CHAPTER-5

FACTORS AFFECTING AGRICULTURAL DEVELOPMENT IN UTTAR PRADESH
CHAPTER – V
Factors affecting agricultural development in Uttar Pradesh

5.1. Importance of factors in growth performance of agriculture sector

The adoption of green revolution technologies undoubtedly led India towards attainment of self-sufficiency in foodgrains production but also caused regional variations across the country. The instability in foodgrain production across crops has been found to depend significantly on the ‘irrigation coverage’ of a crop. Due to variations in climatic conditions, natural resource endowments, institutions, infrastructural developments, population density, etc. pattern of agricultural growth and reaction to various stimulus have varied across states some states have followed the same pattern as at the national level while others have depicted a pattern totally of their own. The state level data shows that yield variance has been a major source of instability in foodgrains production in most of the states. Uttar Pradesh has also been able to bring down instability in foodgrain production in recent period. The state has also lagged behind its targeted agricultural growth of 5.7 per cent set out in Eleventh five year plan.

This low agricultural growth rate in India is due to many problems surrounding the agriculture. C.H.H. Rao (2005)\(^1\) analyzed the agricultural growth from the first decade of the plan period and suggested the continued need for provision of irrigation facilities, strengthening of extension services, developing biotechnologically improved seeds along with adequate supply of institutional credit to raise farm productivity and profitability. Bhatia (1999)\(^2\) established a strong relationship between rural infrastructural development and level of per hectare yield of foodgrain as also of the value of output from agriculture. Mahendra Dev (2002)\(^3\) argued that there is a greater need for public investment in agriculture, irrigation, credit availability, better marketing of agricultural products, research and development (R and D) along with adequate pricing and other incentives for private investment that would help reviving the agricultural growth. It was also observed that throughout the 1990’s, the share of agriculture
in gross capital formation has remained a single digit which explains the slackness of its growth momentum during the past decade. Gulati and Bathla (2001)\textsuperscript{4} observed that there has been an increasing role played by private sector investment in this sector. Public sector investment along with terms of trade has an inducement effect on private sector capital formation. Desai (2002)\textsuperscript{5} suggested that government expenditure should be focused on agricultural R and D, education and extension services, rural electricity and marketing, irrigation and watershed development etc. Reddy and Reddy (2005)\textsuperscript{6} emphasized that there is a need for devolution of powers to water user associations for important functions like assessment, collection of water charges, sanctioning of works etc. Rao and Gulati (2005)\textsuperscript{7} showed that public sector capital formation in agriculture as a proportion of total capital formation in agriculture declined in the recent past as compared to the 1980s. The authors emphasize the need to reverse this trend and increase public investment in agriculture so as to be able to increase the growth in the sector. According to Shariff and Mallik (1999)\textsuperscript{8}, the Indian food basket has changed drastically since 1973-74. Both the share of cereals in the food basket has decreased in rural and urban areas, while the share of other items has increased. This also has reduced the incentives to growth of cereal production. Bhalla and Hazell (2003)\textsuperscript{9} observed that there is a secular decline in the employment elasticity in agriculture over time. One more incentive to the growth of agricultural production is that, despite output per worker increasing in the non-agricultural sector, this increased income causes the demand to increase only for white and luxury goods—imported or otherwise and not for agricultural products because the increased income accrue mostly to managerial profits and salaries of the upper classes whose demand for wage goods is relatively satiated, as observed by Chandrasekar (2006)\textsuperscript{10}.

After the advent of green revolution, Uttar Pradesh faced a number of socio-economic constraints as a result of which, it has lost its leading position in the production of foodgrains after the green revolution. The model of green revolution was mostly successful in some pockets in the northwestern states and it has not widely covered Uttar Pradesh. Various studies also advocate that in terms of development indices, Uttar Pradesh is among the backward states in the country with a number of socio-economic constraints. The poor agricultural
performance in this states is largely due to tiny and fragmented land holdings, higher population density, low per capita income, higher poverty ratio, lower literacy rate, poor infrastructural development (poor road network, poor power supply, poor irrigation facilities and poor extension services). On the other hand, most part of Uttar Pradesh lag behind the rest of India with respect to several institutional, organizational and technological factors. The cumulative result of inadequacy of these factors arose in peculiar subsistence farming with low inputs, low productivity, and low risk technology. Besides, erratic weather conditions, poor adoption of technology, traditional method of farming, low irrigation coverage, deviation in rainfall, high dependency on cereal based (mainly concentrating in wheat and rice production) farming system forced the farmers to adopt the subsistence farming (Rani, 2010).11

