Chapter 1

Agriculture

1.1 Introduction

Agriculture sector is the prime mover of economic growth in Uttar Pradesh. A vast majority of the population in the state virtually relies on agriculture for its livelihood. As high as 65 per cent of the total workforce in the state depends on agriculture, most of whom are below poverty line.

The state has significant bearing on the agricultural performance at the national level. It shared about 13 per cent in the agricultural gross domestic product of the country in 1999-00. The state has immense significance in the context of food security of the country. It contributed about one-fifth of the total foodgrain production in the country, which was highest among all the states. About one-third of all wheat produced in the country comes from Uttar Pradesh. Similarly, around 40 per cent of the country's sugarcane was produced in Uttar Pradesh. Evidently, agriculture of the state has a paramount role in the food production and food security of the country.

This chapter is an attempt to propose policy options and strategies to revitalise the agricultural sector of Uttar Pradesh. Specifically, the objectives are to:

(i) assess agricultural performance during the past two decades 1980-2000,

(ii) identify constraints in achieving higher agricultural growth,

(iii) examine constraints and opportunities for agro-processing, and

(iv) suggest strategic options and recommendations for accelerated agricultural growth.

In order to cover the above aspects, the Chapter is organised as follows: Section 1.2 discusses agricultural performance. Section 1.3 presents aspects related to agricultural diversification and intensification. The status of the agro-processing sector is presented in Section 1.4. Section 1.5 deals with constraints to agricultural growth and Section 1.6 reviews the recent policy initiatives. Strategic options and policy choices are discussed in Section 1.7 and finally Section 1.8 summarises the conclusions.

The analysis is confined to administrative regions (i) Western region, (ii) Central region, (iii) Eastern region, and (iv) Bundelkhand region. Occasionally, hill region (now Uttaranchal State) has also been referred (Appendix A-1.1). According to soil and rainfall pattern the state is also divided into eight agro-eco regions: (i) Western, (ii) Mid-western, (iii) Southwestern semi-arid, (iv) Central plain, (v) Northeastern plain, (vi) Eastern plain, (vii) Vindhyan, and (viii) Bundelkhand (Appendix A-1.2). The rainfall in different regions ranges from 780 mm in Bundelkhand region to 1470 mm in Eastern region.

1.2. Agricultural Performance

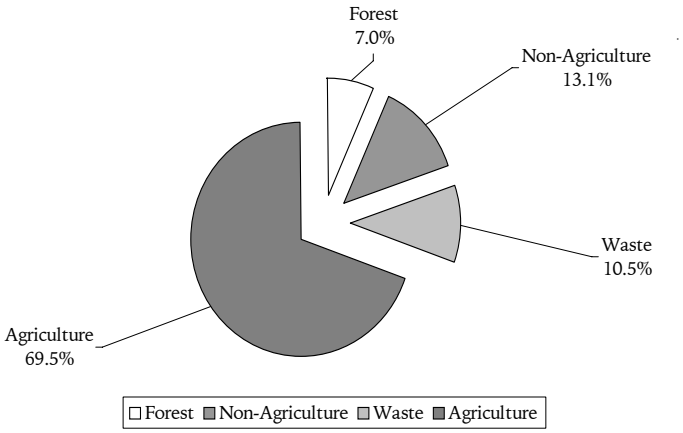
Heterogeneous resource endowments and markedly dissimilar infrastructure development across different regions in the state has led to diverse performance of agriculture. This section provides a brief account of agricultural performance in the state. It is organised into three parts covering land use, enterprise choices, and historical trends in agricultural performance.

1.2.1 Land Use Pattern

Agriculture is the driving force for the economic development of the state. About 70 per cent of available land in Uttar Pradesh was allocated to agriculture in the triennium average ending (TE) 2001/02 (Figure 1.1).

FIGURE 1.1

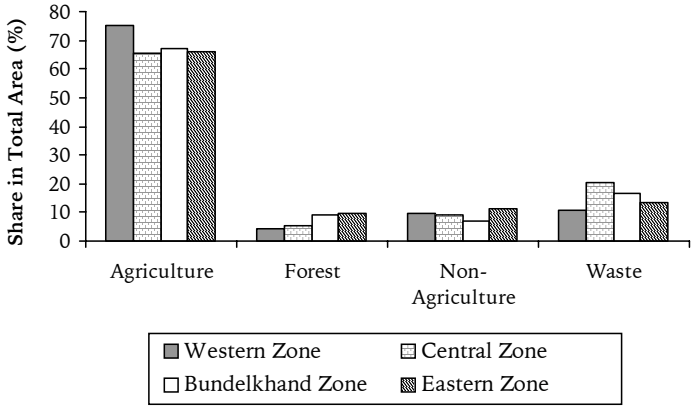
Land Use Pattern in Uttar Pradesh, TE 2001/02



Source: Sankhyikiya (Statistical) Diary, Uttar Pradesh, 2004.

FIGURE 1.2

Land Use Pattern in Different Regions in Uttar Pradesh, TE 2001/02



Source: Sankhyikiya (Statistical) Diary, Uttar Pradesh, 2004.

Land available for agriculture in Uttar Pradesh was 16.8 million ha. Area under forest was only 7 per cent of the total land. This was 23 per cent less than the norms set for maintaining a sound ecological balance in the region. Non-agricultural uses constituted only 13 per cent of the land in the state. Remaining 10.5 per cent land in TE 2001/02 was either degraded or not used for any productive purposes. Ironically, this huge wasted area (about 2.53 m ha in TE 2001/02) was 15 per cent more than the land utilised for agricultural purposes in Punjab. The potential of this ample area needs to be effectively harnessed to generate income and employment opportunities for the poor in the state.

During the past two decades (1980-2000), there was no change in the land use pattern, except mere 1 per cent shift in favour of non-agricultural uses from unutilised land. This implies that the horizontal expansion of land for agriculture and forestry did not transpire during the last two decades.

Land Use Pattern in Different Regions

Agriculture was dominating in land use pattern in all the regions (Figure 1.2). The share of agriculture in the total reporting area ranged from less than 70 per cent in the Central, Eastern and Bundelkhand regions to 75 per cent in the Western region. Area under forest was ranging from around 5 per cent in Western to 9 per cent in the Eastern region in the TE 2001/02.

Historical trends in the land use pattern did not demonstrate any significant area shift in favour of agriculture. With rapid urbanisation and growing land degradation, future scope for area expansion in favour of agriculture would be restricted. Whatever area may be brought under cultivation would be marginal and ecologically fragile, which unambiguously cannot compensate for the land being removed from cultivation due to urbanisation and land degradation. Therefore, future agricultural supplies and growth must be targeted primarily from raising biological yields and intensifying land use instead of area expansion.

1.2.2 Crop Choice

Uttar Pradesh agriculture is highly diversified. It produces numerous crops due to its comparative advantage of wide range of agro-climatic variability. It is one of the major foodgrain producing states in the country.

Foodgrains

Area under foodgrain crops confined around 20 to 21 m ha between 1980 and 2000. This was 83 per cent of the total cultivated area in Uttar Pradesh in the TE 1999/2000 (Table 1.1). It was exceedingly ahead of the national level area under foodgrain crops, which was about 66 per cent in the same period. About one-fifth (42 m tonnes in TE 1999/2000) of country's foodgrain production comes from Uttar Pradesh.

Cereals

Rice and wheat are the principal foodgrain crops. Their relative share in the gross cropped area (GCA) was about 23 per cent and 35 per cent respectively in the TE 1999/2000. Uttar Pradesh is the largest wheat producing state in the country. About one-third of total wheat produced in the country in 1999/2000 was contributed by the state. In case of rice production, the state ranked second, next

TABLE 1.1

Cropping Pattern of Uttar Pradesh*

Crop	*Area ('000 ha)*			*Share in GCA (%)*		
	TE 1982/83	*TE 1991/92*	*TE 1999/2000*	*TE 1982/83*	*TE 1991/92*	*TE 1999/2000*
Rice	5266.02	5587.81	5791.45	21.33	21.92	22.50
Wheat	8046.46	8783.13	8991.46	32.60	34.45	34.93
Sorghum	614.15	509.25	372.58	2.49	2.00	1.45
Pearl Millet	977.09	807.71	839.21	3.96	3.17	3.26
Maize	1203.02	1128.92	1141.76	4.87	4.43	4.44
Other Coarse Cereals	1253.67	729.75	1408.93	5.08	2.86	5.47
All Cereals	**17360.41**	**17546.57**	**18545.39**	**70.33**	**68.82**	**72.04**
Chickpea	1498.24	1160.11	813.79	6.07	4.55	3.16
Pigeon Pea	505.22	485.09	428.24	2.05	1.90	1.66
Other Pulses	879.25	1108.92	1561.97	3.56	4.35	6.07
All Pulses	2882.71	2754.12	2804.00	11.68	10.80	10.89
All Foodgrains	20243.12	20300.69	21349.39	82.01	79.62	82.93
Groundnut	257.66	146.46	110.15	1.04	0.57	0.43
Sesamum	45.53	67.08	94.22	0.18	0.26	0.37
Rapeseed and Mustard	425.34	673.59	692.15	1.72	2.64	2.69
Linseed	72.66	73.65	135.66	0.29	0.29	0.53
Sunflower	4.90	9.53	72.16	0.02	0.04	0.28
Other Oilseeds	55.25	76.64	105.25	0.22	0.30	0.41
All Oilseeds	861.34	1046.95	1209.59	3.49	4.11	4.70
Sugarcane	1679.00	1882.04	1888.03	6.80	7.38	7.33
Potato	271.00	326.82	440.28	1.10	1.28	1.71
Onion	20.11	29.26	48.09	0.08	0.11	0.19
All Vegetables	466.00	577.06	627.09	1.89	2.26	2.44
Misc. Crops	1160.49	1351.28	137.62	4.70	5.30	0.53

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues).

Note: *The statistics refer to Uttar Pradesh prior to bifurcation.

to West Bengal. Among all the cereals, area under wheat increased by 0.95 m ha and of rice by 0.53 m ha between 1980 and 2000. Rice mainly replaced sorghum, pearl millet and maize, while wheat substituted barley and to some extent chickpea. Area under all coarse cereals declined by 0.3 m ha during the same period. Their relative share in GCA has marginally come down from 16 per cent in TE 1982/83 to 15 per cent in TE 1999/2000.

Reasons for Shift in Favour of Wheat and Rice

Irrigation development, both surface and groundwater largely drove area augmentation and shift in favour of wheat and rice. Also responsible were: (i) availability and access of improved high yielding and disease resistance varieties, (ii) huge subsidies on water, power and other inputs, and (iii) assured output prices and procurement by the government. It is worth mentioning that almost 94 per cent of wheat area in the state was irrigated in the TE 1997/98, which was only 45 per cent in 1960/61 and 82 per cent in 1980/81. In case of rice, about 64 per cent was cultivated under irrigated environment in the TE 1999/2000, which was only 12 per cent in 1960/61 and 27 per cent in 1980/81.

Pulses

Relative share of pulses in the GCA was about 11 per cent in the TE 1999/2000. Chickpea (gram) and pigeon pea (*tur*) occupied about 44 per cent of the total pulse area in the same period. Their relative share in total pulse area was as high as 70 per cent in the TE 1982/83. Largely lentil, green gram (*moong* bean), black gram (*urad* bean) and peas substituted these two pulses. During the past two decades, chickpea suffered the most as its area declined by about 46 per cent, from 1.5 to 0.8 m ha between 1980 and 2000. In 1970-71, Uttar Pradesh used to be the leading state in chickpea production in the country, contributing more than 30 per cent of total production. Ironically after three decades in 1999-00, the state has been pathetically relegated to third place after Madhya Pradesh and Rajasthan, and contributed only 10 per cent in the total chickpea production in the country. Chickpea is largely grown under rainfed environment. With the rapid irrigation development in the state, chickpea area gradually shrunk. Availability of short duration varieties of lentil, peas, green gram and black gram facilitated their rapid adoption in diverse environments. Their area

has almost doubled, from 0.9 to 1.6 m ha between 1980 and 2000. Their relative share in GCA increased from 3.6 per cent to 6 per cent. Improved varieties of black gram and green gram are available, which can be grown in rainy, winter and summer seasons. Similarly, lentils can be grown under residual moisture after the harvest of rice crop.

Oilseed Crops

Oilseed crops occupied about 4.7 per cent area in the GCA in the TE 1999/2000. Their area went up by 40 per cent, from 861 thousand ha in TE 1982/83 to 1210 thousand ha in TE 1999/2000. Among oilseed crops, rapeseed and mustard are the most important crops in the state. Their area has increased by more than 63 per cent between 1980 and 2000. Their relative share in the GCA rose from 1.7 per cent to 2.7 per cent over the same period. The area under oilseed crops spurred as a result of the 'Technology Mission on Oilseeds' launched in 1987 to raise production of oilseeds in the country mainly to reduce import of edible oil. A number of programmes were initiated to increase the oilseed production. Improved varieties of oilseed crops were produced and quality seeds were distributed to the farmers. Procurement prices of oilseed crops were also raised, and farmers were assured of the procurement by the government. The programme was quite successful, which made a difference in the edible oil economy of the country.

Sugarcane

Sugarcane is another important crop in the state. Its area has marginally risen from 1.7 m ha in TE 1982/83 to 1.9 m ha in TE 1999/2000. Sugarcane cultivation increased with the expansion of irrigated area in the state. About 90 per cent of all sugarcane in the state was irrigated in the TE 1999/2000. It may be mentioned that Uttar Pradesh was the largest sugarcane producing state in the country. Almost half of the total sugarcane area in the country during 1997-98 was confined in Uttar Pradesh. But with respect to sugar production, it was next to Maharashtra.

Potato

The relative share of potato in GCA increased from about 1 per cent in TE 1982/83 to 1.71 per cent in TE 1999/2000. Uttar Pradesh is the highest potato producing state in the country. About 33 per cent of all potato area in the country was in the state, which contributed about 42 per cent production in 1999/2000. Potato area may further expand provided adequate storage and processing facilities are created in the state.

Vegetables

Area under vegetables also rose steadily in the state from 0.46 m ha in TE 1982/83 to 0.63 m ha in TE 1999/2000, and their relative share in GCA was 2.6 per cent in TE 1999/2000. The area was largely expanding in the peri-urban areas, and further expansion depends upon markets, transport and processing facilities. Area under miscellaneous crops such as cotton, jute, sunn hemp, tobacco, etc. was meagre in the state and their relative share in the GCA was negligible (0.53 per cent in TE 1999/2000).

Crop Choices Across Regions

Crop choices widely varied across different regions. A summary of crop choices in different regions is listed in Table 1.2. Rice and wheat are the principal crops in Central and Eastern regions. In the Western region, rice and wheat coupled with sugarcane were the principal crops. In Bundelkhand region, wheat and pulses were allocated to a large chunk of agricultural land. It is interesting to note that maize was occupying area ranging between 3-10 per cent in all the regions, except

TABLE 1.2

Crop Preferences according to Importance in Different Regions of Uttar Pradesh, TE 1999/2000

Region	*Crop Preferences*			
	High (> 25% of GCA)	*Medium (10-25% of GCA)*	*Low (5-10% of GCA)*	*Least (< 5% of GCA)*
Western	Wheat	Rice, Sugarcane	Pearl Millet, Maize, Rapeseed and Mustard	Barley, Chickpea, Pigeon Pea, Other Pulses, Oilseeds, Fruits and Vegetables
Central	Wheat, Rice	-	Maize, Sugarcane	Barley, Sorghum, Pearl Millet, Chickpea, Other pulses, Pigeon Pea, Oilseeds, Fruits and Vegetables
Eastern	Rice, Wheat	-	Other Pulses	Barley, Sorghum, Pearl Millet, Maize, Chickpea, Pigeon Pea, Oilseeds, Sugarcane, Fruits and Vegetables
Bundel-khand	Wheat	Chickpea and Other Pulses	Sorghum	Barley, Rice, Pearl Millet, Maize, Barley, Pigeon Pea, Oilseeds, Sugarcane, Fruits and Vegetables

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Bundelkhand. It was sorghum, which was cultivated in Bundelkhand in place of maize. In the Western region, pearl millet was also cultivated along with maize. Maize, pearl millet and sorghum are important fodder crops. These crops are also cultivated for human consumption in areas where groundwater quality is not good.

1.2.3 Growth Patterns

Overall agricultural performance in Uttar Pradesh was much inferior during 1990s as compared to 1980s (Table 1.3).

