 70 per cent of 142 FGD farmers had more than three years of CRZBNF experience and 85 per cent were practising CRZBNF on their entire land. Around three-fourths of the farmers were men and rest were women. Some of these farmers had also enrolled under the earlier CMSA programme of GoAP and had been practising chemical-free farming since then. Some had also established demonstration models in their farms and were working as community resource persons in the CRZBNF programme.

Among those who were interviewed, two-thirds were farmers with less than three years of CRZBNF experience but 70 per cent of them practised CRZBNF on the entire land. Two-thirds of these individual farmers were small or marginal farmers and the remaining one-third were medium- or large-scale farmers. More than half of the farmers used desi seeds, around one-third used only hybrid seeds, and rest of them used desi as well as hybrid seeds. About half of the farmers had indigenous breeds of cow and one-fourth had neither cows nor buffaloes and procured cattle dung and urine from other farmers or nearby gaushalas. About

three-fourth of the farmers were men and rest were women. About 10 per cent were tenant farmers. Eighty per cent of interviewed individual farmers were not part of the earlier CMSA programme.

Farming approaches under CRZBNF programme

Climate-resilient ZBNF (CRZBNF) is considered to be within the broad paradigm of agroecology or regenerative agriculture. The CRZBNF programme focuses on growing crops without using any chemical fertilizers, pesticides or other inputs from outside the farming system.

Even though ZBNF techniques promoted by agriculturist Subhash Palekar are the core of the CRZBNF programme, NGOs and farmers have adopted a range of diverse approaches. Techniques of ZBNF involve four wheels—beejamrutham (microbial coating of local cow dung, urine and lime on seeds or seedlings), jeevamrutham (a fermented microbial culture derived from local cow dung, cow urine, jaggery, pulse flour and uncontaminated soil), mulching and whapasa, or soil aeration. Further, ZBNF encourages a multilayered cropping system, i.e. growing multiple crops together, rather than monocropping, and promotes local seeds, integration of trees into farms, and integration of livestock, especially native cows, into farming systems. This paradigm relies on self-reliance of farmers. This approach shuns genetically modified organisms (GMOs).

Organizations like the Centre for Sustainable Agriculture (CSA) and a few other NGOs involved in the implementation of the programme are encouraging farmers with diverse options borrowed from various farming experts from across the country.

Various models adopted under the CRZBNF programme include:

- 365 days green cover (the Dabholkar Method of green covering, which focuses on plants that have microbial association with diverse organisms at their root zone);
- Navdhanya cropping system in rain-fed conditions;
- Seed pelletization method (the Masanobu Fukoaka method of seed balls [Fukoaka was a Japanese farmer and philosopher celebrated for his natural farming techniques and re-vegetation of desertified lands]);

Different terms used for chemical-free agriculture practised in India

Different names are used for chemical-free agriculture in various parts of India. These include jaivik kheti, sahaj kheti, sajeev kheti, yogic kheti, tikka farming, ahimsa farming, homa farming, gou aadharit kheti, zero-budget prakritik kheti, rishi krishi, shiv yog krishi, nanak kheti, vedic farming, sendriya kheti, jaiva krishi, iyarkka ivyavasayam, susthira vyavasayam, akshay krishi, vaishnav kheti, aumma kheti, paramparagat kheti, savayava krishi, kudarati kheti, prakrithi krishi, shasvat kheti, chiranjiv kheti, natueco farming, agnihotra krishi, panchgavya krishi, shri kheti, swashrayee kheti, vishmukt kheti, jeevant krishi, swavlambi krishi, rasaynmukt kheti, deshi kheti, vaikalpik kheti, amrut krishi, poshak kheti, sarwaangi kheti.

- Natueco farming model by Deepak Suchde;
- Green manuring mulch-based Subhash Sharma model;
- ZBNF models (Subhash Palekar poly-crop model, ZBNF vegetable nursery, 36 x 36 model, five-layer model, modified five-layer model);
- Annapurna model and integrated farming system models;
- Half acre continuous vegetable production model with focus on the poorest of the poor;
- SRI methods, pre-monsoon dry sowing technique, Guliragi approach, row water sowing; and
- RFSA (rain-fed sustainable agriculture) model.

Farmers also use various other organic techniques introduced in Andhra Pradesh during the earlier Community Managed Sustainable Agriculture (CMSA) programme and continued under the CRZBNF programme. The techniques include summer ploughing, community bonfire, seed and seedling treatment, white and yellow sticky plates, clipping of tips in paddy, alleys in paddy, bird perches, pheromone traps, trap crops, border crops and the use of botanical extracts—neemasthram, brahmasthram, agniasthram, ipomea solution, cow dung, urine and asafoetida formulation, dry chilli–garlic solution, neem seed kernel extraction, amruthajalam, panchagavya. In addition, farmers use other techniques such as NADEP compost (invented by farmer N.D. Pandharipande from Maharashtra); green manuring; CVR method (invented by farmer Chintala Venkat Reddy from Telangana); and application of waste decomposer, vermicompost, edible oils, oil cakes, tank silt, sheep penning, poultry manure and buttermilk solution.

