CHAPTER-6
SUMMARY OF CONCLUSION, FINDINGS & SUGGESTIONS
CHAPTER- VI
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Agriculture is a critical sector of the Indian economy. It forms the backbone of development in the country. An average Indian still spends almost half of his/her total expenditure on food, while roughly half of India’s work force is still engaged in agriculture for its livelihood. Agriculture is a source of livelihood and food security for a vast majority of low income, poor and vulnerable sections of society. Given that India is still home to the largest number of poor and malnourished people in the world, a higher priority to agriculture will achieve the goals of reducing poverty and malnutrition as well as of inclusive growth. Since agriculture forms there source base for a number of agro-based industries and agro-services, it would be more meaningful to view agriculture not as farming alone but as a holistic value chain, which includes farming, wholesaling, warehousing (including logistics), processing, and retailing. Further, it may be noted that in the last two Five Year Plans, it is clearly mentioned that for the economy to grow at 9 per cent, it is important that agriculture should grow at least by 4 per cent per annum.

Uttar Pradesh is the most important agricultural state of India, not only it has the highest cropped area of 25,785 thousand hectares, but it has the highest number of over 21 million farm holdings as well. Uttar Pradesh is the largest food grain producing state in the country. It produces more than 41.1 million tones of food grains which is about 20% of total food grains of the country. The state produces 38% of India's Wheat, 20% of Paddy, 21% of Sugarcane, 34% of Groundnut, 17.5% of Rape-seed, 8% of Fruits and 16% of Vegetables. Uttar Pradesh is the largest potato producer in the country, contributing 43 percent of the total production. U.P. is the largest milk producing state of the country with an annual milk production of 11.7 million tonnes i.e. accounting for around 16% of the milk production of the country. The total cultivated area of the state is 166.83 lakh ha and the gross cropped area is 255.24 lakh ha. The cropping
intensity in the state is 153 percent. The area sown during rabi is more compared to that in kharif. The area under sugarcane which is an annual crop is 0.38 lakh ha. The state has a population of nearly 18.6 crore, of which nearly 70% is dependant on agriculture directly or indirectly. Therefore about 13 crore people are linked to farming activities, over 21 million land holdings and six to seven persons linked to each land holding. Agriculture is therefore the most crucial sector for socio economic development of state. It contributes the highest share of 33% to the total income of the state. A higher growth in the State’s total economy cannot be achieved or sustained on a long term basis, without good growth in Agriculture.

In this backdrop, the study has been undertaken to make indepth analysis of growth performance of agriculture sector in India with special reference to Uttar Pradesh. The study has shown the importance of agriculture in India and its major states by taking various economic parameters like growth rate in NSDP of agriculture, share in NSDP, employment generation and export etc. The study has further explored the growth performance of agriculture sector especially in Uttar Pradesh with its regional perspectives. The study has also highlighted the various factors which affect the agricultural growth directly or indirectly. The various statistical tools have been applied to evaluate the growth performance and inter-regional differences with respect to agriculture sector in India as well as Uttar Pradesh in particular. The conclusion of the study is summarized as under:

1. **Growth and share of agricultural domestic product in total domestic product.**

The growth performance of the agriculture sector has been fluctuating across the plan periods (Fig 1.3). It witnessed a growth rate of 4.8 per cent during the Eighth plan period (1992–97). However, the agrarian situation saw a downturn towards the beginning of the Ninth plan period (1997–2002) and the Tenth plan period (2002–07), when the agricultural growth rate came down to 2.5 percent and 2.4 percent respectively. This crippling growth rate of 2.4 percent in agriculture as against a robust annual average overall growth rate of 7.6 per cent for the economy during the tenth plan period was clearly a cause for concern. The trend rate of growth during the period 1992-93 to 2010-11 is 2.8 percent while
the average annual rate of growth in agriculture & allied sectors- GDP during the same period is 3.2 percent.

The Eleventh Plan had sought to reverse the deceleration of agricultural growth which occurred in the Ninth Plan and continued into the Tenth Plan. It has had some success in that foodgrain production touched a new peak of 241.57 million tonnes in 2010-11. The Approach Paper to Twelfth Plan drafted by Planning Commission estimates that with a revision of the farm sector GDP growth rates for 2010-11 and the expected good harvest in 2011-12, the average growth in agriculture & allied sectors in the Eleventh Plan may be higher at 3.3-3.5 percent per year against a target of 4 percent.

It is also significant that unlike the overall economic growth pattern, agricultural performance in India has been quite volatile (the Coefficient of Variation (CV) during 2000-01 to 2009-10 was 1.9 compared to 1.1 during 1992-93 to 1999-2000). This is almost six times more than the CV observed in the overall GDP growth of the country indicating that high and perhaps increasing volatility is a real challenge in agriculture, which is likely to increase in the years to come in the wake of climate change.