TABLE 1.3

Annual Compound Growth Rates of Area, Production and Yield of Important Crops in Uttar Pradesh (Per Cent)

Crops	*1980-89*			*1990-99*		
	Prod.	*Area*	*Yield*	*Prod.*	*Area*	*Yield*
Rice	5.86	0.11	5.75	2.69	0.36	2.32
Wheat	3.47	0.75	2.72	3.51	0.81	2.69
Sorghum	1.76	-1.91	3.66	-3.87	-4.41	0.54
Pearl Millet	0.64	-2.82	3.46	3.70	1.27	2.43
Maize	4.02	0.10	3.92	1.74	-0.18	1.92
Finger Millet	0.59	-1.23	1.82	1.05	-0.26	1.30
Barley	-0.70	-4.34	3.64	-0.77	-3.52	2.76
All Cereals	**3.96**	**0.01**	**3.95**	**2.54**	**0.31**	**2.22**
Chickpea	-2.01	-1.50	-0.52	-4.66	-4.12	-0.54
Pigeon Pea	-0.98	-0.37	-0.61	-1.94	-0.36	-1.59
All Pulses	**0.67**	**0.34**	**0.33**	**-1.38**	**-0.75**	**-0.64**
All Foodgrains	**3.56**	**-0.01**	**3.57**	**2.62**	**0.19**	**2.42**
Groundnut	-6.03	-9.28	3.25	-0.93	0.25	-1.18
Rapeseed and Mustard	-1.15	-8.39	7.24	1.16	-0.64	1.80
All Oilseeds	**5.21**	**1.54**	**3.67**	**8.35**	**9.35**	**-1.00**
Sugarcane	3.32	1.19	2.13	2.18	1.55	1.03
Potato	2.76	2.55	0.21	3.78	2.54	1.24
Onion	6.03	6.19	-0.15	-4.14	-0.59	-3.56

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Pace of production increase of important crops slowed down during the decade of 1990. The salient observations are as follows:

- Annual compound growth rate of foodgrain production decelerated during 1990s (2.62%) as compared to 1980s (3.56%). The main reasons for such trends were: (i) slowdown in the yield levels of rice, wheat and other cereals, and (ii) steep decline in pulses area and production. In case of wheat, as high as 70 per cent area is still yielding less than 3 t/ha (Table 1.4). About 33 per cent of the total wheat area in the state is still attaining yields less than the national average of 2.5 t/ha. For rice, an astonishing area of about 78 per cent is yielding less than 2.5 t/ha (Table 1.5). This shows that there is enormous scope to raise yield levels of rice and wheat through better management and intensification of inputs.

TABLE 1.4

Distribution of Wheat Area according to Yield Levels, TE 1999/2000

Yields Levels (T/Ha)	*Total Area (M/Ha)*	*Share in Total Area (%)*
<2.5	3.3	33
2.5-3.0	3.4	37
>3.0	2.6	30

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

TABLE 1.5

Distribution of Rice Area according to Yield Levels, TE 1999/2000

Yields Levels (T/Ha)	*Total Area (M/Ha)*	*Share in Total Area (%)*
<2.2	3.1	54
2.2-2.5	1.5	24
>2.5	1.3	22

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

- Sugarcane production also decelerated during 1990s as compared to 1980s. Area expansion as well as yields increase slowed down during 1990s. Since 1994, sugarcane yields have reached to plateau at 60 t/ha. This was 17 per cent lower than the national average (73 t/ha). In more than 70 per cent of sugarcane area in the state, the yield levels are less than 60 t/ha (Table 1.6).

TABLE 1.6

Distribution of Sugarcane Area according to Yield Levels, TE 1999/2000

Yields Levels (T/Ha)	*Total Area (M/Ha)*	*Share in Total Area (%)*
<50	0.1	8
50-60	1.2	64
>60	0.5	28

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

TABLE 1.7

Area, Production and Yield of Different Crops in Western Region

Crops	*TE 1982/1983*			*TE 1991/1992*			*TE 1999/2000*		
	Area	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*
Rice	1108.84	1535.37	1384.66	1184.77	2596.62	2191.67	1419.06	3396.87	2393.75
Wheat	3148.28	6427.66	2041.64	3320.00	8619.59	2596.26	3250.42	9840.26	3027.38
Sorghum	117.63	75.18	639.10	75.67	66.44	877.98	27.96	24.50	876.03
Pearl Millet	733.27	539.70	736.02	622.24	678.54	1090.48	660.50	922.33	1396.41
Maize	626.83	592.93	945.92	554.27	820.59	1480.48	615.52	1508.39	2450.58
Other Coarse Cereals	226.07	337.10	1491.15	173.23	411.62	2376.17	1080.84	3018.12	2732.98
Chickpea	262.14	224.50	856.43	144.40	146.54	1014.77	56.86	64.69	1137.65
Pigeon Pea	104.43	141.96	1359.42	96.25	107.57	1117.54	77.49	69.20	892.98
Other Pulses	325.04	210.68	648.18	312.14	259.11	830.09	429.62	559.30	1301.85
Groundnut	150.97	113.68	752.98	60.50	52.80	872.73	25.35	21.44	845.74
Sesamum	17.35	1.49	86.05	23.60	3.43	145.46	21.64	3.47	160.48
Rapeseed and Mustard	239.88	153.24	638.80	446.26	438.65	982.96	392.56	355.13	904.66
Linseed	3.41	1.11	326.17	1.10	0.39	355.62	24.83	24.75	996.64
Sunflower	1.30	0.80	615.38	7.13	6.86	962.15	29.40	49.61	1687.30
Soybean	1.53	1.50	978.26	0.22	0.25	1151.52	0.44	0.30	684.21
Other Oilseeds	1.53	1.50	978.26	0.22	0.25	1151.52	22.72	57.53	2531.91
Sugarcane	1125.38	54945.38	48823.84	1246.52	66755.51	53553.65	1167.39	74524.15	63838.08
Cotton	38.37	5.10	132.84	16.65	3.48	208.85	15.27	7.36	482.10
Potato	125.87	2133.58	16950.19	154.69	3066.78	19824.92	231.29	3688.42	15946.95
Onion	7.74	108.11	13968.13	14.58	221.59	15201.92	23.98	104.09	4340.24

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Note: Area = '000 ha; Production = '000 tonnes; Yield = Kg/ha

- Oilseeds production increased sharply during 1990s mainly on account of area expansion. Yields demonstrated declining trends, indicating that oilseeds cultivation was moving towards marginal areas.
- Potato production also increased during 1990s (3.78% annually) than 1980s (2.76% annually). During both the periods, it was largely due to area expansion.

Agricultural performance across regions in the state varied widely. Following are the salient observations on agricultural performance in different regions:

(a) Western Region

Western region is characterised as the food and sugar basket of Uttar Pradesh. Relative share of foodgrain crops in the GCA was around 80 per cent in the TE 1999/2000. Sugarcane accounted for about 12 per cent area in the GCA (Appendix A-1.3). This region contributed about 45 per cent of all foodgrain production and nearly 60 per cent of sugar production in the state during the same period.

Rice and wheat were the main foodgrain crops. Their performance during 1980-2000 was quite impressive. Production of rice increased from about 1.5 m tonnes in TE 1982/83 to 3.4 m tonnes in the TE 1999/2000 (Table 1.7). Similarly, wheat production went up from 6.4 m tonnes to 9.8 m tonnes during the same period. Area expansion contributed more (about 60%) in production

TABLE 1.8

Annual Compound Growth Rates of Area, Production and Yield of Important Crops in Western Region (Per Cent)

Crops	*1980-1989*			*1990-1999*		
	Prod.	*Area*	*Yield*	*Prod.*	*Area*	*Yield*
Rice	5.98	0.48	5.48	3.77	2.24	1.49
Wheat	3.46	0.68	2.76	1.56	-0.46	2.03
Maize	2.29	-0.43	2.72	6.17	0.35	5.80
Barley	3.20	-1.88	5.18	-0.95	-3.90	3.08
Chickpea	-2.85	-5.00	2.26	-10.10	-10.59	0.54
Pigeon Pea	-2.60	-0.33	-2.29	-4.79	-1.70	-3.15
Total Cereals	**3.93**	**0.01**	**3.92**	**3.77**	**1.62**	**2.12**
Total Pulses	**-0.48**	**-1.71**	**1.25**	**1.58**	**-0.87**	**2.47**
Total Foodgrain	**3.46**	**-0.20**	**3.67**	**2.36**	**0.07**	**2.29**
Groundnut	-9.62	-12.35	3.12	-8.22	-7.78	-0.47
Rapeseed and Mustard	12.63	7.96	4.32	-1.56	-1.32	-0.24
Total Oilseeds	**6.73**	**2.70**	**3.92**	**0.49**	**-0.49**	**0.99**
Sugarcane	1.64	1.32	0.32	1.94	0.21	1.72
Potato	4.96	2.83	2.07	3.89	4.88	-0.94
Onion	11.92	10.82	0.99	-8.42	3.54	-11.55

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

TABLE 1.9

Area, Production and Yield of Different Crops in Central Region

Crops	*TE 1982/1983*			*TE 1991/1992*			*TE 1999/2000*		
	Area	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*
Rice	937.70	1028.50	1096.83	985.75	1721.72	1746.61	1070.33	2199.48	2054.95
Wheat	1369.13	2248.20	1642.06	1451.28	3138.60	2162.65	1522.46	3780.89	2483.41
Sorghum	159.51	115.83	726.14	147.90	174.34	1178.75	117.86	102.52	869.85
Pearl Millet	75.84	40.47	533.62	38.99	36.80	943.91	35.41	35.94	1015.16
Maize	152.34	70.95	465.77	167.47	182.85	1091.80	204.56	323.89	1583.37
Other Coarse Cereals	218.42	222.64	1019.31	125.54	198.43	1580.59	53.28	89.72	1683.98
Chickpea	281.70	241.81	858.41	209.86	178.10	848.66	135.81	137.85	1015.05
Pigeon Pea	112.55	161.46	1434.53	117.65	154.47	1312.99	85.14	110.75	1300.84
Other Pulses	152.54	70.32	460.98	203.71	177.98	873.70	172.31	298.29	1731.11
Groundnut	82.66	65.23	789.10	56.97	43.58	764.91	37.04	29.55	797.95
Sesamum	4.62	0.46	98.77	17.31	3.89	224.68	33.42	6.09	182.23
Rapeseed and Mustard	97.37	48.17	494.69	129.33	101.77	786.88	167.74	118.45	706.12
Linseed	3.99	1.08	271.74	4.51	1.69	375.74	7.96	7.38	927.55
Sunflower	0.90	0.50	555.56	1.70	1.88	1108.06	22.17	32.40	1461.43
Other Oilseeds	6.36	2.12	333.33	0.00	0.00	0.00	17.81	39.84	2236.95
Sugarcane	198.03	7909.22	39939.49	274.69	12161.85	44274.29	305.34	16438.84	53838.42
Cotton	0.50	0.05	107.38	0.06	0.01	222.22	12.11	13.27	1095.76
Potato	46.95	676.60	14412.10	58.11	919.65	15826.93	78.01	1450.27	18590.82
Onion	3.04	25.66	8439.69	4.32	64.71	14990.73	3.38	36.60	10818.72

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Note: Area = '000 ha; Production = '000 tonnes; Yield = Kg/ha

increase of rice during 1990s, while it was yield increase during 1980s (Table 1.8). In case of wheat, yield enhancement was responsible for production increase in 1980s as well 1990s. Wheat yields went up from about 2042 kg/ha in TE 1982/83 to 3027 kg/ha in TE 1999/2000. These yields were still lower than the neighbouring state of Haryana. The Western region was far ahead in adoption of improved technology as compared to other regions in Uttar Pradesh. Almost entire wheat (99%) and rice (97%) were cultivated in irrigated environment. Similarly, all rice and wheat was under high-yielding varieties (HYVs). Fertiliser application was also too high (141 kg/ha) in the region.

Sugarcane used to be the most important cash crop in the Western region. Production of sugarcane rose from about 55 m tonnes in TE 1982/83 to 75 m tonnes in TE 1999/2000. Annual compound growth rate of sugarcane production was slightly higher (1.94%) during 1990-99 than the 1980-89 period (1.64%). Increase in sugarcane production was mainly attributed to yield augmentation during 1990s, while area growth during 1980s. This was because most of the sugarcane (97%) was having irrigation facilities in TE 1997/98.

Maize production was also showing rising trend in the Western region. Maize production increased in the region during 1990s, from 0.82 m tonnes in TE 1991/1992 to 1.5 m tonnes in TE 1999/2000. A large increase was noted in Bulandshahr district owing to a starch factory. Maize yields increased rapidly which was possible due to rapid adoption of HYVs of maize.

Potato and onion also gained in the Western region. During the last two decades, potato area doubled from 126 thousand ha in TE 1982/83 to 231 thousand ha in TE 1999/2000.

Oilseeds production has marginally increased in the region. Area and production of pulses, particularly chickpea and pigeon pea, on the other hand, was showing a declining trend. To some extent, green gram and black gram replaced chickpea and pigeon pea.

(b) Central Region

Foodgrain crops accounted for about 75 per cent of the total GCA in TE 1999/2000. It used to be 84 per cent in TE 1982/83. The region dispensed 26 per cent of all foodgrains produced in the state in TE 1999/2000.

Rice and wheat, the main foodgrain crops, accounted for about 59 per cent area in the GCA in TE 1999/2000 (Table 1.9 and Appendix A-1.4). Their production has increased rapidly between 1980-2000. Production of rice, which was about 1.03 m tonnes in TE 1982/83, reached to 2.2 m tonnes in TE 1999/2000. Rise in yield levels

TABLE 1.10

Annual Compound Growth Rates of Area, Production and Yield of Important Crops in Central Region (Per Cent)

Crops	*1980-89*			*1990-99*		
	Prod.	*Area*	*Yield*	*Prod.*	*Area*	*Yield*
Rice	5.44	-0.26	5.72	3.43	1.13	2.27
Wheat	4.27	0.69	3.56	2.94	0.90	2.02
Maize	8.34	1.68	6.55	6.90	2.33	4.46
Barley	-2.78	-4.86	2.18	-1.75	-5.59	4.07
Chickpea	-1.83	-2.33	0.52	-3.87	-5.14	1.34
Pigeon Pea	-0.73	-0.23	-0.51	-4.15	-4.35	0.21
Total Cereals	**4.51**	**0.18**	**4.32**	**7.58**	**5.4**	**2.07**
Total Pulses	**1.07**	**-0.16**	**1.22**	**-1.25**	**-3.71**	**2.55**
Total Foodgrain	**4.09**	**-0.04**	**4.14**	**2.48**	**0.31**	**2.17**
Groundnut	-6.73	-8.96	2.46	-6.00	-4.56	-1.51
Rapeseed and Mustard	6.04	1.77	4.20	2.40	3.18	-0.76
Total Oilseeds	**-1.11**	**-2.37**	**1.29**	**2.25**	**3.64**	**-1.34**
Sugarcane	5.28	3.81	1.41	4.58	2.32	2.20
Potato	3.25	2.19	1.03	7.56	3.69	3.73
Onion	11.27	5.07	5.90	-6.63	-2.64	-4.09

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

was an important source of production increase of rice (Table 1.10). Wheat production also went up in the region during the last two decades, mainly due to yield augmentation. Such an impressive performance was mainly on account of irrigation development, which facilitated adoption of HYVs and application of chemical fertilisers. About 83 per cent of rice and 93 per cent of wheat was cultivated in the irrigated environment. Almost the entire area (99%) of these crops was under HYVs.

Maize is another foodgrain crop, which has come up in the region. Its production has remarkably increased from 71 thousand tonnes in TE 1982/83 to 324 thousand tonnes in TE 1999/2000. Annual compound growth rate of maize production was exceptionally high at 8.34 per cent during 1980s and 6.90 per cent during 1990s.

Area under pulses was shrinking while expanding under commercial crops, namely oilseeds, sugarcane and potato. Rapeseed and mustard were the principal oilseed crops, their production has increased during 1990-2000 through area expansion. Ironically, their yields have almost stagnated mainly due to their spread in marginal areas and high infestation of insect pests.

(c) Eastern Region

Eastern region of Uttar Pradesh is flood prone. Poverty is acute in this region. Therefore, household food security is the primary concern of the farm households in this region. To meet the household food security, as high as 91 per cent of all agricultural land was allocated to foodgrain crops.