CRZBNF beyond four wheels, farmers benefiting from agriculture practices like SRI paddy

Bongi Satyanarayana, a tribal farmer from Pinakota village (Ananthagiri Mandal) of Visakhapatnam district, Andhra Pradesh, has been practising ZBNF for about five years. He grows paddy in both the rabi and kharif seasons on half an acre (0.2 ha) of land. He has a rain-fed orchard on another one and a half acres (0.6 ha) .

Before converting to ZBNF, Satyanarayana harvested just 5 quintals (0.5 MT) of paddy from his half acre plot. However, along with his introduction to ZBNF, he reduced his seed rate—sowing with 20 cm spacing between seedlings—and started practising the System of Rice Intensification (SRI) method of paddy cultivation. As a result, in the first year itself he experienced a 30 per cent increase in yield and in the second year an 80 per cent increase. He has recently become an Internal Community Resource Person (ICRP), whose role is to help farmers transition to natural farming.

Centre for Economic and Social Studies's (CESS's) assessment of CRZBNF results

RySS engaged the Centre for Economic and Social Studies (CESS), a Hyderabad-based research institute, to assess CRZBNF during kharif 2018. It conducted crop cutting experiments (CCEs) in all 13 districts of Andhra Pradesh. Further, 10 villages from each district were selected, and 10 CRZBNF and 10 non-CRZBNF farmers from each village were surveyed. In total, 2,600 farmers were surveyed, out of which 1,300 were ZBNF farmers and 1,300 non-ZBNF farmers.

The study showed that CRZBNF yield increased by 2–23 per cent for maize, groundnut, cotton and Bengal gram crops. But the CRZBNF yield for paddy decreased by 5 per cent. The cost of production decreased for all crops by 1–18 per cent and net income increased for all crops by 9–111 per cent. Farmers also reported benefits such as continuous flow of income through the year as well as improved soil health, quality and taste of crop outputs, resilience of crops to weather variability and health of consumers.

Again, during rabi 2018–19, a total of 1,789 CCEs were conducted by CESS to assess yield across all districts. For some crops, no significant difference was observed in yield of CRZBNF farms as compared to other farms. For crops such as groundnut, Bengal gram, black gram, green gram, sesamum, banana and sugar cane, 2–38 per cent increase in ZBNF yield was observed. For maize and jowar, a 1–7 per cent ZBNF reduction in yield was observed.

Paid out cost by farmers for all ZBNF crops fell by 0.4–38 per cent in rabi. Net income of all ZBNF crops increased by 10–133 per cent in the rabi season. Further, farmers reported improved soil quality; increase in earthworm population, green cover in fields and grain weight; and stronger crop stems. Some of the farmers also reported that crops grown under ZBNF were more resilient to dry spells and wind.

Farmers' perspective on CRZBNF

Summary of FGD responses

For more than 90 per cent of the farmers who participated in Focus Group Discussions (FGDs), yield of ZBNF farms either increased or became equal to that in non-ZBNF farms. Farming expenses for all ZBNF farms decreased as compared to non-ZBNF farms, without any exceptions. Eighty-seven per cent of the farmers were not able to get higher prices for ZBNF farm produce as compared to non-ZBNF. The remaining farmers were able to get higher prices for ZBNF produce through their own efforts or with the help of some organizations.

The general opinion among farmers who participated in FGDs was that ZBNF was time-consuming and required more manual labour than non-ZBNF. Only 15 per cent of farmers felt that their manual labour decreased in ZBNF farms. Ninety per cent of the farmers felt that their net income from ZBNF farms increased as compared to that from non-

CRZBNF giving migrated farmers hope to return to their villages

In Anantapur district, several distressed farmers migrate from their villages—where successive droughts and crop failures have serious impact on the financial health of farmers—to big cities for employment.

Amidst this despair, there are now a few farmers who opt to stay in their villages and practise CRZBNF on their farms as input cost for ZBNF is minimal and they don't have to take loans for expensive farming inputs. Some farmers who migrated to city areas—from Kadiri Mandal, Anantapur—have returned and are now practising ZBNF. One such farmer, K. Shivaram Reddy of village Mallagiahgaripalli, Mandal Kadiri, Anantapur, earned Rs 75,000 in one season in 2017–18 by adopting multicropping under CRZBNF and successfully growing 21 varieties of crops (including among other vegetables, guar, coriander, drumstick, red gram, castor and radish) along with guava orchards.

Another farmer, B. Chandra Sekhar of village Yegupalli, Mandal Kadiri, Anantapur, has a similar story. He was able to earn a profit of Rs 17,000 in one season from his 2.5 acres (1.01 ha) of land with very little water availability for irrigation.