Uttar Pradesh is characterized by abundant natural resources like; diverse agro-climatic conditions, varied soil type and abundance of rainfall which has immense scope for growing the varieties of horticulture crops (Basu, 2008).12 Despite being of this, degree of agricultural diversification is much less in Uttar Pradesh. Thus under this situation, this calls for the change in cropping pattern from low value subsistence farming to high value i.e. multi-cropping pattern. Various studies (Jorge and Valdes, 1995; Chand, 1999; Joshi et al., 2004; Jana, 2006) also suggested that the agriculture diversification may be a means of rapid development in the country in order to solve all the economic ills.

However, in Uttar Pradesh, majority of the farmers are small and marginal, cultivating mainly low value subsistence crops. Previous study also found that the "production of high value commodities is capital, technology and information intensive and is more risky compared to staple foods, while small and marginal farmers are resource constrained and risk averse. Further, a lack of access to markets is also a major limitation to small diversification towards high value horticultural crop. Marketable surplus with small farmers is tiny, while local rural markets are thin, and selling in distant urban markets is costlier" (Birthal, et al, 2008).17 The study has attempted to identify the important factors that affect agricultural growth in Uttar Pradesh. The basic factors affecting the agricultural growth in Uttar Pradesh can be categorized as following:
5.2. Institutional factors

5.2.1. Land Holdings

India is a country of rural economy and it is predominantly agriculture-oriented. In addition, more than 82 per cent of the farmers belong to the small and marginal farmers' category and these farmers have less than 2 hectares of land (GOI, 2011)18. "Such tiny holdings by large majority of the farmers are neither viable nor sustainable for a country with billion plus mouths to feed and the continuous decline in the average size of land holdings also creates a serious problem (Kumar, 2010)19.

Echoing the national trend, the average size of land holdings in Uttar Pradesh has also been reduced by 6.3 per cent over previous census (from 2005-06 to 2010-11) and reached at very small size i.e. 0.75 hectares in 2010-11 (GOI, 2011a)20. This is due to rapid increase in the population as well as number of operation holdings thereby reducing the average size of holding and making them non-viable. In addition to this, fragmentation of land holdings, lack of off-farm occupations and inheritance laws of an equal division of property among heirs, lead to the division of land into small blocks. Such small holdings are often over-manned, resulting in disguised unemployment and low productivity of labour. Moreover, there are several tenancy restrictions in many states. These restrictions range from a complete ban in some states to complete freedom of leasing in some states. There is growing consensus about the need to have a re-look at current tenancy legislation, which sometimes restricts participation of private sector in agriculture. However, under the Indian Constitution, land administration falls under the state governments hence there is large variations across states. Furthermore, skewness in land distribution continued to be serious in these states.

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. However, these small and marginal farmers have the poor economic base. Consequently it has an adverse effect on the growth of agriculture sector in the state. This is because the average cost of cultivating the crops on tiny land holdings is higher as compare to
the cultivation of crops on large land holdings. However, the small and marginal farmers are more efficient in producing the vegetables on per hectare of land due to surplus labour and quick returns. Therefore the growth of agriculture sector can be spurred in the state with active support of government to these small farmers in this direction.

Figure- 5.1: Number and area of operational holdings (categories wise) in Uttar Pradesh.

Source: Input survey, Ministry of Agriculture, GOI

It can be observed from the figure-5.1(a) and figure-5.1(b) that the percentage of number as well as percentage share in total land holdings of marginal farm households have been increasing throughout the census period from 1990-91 to 2010-11. 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. Apart from marginal class, the percentage of number as well as the percentage of area of operational holdings of all other size groups gradually decreased from the agricultural census year 1991 to the census year 2010-11 as shown in the figure-5.1. Thus, this high fragmentation of land restricted and hindered dissemination of modern technology in the agriculture. Apart from characterised by the largest proportion
of small land holdings among all size class, there is also high incidence of
tenancy cultivation in Uttar Pradesh dominated largely by absentee landlords.
This has further choked the growth prospects of the state because such small
segments of land remained out of investment.