The agriculture sector in India has undergone significant structural changes in the form of decrease in share of GDP from 30 percent in 1990-91 to 14.5 percent in 2010-11, thus indicating a shift from the traditional agrarian economy towards a service dominated one. This decrease in agriculture’s contribution to GDP has not been accompanied by a matching reduction in the share of agriculture in employment. About 52% of the total workforce is still employed by the farm sector which makes more than half of the Indian population dependant on agriculture for sustenance. However, within the rural economy, the share of income from non-farm activities has also increased.

The Indian agriculture growth pattern has been highly varied at the state level. Since agriculture is a state subject, the overall performance of the agriculture sector in India largely depends on what occurs at the state level. There is a wide variation in the performance of different states. During 1991-92 to 2009-10, the growth performance of agriculture in Andhra Pradesh (3.45%) and West Bengal (3.84%) was higher than that of others among the selected fifteen
The average growth rate for overall economy of Uttar Pradesh during the X th plan period remained 5 percent which was below the growth rate achieved by the country during this period. The primary, secondary and tertiary sector registered a growth of 2, 9.1 and 5.4 percent, respectively. Primary sector, in which agriculture is an important sub sector has been experiencing very low and fluctuating growth rate, running into negative growth also. Hence, this sector is responsible for low overall growth rate. The contribution of agriculture in the state economy is more than 30%. Keeping in view the potential of its growth and critical role of this sector in employment generation and alleviation of poverty in rural areas, the growth rate of this sector has been kept at 5.7 percent (primary 6.4 percent) within eleventh plan. Agriculture and Animal Husbandry sector registered a growth of 1.4 percent during the tenth plan. The 11th Plan provides an opportunity to restructure the state policies and strategy to achieve faster, broad-based and inclusive growth and focus on bridging the various inequities that continue to fragment the society.

The shares of agriculture, secondary and tertiary sectors in Uttar Pradesh were 34.2, 20.4 and 42.8 percent respectively in 1993-94. In 2010-11, the tertiary sector surged ahead and reached 52.4 percent while the share of secondary sector remained same i.e. nearly 23.4 percent. The agriculture sector lagged behind during this period and its share declined to 20.8 percent in 2010-11. This shows the growth in primary sector, particularly in agriculture and animal husbandry system is much below par. If potential including pisciculture is exploited, it can give a considerable boost to the overall growth in the state. Moreover, the growth in this sector is more dependent upon small and marginal farmers as well as agricultural labour.

Among the four economic regions in Uttar Pradesh, Western region has the highest growth rate of 2.4 per cent in agriculture and allied sector followed by Bundelkhand, Central and Eastern region by 2.3 per cent, 1.8 per cent and 1.4 per cent per annum respectively during the period from 1999-2000 to 2009-10. In case of secondary sector, the Eastern region recorded highest and central region,
the lowest growth rate of 8.3 percent and 7.8 percent per annum respectively during the same period. While in service sector, the Central region recorded the highest growth rate of 7.1 percent per annum during that period.

The share of agriculture and allied sector in their respective total NDDP has declined almost in all regions between the two periods 1999-2000 and 2009-10. Bundelkhand region has the highest percentage composition of agriculture and allied sector (34.5 percent) in its total NDDP in 2009-10 followed by Western (30.3 percent), Eastern (26.5 percent) and Central region (24.3 percent). Among the four economic regions of Uttar Pradesh, Western region has been the most prosperous region of the state in 2009-10, having the highest per capita income at Rs.16487 followed by Bundelkhand, Central and Eastern regions.

2. Growth of employment in agriculture sector

The majority of workforce in India still depends on agricultural sector for employment. This dependency on agriculture sector is more profound in rural areas as nearly 64.3 percent of rural population is employed in agricultural sector. However, there is disguised employment in the sector due to limited opportunities for rural non-farm employment. During the longer period, (1993-94 to 2009-10), however, rural employment growth rates accelerated in both the farm and the non-farm sectors.

There were wide interstate differences in employment growth rate in both rural and urban areas in the period 1993-94 to 2009-10. This interstate variation in case of agriculture sector has been more pronounced which is evident from very high coefficient of variation in case of both rural (C.V. = 157.8) and urban agricultural employment (C.V. = 446.9). While the highest rural employment growth rate was found in Bihar equal to 2.4 percent and the lowest was in 1.08 percent in Maharashtra. Several other states also reported negative rural farm employment growth. These include Andhra Pradesh, Kerala Orissa and Tamil Nadu. The urban agricultural employment growth rate was highest in Assam amounting to 8.2 percent while the lowest was estimated for again in Maharashtra.
3. Growth and share of agriculture in India’s trade