Similarly, Narsimhulu and his brother from village Diguvapalli, Mandal Kadiri, Anantapur, migrated to Bangalore in 2012. They are taking their chances on CRZBNF farming as they have heard about the success a friend in a nearby village has had with CRZBNF.

The decrease in cost of cultivation and good yield even in drought conditions is instilling in farmers the confidence to stay back in their villages.

ZBNF farms. For the remaining few ZBNF farms, net income was equal to that from non-ZBNF farms. Net income did not decrease for any farmer (see *Table 4: Summary of FGD responses*).

Table 4: Summary of FGD responses

Parameter	Trends in FGD responses from 142 ZBNF farmers (% of farmers)		
	Increase	Same	Decrease
Impact on yield of ZBNF farms	57	35	8
Impact on farming expenses in ZBNF	0	0	100
Price received for ZBNF produce	13	87	0
Impact on manual labour for ZBNF	78	7	15
Impact on net income of ZBNF	90	10	0

Note: Farmers were asked to compare their CRZBNF farms with comparable chemical-based farms—preferably their own, if available—or chemical-based farms that had not started ZBNF or the general trend in non-ZBNF farms (chemical-based) in their vicinity or village.

Table 5: District-wise summary of FGD responses for different parameters

District	Responses in FGDs from 142 ZBNF farmers (% of farmers)														
	Impact on ZBNF yield			Impact on farming expenses in ZBNF			Impact on manual labour for ZBNF			Price received for ZBNF produce			Impact on net income of ZBNF		
	* I	# S	@ D	I	S	D	I	S	D	I	S	D	I	S	D
Vizianagram	58	26	16	0	0	100	69	0	31	0	100	0	26	74	0
Visakhapatnam	42	58	0	0	0	100	100	0	0	0	100	0	100	0	0
Guntur	27	0	73	0	0	100	100	0	0	70	30	0	100	0	0
Kadapa	55	45	0	0	0	100	62	15	23	16	84	0	100	0	0
Prakasam	100	0	0	0	0	100	100	0	0	0	100	0	100	0	0

Note: * I is Increase, # S is Same, @ D is Decrease

Impact on yield

In all five districts, except Guntur, where FGDs were conducted, ZBNF yield either increased or became equal in at least 84 per cent of the farmers who participated in FGDs. All farmers from Prakasam reported yield increase; yield also increased for more than half of the ZBNF farms in Kadapa and Vizianagram. However, Guntur—which has monocropping paddy as major crop—showed negative yield trends, with three-fourths of ZBNF farmers reporting decrease in yield as compared to non-ZBNF farms (see *Table 5: District-wise summary of FGD responses for different parameters*).

Individual farmers had mixed results too. In 65 per cent of cases, yield increased or remained the same.

In general, farmers experienced a decrease in yield for various crops in the first one or two years or seasons of transition from chemical farming to ZBNF. Subsequently, after a few seasons or years, ZBNF yield became equal or increased by 5–350 per cent in two-thirds of the crop plots. The transition period for ZBNF yield to become equal to yield from chemical-based farming was one to four years.

In a few cases, however, ZBNF yield increased from the first year itself. But in one-third of the cases, particularly in cases like paddy crop, yield decreased and did not improve after many years of practising ZBNF (see *Table 6: Summary of responses of individual farmers for different parameters*).

Specific crop-related details based on the interviews with individual farmers are as follows:

- Out of 17 plots that cultivated kharif paddy, ZBNF yield decreased for 10 plots, increased for five plots and remained the same for two plots. Variation in ZBNF yield was from –40 to +150 per cent.
- Out of 10 plots that cultivated groundnut, ZBNF yield increased for six plots, decreased for two and remained the same for two plots. ZBNF yield variation was from –10 to +350 per cent.
- Out of seven plots that cultivated rabi paddy, ZBNF yield decreased in six plots and increased in one plot. ZBNF yield variation was from –60 to +7 per cent

Table 6: Summary of responses of individual farmers for different parameters

Parameters (Individual interviews)	Increase (%)	Same (%)	Decrease (%)
Impact on yield of ZBNF farms (sample of 66 crop plots of 40 farmers; n = 66)	47	18	35
Impact on farming expenses in ZBNF (sample of 58 farm plots of 40 farmers; n = 58)	0	10	90
Impact on manual labour for ZBNF (sample of 40 farmers; n = 40)	80	13	7
Price received for ZBNF produce (sample of 40 farmers; n = 40)	50	50	0
Impact on net income of ZBNF (sample of 40 farmers; n = 40)	98	2	0

- In the six plots with mixed cropping, ZBNF yield increased by 5–20 per cent.
- Out of five plots that grew vegetables, ZBNF yield remained the same for two plots and increased in three plots by upto 100 per cent.
- Out of four plots that cultivated black gram, ZBNF yield increased in two plots but decreased in the other two plots by 60 per cent.
- Out of four plots that grew colocasia, ZBNF yield remained the same in one plot and increased in three plots by up to 100 per cent.
- Out of three plots that cultivated pulses, ZBNF yield remained the same in two plots but decreased in one plot by 20 per cent.
- Out of two plots that cultivated green gram, ZBNF yield remained the same in one plot but decreased in another by 40 per cent.
- In one plot each that cultivated chilli, ragi, foxtail millet, mango orchard, cashew, coconut and flowers, ZBNF yield either remained the same or increased by up to 300 per cent. Yield for one plot that cultivated maize decreased by 20 per cent.