5.2.2. Agricultural Credit

Credit is the backbone for each sector of the economy. Credit is one of the
vital prerequisite of the farmers, which facilitate them to meet the investment as
well working capital requirements. Poor credit facilities for investment are an
important hindrance to expansion of area under HYV seeds and the use of
optimal measured quantity of inputs. Like other sectors, availability of credit for
the agriculture sector must be easy, adequate, and timely. Despite of a large
network of Rural Financial Institutions (RFIs), a large portion of the rural
population is continuously neglected by the formal banking sector in India. On
the other hand, inflexible credit flows and security-based lending system is
widespread in formal Indian banking sector. Besides, "due to long gestation
period, lack of trained technical staff to identify the potential activity in this field,
poor eligibility and security problems are some of the reasons behind insufficient
credit flow to agriculture sector. It must be rectified for speedy and easy flow of
the credit to the agriculture sector.

It is obvious from the Fig-5.2(a) that the percentage of credit from
Primary Agricultural Credit Societies (PACS) to the total institutional credit for
agricultural purposes has decreased from 47.9 per cent in 1991-92 to 14.8 per
cent in 2006-07. In the same way the contribution from Primary Land
Development Bank (PLDB) has also decreased from 23.2 per cent in 1991-92 to
10.4 per cent in 2006-07. On the other hand the percentage share of Commercial
Bank branches (CBB) and Regional Rural Bank branches (RRBB) in total
institutional credit for agricultural purposes 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. It is also evident from figure-5.2(b) that the no. of operational holdings
taking credit from PACS and LDB for agricultural purpose have decreased over
the years from 1991 to 2006-07 while that from the Commercial Bank branches
and Regional Rural Bank branches have increased during this aforesaid 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 the same in case of RRBs was a whopping 408 per cent.

**Figure 5.2:** Availability of institutional credit in Uttar Pradesh.

![Figure 5.2](image)

**Source:** Input survey, Agricultural census (www.agricoop.nic.in)

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. It is evident from the fact that most of the agro-machine are costlier, which is beyond the purchasing power of the farmers in Uttar Pradesh. This is primarily because more than 91 per cent farmers fall in the small and marginal farmers categories and almost half of them live in abject poverty. Hence, Uttar Pradesh on this front requires proper treatment from the commercial banks (CBs) and RRBs and urgent need to establish the cooperative banks in all the districts to boost the agricultural activities in the state.
5.3. **Infrastructural Factors**

Infrastructure is the cornerstone for any growth performance in agriculture sector. Infrastructural facilities relate to various types of farm implements and machinery and other structures like tractors, pumpsets, cold storage facilities, adequate supply of power, good rural-urban road network, efficient transportation, developed agricultural marketing and other technological advancement. The availability of these inputs and their skillful utilization maximize the benefits of the farmers which in turn has a positive impact on the growth of agriculture sector. However, the presence of these facilities is highly inadequate in the country and there is large inter-state disparity in their use which has led to dismal agriculture performance in India.

5.3.1. **Net and Gross Cropped Area**

Uttar Pradesh has shown stagnation in the increment of its Net sown area (NSA) and gross cropped area (GCA) during the period of 1991-92 to 2009-10 (Figure-5.3). The net sown area has increased only slightly from 16430 thousand hectare in 1991-92 to 16589 thousand hectares in 2009-10. Similarly the gross cropped area has increased marginally from 24015 thousand hectare to 25440 thousand hectare in the same period. In fact the NSA and 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 this period. This is because of continuous rise in population which led to increase the encroachment of agricultural land for the non- agricultural purposes like rural habitations, forestation, urbanization and industrialization etc. and secondly due to rapid increase in the number of small and marginal operation holdings which leads to adverse impact on land-man ratio. Other reasons for negative growth rate of net sown area may be increase in the fragmentation of land holdings due to equal distribution to heirs as well as due to family sub-division and continuous increase in the fallow land and it makes them non-feasible and undividable for technological use. Therefore, it can be suggested that "the area under crops can grow either through increase in net area sown or through increase in intensity of cultivation. Since a limit has been reached with regard to the possibility of increasing net sown area on a substantial scale, the only method of increasing GCA is through increased intensity of
cultivation brought about through irrigation and through the introduction of short duration crops" (Bhalla and Singh, 2010).21

This has raised serious concerns about the sustainability of land resources. 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 stagnation in the cropping intensity leads to the limited scope for the agricultural development. For achieving the required goal of agricultural development in the state, irrigation facilities is a pre-requisite which would likely to help in increasing gross cropped area as well as cropping intensity.