India’s agricultural export has been constantly increasing and it reached to the value of Rs. 112521.8 crores in 2010-11, which is approximately eighteen times than that in the year 1991-92. The value of agri-exports to total exports of the country has been ranging between 10 to 20 per cent between the period 1991-92 and 2010-11. The major agri-exports of India are cereals (mostly rice - Basmati and non-Basmati), spices, cashew, oilcake/meals, and tobacco, tea, coffee, fruits and vegetables, juice and marine products. Among agricultural products like rice, wheat, spices, fruits, vegetables, processed fruits and juices, the most exported item has been the rice. The large values of coefficient of variation show that there has been instability in the export of all major commodities during the period of 1991-92 to 2010-11. All items has shown positive annual compound growth rate in their export except the wheat which recorded a very high negative growth rate of 31.3 per cent per annum during that period. India’s agri-exports face certain constraints that arise from conflicting domestic policies relating to production, storage, distribution, food security, pricing concerns etc.

Agri-imports constitute only a small proportion of the country’s total imports. During the period 1991-92 to 2009-10, agri-imports have been in the range of 2 to 4 per cent of the total imports of the country. In recent years, edible oil has become the single largest agri-import accounting for more than 50 per cent of the value of total agri-imports. In 2010-11, it accounted for as high as 51.7 per cent of total agri-imports. Another item, which accounts significantly in total agri-imports are pulses (around 12 per cent). Each of the other agricultural and allied products imported into the country - cereals, spices, sugar, milk and milk products, chicken meat etc. - account for very small proportion of total agri-import.


The area under foodgrains at national level have remained almost stagnant at about 122 million hectares respectively but its share in total cropped area reduced from about 66.3 percent in TE 1993-94 to about 63.8 percent in TE
2009-10. At the same time, the area under wheat has increased by 3.8 million hectares, and rice by 1.5 million hectares. The biggest loser has been coarse cereals where the area under cultivation has declined from 33.6 million hectares in TE 1993-94 to 27.9 million hectares in TE 2009-10. The share of coarse cereals in total cropped area fell from 18.1 percent in TE 1993-94 to 14.8 percent in TE 2009-10. During 2009-10, foodgrains production in India was 218.19 million tones. Of the total foodgrains production, production of cereals was 203.45 million tonnes and pulses 14.77 million tonnes. The foodgrains production increased from 177.4 million tonnes in TE 1993-94 to 227.8 million tonnes in TE 2009-10, or by over 28 percent. However, the highest increment was observed in case of cotton followed by fruits and vegetables (97%), condiments and spices (66%) and wheat (39%). Pulses recorded the lowest increment in production, from 12.7 million tonnes in TE 1993-94 to 14.6 million tonnes in TE 2009-10. The largest variation in the area and production during the period of TE 1993-94 to TE 2009-10 was recorded in case of fruits and vegetables. The percentage change in their area was 63.86 per cent while production of fruits and vegetables has increased with the percentage growth rate of 97.38 per cent during that period. Therefore it is clear that the shares of fruits & vegetables have shown an increasing trend in last two decades implying that they have been growing at a much faster rate than the traditional crops sector.

In Uttar Pradesh, wheat is the most widely cultivated cereal crop and its area is constantly increasing over the period and stood first in all the three comparative years at 8231 thousand hectares (Tha) in 1991-92, 9256 Tha and 9670 Tha in 2001-02 and 2009-10 respectively. The area under rice grew up by 5140 Tha to 6072 Tha and further to 5191 Tha during the same period. Alternatively, the area under the most coarse cereals, oilseeds and pulses demonstrate a declining trend in the year 2009-10 as compared to 1991-92 and 2001-02. The area under vegetables increased drastically from 577 Tha in 1991-92 to 778 Tha in 2001-02 and further to 1020 Tha in 2009-10. The area under fruits grew up only from 303 Tha to 357 Tha during the same period. Most of the crops witnessed negative growth in their gross cropped area during the period 1991-2010. The compound annual growth rate of area under foodgrains has significantly decreased from 0.3 per cent per annum in 1991-2001 to 0.1 per cent
per annum in 2001-10. The area under non-foodgrains registered a mild growth; it increased from -2.3 per cent per annum in 1991-2001 to 0.8 per cent per annum in 2001-10. The area under foodgrains still occupies more than 80 per cent of total cropped area due to the traditional cropping pattern as well as traditional food habits. The area under non-foodgrains increased since 1991 and occupies 18.7 per cent of the total area under crops in the state during 2009-10. By economic region wise, Area under the rice and wheat in Eastern region remained highest in the year 2001-02 and 2009-10, however Bundelkhand region has recorded the lowest area under the same crop in those years. In case of Barley the cultivable area decreased to 20.7 Tha and 10.7 Tha in 2001-02 and 2009-10 respectively in Eastern region. In case of maize, the highest area has been recorded in Eastern region in each comparative year as 1710.4 Tha, 1581.6 Tha, and 1383.8 Tha in 1991-92, 2001-02 and 2009-10 respectively. During 1991-92, the percentage share of area under rice and wheat in Eastern region has been equal to 78.2 per cent and 56.8 respectively. The percentage area of barley and jowar was highest in Western and Bundelkhand regions in 2009-10 respectively. The Western and Eastern region had the highest percentage share of area in case of Bajra and maize respectively in 2009-10. In case of total cereals the Eastern region had the highest percentage share of area in the same year.