In cases of multicropping and horticulture crops mixed farming, even though farmers felt that it was difficult to compare their ZBNF farm yield with monocrop chemical farms, they had overall good results. They did not practise multicropping in paddy crops. Further, some farmers were now growing crops in two seasons of the year instead of only one.

Farm plots of farmers showed varied results due to factors such as weather conditions as well as timely application of ZBNF inputs and irrigation, proper implementation of package of practices, crop rotation practices, quality of seed used and historical chemical usage. Some farmers also admitted that initially they did not understand ZBNF techniques entirely and failed to follow some instructions.

Impact on farming expenses

All the ZBNF farmers who participated in FGDs showed decreases in farming expenses. Farmers growing different crops in different districts or regions attributed the decrease in expenses largely to non-usage of chemical inputs and availability of inputs such as cow urine, dung and desi seeds at home.

For individual farmers, farming expenses decreased in 90 per cent of the cases and remained the same in 10 per cent of the cases. Farming expenses for ZBNF crops decreased by 15–80 per cent. Not a single case of increase in farming expenses was observed.

Specific crop details are as follows:

- Out of 17 kharif paddy and seven rabi crop plots, farm expenses decreased for all plots by 15–75 per cent.
- Out of 13 plots of groundnut, colocasia and vegetables multicropping, farm expenses decreased in all plots from 25–80 per cent.
- In a few cases—pulses, black grams, green grams and mixed crops—farm expenses remained the same.
- In all other cases of mixed cropping, millets and pulses, mango, cashew and maize, farm expenses decreased in ZBNF plots.

Farmers felt that as they didn't have to purchase anything from the market, their costs fell drastically under ZBNF. They didn't have to borrow money to purchase expensive chemical inputs and seeds from the market, which was a big relief for them. It enabled them to take sowing risk even in the drought-prone Rayalaseema region, with additonal uncertainties about irrigation. ZBNF minimized farmers' risk in the case of crop failure due to conditions like drought and now several farmers got two crops in a year instead of one crop.

Note: The standard cost of cultivation method is not used as it needs various details like imputed value of family labour cost, farm managerial cost, farm equipment and other maintenance costs, interest paid on loan amount and rental value of owned land. These details were often not readily available with the farmers. Further, various ZBNF inputs such as dung, urine, pulse flours, mulching materials, desi seeds and services like family labour were available free of cost at home in many cases and therefore no expenses were calculated by farmers for such services and inputs. Accordingly, farming expenses of various farmers varied.

CRZBNF positively impacts a marginal woman farmer

Wari Rajeshwari is a woman farmer from Ethemukula village of Prakasam district, Andhra Pradesh. She started ZBNF just one year ago after hearing about it from her friends in self-help groups. She owns 0.5 acres (0.20 ha) of land and has taken 0.5 acres more land on lease. She owns one buffalo but no desi cow. She cultivates groundnut, vegetables and flowers.

She was happily surprised with the twofold or threefold increase in flower yield on her small plot after converting to ZBNF. Earlier, she would purchase chemical inputs worth Rs 5,000 for the crops. Now, she does not have to buy anything from the market as she uses no chemical fertilizers or pesticides. Even though her manual labour has increased, she has more profit because of reduced costs and increased yield.

Farmers making profit even without premium price

Rohini Pratap Munkkala is a software engineer who returned to farming in 2013. He cultivates a 12-acre (4.86 ha) farm in Valluru village in Achanta Mandal, West Godavari district , Andhra Pradesh.

Munkkala grows paddy, coconut and some vegetables for household consumption. He procures a wide variety of native paddy seeds from seed festivals. After three to four years of practising ZBNF, his kharif paddy yield has stabilized and become similar to his yield in chemical farming, approximately 24 quintals (2.4 MT) per acre (0.40 ha). However, in the rabi season, his yield is less than half of what he got with chemical farming. With ZBNF, he gets about 15 quintals (1.5 MT) per acre, while with chemical-based farming the norm is 34–41 quintals (3.4–4.1 MT) per acre. His coconut yield, on the other hand, has doubled. Although he gets a premium price only rarely for certain varieties of rice, due to substantial decrease in expenses involved his overall income has almost doubled with ZBNF.

Impact on manual labour

A minimum of 60 per cent of the farmers from across all five districts in Andhra Pradesh where FGDs were conducted felt that manual labour increased in ZBNF farms. The rest felt it decreased or remained the same.