5.3.2. Irrigated Area

Considering the importance of irrigation in the growth of agriculture and allied activities in the state, attention needs to be focused on the development of irrigation in the state. The Figur-5.4(a) shows the increasing trend of irrigated area in Uttar Pradesh. The 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 (CAGR) of NIA was 1.13 per cent per annum during the same period. The gross irrigated area has also increased from 14771 thousand hectares in 1990-91 to 18896 thousand hectares in 2009-10. It has witnessed a compound growth...
annual growth rate of 1.7 per cent during this period. As far as the sources of irrigation are concerned, the maximum cropped area is irrigated in Uttar Pradesh by tubewells and wells and further the use of tubewells and wells has increased over the years from 1990-91 to 2009-10 (Fig-5.4b). The canals are used for irrigation in the second place and it has shown declining trend during the same period as is evident from the figure. Thereafter tanks and lakes are the main source of irrigation in the state. Currently about 80 per cent of irrigation work is being done by tubewells and wells and 19 per cent by canals and remaining 1 per cent is done by tanks, lakes and other sources.

**Figure 5.4: Net irrigated area in Uttar Pradesh.**

It can be estimated that about 81 per cent of net cropped areas are irrigated in the state during the year 2009-10. The percentage of irrigated area in both NIA to NSA and GIA to GCA has increased in the state between 1991-92 and 2009-10. The percentage of NIA to NSA was increased from 61.6 per cent in
1990-91 to 81.1 per cent in 2009-10. Similarly the percentage of GIA to GCA has increased from merely 58 per cent to 74.3 per cent in the same period. Among the various crops, area under wheat occupies the fist place in Uttar Pradesh which is irrigated most widely. In the second place it is the area under the rice and in third place it is sugarcane which is widely irrigated. Although irrigation expansion seems relatively good as revealed by these data, the Government expenditure on the development of irrigation facilities is poor while private investment in ground water exploitation has been found to be significant in the state. Finally, still more than fifty per cent of gross cropped area seems to be rainfed area and it depends on the gamble of monsoon. This is the matter of concern before the policy makers in the state.

In the Union Budget 2010-11, Government of India has identified that the eastern region has the ample potential for growing all kinds of crops. In this regard, the Government of India outlined the strategy that the green revolution in the farm sector is to be extended to the eastern region of the country, which also comprises the eastern part of Uttar Pradesh, with active involvement of gram sabha (Srinivasan, 2010)\textsuperscript{22}. For achieving this target, it is pre-requisite to induce the investment for the development of irrigation facilities in the state. Hence, development in the irrigation infrastructure may enable to use as much as 60 per cent of its gross cropped area under multi-cropping system which will lead to rapid agricultural growth in the state.

5.3.3. Farm Mechanization

The implements used for agricultural operation help in reducing the time and enhance the efficiency of operations. Several activities have to be performed in the process of crop production which requires more power, time and skill. The modern Agriculture Implements are the need of hour. The lack of proper and adequate mechanization obstructs timely completion of farming operations. Hence, it is needed to improve these hindrances for the upliftment of agrarian society. In addition, it is vital to encourage farm mechanization that will lead to better and well-timed land operation and cultivation practices. As a result, it will promote the growth of agriculture in Uttar Pradesh. For example a large number
of farmer households still harvest crops by using animal operated implements. This results in huge post harvest losses in agriculture.