TABLE 1.11

Area, Production and Yield of Different Crops in Eastern Region

Crops	*TE 1982/1983*			*TE 1991/1992*			*TE 1999/2000*		
	Area	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*
Rice	2860.77	2701.83	944.44	3063.83	5003.14	1632.97	3044.56	6182.36	2030.63
Wheat	2617.43	3958.23	1512.26	3085.79	6020.96	1951.19	3295.05	7735.27	2347.54
Sorghum	79.68	64.64	811.25	73.06	71.56	979.51	73.46	68.96	938.83
Pearl Millet	134.98	104.92	777.28	119.13	128.61	1079.55	119.55	126.48	1057.97
Maize	368.81	202.63	549.42	349.60	350.70	1003.14	276.79	430.31	1554.63
Other Coarse Cereals	473.35	381.78	806.55	103.72	133.43	1286.37	61.64	104.70	1698.53
Chickpea	429.43	340.72	793.43	293.50	261.02	889.35	208.19	172.77	829.90
Pigeon Pea	198.17	224.58	1133.31	198.17	214.04	1080.12	211.24	234.33	1109.29
Other Pulses	254.44	162.70	639.42	281.51	257.65	915.27	432.42	889.12	2056.16
Groundnut	21.09	16.09	762.64	11.55	10.62	919.75	13.44	12.75	949.14
Sesamum	7.19	0.64	88.59	8.49	1.50	176.36	12.37	2.60	210.13
Rapeseed & Mustard	54.13	21.88	404.19	62.57	40.59	648.68	88.14	55.24	626.67
Linseed	40.68	9.84	241.81	25.53	7.76	303.87	45.36	37.89	835.32
Sunflower	2.40	1.70	708.33	0.64	0.53	833.33	15.97	31.95	2000.42
Other Oilseeds	0.04	0.02	636.36	24.17	9.16	379.03	27.17	58.45	2151.15
Sugarcane	308.98	12677.65	41030.65	305.53	14817.60	48497.48	358.77	16618.36	46319.95
Potato	89.66	1222.54	13634.82	99.70	1668.02	16730.39	118.91	1237.90	10410.37
Onion	8.27	79.05	9555.20	8.78	130.67	14887.96	16.04	119.94	7479.11

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Note: Area = '000 ha; Production = '000 tonnes; Yield = Kg/ha

TABLE 1.12

Annual Compound Growth Rates of Area, Production and Yield of Important Crops in Eastern Region (Per Cent)

Crops	*1980-89*			*1990-99*		
	Prod.	*Area*	*Yield*	*Prod.*	*Area*	*Yield*
Rice	7.16	1.42	5.65	2.34	-0.47	2.83
Wheat	4.73	1.99	2.69	2.77	0.37	2.39
Maize	7.57	-0.19	7.78	2.15	-2.28	4.53
Barley	-6.16	-7.04	0.95	-3.51	-6.44	3.14
Chickpea	-2.69	-3.21	0.53	-6.44	-4.26	-2.28
Pigeon Pea	0.12	0.24	-0.12	0.51	-0.1	0.62
Total Cereals	**5.11**	**0.55**	**4.53**	**7.52**	**5.12**	**2.28**
Total Pulses	**0.23**	**-0.82**	**1.06**	**3.93**	**0.47**	**3.44**
Total Foodgrain	**5.04**	**1.04**	**3.96**	**2.20**	**0.26**	**2.47**
Groundnut	-2.27	-5.65	3.59	0.39	1.86	-1.45
Rapeseed and Mustard	6.03	1.84	4.11	3.62	3.35	0.26
Total Oilseeds	**2.67**	**-0.08**	**2.75**	**12.05**	**6.22**	**5.48**
Sugarcane	1.34	-0.42	1.77	-0.89	-0.03	-0.86
Potato	3.74	1.54	2.16	-2.44	1.91	-4.27
Onion	6.92	2.07	4.75	-1.77	6.35	-7.63

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Rice and wheat shared about 75 per cent of the GCA (Appendix A-1.5). Their production went up significantly during the last two decades mainly due to rise in yields (Table 1.11 and 1.12). Rice yields, which were less than 1 t/ha in the TE 1982/83, reached to 2.03 t/ha in TE 1999/2000. The corresponding increase in wheat yield was from 1.5 to 2.35 t/ha. These yield levels are, however, lower than the state average. This region witnessed late green revolution as adoption of HYVs, chemical fertilisers and irrigation picked up during 1980s and continued during 1990s.

Chickpea and pigeon pea were the main pulses in the region. Their area and production was declining but other pulses, like lentil and green gram were spreading in rice-fallow areas. Among oilseeds, rapeseed and mustard and castor seed were the major ones. Their production rose largely due to area expansion. These crops were cultivated in areas which were earlier kept fallow. It could possibly be due to the availability of short duration varieties and irrigation.

(d) Bundelkhand Region

This region is characterised as low rainfall and dry with vast marginal lands. A sizeable area (84%) was allocated to foodgrain crops in this region. Unlike other regions, pulses

TABLE 1.13

Area, Production and Yield of Different Crops in Bundelkhand Region

Crops	*TE 1982/1983*			*TE 1991/1992*			*TE 1999/2000*		
	Area	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*	*Area*	*Prod.*	*Yield*
Rice	92.11	63.50	689.36	85.95	71.16	827.96	74.87	79.85	1066.45
Wheat	537.02	672.72	1252.69	558.19	844.98	1513.78	580.04	1099.63	1895.77
Sorghum	257.33	152.31	591.89	212.62	170.96	804.07	153.30	131.16	855.60
Pearl Millet	33.00	13.77	417.17	27.35	20.49	749.21	23.75	24.20	1018.95
Maize	17.13	12.47	727.82	24.76	29.13	1176.47	17.39	16.70	960.38
Barley	41.63	43.33	1040.83	27.70	39.04	1409.10	19.01	33.24	1748.76
Other Coarse Cereals	41.63	43.33	1040.83	102.65	99.99	974.02	26.05	34.00	1305.30
Chickpea	521.05	401.95	771.41	510.52	345.88	677.52	411.92	276.18	670.45
Pigeon Pea	88.77	122.46	1379.52	71.38	90.99	1274.67	52.62	77.32	1469.55
Other Pulses	123.54	51.11	413.72	283.74	289.61	1020.71	485.72	410.72	845.59
Groundnut	2.69	2.00	742.26	17.20	13.88	807.13	34.02	31.69	931.35
Sesamum	14.41	1.19	82.83	14.77	2.02	136.99	24.36	3.41	140.16
Rapeseed & Mustard	21.38	9.20	430.46	21.93	13.41	611.34	30.64	17.42	568.53
Linseed	24.21	8.18	337.97	42.35	16.78	396.19	47.86	20.96	437.83
Other Oilseeds	15.89	7.73	486.47	39.33	18.26	464.28	22.17	13.79	621.99
Sugarcane	3.30	108.48	32840.57	3.96	150.14	37946.93	5.34	221.95	41543.94
Cotton							1.07	21.74	20260.66
Potato	1.57	26.34	16814.89	1.25	22.68	18098.40	0.64	7.99	12510.86
Onion	0.40	3.88	9628.10	0.60	6.88	11525.14	2.02	5.20	2575.91

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Note: Area = '000 ha; Production = '000 tonnes; Yield = Kg/ha

occupied large share (about 43%) in the GCA in the TE 1999/2000 (Table 1.13 and Appendix A-1.6).

Among cereals, wheat was the important crop. Although its area almost remained static, the production rose as a result of yield enhancement (Table 1.14). Yet the yield levels were too low. This region is lagging far behind in adoption of improved varieties and application of fertilisers. Irrigation facilities are sparse in the region. Average fertiliser consumption (in terms of NPK) was only 36 kg/ha in 1999/2000 as compared to 141 kg/ha in the Western region. Area under HYV of wheat was only 80 per cent, which was near 100 per cent in Western, Central and Eastern regions.

TABLE 1.14

Annual Compound Growth Rates of Area, Production and Yield of Important Crops in Bundelkhand Region

Crops	*1980-1989*			*1990-1999*		
	Prod.	*Area*	*Yield*	*Prod.*	*Area*	*Yield*
Rice	0.86	-1.73	2.64	1.31	-1.58	2.94
Wheat	2.32	0.78	1.53	2.58	-0.76	3.37
Maize	10.16	4.70	5.22	-11.01	-11.06	0.05
Barley	-1.20	-3.29	2.16	-3.36	-4.97	1.70
Chickpea	-1.17	0.97	-2.12	-2.18	-2.38	0.20
Pigeon Pea	-2.30	-2.73	0.43	-0.81	-3.51	2.80
Total Cereals	**1.85**	**0.72**	**1.12**	**1.21**	**-1.92**	**3.19**
Total Pulses	**2.00**	**1.89**	**0.11**	**0.09**	**0.98**	**-0.89**
Total Foodgrain	**1.99**	**0.52**	**1.46**	**0.93**	**-0.47**	**1.41**
Groundnut	30.14	24.97	4.14	11.99	9.71	2.08
Rapeseed & Mustard	-1.66	-2.75	1.12	1.78	2.98	-1.16
Total Oilseeds	**9.15**	**4.73**	**4.22**	**7.66**	**5.75**	**1.80**
Sugarcane	2.75	1.32	1.41	4.95	5.09	-0.14
Potato	-1.66	-3.03	1.41	0.33	-2.32	2.71
Onion	5.05	3.12	1.87	2.13	0.99	1.13

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Pulses production during the decade of 1990s did not show much change. Other pulses conspicuously substituted chickpea and pigeon pea, which were traditionally important pulses. Peas and lentil largely replaced them. In this region, additional area under pulses was also brought from marginal and less fertile areas.

Area and production of oilseed crops also increased rapidly in this region. Area of all oilseed crops increased phenomenally from about 79000 ha in TE 1982/83 to 159000 ha in TE 1999/2000. This region due to scanty rainfall and scarcity of surface and groundwater is naturally specialising in favour of pulses and oilseed crops. Introduction of improved, high yielding and short-duration varieties of pulses and oilseed crops would go a long way in boosting their production and augmenting farm income.

1.3 Agricultural Diversification and Intensification

Horizontal expansion of area in favour of agriculture is a remote possibility in the state. The most promising options to augment farm income and accelerate agricultural growth are: (i) diversification of agricultural enterprises, and (ii) intensification of land and other inputs. This section addresses these two pillars of future sources of agricultural growth in the state.

1.3.1. Diversification for Income Augmentation

Diversification of agriculture refers to a larger crop-mix to augment farm income and enhance resource productivity. In a subsistence agricultural system, diversification was considered as a strategy to minimise farm risks, which arise as a result of fluctuations in output prices, weather uncertainties, and incidence of insect pests, among others. In an era of commercial and market-led agriculture, diversification is nothing but introduction of high value enterprises as growth strategy, which is expected to take entrepreneurs away from subsistence system. Nevertheless, it takes care of risk aversion in agricultural production. Broadly, the purposes of diversification can be listed as: (i) increase in the farm income, (ii) generate employment opportunities, (iii) stabilise farm income over the seasons, and (iv) conserve and enhance natural resources (Vyas, 1996). Simple strategy for diversification is to shift crop enterprises in favour of more profitable crops from the less profitable ones. Price signals and market conditions largely determine the path of diversification. In Uttar Pradesh, diversification became important when excess production of rice and wheat glutted the market and as a result profit margins declined. Rice-wheat system has also adversely affected the sustainability of natural resources, and threatened the production potential of the Gangetic plain.

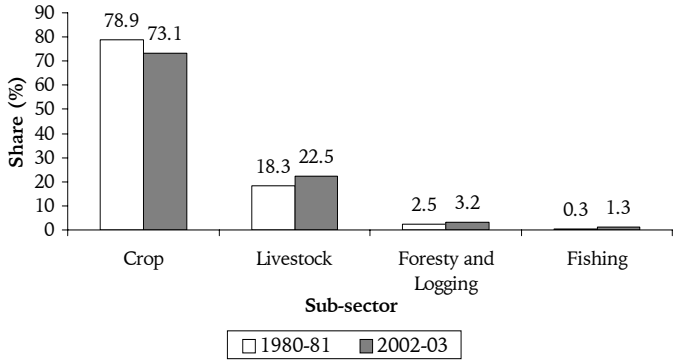
Livestock sector is an important option for diversification. This sector is growing impressively in Uttar Pradesh (Figure 1.3). According to the Livestock Census 1997, the livestock population in the state was highest in the country. In 1997, there were 20 million cattle, 19 million buffaloes, 12 million goats and 3 million pigs. Annually the state produces more than 11 million tonnes of milk and over 116 thousand metric tonnes of meat from buffalo and small ruminants. The annual growth in milk production grew at an impressive rate of 5.5 per cent during 1990s, which was about 4.8 per cent during

1980s. The value of livestock output, which was 18 per cent of the total agricultural output in 1980-81, rose to 23 per cent in 2002-03. The potential of this sector has not yet been fully capitalised. This sector still has huge potential to raise income of small farm householders. This sector is also important for the livelihood of small and marginal farmers. Unlike land, the small and marginal farmers own greater share of cattle and buffalo than the large farmers do. To raise income and generate employment opportunities for the landless labourers, marginal and small farmers, the livestock sector needs special attention.

Ironically, the productivity per livestock unit is too low in the state as compared to the potential. The major reasons for low productivity are failure of artificial insemination, inadequate nutrition, poor health and veterinary services, and unsatisfactory animal management. Besides, large number of animals depend on the common property resources, which are rapidly dwindling.

FIGURE 1.3

Share of Different Sub-sectors in Uttar Pradesh Agriculture

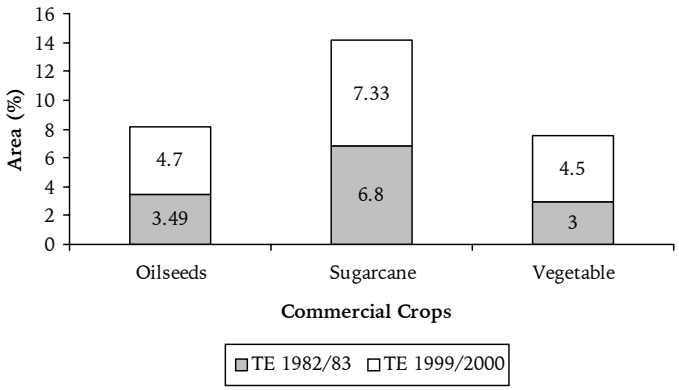


Source: *National Accounts Statistics* (Various Issus).

The crop sector accounts for major share (about 73 per cent) in the value of agricultural output (Figure 1.3); in the crop sector, foodgrains are dominating. The area under foodgrains increased by about 1 m ha between 1980 and 2000. Area under coarse cereals and pulses has declined and cereal production concentrated around rice and wheat. About 0.7 m ha area was added in favour of cash crops such as sugarcane, oilseeds and vegetables; from 3 m ha in TE 1982/83 to 3.70 m ha in 1999/2000. The process of diversification has led to marked increase in their share in the gross cropped area and value of agricultural output (Figure 1.4). Their share in GCA increased from 13 to 17 per cent during the same period. Production of vegetables in the state jumped remarkably from a small quantity of 0.96 m t in 1991/92 to 13.5 m t in 1998/99, most of which was in the plain regions. Uttar Pradesh is the second largest state, next to West Bengal, in terms of vegetable production in the country. Future scope of vegetable production in the state is enormous, subject to policy support and investment priorities.

FIGURE 1.4

Share of Commercial Crops (Per Cent) in Gross Cropped Area



Source: Centre for Monitoring Indian Economy (CMIE) (Agriculture Statics of UP) (Various issus).

Interestingly, area under vegetables was rising on small and marginal farms. It has been observed that small and marginal farms were diversifying a part of their land to extra short duration crops, like vegetables, to augment and stabilise their income over seasons (Jha, 2000). Vegetable cultivation is most suitable to small holders because they possess tiny pieces of land with abundant labour. Vegetable production engages more labour from vulnerable population groups, such as women (Wann *et al.*, 2000). Vegetable cultivation is also found to be beneficial to the soil health and utilises water most efficiently in terms of both production and economic efficiency (Ali, 2000).

Major constraints encountered in further growth of vegetable production are:

(i) non-availability of location-specific recommendations, (ii) non-availability of quality and hybrid seeds, (iii) lack of financial resources, (iv) loss due to diseases, and (v) complete lack of knowledge-based extension and technology dissemination mechanism (Arora, 1998).

Nature and scope of agricultural diversification was quite dissimilar across different regions. It was observed that the share of food-related enterprises was declining in all but the Eastern region (Table 1.15). In the Eastern region, it was obviously due to high incidence of poverty, where farmers are forced to produce food crops to ensure their food security. Nonetheless, maize in the upland of Eastern region provides huge promise for diversification during winter season.

TABLE 1.15

Diversification of Agriculture in Different Regions of Uttar Pradesh, TE 1997/98

Region	*Commodity Groups*	*Share in Value of Output (%)*	*Share in Total Area (%)*
Western	Cereals	53	67
	Pulses	4	5
	Commercial Crops	35	22
	Fruits & Vegetables	8	5
Central	Cereals	66	72
	Pulses	9	11
	Commercial Crops	21	14
	Fruits & Vegetables	4	4
Eastern	Cereals	77	81
	Pulses	8	11
	Commercial Crops	8	2
	Fruits & Vegetables	7	4
Bundelkhand	Cereals	38	42
	Pulses	54	49
	Commercial Crops	8	89
	Fruits & Vegetables	0.5	0.5

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

Diversification was relatively more pronounced in the Western region in contrast to other regions. Central region followed it. In the Western region, the non-food crops contributed about 43 per cent in total value of agricultural output from 27 per cent cropped area. In Central region, share of non-food crops in total value of agricultural output was 25 per cent from 18 per cent area. Area under vegetables is growing in the Western region (Table 1.16). Area substitution between different crop enterprises suggests that existing conditions favour the Western region for diversification. Better market network, roads, agro-processing and irrigation development pre-empted the Western region for diversification. Proximity to Delhi market appeared to be the attraction for diversification in this region. Bundelkhand region was far behind with respect to markets and other infrastructure development, so was the fate of diversification. Providing appropriate markets and processing plants would go a long way to raise farm income and alleviate rural poverty in the rainfed environment of Bundelkhand region through production and processing of pulses and oilseeds.