ZBNF farms needs more time, discipline and attention, and are labour-intensive as they require bio-input preparation and application, de-weeding, and harvesting of different crops at different times. Twenty-three per cent of the farmers in Kadapa and 31 per cent of the farmers in Vizianagram felt that manual labour decreased with time as soil health improved.

For 93 per cent of ZBNF farmers interviewed individually, manual labour increased or remained the same. ZBNF farmers with small landholdings were able to handle labour requirements from within their families but it was relatively difficult for large-scale farmers to meet the increased labour requirements. Some farmers indicated that ZBNF input shops could reduce the manual labour needed.

Prices of ZBNF produce

Prices received by at least 84 per cent of farmers for ZBNF produce in all five districts where FGDs were conducted except Guntur remained the same as they received for produce from chemical-based farming. In Guntur, however, 70 per cent of the farmers were able to get higher prices for ZBNF produce while 16 per cent of the farmers received premium prices in Kadapa.

The CRZBNF programme has not focused on premium prices. Fifty per cent of the farmers interviewed individually were able to get 2–200 per cent higher prices. The rest of the farmers did not get higher prices for ZBNF produce.

Despite initial losses, income under ZBNF doubled

Farmer Ramanjaneyulu M. of Gonevaripalem village, Chemakurthimandal, Prakasam district, Andhra Pradesh, has been practising ZBNF for the last four years on 10 acres (4.04 ha) of land out of which 7 acres (2.83 ha) is on lease. He has two desi cows and grows crops such as drumsticks, bitter gourd, bajra, fodder, paddy, blackgram, green gram, cotton and chillies. He is developing his own desi seeds and distributing these to other farmers as well.

While converting to ZBNF from chemical farming, his crops yield decreased by 20 per cent in the first year, but he had a comparable yield in the second year. Currently, he gets 15–20 per cent more yield for all crops and his expenditure has decreased by 70 per cent.

Earlier, his chemical input cost was around Rs 1.5 lakh for 10 acres (4.04 ha). Now, he doesn't have to purchase anything from the market except jaggery worth Rs 7,000 to prepare ZBNF inputs. However, his family labour has increased manifold now.

For some farm produce he is able to get up to 20 per cent premium while other produce sells at the normal price. His income has almost doubled and his family likes the taste of the ZBNF food.

Pre-monsoon dry sowing—Innovation to drought-proof

Many parts of Andhra Pradesh, especially the Rayalaseema region, have prolonged dry spells during which farmers in rain-fed regions are not able to grow any crops.

An innovation known as pre-monsoon dry sowing by Natural Farming Fellows working under CRZBNF is a system of tilling, sowing and tending the land during the non-farming season or whenever there is no crop cover on the land. It is implemented to a great extent in the last week of May, before the advent of monsoon. Sowing is done during the dry period and the crop is harvested after the monsoon, irrespective of availability of irrigation. During this time, other dry-land farmers who are not practising pre-monsoon dry sowing are not able to grow any crops.

This technique works on the principle of harnessing water vapour from the air to provide moisture to the soil and crops. It provides green cover to agricultural land through the year and helps farmers by ensuring additional income. This innovation is becoming popular—in 2019–20, as per GoAP, 12,549 farmers in about 1,800 villages of Andhra Pradesh implemented it.

Getting a fair and remunerative price for ZBNF produce has been identified as one of the biggest challenges for ZBNF farmers. Farmers sell produce in local markets, to local traders and to middlemen at normal prices, and are struggling with marketing. A few farmers include value addition like processing and packaging and have certified their farm produce as organic and therefore get higher prices.

Impact on net income

There was no case of decrease in income under ZBNF. Net income received by all farmers who participated in FGDs increased in all districts except Vizianagram. This was largely because of a decrease in farming expenses. In the case of Vizianagram, around 74 per cent of the farmers felt that their net income had remained the same even though their overall farm expenditure decreased as their labour cost increased, eating significantly into their profits.

For individual interviewees, net income for almost all the farmers in all districts increased. Even in cases where yield dropped significantly, the net income of farmers increased because of reduced expenses.

Further, earning patterns changed for various farmers practising multicropping as they now received income at intervals through the year instead of just once at the end of a season. The increase in shelf life of farm produce and longer duration of yield of some vegetable crops also contributed to increase of net income. Further, as input costs in natural farming were low, farmers were able to now grow two crops rather than the one crop that they previously grew with uncertain irrigation in chemical-based farming.

Impact on soil health and irrigation requirement

The majority of interviewed ZBNF farmers felt that soil health was improving under ZBNF. Farmers observed an increase in the populations of earthworms and beneficial insects, improved germination rate, deeper penetration of plant roots and better disease-resistant power and plant growth. Soil had become softer and smooth, as soil moisture, soil porosity, soil aeration and water-holding capacity of soil had improved.

None of the farmers said that their water requirement for irrigation had increased under ZBNF. Water needed for irrigation had either decreased or remained the same. Farmers mentioned that the crop had become drought-tolerant and mulching had improved the moisture content of soil.