The pattern of use of different types of implements and machinery used for farm activities in Uttar Pradesh is shown in the figure-5.5. It is observed that the maximum number of implement used for the ploughing or cultivating purpose was wooden or steel plough in 2007. Bullock cart was also extensively used for agricultural purpose estimated to be about 1 million in the same year. It means that the traditional methods or implements are still widespread in the farming system of the state. Although numbers of plough and bullock carts have been drastically decreased over the years from 1993 to 2007 and instead the usage of tractor drawn mould board plough and the tractors for agricultural purposes have increased during this period as shown in figure-5.5. The number of tractors has increased from 0.34 million in 1993 to 0.73 million in 2007. The number of tractors per thousand hectare gross sown area has also increased from 20 in 1993 to 29 in 2007. The diesel and electric pump sets for irrigation purpose has also increased during this period though the pace of increase of electric pump sets is very slow as compared to diesel pump sets. This is primarily due to inadequate and costly supply of electricity in the state. It means the mechanization of agriculture is taking place in Uttar Pradesh but at a slow pace. Therefore it is pertinent for the state government to devise some mechanism in order to promote the mechanization of agriculture in a faster way.
It can be noticed from the input survey that Uttar Pradesh witnessed a remarkable rise in the use of diesel operated new technology like, tractors, pumpsets, harvesters and thrashers etc.. But in spite of this, the state lags far behind as against the agriculturally developed north western states namely Punjab and Haryana in the use of diesel operated implements in the country.

**Table 5.1:** Estimated number of operational holdings using agricultural implements and machinery.

<table>
<thead>
<tr>
<th>Size Groups</th>
<th>Total number of operation holdings</th>
<th>Number of operational holdings using</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ploughs (Wooden/Steel)</td>
</tr>
<tr>
<td>Marginal: (Below 1.0 ha.)</td>
<td>174938</td>
<td>102486 (58.6)</td>
</tr>
<tr>
<td>Small (1.0-1.99 ha.)</td>
<td>30986</td>
<td>25011 (80.7)</td>
</tr>
<tr>
<td>Semi-medium (2.0 -3.99 ha.)</td>
<td>13882</td>
<td>11638 (83.8)</td>
</tr>
<tr>
<td>Medium (4.0 - 9.99 ha.)</td>
<td>4255</td>
<td>3991 (93.8)</td>
</tr>
<tr>
<td>Large (10.0 ha. And above)</td>
<td>271</td>
<td>219 (80.8)</td>
</tr>
<tr>
<td>All Size Groups</td>
<td>224333</td>
<td>143346 (63.9)</td>
</tr>
</tbody>
</table>

*Source:* same as Figure 5.5

Table 5.1 shows the estimated number of operational holdings using some of important agricultural machineries during 2006-07 in Uttar Pradesh. In a total of 22.4 million operational holdings estimated in the state, holdings using different kinds of agriculture implements/machinery were ploughs (wooden/steel) (63.9 percent), tractor drawn mould board plough (3.1 percent), pump sets (diesel/electric) (31.1 percent), power tiller (1.1 percent), power tractor (69.1 percent), and sprinklers (0.2 percent). 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).

5.3.4. Electricity

Considering the importance of irrigation and its impact on growth and development of agriculture and allied activities, attention needs to be focused on the development of power sector in Uttar Pradesh. 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 2000-01 while the total electricity consumption has increased with a rate of 1.8 per cent per annum during the same period. But there has been improvement in the recent decade as the electricity consumption for agricultural purposes has shown an increasing trend with CAGR of 5.2 per cent during the period 2001-02 to 2010-11. But this lags behind the growth rate in the total consumption of electricity (6.8 per cent) in the state during the same period. The overall growth in the consumption of electricity for agricultural purpose has been negative (-0.7 per cent per annum) as against the growth rate in total consumption of electricity which has been positive (4.9 per cent per annum) during the period 1990-91 to 2010-11. It is of great concern for the development of agriculture in the country. The trend of electricity consumption over the years has been shown in the figure-5.6. The total of 78916 lakh K.W.H. of electricity has been used for agricultural purpose while the total consumption of electricity was 430890 lakh K.W.H. in 2010-11 in the state. The no. of consumers using the electricity in their agricultural activities has also increased from 8796000 in 2001-02 to 11954348 in 2010-11 (GoUP, 2011)\textsuperscript{23}.

The picture is grim as far as the extent of electrification of pump sets as well as the development of ground water irrigation in Uttar Pradesh is concerned. 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. This is because of the poor and irregular supply of power. Further, it is also important to underline that large number of villages in the state are still un-electrified. This is one of the major constraints towards the development of agriculture and allied activities in the state.
Under this circumstances typically, majority of the small and marginal farmers in state are mostly dependent on the costlier rented diesel-operated tube wells or pump sets for irrigation. Due to this high operational cost of diesel engine pump sets and poor economic conditions, the farmers (small and marginal) are incapable to access the pump sets facilities for assured irrigation. Consequently, the crop yield in the state is lower than that of their potential levels. In other words, due to increase in the rental charge with every price hike of diesel, the cost of production increases in agriculture sector. Hence, ground water in the state is not fully utilized due to inadequate, non-availability of diesel and poor maintenance of infrastructure and irregular supply of power.

