Structural Transformation in the Primary Sector of Uttar Pradesh Economy since 1980-81

Arima Awasthi & Dr.Manoj Kumar Agarwal,
Department of Economics ,
University Of LUCKNOW

ABSTRACT

The economy of Uttar Pradesh, which is dominated by agrarian activities, continues to be backward in the national context. The state despite being rich in human and natural resources and having vast fertile plains has shown growth performance over the years which remained far below the national average.

Even though the economy of Uttar Pradesh has undergone structural changes overtime with the anticipated decline in the share of agriculture in the SDP, the importance of agriculture has not diminished for two major reasons of national importance. Firstly, that though at the macro level the country has achieved self-sufficiency in food production, it is still facing massive challenges of high population growth, large prevalence of malnutritioned children and high incidence of rural poverty. There is pressure on agriculture to produce more so that farmers' income becomes high. Secondly, the proportion of the dependence of rural population on agriculture for employment has not declined in same proportion as has its share in the SDP.

Considering the importance of agriculture in the State economy,the present paper analyses the trend growth performance of primary sector output in the state during 1980-81 to 2010-11.Paper also discusses factors affecting the primary sectors income growth.

Key Words : *Trend growth, Primary sectors, SDP*

Introduction

Agriculture Sector is a key sector of the Uttar Pradesh economy as vast majority of the population in the State relies on agriculture for its livelihood. The state has immense significance is the context of food security of the country by contributing about one-fifth of the total foodgrain production in the country. It is both a source of livelihood and food security for a majority of low income, poor and vulnerable sections of society[1]. It forms the backbone of development, even though its

[1]John W Mellor and Gunvant M Desai (1986): 'Agricultural Change and Rural Poverty: A Synthesis in John W Mellor and Gunvant M Desai (eds.), *Agricultural Change and Rural Poverty*, Oxford University Press, Delhi.
Montek S Ahluwalia (1986): 'Rural Poverty, Agricultural Production and Prices: A Reexamination'

contribution to the overall SDP of the State has fallen from 49.93 percent in 1980-81 to less than 21.6 percent in 2010-11.

There is a two-fold contribution of agriculture. It is characterized by goods and services which are labourintensive in their production and could stimulate rural employment led economic growth. In other words this sector provides a demand base for the rest of economy, which has multiplier effect for the development of secondary and tertiary sectors at the local, regional and national levels. Evidently, agriculture of the state has a paramount role in the food production and food security of the country.

Considering the importance of agriculture in the Indian and the State economy, the paper is divided into five sections with Introduction in the section I. Section II analyses the trend growth performance of primary sector output in the state during 1980-81 to 2010-11 and three sub-periods, namely, from 1980-81 to 1989-90 (maturing of Green Revolution), and the post-reform period from 1990-91 to 2000-01and the current period from 2000-01 to 2010-2011. Section II is devoted to a discussion of trends in the growth rate of primary sector in Uttar Pradesh. This is followed by a discussion about changes in the land utilization pattern and the cropping pattern of important crops in Uttar Pradesh along with changes in the investment in agriculture and allied sector during the Five Year Plans over the study period in U.P. in Section III.InSection IV we discuss about the level of theuse of agricultural machinery in Uttar Pradesh during the period of study.Finally, Section V summarises the paper with some policy suggestions. The State has immense significance in the context of food security of the country, as it is the largest foodgrain producing state. Hence, even though the economy of Uttar Pradesh has undergone structural changes overtime with the anticipated decline in the share of agriculture in the SDP, the importance of agriculture has not diminished for two major reasons of national importance. Firstly, that though at the macro level the country has achieved self-sufficiency in food production, it is still facing massive challenges of high population growth, large prevalence of malnutritioned children and high incidence of rural poverty.There is pressure on agriculture to produce more so that farmers' income becomes high. Secondly, the proportion of the dependence of rural population on agriculture for employment has not declined in same proportion as has its share in the SDP. Thus widening the income disparity between agricultural and non-agricultural sectors.[2]

Changes in the Share of the Primary Sector and Its Sub-sectors

The structural transformation that accrued in the State economy over the decades is a consequence of the development process witnessed since the beginning of planning in 1951. This is reflected, inter alia, in the growth rate and in the changing sectoral composition of the State Domestic Product (SDP).

The relative share of the primary sector, especially the agriculture and allied sector has declined in the SDP, in the Uttar Pradesh economy, during the period 1980-81 to 2010-11.This suggests that Uttar Pradesh economy is undergoing a structural transformation from reducing its 'relative dependence' on agriculture for its income as well as employment generation.

in John W Mellor and Gunwant M Desai (eds*), Agricultural Change and Rural Poverty*, Oxford University Press, Delhi.

C.H Hanumanth Rao (1997), Inaugural Address in Bhupat M Desai (ed). Oxford and IBM Publishing Co., New Delhi.

Bhupat M Desai and NV Namboodri (1997a), 'Price and Non-Price Determinants of Aggregate Agricultural Supply', in Bhupat M Desai (ed), *Agricultural Development Paradigm for the Ninth Plan under New Economic Environment*, Oxford and IBH Publishing Co., New Delhi.

[2] Ramesh Chand and Sonia Chauhan (1999), *Are Disparities in Indian Agriculture Growing,* Policy Brief No. 8, New Delhi: National Centre for Agricultural Economic and Policy Research.

Table I.1
Percentage Share of Primary Sector and Its Sub-Sectors

ECONOMIC ACTIVITY	1980-81	1990-91	2000-01	2010-11
Agriculture & Animal Husbandary	49.93	42.0	34.9	21.6
Forestry & Logging	1.9	0.4	0.9	2.1
Fishing	0.2	0.3	0.4	0.4
Mining & Quarrying	0.3	0.6	0.9	1.0
PRIMARY	52.3	43.3	37.1	25.1

Source: Calculated from SDP Data

The table I.1 shows that while the share of agriculture and animal husbandry declined from 49.93 percent of the NSDP in 1980-81, to 21.6 percent in 2010-11, the share of forestry and logging and fishing rose meagerly from 1.9 percent and 0.2 percent respectively to 2.1 percent and 0.4 percent respectively during the same period. The share of Mining & Quarrying rose from 0.3 percent to 1.0 percent during the period of study. While the share of agriculture in the state income has been declining significantly, the workforce engaged in agriculture has exhibited only a marginal decline.

Table I.2
Trend in the Growth Rate in the Primary Sector

Economic Activity	1980-81 to 1989-90 (I)	1990-91 to 1999-2000 (II)	2000-01 to 2010-11 (III)	1980-81 to 2010-11 (IV)
Agri. & Allied Sector	2.73	2.24	1.77	2.33
Forestry & Logging	-11.12	11.5	2.3	3.43
Fishing	13.2	6.79	6.3	7.9
Mining & Quarrying	2.95	6.8	8.1	8.2
Primary	2.46	2.63	1.97	2.54
NSDP	4.78	3.59	5.91	4.28

Source: Calculated from NSDP Dat

In the eighties, the trend growth rate of NSDP and also the agriculture and allied sector was 4.78 and 2.73 percent respectively. However, there was considerable volatility in the annual growth rate. During the nineties the growth rate of agriculture & allied activities and fishing declined to 2.24 and 6.79 percent while forestry and logging registered an impressive growth rate of 11.5 percent. However the NSDP grew at the trend growth rate of 5.91 percent during 2000-01 to 2010-11, the growth rate of agriculture and allied sector, foresting and logging, fishing and the whole primary sector decline to 1.77, 2.3, 6.3 and 1.97 percent respectively during the same.