Impact on resilience to adverse climatic conditions

Farmers who participated in FGDs and interviewed individually felt that ZBNF had improved overall resilience of crops to adverse climatic conditions. A few farmers, however, didn't observe any change. No farmer said that ZBNF has any negative impact on crop resilience to extreme weather events. Farmers felt that ZBNF plants had stronger roots that penetrated deeper in soil making them relatively stronger. Therefore, ZBNF crops suffered less damage during cyclones, strong winds, dry spells, waterlogging, heatwaves and droughts.

Smaller cost of cultivation and irrigation needs, better soil health and healthier family motivate ZBNF farmer

Ram Mohan Reddy is a retired military person from village Balapnur of Kurnool district. He has been practising ZBNF for the last three years. He owns 7 acres (2.83 ha) of land and practises ZBNF on 4 acres (1.61 ha). He has two desi cows and grows mainly vegetables.

Ram Reddy is going beyond ZBNF techniques and also uses bio-inputs like waste decomposer and other organic growth promoters available in the market. During the first year, his yield decreased by 50 per cent. In the second year, however, he was able to get a comparable crop yield. In the third year under ZBNF, crop yield increased by 12 per cent.

Currently, his cost of cultivation has decreased by approximately 65 per cent but he has to put in much more labour. Marketing is the biggest problem for him and he has difficulty in getting a fair price for his farm produce. He has noticed an improvement in soil health, less requirement of irrigation and good family health.

Tenant and lessee farmers face challenges

Farmer Ramu from Krugorimilli village in Achanta Mandal of West Godavari district takes 3 acres (1.21 ha) of land on lease and grows paddy in both the rabi and kharif seasons. He has been practising chemical-based farming since 2000. Due to high expenses involved in cultivation and the lease fee, he wants to switch to ZBNF. But he cannot as he does not own the land—his land may rotate and he may have to repeatedly bear the losses associated with conversion.

Impact on pest attack and diseases

Most of the farmers who participated in FGDs and interviewed individually experienced some decline in the incidence of and damage due to pest attacks and diseases after adopting the ZBNF approach. Farmers also felt that pest attacks were less in ZBNF than in chemical farming. Some farmers, however, did not observe any difference in the incidence of pest attacks. Farmers felt that multicropping, planting trap crops, border crops and other non-pesticide management (NPM) techniques were also helpful in managing pests naturally.

Impact on nutrition of family members and livestock

Farmers are encouraged to grow a variety of fruits, vegetables, cereals, pulses and oilseeds to secure nutrition for their families in accordance with different ZBNF models and through kitchen gardens.[88] Examples of the models include Annapurna, Navdhanya and the Five-Layer Model. Most farmers perceived multiple benefits such as better quality as well as nutritious and tasty farm-produce. They also noticed health benefits for their families and livestock due to consumption of diverse food.

CRZBNF benefits related to environment and fertilizer subsidy

The Center for Study of Science, Technology and Policy (CSTEP) performed a comparative life cycle assessment of CRZBNF in Andhra Pradesh. ZBNF and non-ZBNF paddy, groundnut, chilli, cotton and maize crops were assessed and the study was released in November 2019.

The study concluded that ZBNF processes require 50–60 per cent less water and less electricity than non-ZBNF for all selected crops. For irrigated crops, ZBNF utilizes 45–70 per cent less input energy (12–50 GJ per acre) and results in 55–85 per cent less emissions (1.4–6.6 Mt CO2e) than non-ZBNF. For the rain-fed crops, ZBNF requires 42–90 per cent less input energy (1.1–16 GJ per acre) and results in 85–99 per cent less emissions (0.5–11 Mt CO2e). ZBNF reduces methane emissions significantly through multiple aerations. It also suggests that there is a potential to avoid residue burning by practising mulching.[1]

CEEW studied the impact of CRZBNF programme impact on fertilizer subsidy.[2] The study, released in January 2020, suggested that a 75 per cent transition to ZBNF could reduce outflow of fertilizer subsidy by Rs 1,600 crore. If all of Andhra Pradesh converted to ZBNF, zero fertilizer would be used, which could save Rs 2,100 crore fertilizer subsidy annually. The assessment was based on rice, groundnut, and maize crops of 254 ZBNF farmers and 327 chemical-based farmers spread across six districts of Andhra Pradesh. The amount of chemical fertilizers reduced due to ZBNF was calculated and saved fertilizer subsidy accordingly estimated.