However, in order to provide the accessibility of electricity to rural people, Government of India has provided the electricity to the un-electrified villages in the country under the scheme of Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY). Under this scheme, 18,734 rural villages have been electrified against the target of 17,500 un-electrified villages. In addition, 47.18 lakh BPL (Below Poverty Line) households have been provided with free electricity connections as against the target of 47 lakh BPL households in the country.
(Srinivasan, 2010a). In spite of this, most of the regions in the state particularly, Eastern and Bundelkhand regions are still un-electrified. It may be said that this scheme has been largely bypassed in many parts of the state. This is the major challenge before the policy makers in the state to implement the central scheme effectively. Thus, the afore-said economic ills that adversely affect the growth and development of agriculture and allied sector should be rectified in the state.

5.3.5. Storage Infrastructure

Uttar Pradesh need a focus on post-harvest technologies, market infrastructure and storage facilities particular in rural areas for proper development of its agriculture sector. Lack of proper infrastructure like, post-harvest handling, transportation, storage and cold storage facilities, destroy about 25 and 40 per cent of our horticultural commodities, like fruits and vegetables which leads to price volatility of these crops particularly potato and onion. Undeniably, sustainable growth in agriculture is to be considered an instrument to generate the additional employment to the rural economy. However, Uttar Pradesh is making a steady progress in providing cold storage infrastructure but it is insufficient to fulfill the requirements. Besides, it is fact that the agricultural produce are basically perishable in nature and lack of rural infrastructure like power, roads and transportations, marketing infrastructure and inadequate processing and post-harvest technologies force the farmers to sell their produce below the cost of its production. Therefore, the development of cold storage along with road and marketing facilities are precondition to the proper growth of agriculture in the state. To recognize the cold storage infrastructure discrepancies,

As the table-5.2 reveals that the number of units of FCI (Food Corporation of India) in Uttar Pradesh has increased to 163 from 73 during 1991-2011. It led to increase in the storage capacity from 4144 thousand metric tonnes (TMT) to 7834.3 TMT during the same period. State Warehousing Corporation has only meagerly increased from 131 to 140, but storage capacity increased to a considerable level of 3156.6 TMT from 1276.7 TMT during the same period. The number of units of Central Warehousing Corporation shows a decreasing trend from 61 units in 1991-92 to 45 units in 2010-11 and its storage capacity has meagerly increased from 923 TMT to 936.3 TMT during the same
period. Nevertheless, total no. of units as well as total storage capacity in the state exhibits a far improved condition during the aforesaid period as the total number of storage units of all agencies combined, 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 that period.

Table-5.2: Agency-wise number and capacity of storage units in Uttar Pradesh

<table>
<thead>
<tr>
<th>Year</th>
<th>Food corporation of India</th>
<th>U.P. state Warehousing corporation</th>
<th>Central Warehousing corporation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Capacity</td>
<td>Number</td>
<td>Capacity</td>
</tr>
<tr>
<td>1991-92</td>
<td>3 (28)</td>
<td>2231 (50.4)</td>
<td>31 (49.4)</td>
<td>1276 (28.8)</td>
</tr>
<tr>
<td>1995-96</td>
<td>4 (12.9)</td>
<td>151 (6.5)</td>
<td>100 (44.4)</td>
<td>1299 (55.4)</td>
</tr>
<tr>
<td>2000-01</td>
<td>4 (35.4)</td>
<td>2797 (48.0)</td>
<td>154 (54.4)</td>
<td>2145 (36.8)</td>
</tr>
<tr>
<td>2005-06</td>
<td>6 (27.3)</td>
<td>1914 (33.9)</td>
<td>156 (56.1)</td>
<td>2866 (50.7)</td>
</tr>
<tr>
<td>2006-07</td>
<td>76 (27.3)</td>
<td>1906 (33.7)</td>
<td>156 (56.1)</td>
<td>2799 (49.5)</td>
</tr>
<tr>
<td>2007-08</td>
<td>84 (29.9)</td>
<td>2483 (40.2)</td>
<td>152 (54.1)</td>
<td>2756 (44.7)</td>
</tr>
<tr>
<td>2008-09</td>
<td>111 (36.0)</td>
<td>2610 (39.7)</td>
<td>152 (49.4)</td>
<td>3031 (46.1)</td>
</tr>
<tr>
<td>2009-10</td>
<td>100 (32.9)</td>
<td>2669 (45.2)</td>
<td>159 (52.3)</td>
<td>3233 (54.8)</td>
</tr>
<tr>
<td>2010-11</td>
<td>163 (46.8)</td>
<td>3741 (47.8)</td>
<td>140 (40.2)</td>
<td>3157 (40.3)</td>
</tr>
</tbody>
</table>