Expanding the GCA through raising cropping intensity and bringing the fallow and cultivable wastelands under cultivation would further step up the pace of diversification. In Uttar Pradesh, such lands together accounted for about 11 per cent of the total area in TE 2000/01. Some headway has already been made in this direction. Examples are lentil cultivation

TABLE 1.16

Total Vegetable Area in Different Regions of Uttar Pradesh

State/Regions	*Area ('000 Ha)*		
	TE 1982/83	*TE1991/92*	*TE 1999/2000*
Western	224.00	263.59	289.58
Central	77.00	90.91	91.75
Eastern	143.00	156.53	152.43
Bundelkhand	8.00	8.97	5.25
Uttar Pradesh	**452.00**	**520.00**	**539.00**

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various issues) and ICRISAT Database compiled by NCAP.

in rice-fallow system in Eastern region; wheat in sugarcane-based system in Western region; wheat and mustard in potato-based system in Central region; and production of green gram and black gram during summer season. These could be possible due to availability of short duration varieties of different crops.

Availability of water has led to higher agricultural productivity and facilitated multiple cropping. Water availability opens up more opportunities for crop choices. To underpin the diversification in water-scarce regions, introduction of water saving devices, such as sprinkler, drip systems, should receive incentives. Lessons should be drawn from Maharashtra, where the water saving devices in water-scarce regions have intensified diversification in favour of fruits, vegetables and floriculture by substituting coarse cereals.

Possible areas for diversification have been identified in different regions based on the past trends and future prospects. Table 1.17 summarises the potential areas for diversification. Future strategies must consider the production and marketing needs of diversification. Therefore, pro-diversification policies (both in production and post-harvest) and adequate institutional arrangements are required to create suitable conditions

TABLE 1.17

Prospective Area for Agricultural Diversification

Regions	*Cereals*	*Pulses*	*Oilseeds*	*Sugarcane*	*Vegetable*	*Livestock*
Western	-	+	+	+++	+++	+++
Central	+	++	++	+	++	++
Eastern	++	+	+	+	-	+
Bundelkhand	-	+++	+++	-	+	+

Note: + marginal emphasis, ++ moderate emphasis, +++ high emphasis, - reduce emphasis

for diversification. These need to be tuned to match the nature and process of diversification. Obviously, horticultural and livestock products require more attention for post-harvest transport, storage and processing. They need quick processing for delayed disposal and value addition. The requirement for processing of sugarcane, oilseeds and pulses are different than horticulture and livestock products. Incentives to private sector in agro-processing will unambiguously boost agricultural diversification. Agricultural research should also shift priorities towards the farming system approach (which encompasses diversification) with multiple objectives of augmenting and sustaining farm income, generating employment opportunities, alleviating poverty and conserving natural resources.

1.3.2 Intensification for Income and Food Security

Intensification of agricultural land and input management are the key processes for accelerated growth and prosperity in rural areas. This section provides an overview of past patterns and current status of agricultural intensification in the state.

(a) Land

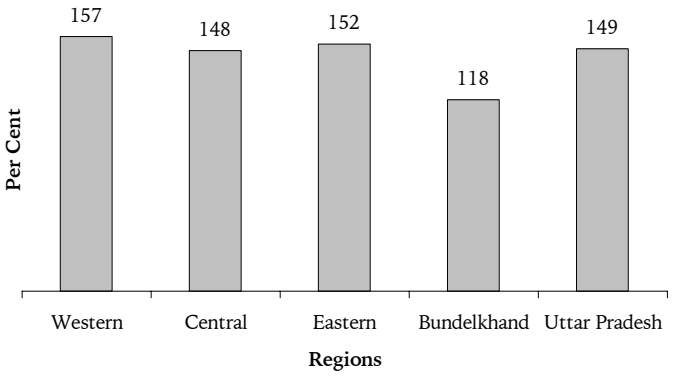
Cropping intensity represents intensification of land. In the state, only less than half (9.5 m ha) of the net cropped area is cultivated more than once. It is better than the national average but lagged far behind than one of the neighbouring states, Haryana. Unfortunately, cropping intensity did not display any significant change over the past two decades in Uttar Pradesh. It was a mere 149 per cent in the TE 2000/01 as against 143 per cent in TE 1982/83. The cropping intensity was highest (157% in TE 2000/01) in the Western region, while lowest (118%) in the Bundelkhand region. To some extent, the sugarcane, which is a long duration crop, masks the land intensification. In spite of that, the Gangetic plain, which is the most fertile and well endowed with water, did not exhibit any indication of intensive land use (Figure 1.5). Constraints to low-cropping intensity are region specific but largely related with water, which include: (i) excessive soil moisture in surface irrigated areas, (ii) inadequate power supply in well irrigated areas, and (iii) water stress in the rainfed areas.

(b) Irrigation

Uttar Pradesh is endowed with rich water resources. The state is bestowed with a vast network of perennial and seasonal rivers. The state also receives plentiful rainfall for crop production and groundwater recharge. About 73 per cent of all cropped area in the state was

FIGURE 1.5

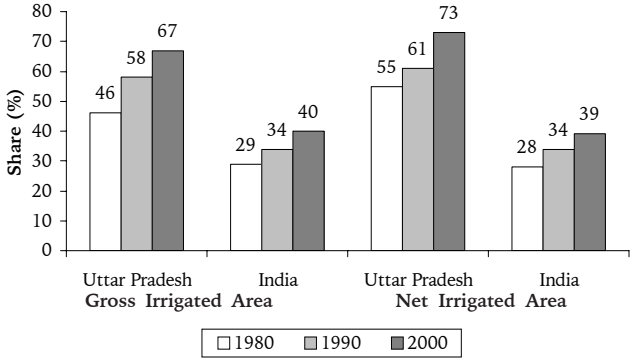
Cropping Intensity (Per Cent) in Different Regions, Uttar Pradesh, TE 2000/2001



Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

FIGURE 1.6

Percentage Share of Gross Irrigated Area in Uttar Pradesh and in India



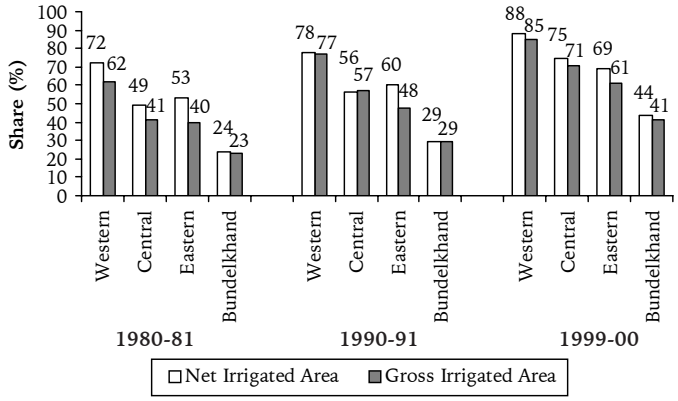
Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

irrigated compared to about 39 per cent in the country in TE 2000/01 (Figure 1.6). Groundwater is the predominant source of irrigation.

Progressive irrigation development in different regions is depicted in Figure 1.7. Western region is way ahead in irrigation development, which is followed by Eastern and Central regions. 70 per cent of all irrigated area in these regions is through groundwater (Figure 1.8). These are part of the Gangetic plain with immense wealth of surface and groundwater. Bundelkhand region is lagging far behind in irrigation development. Scanty rainfall in Bundelkhand region impedes irrigation development in the region. Water saving devices (like drip and sprinkler systems) and watershed-based technologies offer enormous promises for effective water management and irrigation development in Bundelkhand region.

FIGURE 1.7

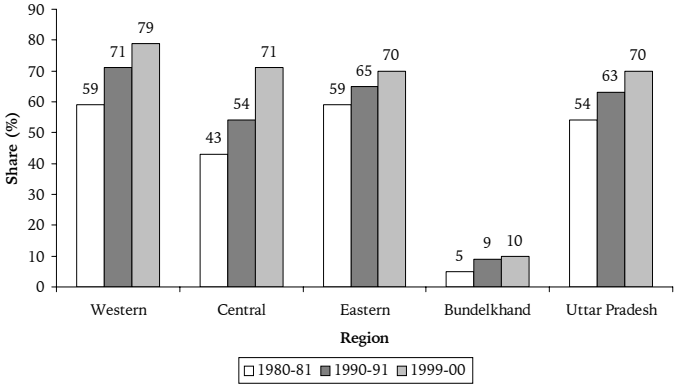
Trends in Irrigated Area in Different Regions of Uttar Pradesh



Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

FIGURE 1.8

Share of Tube Well in Total Irrigated Area (Per Cent)



Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

Rice, wheat, sugarcane and vegetables were the principal irrigated crops. Almost all crops are cultivated under irrigated environments in Western region. Rice, wheat and oilseeds receive higher preference for irrigation in Central region. In the Eastern region, wheat and sugarcane are largely cultivated in irrigated environment. A large part of the eastern region is flood prone, therefore, only upland rice during *kharif* season is given preference for irrigation. Rice, wheat and sugarcane are the favourite crops for irrigation in Bundelkhand region.

Irrigation development played a catalytic role in adoption of improved cultivars and use of chemical fertilisers. Evidence revealed that the regions lagging in irrigation development were also left behind in adoption of improved technologies and modernisation of agriculture and eventually tottered in overall agricultural performance. It calls for more focussed and location-specific research in the rainfed and dry land areas, especially in Bundelkhand region. In irrigated areas, the focus should be to improve irrigation use efficiency. Failing to that, numerous water-related externalities would completely negate the irrigation benefits. These externalities are erupting at an alarming rate in the form of waterlogging, soil salinity and declining water table, among others. These will be discussed in the subsequent section on environmental issues.

(c) Fertiliser

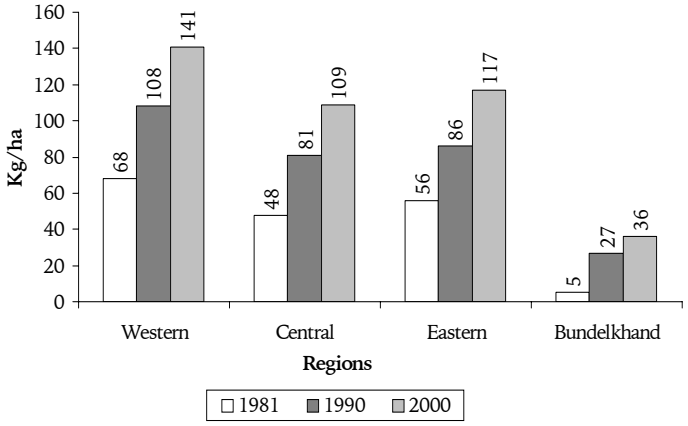
Fertiliser is one of the key elements of new agricultural technology. The central government extended a mammoth subsidy to promote fertiliser use in agriculture. The policy yielded desired results. In TE 1997/98, Uttar Pradesh consumed about 3 million tonnes of fertiliser. This was about 19 per cent of the country's total fertiliser consumption, which was 22 per cent (1.2 million tonnes) in TE 1982/83. A sizeable quantity of total fertiliser was in favour of nitrogenous fertiliser (73%). Rice, wheat, sugarcane and vegetables consumed a bulk of fertiliser in the state. Historical evidence revealed that fertiliser played a key role in significantly raising productivity of different crops, hence contributed in augmenting farm income.

Average fertiliser consumption in Uttar Pradesh was about 127 kg/ha in TE 1997/98, which was about 30 per cent more than the national average (97 kg/ha). The pace of fertiliser consumption in Uttar Pradesh was sluggish and crawling at an annual rate of about 3.6 kg/ha between 1980-81 and 1997-98. There is a large variation in fertiliser consumption across regions in the state (Figure 1.9). The 2000-01 data indicates Western region to be far ahead in fertiliser consumption (141 kg/ha) than other regions. Bundelkhand region was still applying less fertiliser than the national average—it was only 36 kg/ha in TE 2000/01. In the Western region, the more progressive belt of sugarcane-based in Western plain zone consumed a high level of fertiliser at 200 kg/ha (Appendix A-1.7). It may be mentioned that the Western plain zone is the most progressive region in the state, which is comparable with the agricultural performance of Punjab and Haryana.

There was a slight decline in fertiliser consumption when subsidies were partially withdrawn in 1991-92. After a mild setback, Western and Eastern regions showed much faster growth in fertiliser consumption in comparison to Central and Bundelkhand regions.

FIGURE 1.9

Trends in Fertiliser (N+P+K) Consumption in Different Regions of Uttar Pradesh

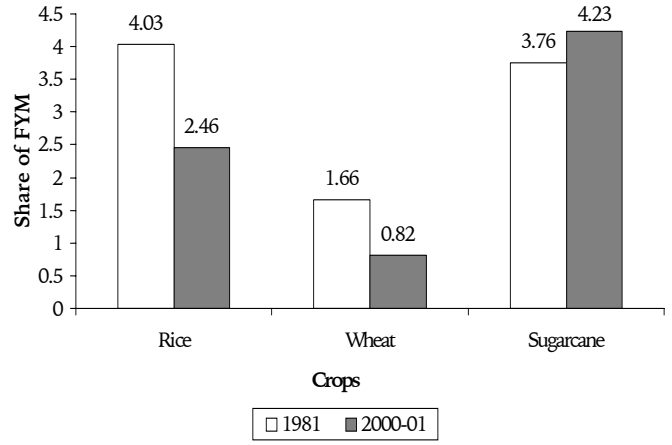


Source: ICRISAT Database compiled by NCAP.

The use of farmyard manure declined with the growing popularity of chemical fertilisers (Figure 1.10). The share of farmyard manure in total production cost has declined from 4.03 per cent in 1982-83 to 2.46 per cent in 2000-01 in rice crop. For wheat, these values were respectively 1.66 and 0.82 per cent. Declining use of farmyard manure adversely affects soil health, water retention capacity and other soil physical properties, which in turn have far reaching implications on agricultural performance.

FIGURE 1.10

Share of Farmyard Manure in Production Cost in Different Crops in Uttar Pradesh



Source: Reports of the Commisson for Agricultural Costs and Prices (Various issues).

(d) Seed

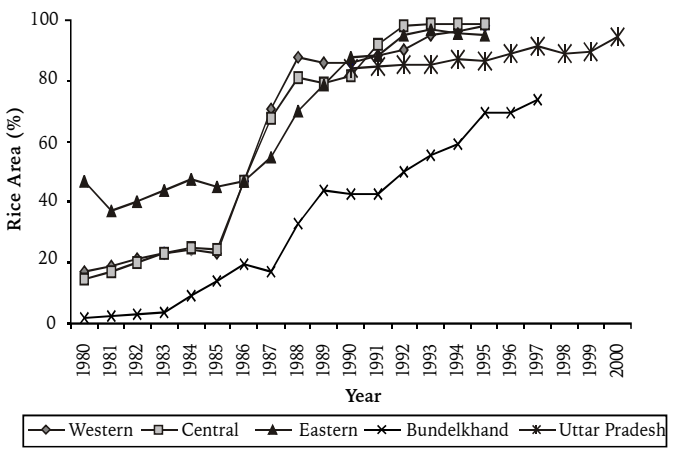
Seed is the most critical input for raising crop productivity. The public sector seed companies, namely the Terai State Seeds and Development Corporation Ltd. and the National Seeds Corporation played a significant role in production and distribution of improved varieties of cereals and other crops. Spread of improved rice and wheat varieties in Uttar Pradesh was far ahead compared to the national average. Almost the entire wheat area and about 95 per cent rice area was under high yielding varieties by TE 1997/ 1998. At the national level, the corresponding figures were 92 and 79 per cent respectively. Adoption of high-yielding varieties of pearl millet in Uttar Pradesh was about 70 per cent as against 67 per cent in the country.

Adoption of improved varieties of rice and wheat in Western, Eastern and Central regions has already reached to 100 per cent ceiling level. Their adoption was lower in Bundelkhand region (Figure 1.11 and 1.12). Adoption of improved varieties of maize has picked up sharply in the Western region after 1987; mainly to meet the fodder and feed requirements. It is noted that the improved varieties were better suited to irrigated and favourable regions. The varieties developed for Bundelkhand region mostly remained in the shelves and did not percolate to the target domain. Slow dissemination of new knowledge and complete absence of the seed sector in the backward and unfavourable regions are the major obstacles in the spread of improved varieties.

Adoption of improved seeds of other crops was low in most parts of the state. Non-availability of sufficient quantity of seed of appropriate varieties of crops like maize, sorghum, sunflower, chickpea, pigeon pea, green gram and groundnut has become the most important limiting factor in raising their productivity. Since the public seed sector and the government agencies focussed on seed production and distribution of rice

FIGURE 1.11

Trends in HYV Area (Per Cent) of Rice in Different Regions of Uttar Pradesh

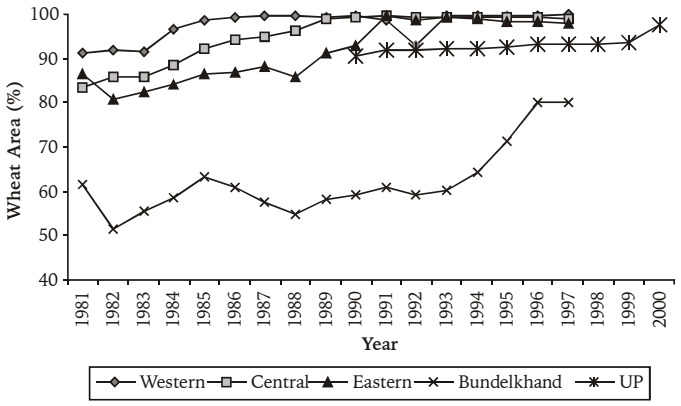


Source: ICRISAT database compiled by NCAP and Directorate of Agriculture GoUP.

and wheat only, the area under improved varieties of other crops lagged behind. Such biased attitude towards rice and wheat has adversely affected the prospects of other crops in the state despite their high potential.