The highest annual growth rate of area of the rice is 16.3 per cent in Western region during the period 1991-2001, which has decreased to 5.7 per cent during the period 2001-2010. In case of wheat and barley, the highest compound annual growth rate of 2.6 and 0.6 per cent has been estimated in Western and Bundelkhand region respectively in the period 1991-2010. In case of bajra and maize, except Bundelkhand, all regions have shown negative growth rate in the same period. Overall, the Eastern region has been reported to have the highest area under total pulses amounting to 1132.1 thousand hectares in 2009-10. Among pulses, the area under urad cultivation has been highest in Central region, followed by Bundelkhand, Eastern and Western regions respectively, in 2009-10. In percentage term, the Eastern region had the highest percentage share of area under total pulses equal to 52.5 per cent and the least percentage was found in the Central region equal to 8.5 per cent in 2009-10. The Eastern region had also the highest percentage share of area under masur, matar and arhar measuring about
83.4, 48.2 and 42.1 respectively in the same year. In the case of urad cultivation, least percentage of area has been recorded in Western and Buldelkhand region in different comparative years. As far as the growth pattern of pulses in various regions is concerned, Bundelkhand region has recorded highest growth rate of 3.7 percent in the period 1991-2010. Among the pulses, the highest compound annual growth rate of 12.3 per cent per annum in area under urad has been registered in Bundelkhand region in the same period. In case of total oilseeds, the Eastern region has the highest area under its cultivation which was 290.9 thousand hectares in 2009-10. The Eastern region has also recorded highest area under rapeseed and mustard cultivation and the lowest area has been recorded in Bundelkhand region in 2009-10. The percentage share of area under total oilseeds of Eastern region was 42.7 percent in 2009-10. The highest compound annual growth rate of 5.2 percent has been estimated for the area of groundnut in Bundelkhand region in the period 1991-2010. All the regions have experienced the negative growth rate in the area of one or other type of oilseeds in the same period.

The production of foodgrain has increased over the comparative years in Uttar Pradesh from 35521.7 thousand metric tones (TMT) in 1991-92 to 44137 TMT in 2001-02 while it has slightly declined by 44023.5 TMT in 2009-10. The production of non-foodgrains has also increased from 124575 TMT in 1991-92 to 136352 TMT in 2001-02 and 137616 TMT in 2009-10. The compound annual growth rate in production of foodgrains showed sharp decline from 2.4 per cent per annum in 1991-2001 to 1.0 per cent per annum in 2001-10. However the production of foodgrains increased with a rate of 0.9 per cent per annum in the period 1991-2010. The growth in the production of non-foodgrains decelerated between the two periods with a growth of 0.4 per cent in 2001-10 as compared to 1.1 per cent per annum in 1991-2001. Among the crops, production volume of sugarcane is the highest in the state. The production of wheat has the second place in the state after the sugarcane. Analyzing the compound annual growth rate, during the period 2001-2010, cotton, sugarcane and pulses showed deceleration in their growth over the period 1991-2001. Alternatively, the growth rate of non-foodgrain crops namely; vegetables, fruits and oilseeds esp. sunflower seeds have shown acceleration in their growth in 2001-10 over the period 1991-
2001 in Uttar Pradesh. By economic region wise, production of rice has been recorded highest and lowest in Eastern and Central region respectively in 2009-10. The highest production of wheat has been recorded in Western region in 2001-02 and 2009-10. Western region has also recorded the highest production of barley in 2001-02 and 2009-10. It is observed that Bundelkhand region has recorded highest production of jowar in each comparative year. The highest production of 143.9 and 1006.7 thousand metric tones (TMT) of bajra and maize has been recorded in Western and Eastern regions respectively during 2009-10. The highest percentage share (37.5 percent) of total cereal production has been estimated in Eastern region. The highest compound annual growth rate of 5.2 percent in case of total cereal production has been estimated for Eastern region in the period 1991-2010. Among the cereals, the maize production has accounted the highest growth rate of 14 percent in Bundelkhand region in the same period. In case of production of total pulses, the Eastern region has been the highest producing region of the state, production of which has been estimated to be 967.4 TMT in 2009-10. Among pulses, the highest proportion was of masur amounting to 769 TMT in the same year. The percentage share of production of total pulses and particularly masur in Eastern region has been estimated to be 64 per cent and 83.4 percent respectively. The highest growth rate in case of total pulses has been estimated to be 2.2 percent for Eastern region. Among different pulses, the highest growth rate of 10 percent in case of urad production has been experienced in Bundelkhand region in the period 1991-2010.