Table I.3
Trend Growth Rate In Sectoral Shares of the Primary Sector

ECONOMIC ACTIVITY	1980-81to 1989-90	1990-91 to 1999-2000	2000-01 to 2010-11	1980-81 to 2010-11
Agriculture & Animal Husbandary	-1.96	-2.15	-4.67	-2.53
Foresty& Logging	-15.19	11.97	10.83	2.98
Fishing	8.03	3.81	-0.55	2.28
Mining & Quarrying	-1.75	4.22	2.12	4.08
Primary	-2.22	-1.74	-3.70	-2.15

Source: Calculated from SDP Data

Primary sector has registered a continuously declining trend in the growth rate of shares of the primary and some of its sub-sectors sector in the NSDP as shown in the table I.3. The primary sector registered a negative growth rate of 2.22 percent in 1980-81 to1989-90 to -3.70 percent in 2000 -01 to 2010-11. Agriculture & Animal Husbandary registered similar trends with the growth rate declining from -1.96 percent to -4.67 percent during the same period. Growth rate of Fishing declined from 8.3 percent to - 0.55 percent during the given period. While trend in the growth rate of shares in Foresty& Logging increased from 15.19 percent in 1980-81 to1989-90 to10.83 percent during 2000-01 to 2010-11. Mining & Quarrying increased from 1.75 percent to 2.12 percent in the same period.

Table I.4

Acceleration in Income of the Primary Sector and Subsectors inU.P.

Equation lny=a+bx+cx^{2}coefficient of x^2;c shows acceleration(if t Value is>=2)

	Dependent Variable	F Value	R^2	b	b_t Value	c	c_t Value
Period I	Agriculture & Animal Husbandary	48.09	0.932	0.021	1.727	5E-04	0.481
Period I	Foresty& Logging	25.23	0.878	-0.16	2.18	0.004	0.608
Period I	Fishing	71.95	0.954	0.188	4.039	-0.01	1.4
Period I	Mining & Quarrying	1.083	0.236	0.076	0.811	-0	0.52
Period I	PRIMARY	37.94	0.916	0.016	1.28	8E-04	0.684
Period II	Agriculture & Animal Husbandary	16.77	0.827	0.018	1.036	4E-04	0.268
Period II	Foresty& Logging	11.57	0.768	-0.45	2.89	0.051	3.681
Period II	Fishing	135.1	0.975	0.06	3.353	5E-04	0.339
Period II	Mining & Quarrying	15.35	0.814	-0.03	0.45	0.008	1.673
Period II	PRIMARY	30.08	0.896	0.009	0.573	0.002	1.175
Period III	Agriculture & Animal Husbandary	145.4	0.973	0.003	0.591	0.001	3.288
Period III	Foresty& Logging	239.6	0.984	0.03	6.421	-0	1.51
Period III	Fishing	381.1	0.99	0.042	4.265	0.002	2.029
Period III	Mining & Quarrying	27.8	0.874	0.105	2.266	-0	0.6
Period III	PRIMARY	260.6	0.985	0.005	1.387	0.001	3.815
Period IV	Agriculture & Animal Husbandary	1017	0.986	0.033	15.6	-0	4.89
Period IV	Foresty& Logging	21.99	0.611	0.14	4.06	0.005	5.205
Period IV	Fishing	1233	0.989	0.113	17.58	-0	5.82
Period IV	Mining & Quarrying	233.7	0.944	0.087	5.782	-0	0.56
Period IV	PRIMARY	1191	0.988	0.031	14.57	-0	2.86

Source: Calculated from the NSDP Data (From 1980-81 to 2010-11)

From the table I.4 it is clear that in period-I i.e. 1980-81 to 1989-90, primary along-with its sub sectors have shown no acceleration. In the period II i.e. from 1990-91 to 1999-2000, Forestry and logging showed a significant acceleration while other sub-sectors and primary sector showed no such trend.Duringperiod III i.e. from 2000-01 to 2010-11, Agriculture and Allied Sector, along with Fishery and also the Primary Sector as a whole has registered acceleration while in the period IV (1980-81 to 2010-11) i.e.the entire period of study acceleration in growth was registered only in forestry and logging, other sectors like the agriculture and allied sector, fishing and the primary sector as such, registered a sharp deceleration.

Fig. 1.1

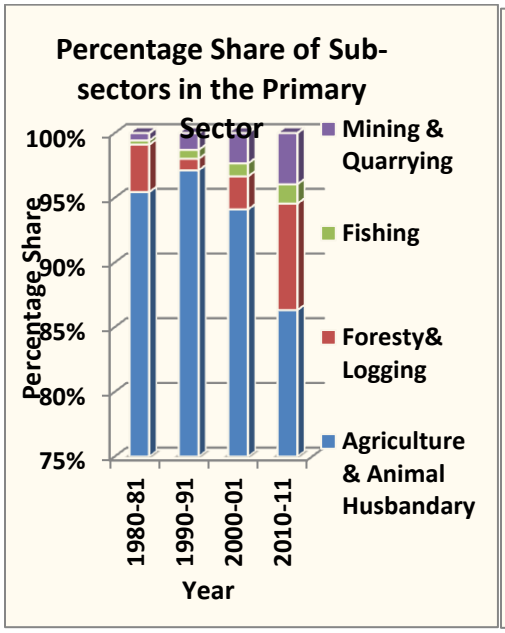
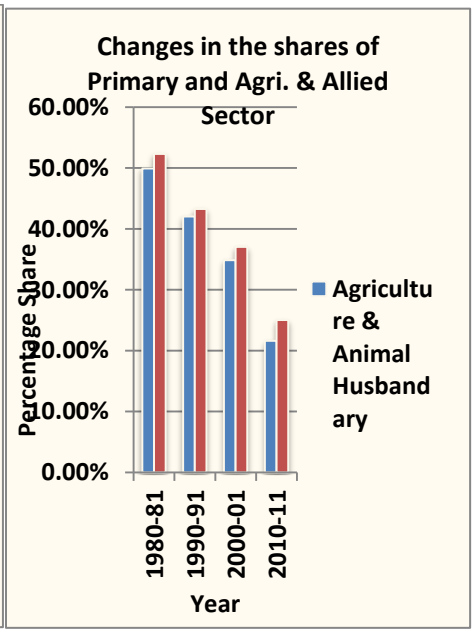
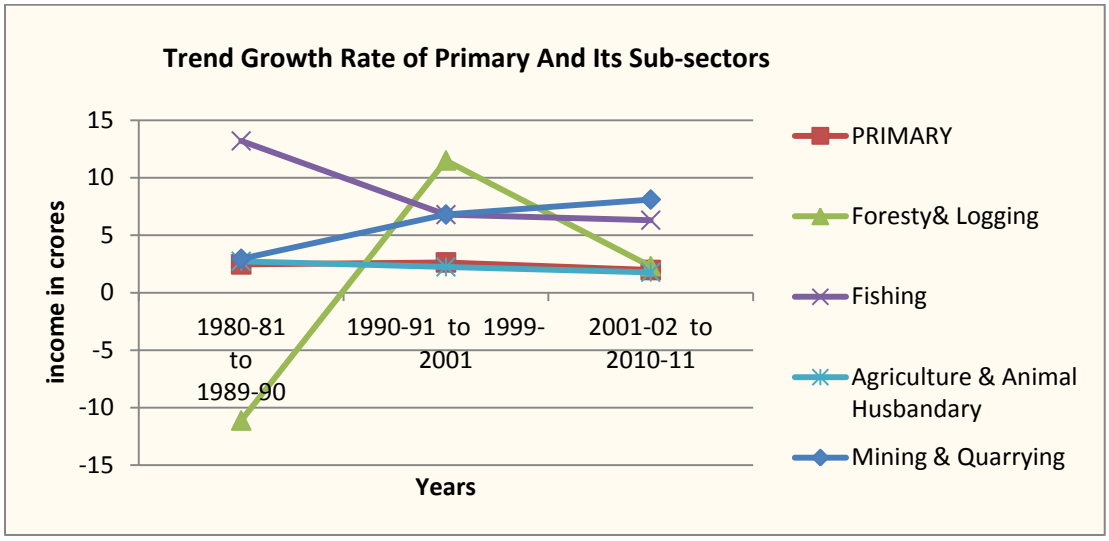