Learning from CRZBNF implementation

Learning from CRZBNF programme includes:

Utilizing historical presence of SHGs, NGOs and CMSA programme
Andhra Pradesh has a good historical presence of women SHGs. Men SHGs and farmers federations are now also being developed at the village level. About 0.16 million SHGs and their 7,106 federations play a central role in knowledge dissemination and extension with farmer families, farm planning for each family in kharif and rabi, meeting working capital requirements, handling community funds and also helping community resource persons (CRPs). Experienced NGOs with expertise in organic and natural farming, which actively participated in the earlier CMSA programme, have been enrolled in CRZBNF programme as resource or implementation organizations. One such example is the Centre for Sustainable Agriculture (CSA), Hyderabad. NGOs with local presence and experience in sustainable agriculture like Watershed Support Services and activities Network (WASSAN), Accion Fraterna Ecology Centre, Jattu Trust and others have been enrolled.

Trainings at mass as well as individual level, engagement of best practising farmers and young graduates
The basic foundation of the CRZBNF programme is knowledge dissemination. RySS has organized mega trainings, with around 5,000–9,000 farmers in each training spread

over four to nine days. Additionally, there is knowledge dissemination from farmer to farmer in villages. CRZBNF trainers and extension workers are the best practising farmers, called Community Resource Persons (CRPs). CRPs are responsible for mobilizing, motivating and providing regular handholding support to farmers in the transition process. Some CRPs were trained during Andhra Pradesh's earlier CMSA programme. Internal community resource persons (ICRPs) are appointed normally in their village itself. This ensures 24x7 access of extension staff to the farmers.

Mass-level trainings of CRPs and ICRPs are also conducted at regular intervals to improve their knowledge. Young agriculture graduates known as Natural Farming Fellows (NFFs), who have been posted in villages to practise farming themselves, set up CRZBNF models and showcase the results to farmers. NFFs play an important role in demonstration and dissemination of the programme and in innovating new techniques like pre-monsoon dry sowing, which is proving useful in drought-affected regions.

Extensive use of Information and Communications Technology in knowledge dissemination
RySS has engaged professional agencies to make short videos on CRZBNF practices, crop-specific recommendations and case studies of successful CRZBNF farmers in the local language, with real farmers. CRPs use video projectors to show these video films in villages in the evenings. This method of dissemination of information to farmers through videos seems very effective. RySS is also promoting these videos through social media so farmers have easy access to them.

Flexibility for farmers making the transition
The approach adopted by RySS, unlike PKVY's typical process, allows farmers more flexibility to adopt CRZBNF. Even farmers who use chemicals but follow any of the core principles of ZBNF are recognized and involved in the process. This may encourage and support farmers to continue and adopt all CRZBNF practices in due course, gradually decrease and finally stop the use of chemicals.

Farmers need support with regard to availability of farming inputs
Some farmers have easy access to inputs, while others need support to procure them. While the CRZBNF programme recommends indigenous cows for the preparation of farm inputs and claims that one cow is sufficient for 30 acres (12.14 ha) of land, farmers interviewed felt that one cow was sufficient for approximately 5 acres (2.02 ha) only. On the basis of data sourced from the National Dairy Development Board, 2018,[89] some districts such as Srikakulam, Viziangaram, Visakhapatnam, Anantapur and Chittoor have sufficient numbers of indigenous cattle, while other districts such as East Godavari, West Godavari, Krishna, Guntur, Prakasam, Nellore, Kadapa and Kurnool have deficits to fulfil the requirement. But if the entire population of cattle including indigenous, cross-bred and buffalo are considered, all districts have more than enough cattle availability for 100 per cent CRZBNF coverage.

Farmers need to be given alternatives and support as per the local circumstances. Need-based input shops for easy availability of inputs like ghanjeevamrutham, agni asthrams, brahma asthrams, local seeds, and tools like yellow and white sticky traps, pheromone traps etc. are being planned in each village. These efforts are, however, still in the early stages and

at a small scale. Similarly, RySS has also made efforts to promote cattle-shed lining, urine collection tanks, and custom hiring centres. Further, availability of mulching material at all places is a concern. The programme now intends to focus on live mulching to address the issue.

Requirement of indigenous seeds

CRZBNF recommends the use of indigenous seeds but most farmers still use hybrid seeds. Some, in the case of cotton crop, even use GM seeds.

Seeds are the most important part of farming but availability of good-quality desi seeds is an issue. To promote indigenous seeds and community seed banks, RySS has roped in organizations like the Centre for Sustainable Agriculture, Jattu and WASSAN. Farmers are dependent on private markets for seeds, and community seed banks will promote farmers' seed sovereignty.

Labour-intensive and time-consuming nature of CRZBNF is a concern

Farming is no longer attractive among village youths. The mindset of farmers is not easily changed to win confidence for natural farming. The labour-intensive and time-consuming nature of ZBNF prove to be an obstacle for making the transition to natural farming. Small farmers can afford increased labour using their family labour but it is difficult for big farmers to get adequate labour for big farms. Some big farmers, however, innovatively use locally developed solutions to make ZBNF less labour-intensive but implementation of such technology needs initial investment, which poses an obstacle.