In case of total Oilseeds, the highest production was reported by the Eastern region estimating about 201.1 TMT in 2010 in which the major chunk was shared by rapeseed and mustard which amounted to 190.7 TMT. The percentage share of eastern region in total oilseeds was 32 percent in the same year. The compound annual growth rate of production of total oilseeds has been estimated to be positive only for eastern region equal to 2.6 per cent in the period 1991-2010. In case of rapeseed and mustard production only the Eastern region has shown positive growth rate in each period and Bundelkhand has shown negative growth rate in all periods. The yield of foodgrains has decreased with the rate of 3.22 per cent per annum during the period 2001-2010, as compared to (-)1.02 per cent per annum in 1991-2001 in Uttar Pradesh. The growth rate of
yield of non-foodgrains has improved in 2001-10 (1.9 per cent per annum) over the period 1991-2001 (-0.2 per cent per annum). Among the various crops sugarcane registered first position followed by vegetables, fruits, wheat, rice and total pulses during all the three comparative years, i.e. 1991-92, 2001-02 and 2009-10. During the period from 1991-92 to 2009-10 that yield growth rate of rice, wheat, maize, barley, jowar, bajra, rapeseed and mustard, sunflower seeds, cotton, fruits and vegetables in Uttar Pradesh had been positive. The growth in productivity of sunflower was maximum in this period followed by cotton, bajra, fruits, rapeseed and mustard, vegetables, wheat, maize, jowar, rice and barley. By economic region wise, the yield of rice, wheat and barley has recorded highest in Western region in each comparative years. The yield of jowar has been recorded highest in Eastern region in 2001-02 and 2009-10. In case of bajra and maize the highest yield of 17.8 quin/hac and 22.3 quin/hac respectively was recorded in Western regions in 2009-10.

In the period 1991-92 to 2009-10, all the regions of Uttar Pradesh has recorded negative growth rate of yield of rice except Eastern region. In case of yield of Pulses, the Eastern region ranks first among the four regions of the state, which reported the yield of 19.9 quintal per hectare in 2009-10. Among the pulses, the highest yield has been estimated to be 11.9 quintal/Ha for arhar in the Central region. The compound annual growth rate of yield of total pulses has been estimated to be negative in all regions in the period 1991-2010. The highest yield growth rate among different pulses has been recorded for arhar in Central region of the state. The growth of yield of urad has decreased by -0.9 per cent in 1991-2001, but increased by 5.8 per cent in 2001-10 and by 0.4 per cent in overall period of study. In case of yield of Oilseeds also, the Eastern region has shown the highest value of about 10.5 quintal/Ha and the lowest yield of 4 quintal/Ha was reported in Bundelkhand region in 2010. Among oilseeds, the maximum yield of 16.6 quintal/Ha was recorded in case of sunflower in Central region in the same year. The compound annual growth rate of yield of total oilseeds has been turned out to be negative in all regions of the state in the period 1991-2010. The maximum yield growth rate among the various oilseeds has been estimated to be 5.2 per cent for sunflower in the Central region.
5. Regional disparity and agricultural growth in Uttar Pradesh

Due to different endowment of natural resources like soil fertility and water resources, Uttar Pradesh has been divided economically into four regions namely, western, central, eastern and Bundelkhand region. There are sharp variations in the levels of economic and social development across the four regions of the state. This inter-regional variation also exists in case of agricultural development. The agricultural disparity between four economic regions of Uttar Pradesh has been assessed by comparing their Index for Agricultural efficiency (IAE). A one-way ANOVA was applied on a time-series data to compare the mean level of IAE of four regions of the state. The assumption of homogeneity of variance across groups has also been tested through the Levene test for homogeneity of variance. The SPSS results showed that there was no significant violation of this assumption: $F (3, 72) = .176, p = .912$. Apart from this, the overall $F$ for the one-way ANOVA has been found statistically significant: $F (3, 72) = 404.380, p < .05$. This means that there was at least one inequality between any two regions of the state. The Tukey HSD test (using $\alpha = .05$) showed that all the regions differ significantly from each other in their agricultural efficiency. It has been found that the Bundelkhand region ($M = 0.48$) scored significantly lower on IAE than all three region. “The Eastern region” ($M = 0.84$) was significantly less agriculturally efficient than the “Central region” ($M = 1.0$). “The Western region” showed a mean level of IAE ($M = 1.4$) which was significantly highest among four regions of Uttar Pradesh.