FIGURE 1.12

Trends in HYV Area (Per Cent) of Wheat in Different Regions of Uttar Pradesh



Source: ICRISAT database compiled by NCAP and Directorate of Agriculture GoUP.

Ironically, the yield levels of rice and wheat were considerably low in Central and Eastern regions in spite of the large area covered by high-yielding varieties. The main reason ascribed is low seed replacement rates in these regions. This must be stepped up by encouraging seed production programme. For Bundelkhand region, it is suggested that the research programmes of the Indian Council of Agricultural Research (ICAR) institutes and the State Agricultural Universities should reorient and reprioritise their research portfolio in view of available resources and environment.

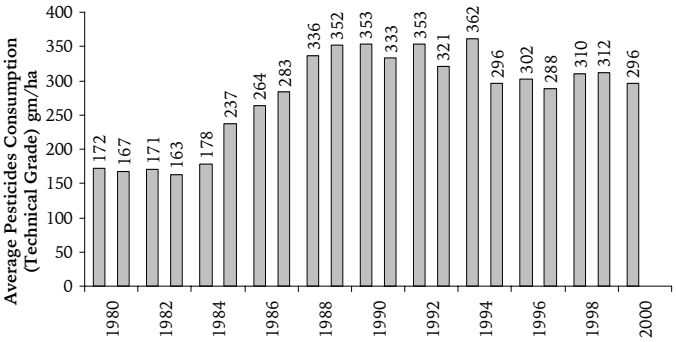
(e) Pesticides and Herbicides

The growing number of insects, diseases and weeds adversely affect all major crops. The losses due to insect pests are estimated in the range of 8-25 per cent, the highest being for fruits and vegetables. Despite huge losses incurred due to these biotic factors, application of chemicals for their management is too meagre. Share of pesticides in the total cost of production in different crops was negligible; 1.23 per cent in rice, 0.24 per cent in wheat and 0.19 per cent in sugarcane during 1996-97.

Pesticide use in agriculture was meagre at 178 gm/ha in 1984. There was a remarkable jump in pesticide use, when 50 per cent subsidy on pesticides was extended by the central government under a Special Foodgrain Production Programme (Rice). Pesticide use peaked at nearly 352 gm/ha in 1989-90, when the programme was extended to wheat. Reduction in subsidy to 25 per cent in 1991-92 and later complete withdrawal in 1994-95 marked a sharp decline in pesticide use, which fell to 296 gm/ha tonnes in 2000-01 (Figure 1.13).

FIGURE. 1.13

Trends in Pesticides Usage in Uttar Pradesh



Source: Directorate of Agriculture Statistics and Crop Insurance, GoUP.

Withdrawal of pesticide subsidies coincided with the Integrated Pest Management (IPM) programme. The main aim of the IPM is to maintain the pest population at levels below that cause economic loss to the crop. It advocates minimum use of pesticides, and encourages agronomic management and biological options. Uttar Pradesh has already instituted nine laboratories to generate bio-agents but still its use in not popularised due to high cost and lack of storage facilities at block level.

1.4 Status of Agro-processing Sector

Agro-processing sector is reckoned as a promising growth frontier in agricultural economy of the state. It has measly grown in the past despite the fact that the state enjoyed the prime position in terms of agricultural production. The state ranked number one in terms of production of wheat, sugarcane, maize, vegetables, potato and livestock products, including milk. In terms of rice production, the state is next to West Bengal. The state enjoys the following comparative advantages:

- Large consumer base within the state and neighbouring states. Western region has the geographic advantage due to its proximity to Delhi market.
- Fruits and vegetable sector can easily be tied up with 'Safal'.
- Dairy sector can be linked with 'Mother Dairy', and several private dairy entrepreneurs.

- Adequate and fairly regular supply of raw material.
- Proximity to international port.
- Availability of a cargo station in the capital, Lucknow.

The state has 311 heavy and medium agro-processing industries with a total investment of Rs. 2500 crores. There are 42586 small-scale agro-processing and cottage industries with a total investment of mere Rs. 700 crores.

1.4.1 Sugar

The sugar industry enjoys the prime position in terms of number and investment. There are 125 sugar mills of which 105 are functional with an installed capacity of 396 thousand T.C.D. There are 46 per cent sugar factories in the joint sector, 29 per cent in public sector and 25 per cent cooperatives in 1998-99 (Table 1.18). The annual production of sugar ranges between 392 thousand tonnes and 450 thousand tonnes with a sugar recovery of 9.3-9.5 per cent.

TABLE 1.18

Distribution of Existing Sugar Mills in Uttar Pradesh, 1998-99

Region	*Number of Sugarcane Factories*				*Sugar Prod. (Lakh Tonnes)*	*Installed Daily Cane Crushing Capacity (Tonnes)*
	Joint Stock	*Public Sector*	*Coop.*	*Total*		
Eastern	22	20	8	50	881	116589
Central	19	9	18	46	1600	152816
Western	16	7	6	29	1441	126719
All Uttar Pradesh	**57**	**36**	**32**	**125**	**3922**	**396124**

Source: *List of Sugar Mills in India, Bangladesh and Pakistan*, 1998-99; *Indian Sugar Year Book*, 1997-98-99.

Besides, there are 1115 *khandsari* industries of which only 900 are functional. Their crushing capacity is 79 million tonnes but they are producing only 400 thousand tonnes of *gur* and *khandsari*. The recovery of *khandsari* ranges from 6.2 per cent in the Eastern region to 7.48 per cent in the Western region. The recovery of *gur* ranges from 11.47 per cent in the Central region to 11.86 per cent in the Western region (Table 1.19). There is considerable scope for expansion and upgradation of both sugar and *khandsari* industries.

Another industry, which is closely linked with sugar industry, is distillery. There are about 40 molasses-based distilleries functioning in the state having an installed capacity of 7000 kilolitres with a total investment of Rs. 140 crores. The production of molasses has gradually came down from 2699000 tonnes in 1995-96 to 1880000 tonnes in 1997-98 (Table 1.20). However, more recently the trend appears to have reversed with increasing demand of chemical factories, which depend on the by-products of the sugar industry.

TABLE 1.19

General Characteristics of Sugarcane Processing Units in Uttar Pradesh, 1997-98

Processing Unit	*Zones*	*Avg. Crushing Capacity (TCD)*	*Avg. Crushing Capacity Utilisation (Per Cent)*	*Total No. of Operating Days during Season*	*Avg. Recovery (Percentage)*
Gur	Western	9.50	98	184	11.86
	Central	7.14	80	172	11.47
	Eastern	6.38	74	150	10.56
Khandsari	Western	125	68	201	7.48
	Central	105	54	161	6.64
	Eastern	80	33	152	6.21

Source: Singh, Naveen Prakash (2000). *An Economic Appraisal of Sugar Industry under Different Processing Sectors of UP.*, Ph.D. thesis submitted to IARI, New Delhi (unpublished).

TABLE 1.20

Molasses Production ('000 Tonnes) in Uttar Pradesh from 1995-96 to 1997-98

Region	*1995-96*	*1997-98*	*2000-01*
Eastern	658.00	431.30	548.5
Central	1122.00	786.30	852.1
Western	919.10	662.00	768.5
All Uttar Pradesh	**2699.10**	**1879.60**	**2169.1**

Source: *Indian Sugar Year Book*, various issues.

Sugar sector is the most promising in the state, yet it is faced with acute uncertainty. It is in the grip of state control through several restrictions including stocking, and movements. Existing government policies discourage private sector investment to modernise and upgrade production facilities to take benefit of scale economies. There are many sugar factories, which have become obsolete and inefficient. It is opportune time for the government to relook at the existing control mechanisms, which encourage private sector investment to modernise the plants with latest technical know-how and efficiently increase sugar production in the state.

1.4.2. Rice and Wheat

Rice and wheat based agro-processing industries occupy second place next to the sugar industry with

respect to investment and employment opportunities. There are 2597 rice mills in the state, which process roughly 3500 thousand tonnes of paddy. There are 128 flour mills processing about 2440 thousand tonnes of wheat.

1.4.3. Horticultural Products

Vegetables, including potato and onion, have vast potential for value addition through agro-processing. In the absence of any appropriate provision of post-harvest management, the farmers incur heavy damages and financial losses. Potato production in the state is just touching 10 million tonnes, which is highest in the country. Ironically, there is no potato processing industry in the state except for a few small potato chips making units. These units utilise only a fraction of the total produce. A reluctant attitude of the government towards potato acted as a constraint in capitalising the potential benefits. Potato farmers are badly hit by a sharp decline in potato prices during the harvest time. The cold storage facilities are not very effective due to uncertain and interrupted power supply.

Like potato, vegetable production in the state is also quite significant at 1600 thousand tonnes. There are only 462 agro-processing units engaged in processing of fruits and vegetables. These are too few in comparison to the volume of production. Farmers and traders encounter huge post-harvest losses. The state made some efforts in the past by establishing some processing and training centres. At present, there are 8 post-harvest technology centres and 14 sub-centres for horticultural crops, 10 food technology-training centres, 101 community food preservation centres and 1 institute on food preservation and packaging. These are too less.

Potential Areas for Agro-processing

The state has identified few potential areas for agro-processing. Important ones are: (i) onion flacks, onion powder, garlic power in Mainpuri, Agra and Etawah areas, (ii) fruits and vegetables in the Western region, and Lucknow, Varanasi and Allahabad, (iii) flowers in the Western region and Lucknow, (iv) canned mushroom in the Western region, (v) oleo resin in Ghaziabad, Agra, Jhansi, Kanpur and Deoria, (vi) table margarine and bakery in Ghaziabad, Pilibhit, Sitapur, and (vii) *azadira* extract in Saharanpur and Varansi.

To expand the scope of the agro-processing sector in the state, following measures need to be initiated:

- **Sugar**: Remove all controls on levy, movement and stocking of sugar and molasses. Also, encourage scale economies and infrastructure costs.
- **Rice milling**: Remove all controls like levy, movement, and stocking by private trade.
- **Potato**: Vertical development is needed for processing. It calls for special R&D, and cold storage facilities.
- **Fruits and vegetables**: It calls for better transportation and cold storage facilities. The need is to tie up with major distribution centres.
- **Milk products**: Strengthen linkages with 'Mother Dairy' and 'Parag'.

Post 1990, the state government has formulated new industrial and Agro-Industrial Policies, which are expected to boost the agro-processing sector in the state. The main purpose of these policies is to attract private sector participation in this sector.

1.4.4. Livestock Products

The state is home to numerous undernourished and unproductive animals. According to the 1997 Census, there were around 19 million buffaloes, 20 million cattle, 11.8 million goats, 1.9 million sheep, 3.1 million pigs and 12.1 million poultry. In the livestock sector, the state contributes about one-sixth of the total production in the country. However, livestock processing in the state is yet to develop. At present, there are only two-heavy/medium meat processing units functioning at Aligarh and Unnao with an annual turnover of 45000 tonnes of processed meat. Besides, there are eight small meat-processing units, which yield about 4500 tonnes of meat. One Integrated Broiler Production-cum-Processing Plant is under construction. Some cooperative ventures like 'Parag', are operating in the dairy sector. Obviously, there is a large gap between production and processing of livestock products in the state.

1.5. Constraints to Growth

Uttar Pradesh agriculture is in the grip of numerous constraints to growth. It appears that the past efforts towards the agricultural sector were very casual. There were no concerted and integrated efforts to boost agricultural growth. This is the reason that despite the state's geographical advantage, in terms of soil, water and climate, the agricultural performance was far from satisfactory. Tremendous potential exists in the agricultural sector provided the existing constraints are mitigated. This section lists important constraints, which need to be addressed.

1.5.1. Policy Constraints

(a) Investment in Agriculture

The most critical constraint in Uttar Pradesh agriculture is underinvestment in key areas. It is

distressing to note that the per capita plan outlay in Uttar Pradesh is the lowest among all the states (Shankar, 2001). A more disturbing fact is that the public investment in agriculture in different five-year plan periods has decreased in the state. Investment in agriculture has come down to Rs. 393 crores per annum in the Eighth Five-Year Plan at 1980-81 prices from Rs. 626 crores per annum in Sixth Five-Year Plan; a fall of about 37 per cent. Share of public investment in agriculture has also declined from 17.2 per cent in the Sixth Five-Year Plan to 14.7 per cent in the Eighth Five-Year Plan (Table 1.21). Although this phenomenon corresponds to the national level trends, but a state like Uttar Pradesh cannot afford to sustain agricultural growth in such an environment. This conveys a clear neglect by the government towards agriculture. Such an attitude of the government discourages the private sector to invest in agriculture.

TABLE 1.21

Public Investment in Agriculture and Allied Heads in Different Plan Periods (1980-81 Prices)

Plan	*Public Investment in Agriculture (Rs. Crore/Year)*	*Share in Total Agriculture Outlay (%)*
Sixth Plan	626	17.2
Seventh Plan	419	15.2
Eighth Plan	393	14.7

Source: *Uttar Pradesh at a Glance* (Various issues).

Unfortunately, a large share of the proposed public investment in agriculture is gulped by the mammoth subsidies on irrigation, fertiliser, power, seed and credit. These subsidies have posed more deleterious impact in terms of reduced public investment in agriculture on account of erosion of investable resources. In some cases, these subsidies also encouraged wasteful application of resources, like water and power, and adversely affected the sustainability of natural resources in the state. The foremost priority of the government should be to mobilise resources for investment in those areas that attract private sector participation and promote agricultural growth.

(b) Land Reform

Land for agricultural purposes in the state remained almost static during the past two decades. It was around 17 million ha. Vertical utilisation of land was also at a snail's pace. Besides meeting the food needs of the growing population, the pressure on agricultural land also comes from industry and housing.

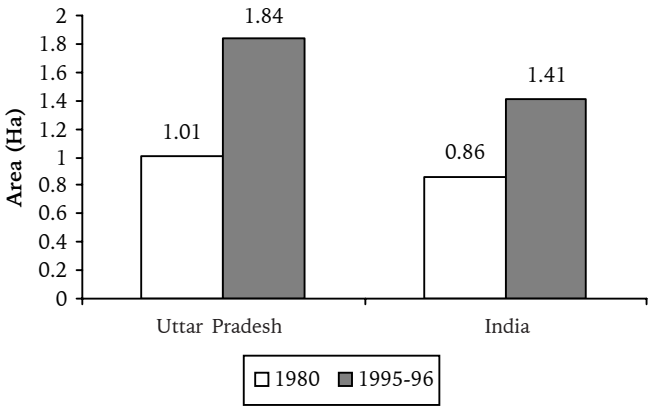
The smaller size of landholdings and existing land tenancy laws are impeding investment and leading to inefficiencies in agriculture. The growing concern is on: (i) declining holding size, (ii) increasing fragments of land, and (iii) rising number of small and marginal farmers.

The existing land tenancy laws restrain private investment. The earlier efforts towards land reform were rewarding. The reform process led to increased private investment in agriculture that witnessed better agricultural performance. The reforms in the state were carried out in the following sequence: (i) abolition of *zamindari* and intermediary systems, (ii) protection of tenant rights and regulation of rents, (iii) consolidation of landholdings, (iv) ceiling on landholdings, and (v) distribution of surplus land among marginal farmers and landless labourers.

Now there is no check on the declining holding size, which are gradually becoming unviable. According to the 1995-96 Agricultural Census, there were about 21.5 million landholdings in the state. In addition, there were more than 1.5 million landless labourers in the state. The average size of landholding in the state was 0.86 ha in 1995-96, which has shrunk from a level of 1.01 ha in 1980-81 (Figure 1.14).

FIGURE 1.14

Average Size of Landholding



Source: *Agricultural Census,* 1995-96.

About 90 per cent of landholdings in the state were small and marginal, which owned about 58 per cent of the land in 1995-96 (Table 1.22). The smaller size of land is often deprived of economies of scale. Appropriate institutional arrangements in the form of cooperative and self-help groups would prove rewarding to take advantage of economies of scale. There is also a need to revive the concept of consortium of small and marginal farmers to efficiently utilise agricultural land for augmenting income and accelerating agricultural growth.

TABLE 1.22

Distribution of Number and Area of Operational Holdings

Farm Size	*Holdings (%)*		*Area (%)*	
	1980-81	*1995-96*	*1980-81*	*1995-96*
Marginal	70.6	75.4	25.7	33.7
Small	16.3	14.5	22.6	23.8
Medium	12.7	9.9	45.5	39.2
Large	0.4	0.2	6.2	3.3

Source: *Agricultural Census,* 1995-96.