Fig.1.2



Source: Statistical Diary, U.P. Various years Calculated from NSDP Data

Fig 1.3



Source: Statistical Diary, U.P. Various years Calculated from NSDP Data

Land Utilization and Cropping Pattern in Agriculture in Uttar Pradesh

Land Utilization Pattern in Uttar Pradesh

The land utilization pattern displayed minimal changes since 1980-81. Its composition in 1984-85 and 2010-11 is shown in the given table I.5.The net sown area was 57.7 percent of the reported area (29.85 m.ha) in 1984-85, which though declined in area but increased to 68.6 percent of the reported area (24.70 m.ha) in 2010-11.

The share of fallow land increased from 11.38 mha to 12.15 mha i.e. from 3.8 percent to 5.0 percent during the same period. There had been marked decline in the percentage share of forest and pastures from 17.17 percent and 1.7 percent in 1984-85 to 6.8 percent and 0.27 percent in 2010-11 respectively. There was also percentage decline in barren land and culturable waste land. While the NSA (Net Sown Area) increased from 57 percent to 68.6, the area sown more than once increased from 26.3 percent to 37.3 percent.

Table I.5 Table I.4

Table I.5
Land Use Pattern in Uttar Pradesh

Sl. No.	Particulars	1984-85	2010-11	1984-85 (%)	2010-11 (%)
1.	Reporting Area	29852	24170	100	100
2.	Forest	5126	1658	17.17138	6.859743

3.	Barren Land	1112	486	3.725044	2.010757
4.	Non-agricultural use	2377	2835	7.962616	11.72942
5.	Culturable waste	1118	426	3.745143	1.762516
6.	Pastures	352	66	1.17915	0.273066
7.	Misc. trees etc.	560	354	1.875921	1.464626
8.	Current fallow	1138	1214	3.81214	5.022755
9.	Other fallow	820	538	2.746885	2.2259
10.	Net area sown	17248	16593	57.77837	68.65122
11.	Area sown more than once	7873	9022	26.37344	37.32727

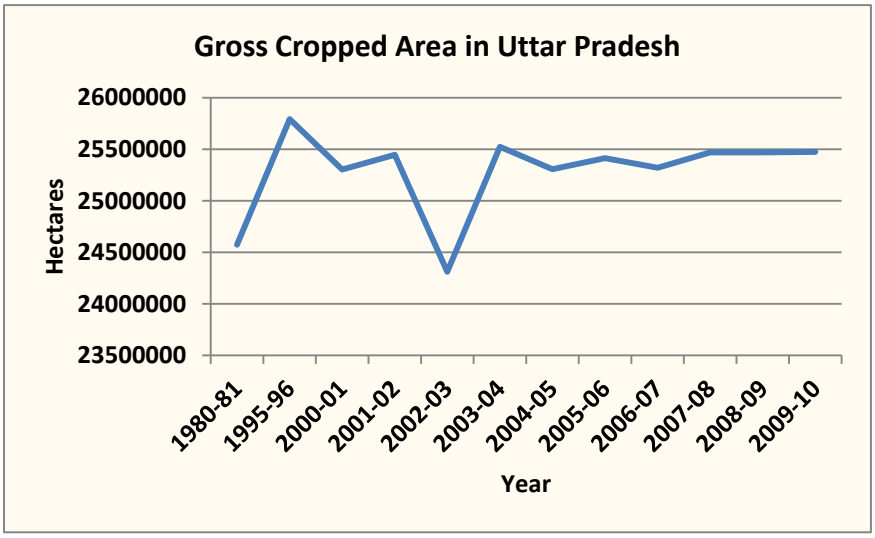
Source: Sankhyakiya (Statistical) Diary, Uttar Pradesh (1984-85, 2010-11

Table I.6
Gross Cropped Area in Uttar Pradesh

Sl. No.	Period	Area in ha
1.	1980-81	24573897
2.	1995-96	25792964
3.	2000-01	25304147
4.	2001-02	25446880
5.	2002-03	24311182
6.	2003-04	25524605
7.	2004-05	25307363
8.	2005-06	25414347
9.	2006-07	25320596
10.	2007-08	25470137
11.	2008-09	25470767
12.	2009-10	25473934

Source: Sankhyakiya (Statistical) Diary, Uttar Pradesh (1984-85, 2010-11)

Fig.1.4



The share of agriculture in the total reporting area is the largest and ranged from less than 70 percent in the Central, Eastern and Bundelkhand regions to 75percent in the Western region. Area under forest was ranging from around 5percent in the western to 9percent in the Eastern region. The trends in the land use pattern during the period of study do not demonstrate any significant shift in favour of agriculture. With growing land degradation and rapid urbanization, future scope for area expansion in favour of agriculture purpose would be restricted. Marginal and ecologically fragile area, when brought under cultivation cannot compensate for the land which has been removed from cultivation. Hence, an increase in agriculture production can be made possible only through raising biological yields and intensifying the land use, instead of area expansion.

Land availability for agriculture in Uttar Pradesh was 26.37 percent in1984-85 which increased to 37.32 percent in 2010-11. Area under the forest cover was 17.17 percent and 6.85 percent respectively, during the period. This was much less than the norm set for sound ecological balance in the region. Land under non-agricultural uses constituted 7.96 percentonly land, while remaining land was either degraded or not used for any productive purpose. Ironically the amount of land, Punjab has utilized about for agriculture, this huge wasted area is more the 15 of that land. To generate income and employment opportunities for the poor in the state, the potential of this ample area needs to be harnessed.

Cropping Pattern in Uttar Pradesh

Agriculture in Uttar Pradesh continues to be dominated by foodgrains. While the Gross Cropped Area (GCA) wasunder foodgrain in 1980-81, has declined in 2010-11. It still was exceedingly high and much ahead of the national level area under foodgrain crops. Rice and wheat are the principal foodgrain crops with relative share of andin the Gross Cropped Area (GCA). Uttar Pradesh produces about 1/3rd of the wheat produced in the country, being the largest wheat producing state.It ranks second in the production of rice in the country.From the table I.8 area under wheat and rice increased from 8.11 mhaand 5.29 mha in 1980-81 to 9.73 and 5.62 mha respectively in 2010-10 registering a rise of 1.3 mha in the GCA in wheat and 0.34 mha in GCA in rice during the period of study. Rice mainly replaced sorghum, pearl millet and maize, while wheat substituted barley and chickpea. The area under all coarse cereals declined during the given period.