6. Factors of agricultural growth in Uttar Pradesh

The average size of land holdings in Uttar Pradesh has been reduced by 6.3 per cent between two census period (from 2005-06 to 2010-11) and reached at very small size i.e. 0.75 hectares in 2010-11 (GOI, 2011). Uttar Pradesh witnessed fast increase in the number of small and marginal operational land holdings from 179.5 lakh in 1991 to 211.8 lakh in 2010-11, thereby making their land operationally non-viable. In the state more than 92 per cent of the land holdings consist of small and marginal farmers. The percentage of number of marginal land holdings increased from 73.9 per cent in 1991 to 79.2 per cent in 2010-11. As a result, this led to rise in the percentage of total area of operational
holdings of marginal class from 31.4 per cent in 1991 to 39.3 per cent in 2010-11. According to input survey of 2006-07, the percentage of credit from Primary Agricultural Credit Societies (PACS) and Primary Land Development Bank (PLDB)) to the total institutional credit for agricultural purposes has decreased from 47.9 per cent and 23.2 per cent in 1991-92 to 14.8 per cent and 10.4 per cent respectively in 2006-07. On the other hand the percentage share of Commercial Bank branches (CBB) and Regional Rural Bank branches (RRBB) have increased from 12.3 percent to 24.6 per cent and 17.8 per cent to 50.2 per cent respectively during the same period. The percentage change of no. of operational holdings taking financial credit from commercial banks for agricultural purpose was 195 per cent during the period 1991-92 to 2006-07 and in case of RRBs, this was a remarkable 408 per cent. The percentage decline in the no. of operational holdings that took credit from PACs during the period 1991-92 to 2006-07 was 23.3 per cent and that in case of LDBs was 55.1 per cent.

The net sown area (NSA) and gross cropped area (GCA) in the state have witnessed the negative compound annual growth rate of 0.3 per cent and 0.1 per cent per annum respectively during the period 1991-2010. The cropping intensity (CI) in the state has increased from 146.2 per cent to 153.4 per cent during 1991-92 to 2009-10 with the compound annual growth rate of only 0.3 per cent. The Net irrigated area (NIA) in Uttar Pradesh has increased from 10661 thousand hectares (Tha) in 1990-91 to 13457 Tha in 2009-10. The compound annual growth rate of NIA was 1.13 per cent per annum during the same period. The mechanization of agriculture in the state has also taken place at a greater scale such as the no. of tractors has increased from 0.34 million in 1993 to 0.73 million in 2007. The number of tractors per 1000 hectare gross sown area has also increased from 20 in 1993 to 29 in 2007. In a total of 22.4 million operational holdings estimated in the state, 63.9 percent holdings were using ploughs (wooden/steel), 31.1 percent, the pumpsets (diesel/electric) and 69.1 percent, the power tractor during the period of input survey, 2007. The proportion of holdings using tractor was the highest (97 percent) in large holdings followed by medium (96.3 percent), semi-medium (95.2 percent), small (80.8 percent) and Marginal (64.2 percent). The electricity consumption for agricultural purposes in Uttar Pradesh decreased (in terms of CAGR) with the rate of 15.8 per cent per annum
during 1990-91 to 2009-10 while the total electricity consumption has increased with a rate of 1.8 per cent per annum during the same period. According to input survey of 2006-07, only 3.7 per cent of the farmer’s households are irrigating land by using electric pump sets in Uttar Pradesh. The total number of storage units of all agencies combined in the state has increased from 261 in 1991-92 to 348 in 2010-11 and that storage capacity has increased from 4144 TMT to 7834.3 TMT in the same period. The total road length in the state has increased from 71773 kilometer in 1990-91 to 170951 kilometer in 2009-10. The estimated compound annual growth rate of road length stands at 4.2 per cent per annum during that period. The demand for quality/certified seeds in the state was 55.25 lakh quintals with supply of only 46.63 lakh quintals during 2010-11, leading to deficiency of 8.62 lakh quintals. Among the type of fertilisers, nitrogenous fertiliser is the most widely used in the state followed by phosphatic and potassic one. The use of potassic fertilisers has increased with maximum compound annual growth rate of 10.4 per cent in the period 1990-91 to 2009-10. The growth rate of nitrogenous and phosphatic fertilisers has been 2.8 and 5.9 per cent respectively during the same period.

The pesticides consumption in the state stands at 8839 metric tonnes (MT) in 2011-12 in which 3380 M.T. was utilized in kharif season and 5459 M.T. in rabi season respectively. The decadal fall in the growth rate of agriculture is more severe than that of population. The growth rate of agriculture declined from 37.5 per cent in the period 1981-1991 to 22.3 per cent in 2001-2011 whereas in case of population, it has declined from 25.6 per cent to 20.1 per cent between the same periods. The literacy rate has increased from 41.6 per cent in 1991 to 69.72 per cent in 2011. Improvement is noticed both in male and female literacy rates. The poverty ratio in the state declined in rural areas from 42.28 per cent in 1993-94 to 39.4 per cent in 2009-10, while in urban areas, it has declined from 35.39 per cent to 31.7 per cent during the same period. And the total poverty ratio in the state declined from 40.8 per cent in 1993-94 to 37.7 per cent in 2009-10.