1.5.2. Institutional Constraints

(a) Seeds

Non-availability of quality seeds of improved varieties and very low seed replacement are the most important constraints in raising agricultural productivity and production. Availability of quality and high-yielding seeds of rice and wheat has led to their area expansion at the cost of pulses and oilseeds. The need is to take a balanced approach for seed production, storage and marketing of principal crops.

The existing infrastructure with respect to seed production, storage, transportation and marketing is inadequate in terms of both quality and quantity. Similarly, the seed quality assurance aspects are also unsatisfactory. The seed testing facilities, human resources and required skills are lacking and need considerable improvement. If diversification is to succeed, a strong seed sector is a pre-requisite. These deficiencies call for a comprehensive approach to reorganise seed sector that facilitate quality seed production, storage and marketing of promising crops.

(b) Credit

The agricultural sector is starving for finance. As stated earlier, the investment in agriculture has declined over the past two decades. The lending performance of the existing banks is much below than the desired level. Credit-debt ratio is low (about 27%), which needs to be raised to 60 per cent. The available information revealed that the commercial banks and the Regional Rural Banks (RRBs) associated with them were not advancing the required credit to the farmers. The cooperative banks that have enrolled almost 50 per cent of the farming families as their members were also not performing satisfactorily. Since about 50 per cent of the societies were under 'red category', the member farmers were deprived of credit facilities. Agricultural diversification in favour of high value crops and agro-processing are capital-intensive. A strong credit sector can facilitate promotion of agricultural diversification towards high value crops and agro-processing.

To support farm credit, the National Bank for Agriculture and Rural Development (NABARD) developed a comprehensive programme. The NABARD prepared a Potential Linked Credit Plan (PLP) for 1998-99, 1999-2000 and 2000-01. The salient achievements are listed below:

- More than 60 per cent of the credit was given as crop loan and agricultural term loan.
- Introduced the new concept of 'Kisan Credit Cards' (KCCs) to increase the flow of credit in rural areas. 800 thousand credit cards have already been issued, and additional 700 thousand were to be issued by March 2001. This scheme has expanded further and recent data indicates that 7.43 million KCCs have issued in Uttar Pradesh.

Besides, the concept of self-help group (SHG) for micro-financing has been introduced in the Uttar Pradesh Sodic (Alkali) Land Reclamation Project. Roughly, 8000 SHGs have already been formed in the state. The scheme has made a remarkable success, and the concept of micro-financing has gained popularity in rural and urban areas. The concept must be replicated to the other areas too.

1.5.3. Infrastructure Related Constraints

Investment in agricultural infrastructure, especially irrigation development and rural roads, facilitates intensification and diversification of agriculture. This section briefly provides constraints related to irrigation management and rural roads in the state.

(a) Irrigation

The state is far ahead in irrigation development in comparison with the national average. Unfortunately, the irrigation system of the state is characterised as inefficient and deficient. Numerous constraints have been attributed for the poor performance of the irrigation system. The important ones are listed below:

- Unreliable water supply caused by a failing public irrigation and drainage system. The present structure and organisation of the irrigation sector is supply-driven with investment decisions based mainly on welfare and distribution of subsidies. The result is inefficient use of water and low cost recovery.

- The sector is draining limited fiscal resources primarily due to high subsidies and establishment charges.
- The irrigation sector has become bankrupt, which is unable to maintain and operate its infrastructure and mobilise investment. The sector is causing concern to the state exchequer.
- The water use efficiency of the surface irrigation system is very low (about 69%). The main reasons are extensive seepage, uneven and unreliable distribution of water over the entire canal command area, and inadequate maintenance and modernisation of outdated irrigation structures.
- The performance of public tube wells is very poor (30% of capacity). It is mainly on account of erratic power supply and poor maintenance. The resources for operation and maintenance of public tube wells are underfunded. Of the total 29 thousand tube wells in the state, 12.5 thousand have already exceeded a life of more than 20 years. The technical and operational life of a tube well is 17 years.
- The annual loss per tube well is over Rs. 100 thousand. It is due to underutilisation (1602 hours of running) than the norm of 2500 hours. Of the total loss from the irrigation sector, 54 per cent is ascribed to state tube wells and 46 per cent to the canal system.
- Mismanagement of the irrigation system is causing several environmental problems. These include falling water table, soil salinity/sodicity/ alkalinity and waterlogging. If unattended, these would severely reduce the land capacity to increase agricultural production.
- Still one-third of the agricultural land is rainfed. Improving productivity in rainfed areas is critical for poverty alleviation, equity aspects and environmental sustainability. Bundelkhand region has poor surface and ground water resources. The region needs a different approach of water management than practised in favourable and shallow water table regions.

The state government took some positive steps in the past to overcome some of the problems. Important among others was the announcement of the State Water Policy (SWP) in 1999. More about the SWP is given in the subsequent section.

(b) Rural Roads

Rural roads are not well developed in the state. Road density per lakh population in the state is 142 kms, which is very low compared to the national level (246 kms), and significantly below that of Maharashtra (303 km) and Kerala (462 km). The total length of rural roads in the state is 1.84 lakh kms. The status of village connectivity in the state is 50 per cent, which is below the all-India average of 56 per cent and far below that of Gujarat (85%), Tamil Nadu (69%) and Kerala (100%).

The major constraints identified for rural road development in the state are:

- Paucity of funds for construction and maintenance.
- Inadequate maintenance of rural roads leads to their rapid deterioration. It is estimated that poorly maintained roads increase transportation costs by 30-40 per cent.
- Lack of ownership of more than 50,000 kms of brick paved and earthen roads constructed under poverty alleviation programme.
- Non-involvement of user communities in the maintenance of these community assets.

A poor rural road network restricts input delivery system and marketing of outputs. Lack of good road connectivity is the paramount obstacle in attaining higher agricultural growth and diversification of agriculture towards high value crops, livestock and agro-processing.

1.5.4. Degradation of Natural Resources

Degradation of soil and water resources is posing a serious threat to the agricultural sector of the state. The important problems are: (a) land degradation, including soil sodicity or alkalinity, (b) waterlogging, (c) declining water table, and (d) nutrient mining. These problems need immediate attention. These problems are briefly discussed below:

(a) Land Degradation

Land degradation is rampant in the state. More than 5 mn ha area in Uttar Pradesh is having the problem of mild to severe sodicity. Roughly, 1.3 mn ha is severely affected due to sodicity, where nothing can be produced. The worst affected areas include the Eastern region, and to some extent, the Central region of the state. Introduction of canal irrigation in high rainfall areas without adequate provision of drainage was responsible for the rising water table and growing menace of sodicity. Appendix A-1.8 provides district-

wise extent of sodicity in the state. Technological options in the form of chemical and biological amelioration of sodic soils are available. Salt-tolerant varieties of rice and wheat are available. Both chemical and biological methods were applied to reclaim the sodic soil in different parts of the state. Past efforts by the Uttar Pradesh Land Reclamation and Development Corporation were remarkable. The efforts were to demonstrate that the user participatory approach in planning, implementation, and evaluation is more effective in the success of the land development programmes. These must be sustained. The major constraints in implementation of land development schemes are related to: (i) absence of ownership by the user communities, and (ii) lack of coordination among the various executing agencies.

Large area under village common lands in the state is also affected due to the menace of sodicity. Afforestation of these soils is also possible. Technologies and tree species have been identified, and found technically and financially feasible proposition in the village common lands affected by sodicity. A part of these lands may be leased to the corporate sector on a long-term basis for afforestation. Such an attempt would attract revenue for the villages besides generating employment opportunities for landless labourers, improving the sustainability of natural resources and enhancing the quality of micro-climate.

(b) Waterlogging

Waterlogging in canal irrigated areas is also posing a serious threat to agricultural production in the state. Of the total 8.5 million ha waterlogged area in the country, about one-fourth is confined to Uttar Pradesh. Available estimates reveal that about 4 million ha area is affected by the high water table during the post-monsoon period. Annual loss due to waterlogging is estimated at 1 tonne/ha. Most of the canal command areas in the Eastern region are seriously affected, which in many cases leads to abandoning agricultural activities. It is reported that waterlogging, poor drainage and floods plague agricultural production during the *kharif* season in the Eastern region. The main reasons for the growing water table are: (i) transmission losses from main and branch canals and distributaries, (ii) faulty on-farm water management, (iii) lack of natural drainage, (iv) upheaval in the river bed, (v) indiscriminate cultivation in the beds of drainage channels, (vi) interception on natural drainage due to construction of roads, embankments, etc., (vii) discharge of surplus canal water into channels with inadequate capacity, and (viii) non-utilisation of groundwater (Bhargava and Abrol, 1990).

Availability of cheap canal water in comparison to the high cost of groundwater extraction discourages farmers to use the groundwater. Sharda Sahayak canal command is an example where the problem posed serious threat to agriculture. There are reports that within four years of commencement of the canal command, 16 per cent of the area was swamped by water. Floods also damage about 15 per cent of the crop area annually in the Eastern region of the state.

The remedy for managing the problem of waterlogging is quite simple. The Eastern region has vast good quality of groundwater. Installation of shallow tube wells will act as a vertical drainage as well as a source of irrigation. Incentives may be given to farmers for installing tube wells and using groundwater for irrigation.

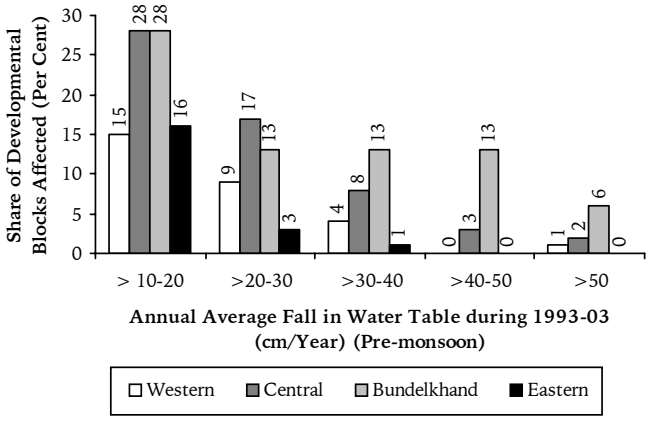
(c) Declining Water Table

Excessive use of groundwater is adversely affecting the groundwater table. This problem is more prominent in the Western and Central regions. The principal causes of declining water table are: (i) mushrooming growth of tube wells in the region, (ii) highly subsidised electricity to extract groundwater, (iii) scarcity of canal water, and (iv) expansion of high water requirement crops like rice and sugarcane.

The status of declining water table is given in Figure 1.15. The fall in water table was quite significant in the Western region. High intensity of tube well irrigation due to area expansion in favour of rice and sugarcane was the principal reason for steep decline of the water table.

FIGURE 1.15

Decline in Water Table in Different Regions



Source: Ground Water Board, UP.

There are reports that the number of dark and grey blocks is gradually rising in the state. As against 17 dark and 77 grey blocks in January 1990, these numbers increased to 110 and 194 by April 1998 (Table 1.23).

TABLE 1.23

Dark and Grey Blocks in Uttar Pradesh (as on April 1998)

Region	*Total Development Block*	*Dark*	*Grey*
Western	252	70	64
Central	146	14	37
Eastern	294	26	93
Bundelkhand	NA	NA	NA

Source: Ground Water Year Book (2000).

The adverse effect of the declining water table is a rise in the energy cost of water extraction. It has equity implications as well. Introduction of water saving devices, like micro-irrigation systems, diversification of agriculture towards low water requirement crops and withdrawal of subsidies on power may control the fall in the water table. Conjunctive use of surface and groundwater will control the falling water table.

(d) Nutrient Mining

Nutrient mining is another constraint in agricultural production in the state. There is evidence that soils are becoming deficient with respect to nitrogenous and other macronutrients, like phosphorous and potash. The status of macronutrients (N, P, K) is deteriorating in all the regions. Zinc and manganese deficiency in Eastern and Western regions, and boron deficiency in the Central and Eastern regions is becoming prominent. The deficiencies are more acute in the Eastern regions where 40 per cent of the samples tested were low in zinc, 60 per cent in iron, and 13 per cent in manganese.

TABLE 1.24

Implication of Subsidies on Balanced Use of NPK

Region	*NPK Ratio*								
	TE 1982/83			*TE 1991/92*			*TE 2000/01*		
Western	1	0.25	0.09	1	0.25	0.05	1	0.25	0.04
Central	1	0.25	0.10	1	0.26	0.06	1	0.33	0.03
Eastern	1	0.28	0.13	1	0.29	0.07	1	0.28	0.04
Bundelkhand	1	0.46	0.07	1	0.61	0.01	1	0.71	0.01
Balanced Ratio	1	0.50	0.25	1	0.50	0.25	1	0.50	0.25

Note: *Sankhyikiya* (Statistical) Diary, Uttar Pradesh and author's calculation.

Biased subsidy in favour of nitrogenous fertiliser has also adversely affected the balanced use of nutrients. The balance of important nutrients, N:P:K, has distorted as a result of partial withdrawal of fertiliser subsidy in 1991. Table 1.24 shows that balance use of N:P:K has been distorted more during the 1990s. The crop yields are adversely affected due to nutrient deficiencies. Introduction of leguminous crops in the cropping sequence and rationalisation of the fertiliser subsidy will correct the distortion.

1.5.5. Constraints in Agro-processing

The state has enormous potential for value addition of agricultural commodities through agro-processing. Following constraints have been identified for enlarging the scope of agro-processing in the state:

- Non-availability of suitable varieties for processing.
- Supply-driven processing units in the past have become unviable due to lack of suitable backward and forward linkage.
- Lack of cooling chambers and cooling chains.
- Inadequate equity and investment funds for agro-processing sector.
- Rudimentary knowledge of post-harvest management techniques among farmers and traders.
- Weak research and education in post-harvest technologies.

Since vegetables and fruits are bulky and perishable, their post-harvest handling costs are high. Seasonality in their production causes further instability in prices if adequate storage facilities are not available. Very little of the surplus produce is processed because modern methods of preservation are expensive, and consumers prefer fresh vegetables to processed vegetables (Subramanian *et al.,* 2000).

The state government initiated several policy measures to alleviate the above constraints to encourage agro-processing. These measures will be discussed in the subsequent section.

1.5.6. Constraints in the Livestock Sector

Livestock sector is growing under numerous constraints. Releasing the existing constraints would enormously boost this sector quantitatively and qualitatively. Important constraints limiting the growth prospects of this sector are listed below:

- Lack of sufficient infrastructure for artificial insemination facilities.

- Inadequate veterinary and health services.
- Important vaccines are in short supply due to budgetary constraints.
- Lack of adequate nutrient feed and fodder due to erratic and/or short supply during the dry season.
- Farmers lack of knowledge about improved health, nutrition and better management facilities.
- Absence of infrastructure and institutional facilities which otherwise interface production and marketing.

1.5.7. Research and Technology Transfer

In the past, the public research and extension played a major role in bringing about the green revolution in the Western region during mid-1960s and early 1970s. Later, the technology spilled over to the Eastern and Central regions in the state. There are three state agricultural universities, several agricultural colleges and a number of ICAR institutions to meet the diverse research and education requirements of the state. The state government at the Indian Institute of Management, Lucknow, has established an Agricultural Management Centre. Its aim is to address the issues related to management of agriculture and propose to launch a course on agri-business management.

It is now disturbing to note that the share of all-India public investment in agricultural research in the state has drastically declined to 3.3 per cent in 1999 from about 7.1 per cent in 1980. The major constraints in agricultural research system have been the lack of resources of public funds for research. Decadal investment at current prices in agricultural research under plan expenditure was too inconsistent, which ranged from Rs. 16 crores in 1994-95 to Rs. 14 crores in 1996-97, Rs. 24 crores in 1998-99 and Rs. 17 crores in 1999-00. The latter was 0.3 per cent of the total plan expenditure. At constant prices, the expenditure showed a continuous fall. The expenditure on research and education per hectare of cropped area was the lowest in Uttar Pradesh at Rs. 30 per ha as compared to Rs. 194 per ha in Punjab. In order to support the diversification process in the state and revitalise research activities towards newer and high value crops, efforts will be needed to invest more resources in agricultural research and education.

It is desirable to allocate a larger share of agricultural gross domestic product to research. It is equally important to ensure that the optimum use of available research resources is made through improved management of research institutions. Effective mechanisms for research priority setting need to be evolved in the state. The Uttar Pradesh Council of Agricultural Research (UPCAR) has to play a vital role. Greater networking and sharing of information with national and international institutions is required. Spending on research needs to be restructured so that operational funding can increase and investigating scientists have greater control over research resources.

The mechanism of Zonal Research Station (ZRS) and the Krishi Vigyan Kendras (KVKs) meant to link location-specific research with extension agents and farmers have not performed satisfactorily. Most of the research is supply-driven, the agenda for which is decided at the top level. A demand-driven and bottom-up approach would maximise the returns to investment in research.