Table I.7
Production of Agricultural Commodities in Uttar Pradesh

Product	1980-81	1990-91	2000-01	2009-10
Rice	5569411	10260347	11679149	11794150
Javar	409951	493036	329499	192723
Bajara	733097	875076	1277360	1516391
Maize	893911	1445468	1493964	1101196
Wheat	13364977	18600051	25168332	27776950
Gram	1288229	1121554	702718	504314
Other Pulses	1238201	1650255	1988960	1401673
Total Pulses	2526430	2771809	2160356	2376428
Total	24948000	35516008	42751000	44664487
Oil Seed	373672	849304	710258	807627
Potato	4164769	6393868	8398000	12849898

Source: Uttar Pradesh KeKrishiAnkari (Various Issues)

Reasons for Shift in Cultivation in Favour of Wheat and Rice

Irrigation development drove area augmentation and shift in favour of wheat and rice. Access to High Yielding Varieties (HYV) and disease resistance varieties, huge subsidies on water, power and other inputs and assured output prices and procurement by the government, were some other reasons for this shift. Relative share of pulses in the GCA was about 11.68which declined to 9.96percent GCA. The share of gram in the pulses was 55percent in 1980-81 which came down to 23.89percent in 2009-10. Similar was the case with tur. Their share was largely substituted by lentil, green gram, black gram and peas.Gram suffered the most of as its area was brought down from 1.5 mha to 0.6 mha of GCA between 1980 and2009-10.

Oil seeds occupied 4.35percent of the GCA in 2009-10. Their area went up by 30percent from 0.861 mhain 1980-81 to 1.11 mha in 2009-10. Among the oilseeds crops, rapeseed and mustard are the most important crops in Uttar Pradesh. Their area has increased by more than 30percent between 1980 and 2009-10. The area under oilseeds rose as a result of the 'Technology Mission on Oilseeds' launched in 1987 to raise the production of oilseeds in order to reduce the import of edible oil. A number of programs like production of improved varieties of oil seed crops, distribution of quality seeds among farmers, raising the procurement prices of oil seeds and its assured procurement by the governments were the programs initiated by the government. Area under the vegetables has also rose steadily in the state from 0.46 mha 0.63 mha in 1999-2010. Uttar Pradesh is the largest sugarcane producing state in the country with about half of the area under sugarcane cultivation confined in the state of Uttar Pradesh. Due to expansion in the irrigated area in the state sugarcane cultivation has risen from 1.7 mha in 1982-83 to 2.1 mha in 2009-10.

Table I.8

Area /Average Yield of Some Important Crops in U.P.

Product	1980-81		1990-91		2000-01		2009-10	
	Area	Avg.	Area	Avg.	Area	Avg.	Area	Avg.
Wheat	8111932	16.50	8567674	21.70	9239311	27.24	9752215	28.50
Rice	5291345	10.53	5616728	18.27	5907151	19.77	5625899	20.96
Javar	677905	5.99	5263536	9.36	347427	9.48	207848	9.27
Bajara	994883	7.37	785108	11.50	881013	14.50	919178	16.50
Maize	1223547	16.69	919178	13.06	920841	7.21	756300	14.56
Gram	1495881	8.69	1275254	8.79	833007	8.44	609433	8.28
Other Pulses	1363424	9.08	1764732	9.35	1858671	10.17	1940728	7.22
Total Pulses	2859305	23.09	3039986	18.42	2691678	13.53	2550161	9.47
Total	20469008	12.19	2038000	17.39	20308000	23.04	19975778	22.36
Oil Seed	708724	5.27	1019615	8.35	860585	8.25	1114998	7.24
Potato	256648	156.66	321589	190.29	394000	213.14	518304	247.92

Source: Uttar Pradesh KeKrishiAnkari (Various Issues)

It was observed from the table I.8 and the figure earlier that Uttar Pradesh cropping is dominated by food grains which constituted percent of the area under cultivation. It is characterized with high yield. From the table and the figure it could be seen that among the food grains wheat registered a high yield which rose from 16.50 Qt/ha in 1980-81 to 28.5 Qtl/ha. While that of rice in 10.53 Qtl/ha and 20.96 Qtl/ha respectively in the same period. The area under jowar declined from 677905 hectares in 1980-81 to 207848 hectares in 2009-10. Average yield for all major crops have gone up except pulses which was Qtl/ha in1980-81 and stood at 7.47 Qtl/ha in 2009-10. Average yield of potatoes was 156.66 Qtl/ha in 1980-81 to 247 Qtl/ha in 2009-10

Fig.1.5

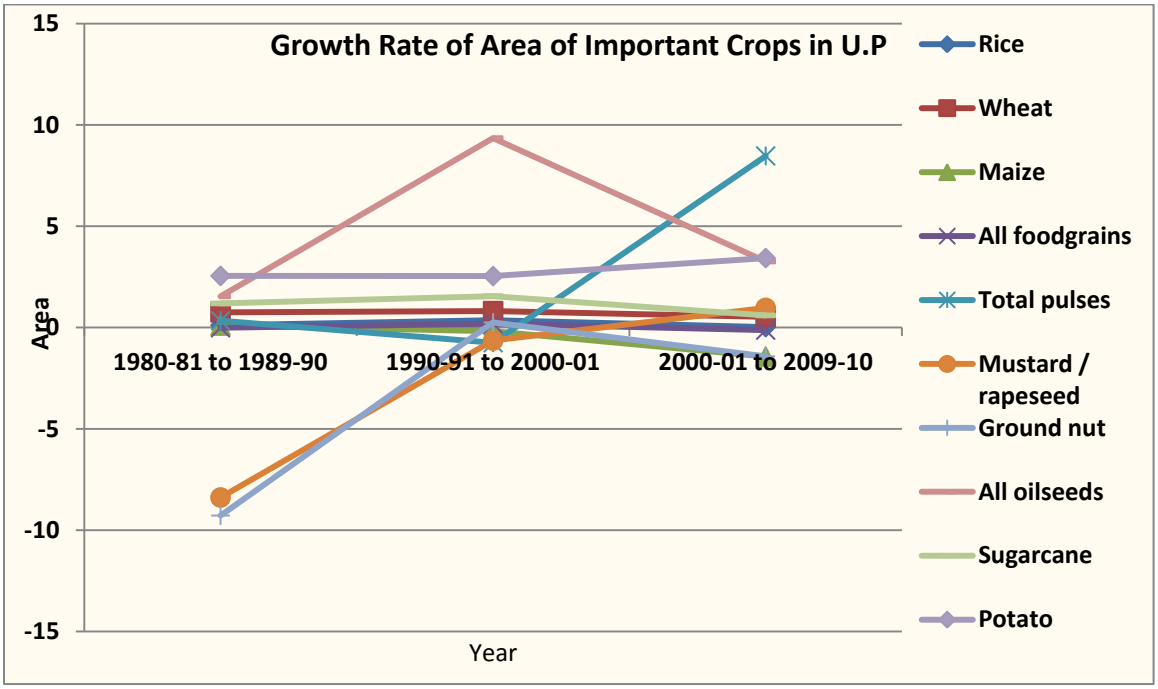

Growth Rate of Area of Important Crops in U.P
15
10
5
0
-5
-10
-15
Area
1980-81 to 1989-90
1990-91 to 2000-01
2000-01 to 2009-10
Year
Rice
Wheat
Maize
All foodgrains
Total pulses
Mustard / rapeseed
Ground nut
All oilseeds
Sugarcane
Potato