Farmers expect fair and remunerative price for ZBNF

Almost all the farmers who have surplus farm produce to sell say that getting fair prices is the biggest issue for them. They feel that while they are ready to put in the hard work ZBNF requires, it's of little use if they don't get fair and remunerative prices for natural farm produce. Few ZBNF farmers manage to get fair or premium prices for ZBNF produce.

RySS is managing a comprehensive database for each ZBNF farmer, which could be used to get the PGS-India certificate for the farmers. To ensure good prices for farmers, focus on local procurement of the produce as well as the entire supply chain will be needed. Value addition, processing, packing, storage and branding of the package has to be given adequately focus.

ANNEXURE 2: STATE-WISE NUMBER OF ORGANIC FARMERS

No.	State/Union Territory	Total no. of clusters under PKVY from 2015–16 till date#	No. of farmers under PKVY from 2015–16 till date* ('000s)	Farmers registered on PGS portal^ ('000s)	Farmers registered on TraceNet portal (third party)+ ('000s)
1	Andhra Pradesh	5,300	265	5	29
2	Bihar	427	21	17	3
3	Chhattisgarh	1,200	60	46	16
4	Gujarat	100	5	14	46
5	Goa	504	25	0	6
6	Haryana	20	1	1	4
7	Jharkhand	250	13	15	18
8	Karnataka	545	27	36	59
9	Kerala	619	31	22	35
10	Madhya Pradesh	3828	191	105	335
11	Maharashtra	1258	63	59	109
12	Odisha	1040	52	25	65
13	Punjab	250	13	0	2
14	Rajasthan	6150	308	126	95
15	Tamil Nadu	312	16	12	14
16	Telangana	690	35	17	5
17	Uttar Pradesh	620	31	50	54
18	West Bengal	120	6	7	3
19	Assam	220	11	9	19
20	Arunachal Pradesh	19	1	1	6
21	Mizoram	34	2	1	8
22	Manipur	30	2	1	5
23	Nagaland	24	1	1	8
24	Sikkim	150	8	0	66
25	Tripura	50	3	2	3
26	Meghalaya	45	2	2	36
27	Himachal Pradesh	210	11	12	19
28	Jammu and Kashmir	28	1	2	19
29	Uttarakhand	4,485	224	151	55
30	Andaman and Nicobar	68	3	0	0
31	Daman and Diu	55	3	1	0
32	Dadar and Nagar Haveli	500	25	0	0
33	Delhi	500	25	13	0
34	Puducherry	8	0	0	0
35	Chandigarh	65	3	0	1
36	Lakshadweep	135	7	0	4
	Grand total	29,859	1,493	753	1,147

As responded in Lok Sabha unstarred question no. 1496 dated 11 February 2020.

* As responded in Lok Sabha unstarred question no. 1496 dated 11 February 2020.

^ As responded in Lok Sabha unstarred question no. 1898, dated 3 March 2020.

+ As responded in Lok Sabha unstarred question no.1898, dated 3 March 2020.

Source: Ministry of Agriculture and Farmers' Welfare.

ANNEXURE 3: QUANTUM OF NPOP-CERTIFIED FOOD PRODUCTS

Food category	Total NPOP production in India (MT) in 2018–19	Per cent of total NPOP certified products (%)	Produced by Madhya Pradesh, Rajasthan, Maharashtra (% of total NPOP food category in India)	State producing highest quantity (% of total NPOP food category in India)
Cereals and millets	269,546.7	10.4	36.1	Uttar Pradesh (32.5)
Dry fruits	8,834.2	0.3	18.4	Goa (27.8)
Fibre crops	312,939.4	12.0	58.9	Madhya Pradesh (29.4)
Flowers	11,015.8	0.4	7.7	Karnataka (91.9)
Fodder crops	1,851.2	0.1	3.6	Jharkhand (76.9)
Fruits	35,802.2	1.4	4.4	Karnataka (22.8)
Medicinal, herbal, aromatic plants	48,423.8	1.9	18.1	Uttar Pradesh (65.4)
Oilseeds	727,148.2	28.0	97.0	Madhya Pradesh (67.7)
Plantations	61,320.5	2.4	0.2	West Bengal (32.2)
Pulses	71,874.9	2.8	84.9	Madhya Pradesh (56.6)
Spices	56,207.7	2.2	51.0	Madhya Pradesh (26.4)
Sugar crops	984,730.1	37.9	64.7	Maharashtra (62.6)
Tuber crops	289.1	0.0	16.5	Meghalaya (42.2)
Vegetables	7,134.7	0.3	56.6	Rajasthan (36.3)
Miscellaneous	1,964.5	0.1	66.5	
Total	2,599,082.9	100		

Source: The Agricultural and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry, Government of India.

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Organic and natural farming in India is still at a nascent stage. To scale it up and make it a mass movement, governments at the Centre and in states must take big steps.

Mainstreaming organic and natural farming will address the ecological, economic and existential crisis in Indian agriculture. Only by using farming methods that are sustainable in the long run will Indian agriculture—and India—become truly self-reliant.

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