During the green revolution period, the extension agencies performed remarkably in disseminating the research outputs to the farmers' fields. In the post-green revolution period, however, the extension delivery mechanism found itself unable to respond to the changing demand of the farming community. Innovative approaches are to be devised to meet the more complex and challenging requirements in the era of globalisation and liberalisation to become more competitive through diversifying agriculture towards high value crops and conserve natural resources for sustained agricultural growth.

1.6. Recent Policy Initiatives

During 1990s, the state government initiated the process to revitalise the agricultural sector by announcing various policy resolutions to support the agro-processing sector for diversification of agriculture, value addition of important agricultural products, greater participation of the industry in agriculture and better management of the input sector. These include (a) Industrial Policy, 1994 (IP 94), (b) Agro-industrial Policy, 1995 (AIP 95), (c) State Water Policy, 1999, and (d) State Agricultural Policy, 1999. Besides, several old laws were amended or repealed with the sole aim to accelerate agricultural growth. These policy measures are briefly outlined below:

1.6.1 Industrial Policy and Agro-Industrial Policy

The major changes announced in IP 94 and AIP 95 were related to: (i) reducing regulatory barriers to entry and operation of private sector, (ii) simplification and decentralisation of producers, (iii) providing a package

of investment incentives, and (iv) creation of funds for improved access to investment capital. Some of the enabling provisions of IP 94 and AIP 95 are as follows:

- Land ceiling limits relaxed for purchase of land for industrial use, purchase procedures decentralised and simplified.
- Sales tax replaced by a simpler trade tax regime.
- Abolition of inspector *raj*.
- Single window system established for rapid clearance of application from entrepreneurs.
- Trade tax concessions and deferment facility provided.
- State equity fund and Uttar Pradesh Venture Capital Fund set up and operational.
- State Equity Fund augmented for promotion of agro-industries.
- Provision for a separate Agri-Business Ventures Capital Fund.
- Privatisation of uneconomical public sector enterprises.

1.6.2 Other Policy Reforms in Agricultural Sector

The state government has relaxed and revoked several control orders under the Essential Commodities Act, 1955. This Act was the major obstacle in the growth of private trade of agricultural commodities. All restrictions on foodgrain movement have been removed. Stock limits for foodgrains, oilseeds, edible oil, sugar and jaggery have also been relaxed. Similarly, the constraining provisions (such as fixation of rental charges) of the Uttar Pradesh Cold Storage Act, 1976, have been repealed. Some of the provisions made to delicensing and simplifications of procedures are listed below:

- Wheat trade completely delicenced in 1995.
- *Basmati* rice exempted from payment of levy.
- *Basmati* export rice exempted from *mandi* fees.
- Non-*basmati* rice for export exempted from levy in 1995-96.
- Traders operating under licensing provisions of the Essential Commodities Act, 1955 exempted from its penal provisions from 1995.
- Trade tax on vegetable and refined oil reduced from 7 per cent to 4 per cent in 1996.
- Renewal period of licence under Uttar Pradesh Horticulture and Nurseries Act relaxed from annual to once in five years.
- Dairy industry delicenced in 1992 under Uttar Pradesh Milk Act, 1976.
- Retail trade in fertiliser delicenced up to 25 mt.

The state government is also moving towards a more realistic cost recovery regime. Following measures were launched towards cost recovery:

- Canal irrigation charges were revised in 1994 after a gap of 12 years. The rates were almost doubled.
- Power tariffs were revised in 1995 and were fixed at Rs. 0.50 per KW for private tube wells and Rs. 1.77 per KW for public tube wells.
- Initiatives taken for community participation in watershed programmes.
- Partial cost recovery in animal health and breeding services has been instituted in 1996, which used to be completely free earlier.
- Full cost recovery of improved horticulture planting material.

The policy initiatives during 1990s proved quite rewarding. This encouraged private sector participation. IP 94 and AIP 95 have resulted in negotiating private investment worth more than Rs. 35,000 crores in different sectors of the state. The dairy sector also benefited as a result of the 1992 regulation. The state scraped the licensing provision under Uttar Pradesh Milk Act, 1976 in line with the Government of India policy. The new policy initiative increased the private milk processing capacity. The milk processing capacity in the state touched about 14 million litres per day in four years of amending the Act from 4.7 million litres per day.

1.6.3. State Water Policy

The Uttar Pradesh government announced the State Water Policy (SWP) in 1999. This policy was in tune with the National Water Policy, 1987. The SWP envisaged far-reaching reforms in the irrigation sector involving institutional structures, legislations and management aspects. The purpose was to ensure self-sufficiency in water resource development through improved water management and community participation. The initiative needs support in terms of irrigation and drainage investments in physical infrastructure rehabilitation, modernisation and development.

The success of the noble initiative of SWP depends on how institutional structures and mechanisms are effective. In this direction, the state government has also initiated some new institutional arrangements. The state government has launched a three-pronged strategy to address some of the irrigation related issues. These include: (i) creating an additional irrigation potential of 7.3 million ha, and making optimum use of unutilised existing 8 million ha potential, (ii) encouraging private sector to exploit groundwater potential through private tube wells with adequate checks to prevent over-exploitation, and (iii) rigorously following the watershed approach to develop rainfed areas.

Some new institutional arrangements have been initiated by the state government such as the establishment of a State Water Board, setting up of a Water Tariff Regulatory Authority, testing of the new approach in the Ghagra-Gomti basin, right-sizing of the state irrigation department. In the rainfed areas, the focus has been decided on the adoption of the watershed approach. To augment the resources for the purpose, a Watershed Development Fund (WDF) has been established at NABARD. The new watershed guidelines, WARSA *Jan Sahbhagita* provide for decentralised decision making at the level of the watershed communities, flexibility for local level innovations in technology and active involvement of the watershed communities in the planning, implementation and maintenance of their watersheds.

1.6.4. Seed Sector Reform

The Uttar Pradesh government has initiated a series of measures to reform the seed sector with the sole objective of supplying quality seeds to the farmers. Important ones are listed below:

- **Seed Perspective Plan**: A 10-year seed perspective plan has been prepared to take care of the growing demand for seeds particularly of hybrids, oilseeds and pulses.
- **Seed Replacement Rate**: Owing to the low seed replacement rate, the performance of high yielding varieties is gradually deteriorating. The government in the State Agricultural Policy has decided to raise the seed replacement rate from the current 11 per cent to 20 per cent.
- **Seed Infrastructure**: The government has launched a programme to upgrade the seed infrastructure through the macro-mode of assistance.
- **Seed Act**: At the national level, several changes have been made in the Seed Act to make it more effective and encourage private sector participation in seed production and marketing. The Uttar Pradesh government has taken up a number of decisions to enforce the new Seed Act.

1.6.5. Uttar Pradesh Agricultural Policy

Uttar Pradesh was the first state to launch 'Agricultural Policy' in 1999, even before the national agricultural policy announced in 2000. The main objectives of the policy are to: (i) encourage scientific agriculture, (ii) achieve an annual growth rate of 5.1 per cent, (iii) develop appropriate eco-friendly farming systems, (iv) maintain ecological balance, (v) diversify existing agriculture towards high value crops, and (vi) develop appropriate infrastructure facilities (Government of Uttar Pradesh, 1999). The main focus of the policy is employment generation and poverty alleviation through (i) intensification of cereal-based cropping systems to ensure food security, (ii) diversification of farming systems leading to regional specialisation in production of commodities best suited to their respective biophysical endowments, and improve the sustainability of soil and water resources. Following are the salient features of the policy document:

- Expand cropped area from the existing 17.4 m ha to 17.7 m ha by reclaiming problem soils.
- Increase cropping intensity to 200 per cent by the end of 2007.
- Seed replacement rate to be raised from the existing 11 per cent to 20 per cent.
- Fertiliser (NPK) consumption to be stepped up to 160 kg/ha. Biofertilisers will also be encouraged.
- Agriculture would be encouraged to diversify. Production of fruits and vegetables would be raised. Export of horticultural products would be promoted.
- Livestock, poultry, fisheries, floriculture and sericulture would be given more emphasis to increase their production and export.
- Enhance sugarcane productivity from the existing level of 60 tonnes/ha to 70 tonnes/ha by 2007.
- Agricultural research and extension would be reoriented to make them more demand-driven.
- High priority to people's participation in developmental programmes.

The evolution of the above mentioned policy changes are addressed to accelerate agricultural growth, attack poverty and conserve natural resources. These policy measures are in line with the liberalisation regime. It is expected that these policy reforms will have far-reaching implications in enhancing income, generating income and improving the environment. The success of these policy measures would rely on how effectively and sincerely these are implemented.

1.7. Strategic Options and Policy Choices

A multi-prone strategy and integrated approach would facilitate promotion of sustainable agricultural development in Uttar Pradesh. Isolated and *ad hoc* approaches of the past may be completely ineffective in an open and competitive market regime. The future agricultural development efforts must focus on innovations that improve productivity of land and of farm labour. There is a strong need to interface farm, firm and innovations.

1.7.1. Investment in Agriculture

Public investment in agriculture has sharply fallen in the state. Agriculture must be treated as an industry of 20 million farm holders, who employ 30 million workforce. Stepping up of public investment in agricultural infrastructure is a prerequisite for attracting private investment to transform agriculture of the state in transition to a commercial and sustainable venture. Resources need to be mobilised through gradually scrapping subsidies, improving efficiencies and issuing some sort of 'agricultural infrastructure bonds'. Mobilise resources for research in biotechnology, genetic engineering and tissue culture.

1.7.2. Land Markets

The existing land laws need to be reoriented and relaxed for long-term lease and contract farming, which will facilitate participation of the corporate sector in agriculture and allied activities. This will encourage utilisation of wastelands for productive purposes. Village common lands are invariably kept fallow and cause several negative externalities. These lands may be leased-out to the private or corporate sector for afforestation programmes and medicinal plants for a reasonably long-term period. Such an initiative will (i) generate employment opportunities in rural areas, (ii) augment income of rural poor, (iii) raise production of forest and medicinal plants, (iii) conserve soil and water resources, and (iv) improve micro-climate of the region. The land ceiling and land lease systems should also be amended to accommodate the commercial seed production and exportable crops for the corporate sector.

To enable the rural poor to come out from the clutches of existing land laws, the issue of land reforms—land ceiling and land tenancy—needs to be examined in view of creating viable landholdings. Tenancy laws need to be amended to encourage the landless and near-landless to lease-in land from large farmers, whose ownership rights must be protected. When tenancy becomes legalised and formalised, tenants will have easy access to financial institutions to seek credit. Such a policy reform will be a boom for the agricultural diversification process in favour of high value cash crops, which demand higher capital and credit.

1.7.3. Reform in Irrigation Sector

The state is abundant in water resources. However, the irrigation sector faces three critical problems: (i) large unutilised potential, (ii) under pricing of irrigation water, and (iii) injudicious use leading to land degradation. All these problems are interrelated.

The state has huge irrigation potential, which is not yet exploited fully. The ultimate irrigation potential in the state is about 31.7 million ha; 43 per cent surface irrigation and 57 per cent groundwater irrigation. 2.5 million ha area is yet to be provided irrigation. The degree of utilisation of created potential in the state by sources is lowest for state tube wells (30%) and highest for private tube wells (70%). It is 62 per cent for major and medium surface irrigation projects. The low utilisation of surface irrigation is due to extensive seepage, uneven and unreliable water delivery and inadequate maintenance and modernisation of irrigation structures. The poor performance of public tube wells is because of inadequate and erratic power supply. It would be beneficial to replace diesel and electricity by solar energy for running tube wells to overcome the problem of erratic power supply and to make it more cost effective. Even replacing diesel by electricity could be highly cost effective. Operation and maintenance of surface irrigation system and public tube wells are underfunded due to hidden subsidies extended by the government to the irrigation sector. During 1994-95, a sizeable amount of Rs. 707 crores subsidy was extended to the irrigation sector: Rs. 422 crores in surface irrigation and Rs. 284 crores in state tube wells (Government of Uttar Pradesh, 1997). This huge subsidy is jeopardising the investment needs in operation and maintenance of the irrigation system, which is leading to irrigation inefficiencies and land degradation.

To improve the irrigation efficiency, the first step should be to distribute the management and maintenance of surface irrigation system into three stages: (i) reservoir by the government, (ii) canals by the private sector, and (iii) distributaries by the irrigation users. The public tube wells should also be gradually handed over to the private sector. Such a strategy will be a leaping step towards reform in the irrigation sector. It will completely phase out the subsidies from irrigation. Each party will intend to optimise irrigation efficiency for revenue maximisation. The existing tariff regulatory body should also be unbundled. Incentives should be extended to encourage use of water-saving devices like drip and sprinkler irrigation system.

1.7.4. Credit Sector

Access to credit is a critical factor for agricultural growth. Adoption of improved agricultural technologies, diversification towards high value crops and agricultural intensification are more capital-intensive and demand credit. There is a need to strengthen existing rural credit institutions and promote the self-help groups to mobilise savings and access credit for productive purposes. The Kisan Credit Card scheme must be vigorously popularised among farmers to overcome numerous hassles encountered for easy accessibility of credit to purchase critical inputs like improved seeds, fertilisers, pesticides, machines, etc. (see Appendix A-1.9 for results from a survey analysis). Several innovative models are in place by Rabo bank, ICICI bank, and NABARD in different parts of the country to involve farmers and agri-business for providing credit in the agriculture sector. There is a need to adapt the new models for promoting agriculture in the state.

1.7.5. Intensification and Diversification of Agriculture

Diversification of agriculture should constitute a major plank of the agricultural strategy in the state. Agriculture in the state is gradually diversifying in response to price signals. Growth rates in foodgrains have been slowed down during 1990s, while those of the commercial crops have gradually risen. The process needs to be stepped up. It is estimated that the demand for fruits, vegetables and milk will grow and is expected to be 70, 110 and 120 million tonnes respectively by 2007. To maintain the share of the state in national production, the output will have to grow significantly; fruits by 6.5 per cent per annum, vegetables by 5 per cent per annum and milk by 6.5 per cent per annum. Production niches are to be identified to raise their production.

Agriculture in the Western region calls for a greater diversification. The region has reached a plateau in the production of cereals. The Western region attained high levels of crop yields, which now have stagnated. The cropping intensity in the region is also high. There is little scope to augment income in the region through crop intensification. The Western region has a comparative advantage in diversifying mainly due to proximity to a vast Delhi market. This region must gradually diversify towards vegetables, livestock products, and floriculture. Accomplishing agricultural diversification on a wide scale requires more adaptive research and extension. It also requires policies that induce farmers to diversify production. The need is to link the production and marketing through appropriate institutional arrangements. This will also require full backing from the input sector. Therefore, an integrated approach is to be adopted to interlock input sector, production and marketing.

Agriculture in Bundelkhand, Central and Eastern regions needs to be intensified. These regions have relatively less land use intensity besides low levels of inputs in agriculture. Owing to meagre use of modern inputs, the crop yields are too low in these regions. Bundelkhand is emerging as a major pulse and oilseed-producing region. During the past decades, area under important pulses and oilseeds has remarkably increased in this region. Yields, although, are too low. Bundelkhand region is water scarce. Pulses and oilseeds require less water, therefore, compatible with the resource endowments. Improved and short duration varieties of pulses and oilseeds need to be introduced in this region. Necessary processing units for pulses and oilseeds should also supplement production technology. This calls for private investment in agro-processing units.

The Central region is also gradually diversifying towards oilseeds and sugarcane. Rapeseed and mustard are the principal oilseed crops in the Central region. Eastern region has niches for winter maize. These two regions also need to be intensified towards better utilisation of land and other inputs. Introduction of short duration and high-yielding varieties, increased use of fertiliser and better insect and pest management would intensify agriculture in these regions. Lack of credit facility is constraining the adoption of improved technologies.

1.7.6. Watershed Development

Rainfed areas, particularly Bundelkhand region, have low irrigation potential owing to its topography and

resource endowments. The region falls in the low rainfall zone, which starve for water during critical stages of crop production, thus obtaining low yields. Watershed development is the key strategy for conserving rainwater most effectively, hence raising income and generating employment opportunities in the rainfed areas.

1.7.7. Agro-processing

The state has vast scope for value addition of agricultural products through agro-processing. The prospective commodities are sugar, rice, wheat, potato, mango, milk products, etc. The existing agro-processing units (including sugar) are insufficient. Many are obsolete and inefficient. The agro-processing sector needs to be revitalised and modernised. Private sector is vital for promoting the agro-processing sector in the state. The state can promulgate proactive policies conducive to promote agro-processing, which enthuse active participation of the private sector. The essential conditions for making the agro-processing units viable are: (i) regular supply of raw material, and (ii) desired quality of raw material. For sustainable supply of raw materials, production niches are to be identified. These niche areas may act as a hub for development of commercial high-tech techniques. For quality control, the agro-processing units may supply important inputs, including seeds, to the producers. Few sugar factories practice this. Pepsi in Punjab is another successful example of processing tomato and potato for multiple products. Contractual arrangements need to be developed to tie up agro-processing units with the producers. Similarly, the policy environment should provide investment incentives (like tax holidays) to the private sector in the agro-processing sector. The procedures to install agro-processing units should be simple and hassle-free from the existing regulatory barriers. In this context, IP 94 and AIP 95 are welcoming steps.