Fig.1.6

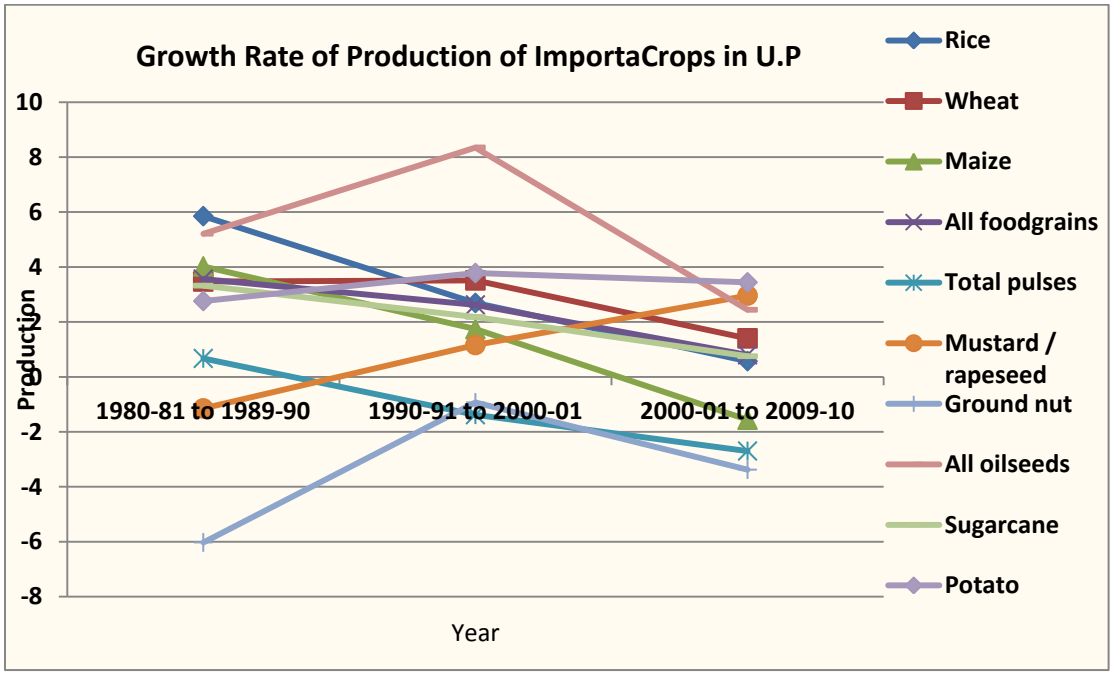
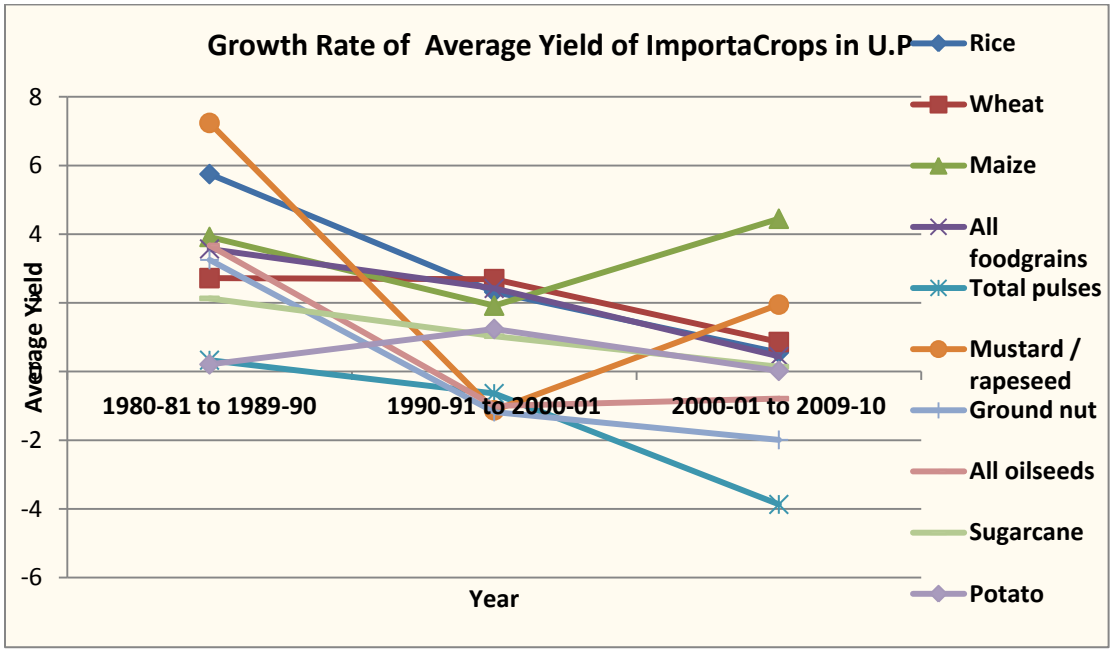

Growth Rate of Production of ImportaCrops in U.P
10
8
6
4
2
0
-2
-4
-6
-8
Production
1980-81 to 1989-90
1990-91 to 2000-01
2000-01 to 2009-10
Year
Rice
Wheat
Maize
All foodgrains
Total pulses
Mustard / rapeseed
Ground nut
All oilseeds
Sugarcane
Potato

Fig.1.7



During the 1960s growth in areas was the major source of production growth in the country.[3]The introduction of High Yielding Varieties in wheat and rice during the late sixties alongwith improved method of cultivation lead to high growth rate of production of wheat and rice.With decline in the area, impressive growth in the production of most crops during 1980-81 to 1989-90, was mainly contributed by growth in yield.

Growth Rates by Area of Major Crops in Uttar Pradesh

The growth rates of area under the important crops in the table I.9 show that over the entire period foodgrains registered negative growth rate (1980-81 to 2010-11). Whereas in case of all commercial crops viz. sugarcane, oilseeds etc.

[3] GS Bhalla and Gurmail Singh (2001), *Indian Agriculture Four Decades of Development*, New Delhi, Sage Publication

A Vaidyanathan (1992), instability in Agriculture: Extent, Causes and Consequences; A Review Article, Indian Economic Review, 27(2).

Table I.9
Districtwise Growth Rate of Area,Production and Average Yield Important Crops in U.P.

	1980-81 to 1989-90			1990-91 to 2000-01			2000-01 to 2009-10		
	Prod.	**Area**	**Yield**	**Prod.**	**Area**	**Yield**	**Prod.**	**Area**	**Yield**
Rice	5.85	0.11	5.75	2.69	0.36	2.32	0.57	0.02	0.55
Wheat	3.47	0.75	2.72	3.51	0.81	2.69	1.40	0.53	0.86
Maize	4.02	0.10	3.92	1.74	-0.18	1.92	-1.56	-1.43	4.45
All foodgrains	3.56	-0.01	3.57	2.62	0.19	2.42	0.80	-0.13	0.44
Total pulses	0.67	0.34	0.33	-1.38	-0.75	-0.64	-2.70	8.47	-3.87
Mustard / rapeseed	-1.15	-8.39	7.24	1.16	-0.64	-1.13	2.96	0.97	1.95
Ground nut	-6.03	-9.28	3.25	-0.93	0.25	-1.18	-3.38	-1.42	-1.99
All oilseeds	5.21	1.54	3.67	8.35	9.35	-1.00	2.44	3.26	-0.79
Sugarcane	3.32	1.19	2.13	2.18	1.55	1.03	0.75	0.60	0.14
Potato	2.76	2.55	0.21	3.78	2.54	1.24	3.44	3.43	0.02

Source: Agriculture Statistics of U.P. (Various Issues) and Database Compile by NCAP

The growth rates were statistically significant. The growth rate in case of oil seeds was more marked in second and third period, while in case of sugarcane it was much higher in the second period. Area under foodgrain crops was confined around 20 to 22.3 (in ha) between 1980-81 to 2009-10. This was 83% of the total cultivated area in Uttar Pradesh in 2009, while that of national level was 66% during the same period.