**Source:** Food corporation of India/Central/State warehousing corporation U.P.

Proper cold storage infrastructure is equally important for better upliftment of the agriculture and allied sectors. In Uttar Pradesh, it is operational in all three sectors viz; private sector, cooperative sector and public sector. The number of private sector owned cold storages in Uttar Pradesh are 1501 and storage capacity therein is 8770.5 thousand metric tons (TMT). The number of cold storages in the cooperative sector was 87 and the storage capacity were
281.5 TMT while number of that in the public sector were only 3 and the storage capacity were only 8 TMT (GOI, 2010). The means that the private players are the dominating force in the operation and maintenance of cold storages in the state.

Alternatively, due to economic constraints, farmers are unable to access cold storage facility, even when it is accessible and efficiently managed. Consequently, majority of the farmers rely on almost daily sales of their produce for generating income. This has forced them to accept the lower price which has the direct bearing on the incentives for agricultural production and hence the growth of agricultural sector is jeopardized.

5.3.6. Transportation

The development of any region is quite impossible without the provision of good physical infrastructure. Therefore it is appropriately said that infrastructure is the backbone and basic requisite for the economic development of a region. Availability of good quality physical infrastructure also helps in improving the investment climate in the region. In this regard; proper connectivity and transport links are considered to be most critical for delivery of services, transaction of commerce, and connection with growth centers around the country and therefore has far-reaching implications on the agricultural development in the state.

The economy of Uttar Pradesh is growing faster year on year due to continuous increase in its GDP. This economic development is also the sign of the development of its agricultural sector which is the base of state economy. Among the various infrastructure, road and transportation is significant for the economic development of the rural economy. Rural infrastructure like road connectivity and transport facilities is one of the most crucial mechanism, which has a close link with the reduced transportation cost and market expansion, and thus overall improved agricultural productivity and competitiveness in the economy. "Rural infrastructure and support services play a key role in promoting rural development, in particular enhancing agricultural production. They influence the quality, quantity, diversity, affordability, distribution, and stability of food supply from rural areas" (Yadav, 2010).
The largest means of transportation of goods and services in Uttar Pradesh has been the road network comprised of national highways and roads maintained by P.W.D. department of Uttar Pradesh. Figure-5.7 shows that there has been considerable increase in the total road length in the state maintained by P.W.D. during the period 1991 to 2010. This 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 which is otherwise, not so impressive in such a long period. The area density of road length has increased from 243.8 kilometer to 709.6 kilometer per thousand kilometer square during the same period. The population density of road length has increased from 53.1 kilometer to 87.3 kilometer per lakh population during that period. The number of villages which are linked with road, also increased from 33156 to 71336 during the same period. So now at present, about 72.8 per cent villages are linked with road in comparison to only 29.4 per cent villages which were linked to road in 1990-91.
Besides the road network, there is also an extensive and well-developed rail system passing through Uttar Pradesh and substantial potential exists for development and utilization of inland waterways. Although the progress in the growth of railway route during the period 1990-91 to 2009-10 has been almost null (Fig-5.7). The compound annual growth rate of railway route in the state turns out to be negative with 0.2 per cent per annum during the said period. The total railway route length in the state has been to be 8762 kilometer in 2009-10. Rapid development and strengthening of the road and rail network will provide momentum for accelerating the process of agricultural development in the state.

Overall the present condition and the progress of road and railway connectivity in Uttar Pradesh is not upto the mark. This has led to the huge wastage of agricultural produce which in turn causes price volatility in the market. Therefore, in order to reduce such wastage, major attention has to be given to improve rural infrastructure especially post-harvest technologies and marketing infrastructure. It may be said that high transportation cost is one of the important cause of the low agriculture growth in the state. Hence Inland infrastructure should be strengthened in the state for all round development.