1.7.8. Research and Technology Transfer

The role of research and technology transfer will be critical in practising scientific farming. The need is to reprioritise the agricultural research portfolio keeping in view the new economic environment and scale of farming units. Existing research focus is largely biased towards rice and wheat. It is yet to be tuned to consider new challenges, resource endowments and scale of farming units. More thrust should be focussed on high value crops. Research priorities need to be demand-driven. A bottom-up approach would go a long way to improve the research and production efficiency. More adaptive research is called for developing location-specific technologies in view of resource endowments of the region and the farming community.

Similarly, the agricultural extension system needs to be completely revamped. The system has completely crumbled and is incompetent to contribute due to resource crunch. Innovative models are to be developed and implemented for efficient technology transfer. In this context, the 'Help-Line Service' initiated by the Chandra Sekhar Azad University of Agriculture and Technology, Kanpur, is worth mentioning. The scheme is an initiative, which interfaces farmers and the specialists through telephone. The scope of such an innovative scheme needs to be widened. Information technology may also play an important role in technology transfer. Besides, there is a strong need for capacity building of the existing extension personnel to meet the new challenges.

Some innovative methods are in progress under the aegis of a mega-project entitled 'National Agricultural Technology Project'. These are based on the principal of demand-driven research and extension. Initiatives like Strategic Research and Extension Plans (SREP) and Agricultural Technology Management Agency (ATMA) are under experimental stage to develop demand-driven research and extension agenda at the district level. These programmes have active involvement of the stakeholders in determining research and extension agenda.

1.8. Conclusions

Agricultural performance of Uttar Pradesh is too dismal during the past two decades. The state is bestowed with rich natural resources. The available resources are mismanaged and injudiciously used due to excessive population pressure and absence of growth-oriented policies. Public investment in agriculture is rapidly declining, which is swallowed by the mammoth amount of subsidies on irrigation, fertiliser, power and credit. Average size of landholdings are tiny (about 0.9 ha), fragmented and showing symptoms of degradation.

The state is predominantly producing foodgrains. Rice and wheat are the principal foodgrain crops. Pulses and oilseeds are important in the Bundelkhand region. Agriculture in Uttar Pradesh is to be intensified by gradually removing supply side bottlenecks through well knitted institutional and policy reforms. Programmes and policies need to be tuned to facilitate adoption of science-based high-tech agriculture to compete in domestic and global markets. Lack of credit, absence of a strong seed sector and undeveloped

infrastructure are the major stumbling blocks in modernising and intensifying agriculture.

Speed of agricultural growth has slowed down at a much lower level. Diversification of agriculture in favour of high value and commercial crops (like sugar, fruits and vegetables), livestock products and poultry offer enormous potential to augment farm income and generate employment opportunities in rural areas. Agro-processing sector holds tremendous potential, which needs to be encouraged. Lack of suitable agro-based raw material and complex policies restrain the private sector participation in agro-processing venture. Adding value to agricultural products through processing would go a long way in improving agricultural performance in the state. In an era of liberalisation and globalisation, the state government must aggressively launch programmes to boost agricultural diversification and agro-processing.

Existing policies need to be reformed in the light of the new economic regime. Agriculture should be treated as an industry of 20 million landholders, who employ some 30 million workforce. Investment in agriculture must be stepped up through resource mobilisation.

Land lease laws need to be relaxed and open. Management of wastelands should be through tripartite agreement between the state government, local community and business houses for promoting high value agriculture.

Irrigation, credit, seed and technology transfer sectors need complete revamping. These sectors are gulping sizeable public resources and need to be managed in a decentralised pattern by involving participation of the stakeholders. Policies need to be crafted to simplify procedures, strengthen community participation and develop public-private partnership in agro-processing.

An integrated approach through appropriate policies, improved institutional arrangements and better infrastructure would enhance agricultural performance in Uttar Pradesh.

References

Ali, Mubarak (2000). "Dynamics of Vegetables in Asia: A Synthesis", in Mubarak Ali (ed.), *Dynamics of Vegetable Production, Distribution and Consumption in Asia*, Asian Vegetable Research and Development Center, AVRDC, Taiwan.

Arora, V.P.S. (1998). *Managing Vegetable Marketing in Hill Region of Uttar Pradesh*, Department of Agricultural Economics, G.B. Pant University of Agriculture and Technology, Pantnagar, p. 269.

Bhargava, G.P. and I.P. Abrol (1990). "Nature and Extent of Salinity and Waterlogging: Problems in India", in I.P. Abrol and V.V. Dhruva Narayana, *Technologies for Wasteland Development*, Indian Council of Agricultural Research, New Delhi.

Government of Uttar Pradesh (1997). *Strategy of Agricultural Development in Uttar Pradesh: Post Reform Period*, Department of Coordination (APC Branch), Government of Uttar Pradesh, Lucknow.

————. (1999). *Agriculture Policy Uttar Pradesh*: *A Framework for Progress and Prosperity*, Lucknow.

Jha, D. (2000). "Agricultural Research and Small Farms", *Indian Journal of Agricultural Economics* 56(1): 1- 23.

Shankar, K. (2001). "UP on the Financial Brink", *Economic and Political Weekly* 36(2): 1677-1680.

Sharma, Anil (2005). *The Kisan Credit Card Scheme: Impact, Weaknesses and Further Reforms*, National Council of Applied Economic Research, New Delhi.

Subramanian, S.R., S. Varadarajan and M. Asokan (2000). "India" in Mubarak Ali (ed.), *Dynamics of Vegetable Production, Distribution and Consumption in Asia*. Asian Vegetable Research and Development Center, AVRDC, Taiwan.

Vyas, V.S. (1996). "Diversification in Agriculture: Concept, Rationale and Approaches", *Indian Journal of Agricultural Economics* 51(4): 636-643.

Wann, J.W., T.K. Peng, and M.H. Wu (2000). "Taiwan", Mubarak Ali (ed.), *Dynamics of Vegetable Production, Distribution and Consumption in Asia*, Asian Vegetable Research and Development Center, AVRDC, Taiwan.

APPENDIX A-1.1

List of Districts in Different Regions of Uttar Pradesh

Region	*Districts*
Western Region	Agra, Mainpuri, Firozabad, Aligarh, Bareilly, Badaun, Bulandshahr, Etah, Etawah, Farrukhabad, Mathura, Meerut, Ghaziabad, Muradabad, Pilibhit, Rampur, Muzaffarnagar, Saharanpur, Bijnor, Shahjahanpur, Bagpath, Gautam Buddha Nagar, Hathras, J.B. Fule Nagar, Kannauj, Auraiya
Central Region	Barabanki, Fatehpur, Hardoi, Kanpur, Khiri, Lucknow, Rai Bareli, Sitapur, Unnao
Eastern Region	Allahabad, Kaushambi, Azamgarh, Maunath Bhanjan, Ballia, Bahraich, Basti, Siddharthnagar, Deoria, Faizabad, Gazipur, Gonda, Gorakhpur, Maharajganj, Jaunpur, Mirzapur, Sonbhadra, Pratapgarh, Sultanpur, Varanasi , Bhadoi, Balarampur, Shravasti, Chandauli, Sant Ravi Das Nagar, Kushinagar, Sant Kabir Nagar, Ambedkar Nagar
Bundelkhand Region	Jhansi, Jalaun, Hamirpur, Mohaba ,Banda, Chitrakut, Lalitpur

APPENDIX A-1.2

List of Districts according to Agro-eco Region in Uttar Pradesh

Agro-climatic Zones	*Districts*
Western Plain Zone	Saharanpur, Muzaffarnagar, Meerut, Ghaziabad, Bulandshahr, Bagpath, Gautam Buddha Nagar
Mid-western Plain Zone	Bijnor Moradabad, Rampur, Barielly, Pilibhit, Sahajahanpur and Badaun
South-western semi arid Zone	Aligarh, Etah, Mainpuri, Mathura and Agra
Central Plain Zone	Lakhimpur, Kheri Sitapur, Hardoi, Farrukhabad, Etawah, Kanpur, Kanpur Dehat, Unnao, Lucknow, Rae Bareli, Fatehpur and Allahabad
Bundelkhand Zone	Jhansi, Lalitpur, Banda, Hamirpur, Jalaun
North-eastern Plain Zone	Gonda, Bahraich, Basti, Gorakhpur and Deoria
Eastern Plain Zone	Barabanki, Faizabad, Sultanpur, Pratapgarh, Jaunpur, Azamgarh, Ballia, Ghazipur and Varanasi
Vindyan Zone	Mirzapur, Allahabad, Varanasi

APPENDIX A-1.3

Cropping Pattern of Western Region

Crops	*Share in GCA (%)*		
	TE 1982/1983	*TE1991/1992*	*TE 1999/2000*
Rice	12.19	12.72	14.77
Wheat	34.62	35.63	33.83
Sorghum	1.29	0.81	0.29
Pearl Millet	8.06	6.68	6.87
Maize	6.89	5.95	6.41
Other Coarse Cereals	2.49	1.86	11.25
Chickpea	2.88	1.55	0.59
Pigeon Pea	1.15	1.03	0.81
Other Pulses	3.57	3.35	4.47
Groundnut	1.66	0.65	0.26
Sesamum	0.19	0.25	0.23
Rapeseed & Mustard	2.64	4.79	4.09
Linseed	0.04	0.01	0.26
Sunflower	0.01	0.08	0.31
Other Oilseeds	0.02	0.00	0.24
Sugarcane	12.37	13.38	12.15
Potato	1.38	1.66	2.41
Onion	0.09	0.16	0.25
Vegetables	0.99	1.01	0.36
Misc. Crops	7.46	8.42	0.17

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

APPENDIX A-1.4

Cropping Pattern of Central Region

Crops	*Share in GCA (%)*		
	TE 1982/1983	*TE 1991/1992*	*TE 1999/2000*
Rice	22.79	22.72	24.18
Wheat	33.28	33.45	34.40
Sorghum	3.88	3.41	2.66
Pearl Millet	1.84	0.90	0.80
Maize	3.70	3.86	4.62
Other Coarse Cereals	5.31	2.89	1.20
Chickpea	6.85	4.84	3.07
Pigeon Pea	2.74	2.71	1.92
Other Pulses	3.71	4.69	3.89
Groundnut	2.01	1.31	0.84
Sesamum	0.11	0.40	0.76
Rapeseed & Mustard	2.37	2.98	3.79
Linseed	0.10	0.10	0.18
Sunflower	0.02	0.04	0.50
Other Oilseeds	0.15	0.00	0.40
Sugarcane	4.81	6.33	6.90
Potato	1.14	1.34	1.76
Onion	0.07	0.10	0.08
Vegetables	0.66	0.66	0.23
Misc. Crops	4.46	7.27	7.81

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

APPENDIX A-1.5

Cropping Pattern of Eastern Region

Crops	Share in GCA (%)		
	TE 1982/1983	TE 1991/1992	TE 1999/2000
Rice	34.59	35.62	36.05
Wheat	31.65	35.88	39.01
Sorghum	0.96	0.85	0.87
Pearl Millet	1.63	1.39	1.42
Maize	4.46	4.06	3.28
Other Coarse Cereals	5.72	1.21	0.73
Chickpea	5.19	3.41	2.46
Pigeon Pea	2.40	2.30	2.50
Other Pulses	3.08	3.27	5.12
Groundnut	0.26	0.13	0.16
Sesamum	0.09	0.10	0.15
Rapeseed & Mustard	0.65	0.73	1.04
Linseed	0.49	0.30	0.54
Sunflower	0.03	0.01	0.19
Other Oilseeds	0.00	0.28	0.32
Sugarcane	3.74	3.55	4.25
Potato	1.08	1.16	1.41
Onion	0.10	0.10	0.19
Vegetables	0.54	0.56	0.21
Misc. Crops	3.33	5.08	0.11

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

APPENDIX A-1.6

Cropping Pattern of Bundelkhand Region

Crops	Share in GCA (%)		
	TE 1982/1983	TE 1991/1992	TE 1999/2000
Rice	4.46	4.07	3.42
Wheat	25.99	26.40	26.53
Sorghum	12.46	10.06	7.01
Pearl Millet	1.60	1.29	1.09
Maize	0.83	1.17	0.80
Other Coarse Cereals	2.02	4.86	1.19
Chickpea	25.22	24.15	18.84
Pigeon Pea	4.30	3.38	2.41
Other Pulses	5.98	13.42	22.22
Groundnut	0.13	0.81	1.56
Sesamum	0.70	0.70	1.11
Rapeseed & Mustard	1.03	1.04	1.40
Linseed	1.17	2.00	2.19
Sunflower	0.00	0.00	0.00
Other Oilseeds	0.77	1.86	1.01
Sugarcane	0.16	0.19	0.24
Potato	0.08	0.06	0.03
Onion	0.02	0.03	0.09
Vegetables	0.29	0.34	0.12
Misc. Crops	12.80	4.18	8.72

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

APPENDIX A-1.7

Fertiliser Consumption and Irrigated Area in Different Agro-eco Regions of Uttar Pradesh

Sub-Region	Fertiliser Consumption (Kg/Ha)			Gross Irrigated Area (%)		
	TE 1982/83	TE 1991/92	TE 1997/98	TE 1982/83	TE 1991/92	TE 1997/98
Rice	0.86	-1.73	2.64	1.31	-1.58	2.94
Western Plain	87.12	120.58	202.94	81.18	91.99	96.45
Mid-western Plain	66.18	114.05	153.57	53.06	72.65	81.03
South Western Semi Arid	45.43	77.81	126.47	63.38	77.42	80.40
Central Plain	52.79	83.34	93.47	43.01	57.46	66.83
Bundelkhand	14.57	28.29	42.82	21.34	28.28	29.91
North-eastern Plain	47.39	80.61	84.25	35.02	37.91	29.21
Eastern Plain	67.84	97.16	139.74	48.33	60.10	71.89
Vindhyan	35.39	57.82	176.81	36.18	46.64	82.52

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

APPENDIX A-1.8

District-wise Area under Sodic Soils in Uttar Pradesh

District	*Total Sodic Land (ha)*
Western Region	
Agra	11114
Aligarh	21591
Badaun	11171
Bareilly	12454
Bijnor	11185
Bulandshahr	15854
Etah	6381
Etawah	13342
Farrukhabad	20869
Mainpuri	18454
Mathura	5406
Meerut	4544
Moradabad	8206
Muzaffarnagar	6500
Philibhit	6170
Rampur	7498
Saharanpur	3253
Shahjhanpur	6072
Central Region	
Barabanki	7721
Fatehpur	11752
Hardoi	17590
Kanpur	48199
Kheri	6473
Lucknow	10064
Rae Bareili	23174
Sitapur	7752
Unnao	15633
Eastern Region	
Allahabad	29068
Azamgarh	9667
Bahraich	7497
Ballia	12905
Basti	6112
Deoria	9661
Faizabad	5784
Ghazipur	4875
Gonda	8323
Gorakhpur	63232
Jaunpur	7145
Mirzapur	28671
Pratapgarh	9587
Sultanpur	15090
Varanasi	8676
Uttar Pradesh	**565255**

Source (Basic Data): *Uttar Pradesh Ke Krishi Ankare* (Agriculture Statistics of UP) (Various).

APPENDIX A-1.9

Findings of RBI/NCAER Survey of Kisan Credit Card System

The Kisan Credit Card (KCC) scheme was introduced in 1998-99, a step towards facilitating farmer's access to short-term credit from the formal institutions. Up to January 2004, a total of 36.88 million cards had been issued to farmers covering all major state of the country. The numbers of KCCs issued represent coverage of about 32 per cent of total operational landholdings in the country. Among the various states of the country the maximum number of KCCs have been issued in Uttar Pradesh (7.43 million) followed by Andhra Pradesh (6.07 million) and Maharashtra (3.72 million). In terms of amount sanctioned through KCCs, Uttar Pradesh occupies second position after Maharashtra.

In Uttar Pradesh, cooperative banks have a share of 57.7 percent (62 per cent for all-India) of the total number of KCC issued and 36.6 per cent (58.9 per cent for all-India) of the amount sanctioned in the state. The share of Regional Rural Banks in the state is 16.6 per cent (10.0 per cent for all-India) of the total number of KCC issued and 21.1 (10.6 per cent for all-India) per cent of the amount sanctioned in the state. The share of the Commercial Banks, 25.8 per cent (28.0 per cent) of the KCC issued and 42.3 per cent (30.6 per cent) of the amount sanctioned. In Uttar Pradesh, for the year 2003-04 the cooperative banks and regional rural banks both achieved their targets.

The survey analysis shows that the KCC scheme has made a significant impact on the availability of short-term credit from formal sources at the farm level. With increase in amount borrowed from the formal sources by KCC holders the amount borrowed from informal sources has come down by 46 per cent in the combined sample after they were given KCCs. A major change that has been witnessed after the introduction of KCCs is that there is a significant drop in number of sample farmers borrowing exclusively from informal sources for meeting their short-term credit needs. In general there has been around six per cent decrease in cost of borrowing short-term credit from formal sources after the farmers were given the KCCs.

Source: Sharma, A. 2005.