Crop Specific Growth Pattern

- With a comparative picture in average annual growth rates of area, production and yield shows that the agricultural performance in Uttar Pradesh was much inferior during 1990s and afterwards as compared to 1980s.
- Annual compound growth rate of foodgrain production decelerated in 1990s (2.62 percent) and 2000-2010 (0.08percent) as compared to 1980s (3.56percent). It was due to slowdown in the yield levels of wheat and other cereals, rice, all foodgrains, sugarcane etc. and due to a steep decline in pulses area and production.
- Oilseeds production increased sharply during 1990s mainly on account of area expansion. Yields demonstrated declining trend, indicating that its cultivation was moving towards marginal areas.
- Potato production increased during 1990-99 and 2000-01 (3.78percent and 3.43percent annually) than 1980s (2.76percent annually) which was largely due to area expansion during both the periods.
- Sugarcane production showed a decelerating trend throughout the period under-study 1980s (3.32percent annually), 1990s (2.18percent) and 2000-10 (0.75percent annually).
- This was because since 1994 sugarcane yields have reached to plateau of 68 t/ ha which is 17percent lower than the national average of 13 t/ha. The yield levels are less than 60 t/ha in more than 70percent of the sugarcane areas in the State.

Distribution of Number and Area of Operational Holdings in Uttar Pradesh

Uttar Pradesh is predominantly a small landholding state with large regional variations in average form size. Around 24.5 percent of farmers in 2005-06 have land holding of less than 2 ha. The share of small and marginal farmers has increased in the number of farming household with fragmenting and shrinking farm size. And this trend will continue in future, due to large population and mass poverty in Uttar Pradesh putting excessive pressure on natural resources leading to fragmentation of landholdings.

Table I.10
Distribution of Numbers and Area of Operational Holdings

Farm Size	Holding (%)			Area (%)		
	1980-81	1995-96	2005-06	1980-81	1995-96	2005-06
Marginal (<1 ha)	70.6	75.4	77	25.7	33.7	38.9
Small (1-2 ha)	16.3	14.5	13.81	22.6	23.8	24.2
Medium (4-10 ha)	12.7	9.9	1.90	45.5	39.2	13.3

Large (10 ha & above)	0.4	0.2	0.12	6.2	3.3	2.4

Source: Agriculture Census, (2005-06)

Across the regions, the number of small farm holdings is highest in the Eastern region, about 95% cultivating 72% of land. The average size of farm holding is lowest in Eastern region, 0.64 ha and highest in Bundelkhand region, 1.49 ha.

Fig. 1.8

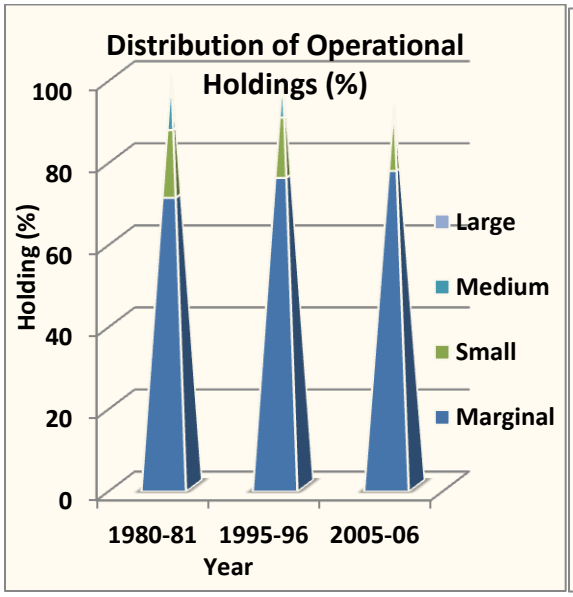


Fig.1.9

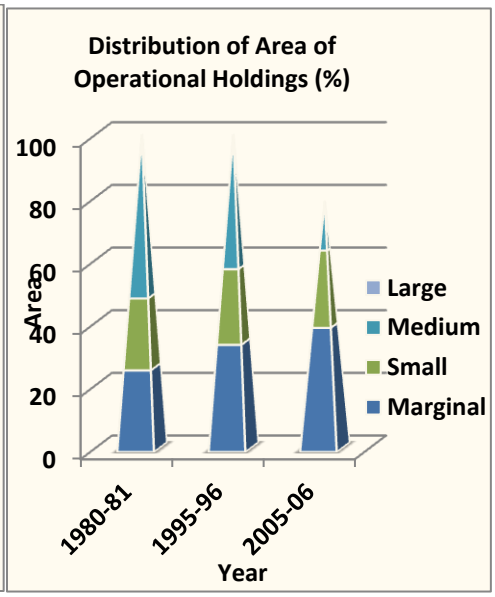
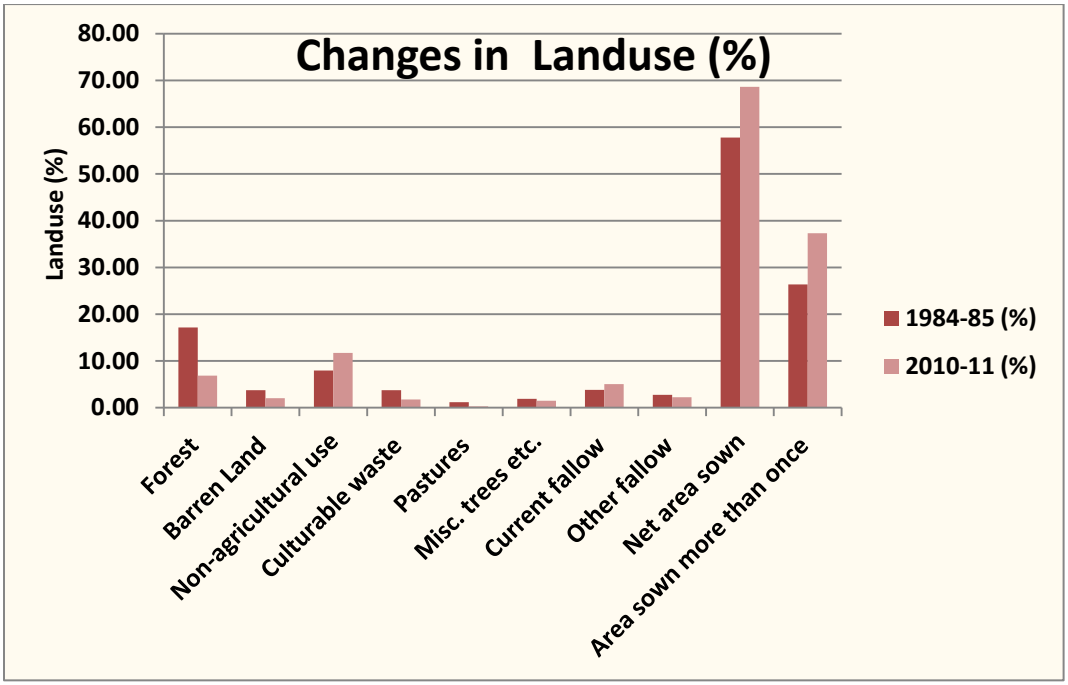