The improvement in all these institutional, infrastructural, technological and socio-economic factors has helped the agricultural sector in Uttar Pradesh to develop more rapidly. The simultaneous multiple regression method has been
used in the present study to find the effect of some input variables on the agricultural growth in the form of increment in GSDP agriculture. The estimates of regression parameters reveal the impact of predictor variables on the growth of GSDP agriculture. The overall regression, including all nine predictors taken in the present study, has been statistically significant, $F (9, 5) = 13.84, p < 0.005.$ Further the model explains about 96 per cent variation in GSDP agriculture ($R^2 = 0.961$, adjusted $R^2 = 0.892$) but none of the included variables turned out significant statistically at 5 per cent level of significance. It means that various factors have influenced the agricultural growth in Uttar Pradesh collectively and not individually.

7. **Major findings of the study**

Major findings of the study may be summarized as follows:

1. The interstate variation in India is more pronounced in case of growth of agriculture sector in comparison to other sectors of the economy which is evident from higher coefficient of variation in CAGR of NSDP-agriculture than that of secondary and tertiary sectors ($C.V._{Agri} = 51.5; C.V._{Secondary} = 29.4$ and $C.V._{Tertiary} = 20.3$).

2. There is also wide variation among the states of India in CAGR of value of crop output ($C.V. = 114.3$) and value of yield ($C.V. = 77$).

3. The share of foodgrain in total cropped area in the country reduced from about 66.3 percent in TE 1993-94 to about 63.8 percent in TE 2009-10. On the other hand, share of non-foodgrain in total cropped area increased from 25.8 percent to 29.5 percent between the same periods.

4. The value of agri-exports to total exports of the country has been ranging between 10 to 20 per cent between the period 1991-92 and 2010-11. The share of agriculture in total export of India was about 9.7 percent in 2010-11.

5. The compound annual growth rate of area under foodgrains in Uttar Pradesh has decreased from 0.3 per cent per annum in the period 1991-2001 to 0.1 per cent per annum in the period 2001-2010. The growth rate of area under non-foodgrains increased from -2.3 per cent per annum to 0.8 per cent per annum between the same period.
6. The compound annual growth rate of production of foodgrains in Uttar Pradesh has declined from 2.4 per cent per annum in the period 1991-2001 to 1.0 per cent per annum in the period 2001-2010. However the production of foodgrains increased with a rate of 0.9 per cent per annum in the whole period 1991-2010. The growth in the production of non-foodgrains decelerated between the two periods with a growth of 0.4 per cent in the period 2001-2010 as compared to 1.1 per cent per annum in the period 1991-2001.

7. The yield of foodgrains in Uttar Pradesh has decreased with the rate of 3.22 per cent per annum during the period 2001-2010, as compared to (-1.02 per cent per annum in the period 1991-2001. The growth of yield of non-foodgrains has improved in the period 2001-2010 (1.9 per cent per annum) over the period 1991-2001 (-0.2 per cent per annum).

8. There has been found significant regional disparity in Uttar Pradesh. It has been established statistically that the four economic regions of the state differ significantly from each other in their level of agricultural performance, measured by Index for Agricultural efficiency (IAE).

9. Various factors of production have played significant role in the agricultural development of Uttar Pradesh. The importance of input factors has been evaluated by running a simultaneous log linear regression model on GSDP agriculture. The overall regression, including all nine predictors taken in the present study, has been statistically significant. Further the model explains about 96 per cent variation in GSDP agriculture but none of the included variables turned out significant statistically at 5 per cent level of significance. It means that various factors have influenced the agricultural growth in Uttar Pradesh collectively and not individually.

8. Suggestions

(1) There is an urgent need to develop agricultural infrastructure to meet the rising demand in India for food grains and other Agri-products. Setting up storage and processing facilities for our farm products is one big issue that needs to be tackled by the policy makers in the country. Building of rural roads, rural
telecom and rural electrification need to be accelerated and coordinated. Farm subsidy amounts to about Rs. 1 lac crore. The sector can be better off if this were to be spent as investment towards the development of infrastructure towards agricultural sector.

(2) It is also necessary for strengthening of agricultural research and technology development and institutional support system. There is an urgent need for augmenting the physical and economic connectivity of farm to market, post harvest operations including the role of food processing industries and ultimately enhancing farmers income, rural employment security and inclusiveness. Reform should be taken up to encourage private sector investment in agriculture.