Fig.1.10



Fertilizer Consumption

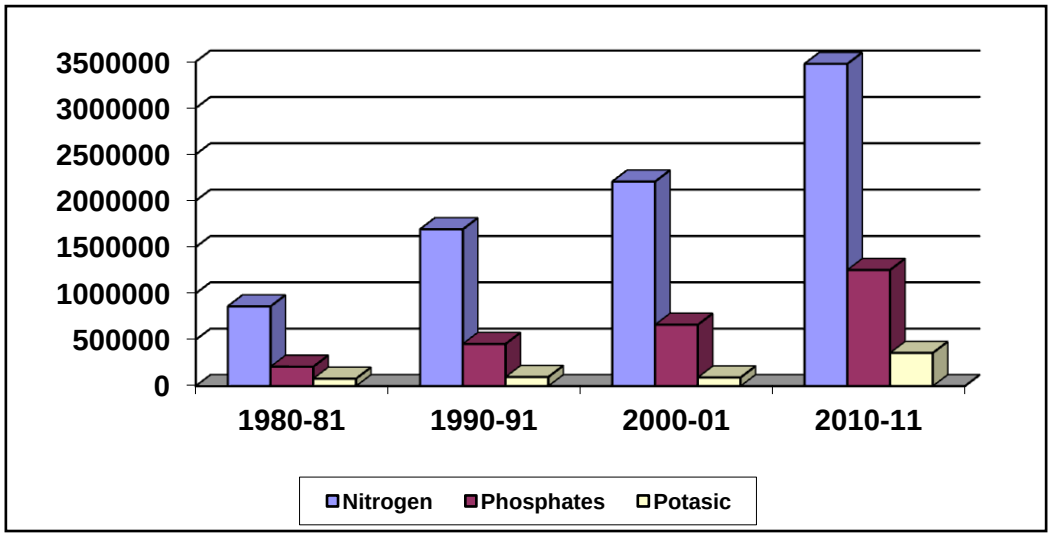
The consumption of fertilizer is an important indicator of progress in agriculture even though increasing fertilizer consumption does not often result in commensurate increase in productivity and production. It is rising continuously in Uttar Pradesh from 1.15 million tonnes to 5.08 million tonnes in 2010-11.

Table I.11
Quantity of Chemical Fertilizer (NPK) used in Uttar Pradesh
During 1980-2011

Years	1980-81	1990-91	2000-01	2010-11
Nitrogen	860642	1691883	2206497	3476864
Phosphates	209338	455488	662083	1253453
Potasic	80613	98348	93249	358092
Total	**1150593**	**2245719**	**2961829**	**5088409**

Source: Uttar Pradesh KeKrishiAankre, U.P. (Various Issues)

Fig.1.11



As far as the level of NPK ratio is concerned, the table shows I.11 it was distorted from the normal level (4:2:1), in 1981-82 to 11:28:3.59:1 in 2008-09 due to the decontrol of phosphatic and potasic fertilizers in 1992.

There is still widespread ignorance among farmers about the appropriate of fertilizer in terms of quantity and variety.Soil test based application of fertilizers and application of micronutrients has still not become a rule rather the application of fertilizers is governed by their prices. It is apparent that an integrated nutrient management approach is required to enable a balanced use of fertilizers for optimum results. Also, the setting up of adequate capacity for soil testing needs to be continued.

Irrigation

Irrigation has a vital role in the agricultural development for a State like Uttar Pradesh. Irrigation facilities in U.P. are relatively well-developed

Table I.12
Net Area Irrigated by Different Sources

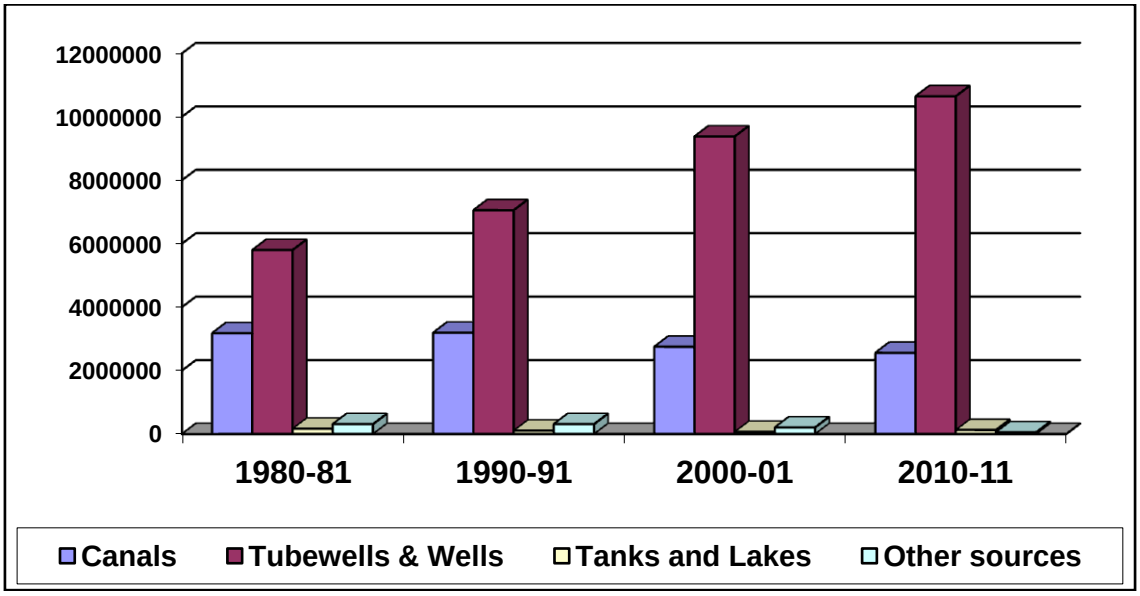
Sources	1980-81	1990-91	2000-01	2010-11
Canals	3178250	3192858	2748801	2558098
Tubewells& Wells	5799490	7054297	9378427	10646697
Tanks and Lakes	166364	104437	67145	125891
Other sources	308934	309119	206134	52716
Total	9453038	10660711	12400507	13383402

Source: Statistical Diary (Various Issues)

.

The table I.12 provides details of irrigation by different sources in the State. It shows that tube wells are the major sources of irrigation followed by canals, tanks and lakes. This shows that there is large dependency upon ground water instead of surface water.

Fig1.12



Use of Agricultural Machinery in Uttar Pradesh during 1982-83 to 2007-08

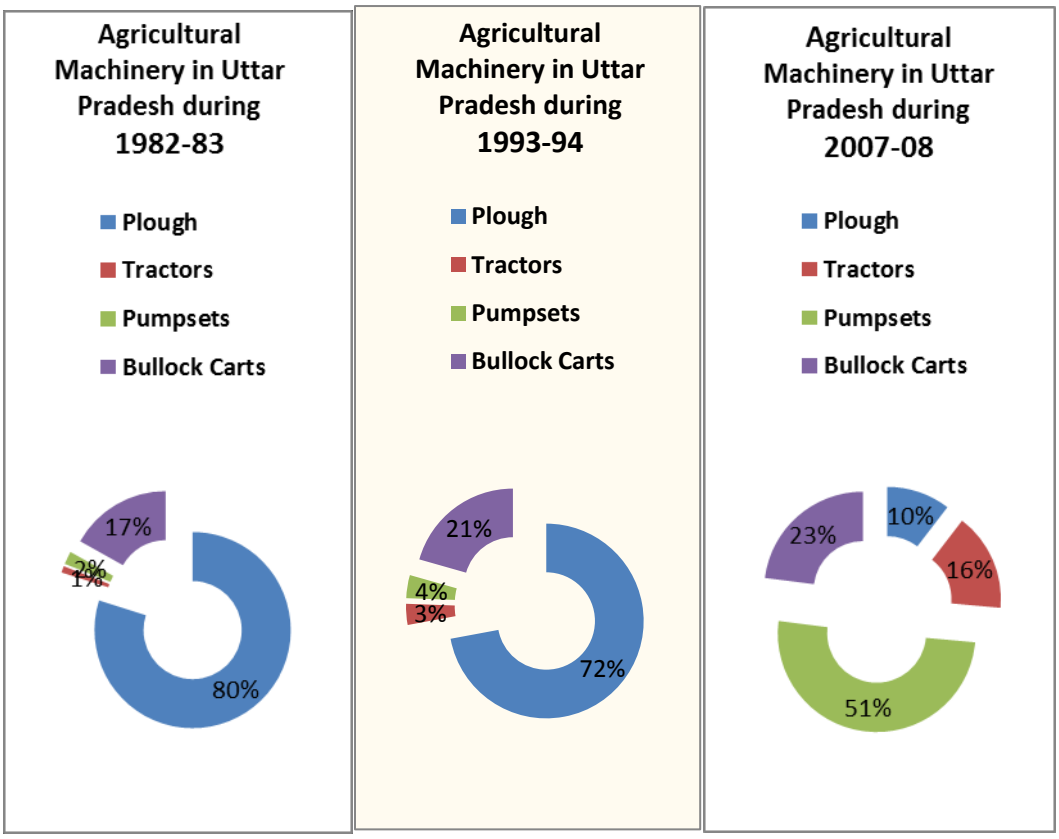
Agricultural implements and machinery helps in speeding up agricultural operations and increasing the productivity of land and labour. As against the availability of 8 tractors per 1000 hectare of gross sown area in 1982-83, in 2007-08 there were 29 tractors per 1000 hectares over available while the use of plough (both wooden and iron) in agriculture operations have declined, the use of electric pumpsets have risen sharply between 1982-83 to 2007-08. There is also almost fifty percent decline in the use of bullock carts.

Table I.13
Agricultural Implements and Machinery Uttar Pradesh
(1982-83 to 2007-08)

Sources	1982-83	1993-94	2007-08
Plough	10314680	7156524	475264
Tractors	140821	346662	733154
Pumpsets	277370	380686	2312113
Bullock Carts	2178583	2045546	1050657

Source: Sankhyakiya (Statistical) Diary, Statistical Uttar Pradesh

Fig.1.13 Fig.1.14 Fig.1.15



Investment in Agriculture

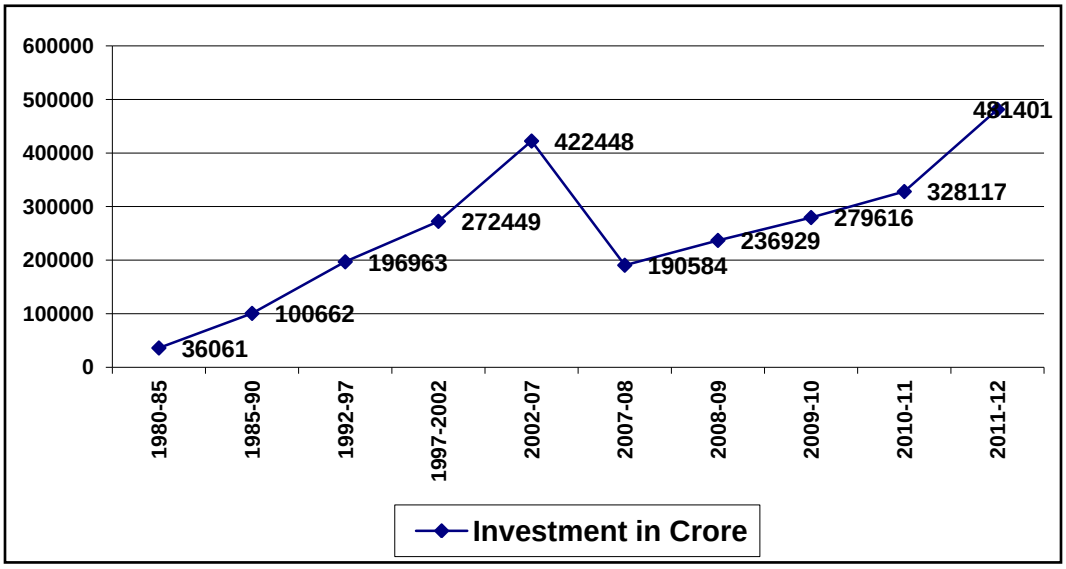
Investment, both public and private, is required to bring about technological change in agriculture and attain higher agricultural growth. Agriculture and allied sector in the state witnessed stagnation and even decline in public investment during some years in the post-reform period. As it is clear from the table I.14 a share of public sector gross capital formation in total GCF in the agriculture sector declined from 8.4 percent and 9.2 percent during 1985-90 and 1992-97 respectively to 7.7 percent in the Ninth Plan i.e. 2002-07. This trend however reversed during 2011-12 when public investment rose to 10.4 percent i.e. from 190584 Cr in 2007-08 to 481401 Cr in 2011-12.

Table I.14
Investment in Agriculture and Allied Sector during Five Year Plans

Plan	Year	Investment in Crore	% share of total Ex.
VI	1980-85	36061	5.5
VII	1985-90	100662	8.4
VIII	1992-97	196963	9.2
IX	1997-2002	272449	9.6
X	2002-07	422448	7.7
XI (1st year)	2007-08	190584	7.8
XI (2nd year)	2008-09	236929	6.9
XI (3rd year)	2009-10	279616	7.5
XI (4th year)	2010-11	328117	8.31
XI (5th year)	2011-12	481401	10.24

Source: Uttar Pradesh at a Glance (Various Issues)

Fig.1.16



Infact, the growth performance of agriculture at the National and the State level was splendid during the 1980s. But its deceleration during the 1990s was attributed to the reduction and consequently stagnation in growth of public expenditure on agricultural infrastructure, defunct extension services and biased economic reforms.[4]

V. Conclusion

Inspite of the fact that Uttar Pradesh is a major foodgrain producing state, however, in terms of per capita production and yield per hectare, it is an average. There are many supply side constraints for higher agriculture growth:

1. The investment, both public and private, in agriculture sector is declining over the years. This trend however reversed during 2011-12 when public investment rose slightly.
2. Due to large population size and mass poverty putting excessive pressure on natural resources leading to fragmentation of landholdings since 1980s.
3. Unavailability of best quality seed and comparatively lower use of fertilizers.
4. Weak agriculture credit system.
5. The Uttar Pradesh economy is characterized by deteriorating quality of land and water resources. There is large dependency upon ground water instead of surface water.

[4] R. Thamarajakshi (1999), *Agriculture and Economic Reforms,* Economic and Political Weekly, 34(14): 2393-95.

PulapreBalakrishna (2000), *Agriculture and Economic Reforms: Growth and Welfare* Economic and Political Week, 35(12); 999-1004.

S. Hirashima (2000), *Issues in Agricultural Reforms: Public Investment and Land Market Development,* Economic and Political Week, 35(43 & 44); 3879-84.

S. Mahendradev (2000); *Economic Reforms, Poverty Income Distribution and Employment,* Economic and Political Week (10): 823-35.

V.S. Vyas (2001), *Agricultural Growth in India, Role of Technology, Incentives and Institutions,* New Delhi: Oxford University Press.

C.H. Hanumatha Rao (2005). *Reforms Agenda for Agriculture,* Economic Political Weekly, 33(29). 615-20.

6. Lack of proper supply driven research and technology transfer.

Recommendations

- Augmenting investment by increasing public investment which will help attracting private investment.
- Mobilizing resources by way of issuing agri-infrastructure bonds and improving efficiency in agricultural sector.
- Relaxing land laws to facilitate long term lease and contract farming.
- Improving research in biotechnology, genetic engineering and tissue culture.
- Reforming the Irrigation sector.