(3) There is an urgent need to establish a trained and dedicated cadre of agricultural extension workers. The State governments should fill up vacancies of extension personnel in agriculture, horticulture and allied departments within a reasonable time frame to tackle the problem of manpower shortage.

(4) A national network of advanced soil testing laboratories should be established to promote balanced nutrient application and advise the micro nutrient deficiencies to the farmers.

(5) The flow of credit, particularly to small and marginal farmers should be made speedier and hassle free. Whether based insurance products should be promoted to increase the coverage which is now at a nascent stage. It is also necessary to ensure timely availability of quality seeds and agro chemicals to the farmers at the time of their need.

(6) An aggressive strategy for a paradigm shift in fertilizer policy is required. The state governments should consciously promote and facilitate the production and usage of bio fertilizers, vermin composting, green manuring and other eco friendly fertility enhancing activities

(7) Appropriate policy interventions are needed to transfer the benefits of the price rise to the farmers and at the same time to strengthen social safety programmes to assure access to food on part of the poor. The state government should abolish the Mandi tax and allow direct sourcing of farm produce by agribusinesses and organised retails and hence reduce several rounds of
transportation and loading and unloading costs etc. The MSP must be fixed for all major commodities and implemented judiciously throughout the country.

(8) Linkages with agro-industries are also necessary to proper handling and consumption of the agricultural produce. The links to agro-industries such as biomass power plants, bio-fuels and edible oils can provide an assured market to farmers at remunerative prices and generate significant non-farm employment opportunities.

(9) Crop yields can be increased through the introduction of technologies such as drip irrigation or through education and training of farmers. Further innovations like bio-fuels and drought tolerant crops will further contribute to sustainable production efficiencies.

(10) Immediate attention and action is needed in relation to improving the productivity of wheat, rice, pulses and oilseeds in the Indo-Gangetic plains and eastern India, including eastern Uttar Pradesh. In most of these areas, water management and not water availability is the major constraint in productivity improvement.

(11) Low yield areas such as in Eastern and Bundelkhand region are to be demarcated and an analytical measurement should be taken up to find out the reasons of yield gap and low factor productivity. Local farmers and private money lenders should come forward and extend their cooperation with the government officials in conducting various surveys relating to the growth of production in the agricultural sector

(12) Advanced techniques for rain-water harvesting coupled with improved methods for water management can dramatically improve the productivity of both irrigated and rain-fed cultivation in the country. The next green revolution would emerge from improvement in rain-fed agriculture technology aimed at developing systems with low water requiring crops and breaking the crop-yield barriers.

(13) Organic farming and use of bio-pesticides have to be encouraged as it will help recharge the soil that has been exhausted by excessive use of chemical fertilisers and this in turn may reduce the risks of crop failures. Organic farming
(14) Diversification is a key issue to address the challenges of climate change and drought. Diversifying the existing cropping patterns from traditional wheat-rice to include more foodgrains, vegetable crops, horticultural crops, plantation crops and

(15) There is need for accelerated emphasis for area expansion and productivity enhancement in horticulture. Horticulture is the key component to increase the agriculture growth to more than 4 per cent in coming Five-Year Plans.

(16) The establishment of a large number of village-based farm schools should be promoted throughout the country, mostly as private institutions supported and supervised by government. All agro-industries, KVKs, agricultural colleges and research institutes should set up village based farm schools on lands leased from farmers. Also the agri-preneurship development may be made part of agriculture curriculum in agriculture universities.

(17) The Self-Help Groups should be promoted to adopt farming ventures such as dairy farming, mushroom production, fish production, beekeeping and food processing. These SHGs can also take the task of input delivery among the group members, contract farming and marketing of their produce.

(18) Community Radio station for agriculture and rural development should be promoted in Public-Private Partnership model. Community radio, Call centres and Mass media need to be harnessed for wider dissemination of best practices. Village Knowledge Centres, and online databases in local languages should be established.

(19) There should be increased practice of Crop rotation which allows varied nutrient demand and rooting depth thus reducing nutrient mining. This encourages the presence of a wider variety of organisms, improves nutrient cycling and improves natural processes of pest and disease control.

(20) There should be a national level Task Force to draw guidelines for convergence in planning and implementation at district level of major flagship
programmes of the Central Government like Rashtriya Krishi Vikas Yojana, National Horticulture Mission, Food Security Mission with Mahatma Gandhi National Rural Employment Guarantee Scheme. The Task Force should ensure that dedicated officials with fixed term of not less than two years of tenure should be entrusted such responsibility with defined objectives.

(21) Krishi Vigyan Kendras should work in a holistic approach with agriculture, horticulture and other sister departments in the district for effective delivery of the technology and inputs in an effective way. They should meet every quarter to discuss their input delivery and technology dissemination strategies in an effective manner.