5.3.7. Agriculture Marketing:

Marketing is the key instrument in the development of the agriculture sector. Agriculture marketing includes the movement of agricultural produce from farms where it is produced to the consumers or manufacturers. It also includes the marketing of production inputs like fertilizers, pesticides and other agricultural chemicals, livestock feed, farm machinery, tools and equipment and services to the farmers (Patnaik, 2003)27.

The basic feature of agricultural efficient marketing system is not only to provide the opportunities to purchase the consumer goods but also to provide incentives to the farmers to produce more. It should also encourage true competition among the traders and abolish the exploitation of farmers’ particularly small and marginal farmers. In the market system, farmers sell their agricultural produce directly or indirectly to the consumers and other rural associations. India's agriculture marketing systems are classified into three broad categories namely; (i) Rural Primary Markets, (ii) Secondary/Assembly Markets
and (iii) Wholesale Markets. The rural primary markets cater to the local demand and it is located in nearby village as a *haats* (it also called as *Painth* in Uttar Pradesh). The secondary markets are located nearby the centres of wholesale or nearby production centres which cater to the distant demands, whereas, wholesale markets accumulate large quantity of agricultural produce from different sources, and it caters into small assortment to meet the needs of retailers in the country.

According to the 10th Plan Documents for state of markets in India, "the current market system is dominated by traders. Appropriate and effective linkages between the producers and sellers continue to be weak. The absence of rural road connectivity and other infrastructure, combined with improper management, lack of market intelligence has resulted in a system that is unfavorable to the farmers. The adverse impact of all these is more pronounced in the case of small and marginal farmers who constitute about 75 per cent of the entire farming community. The primary rural markets are the first contact point for the rural producers and sellers. There are over 27 thousand primary rural markets, scattered across the country. These are, however, not equipped with basic facilities such as platforms for sale and auction, electricity, drinking water, link roads, traders premises, facilities for post-harvest management, etc. the private sector and joint ventures for setting up markets need to be encouraged with suitable policies and incentives for free and competitive trade (Chakraborty, 2003)28.

The marketing infrastructure deserves special attention in case of horticultural crops like fruits and vegetables. Because due to perishable nature of horticulture produce, farmers sell their produce immediately after harvest which until reaches the final consumers passes through the various types of intermediaries. This large chain of intermediaries results into high marketing costs which in turn makes the profit margins of small farm growers thin (Prasad, 2008).
5.4. Technological Factors

5.4.1. HYV Seeds

Under the new agricultural approach special concentration has been made on the development and adoption of high-yielding varieties of seeds. It is obvious from figure-5.8 that the availability of Certified/quality seeds has been short of its total demand in recent years in Uttar Pradesh. During 2010-11, the demand for quality seeds was 55.25 lakh quintals with supply of only 46.63 lakh quintals, leading to deficiency of 8.62 lakh quintals in the state while in 2011-12, there was a deficiency of 4.33 lakh quintals of certified качества seeds in the state. However, in 2009-10, the demand of Certified/Quality seeds was 42.7 lakh quintals with supply of 45.11 lakh quintals leading to the surplus of 2.41 lakh quintals. The supply of certified/quality seeds from the government agency was higher than that from the private agency in 2009-10 but from onwards the trend has reversed in recent years (Fig-5.8).

Fig.5.8: Total requirement and agency wise availability of Certified/Quality seeds in Uttar Pradesh (Quantity in lakh quintals)

Source: www.seednet.gov.in. and lok sabha starred question No. 2677, dated 28/8/2012
The Table-5.3 shows the crop-wise demand and availability of HYV seeds in Uttar Pradesh during 2009-10. It is obvious from the Table that availability of linseed, maize, lentil, peas, jowar, moong, groundnut, soyabean and cotton is less than their respective demand in the state. However wheat, paddy, gram, barley, lentil, peas, urad, bajra, and arhar, have surplus availability in the state. Further, crop-wise total availability stands at 3558816 and 64248 quintals for rabi-certified and kharif-foundation seeds respectively in the state while demand is 3425200 and 14342 quintals respectively for two types of H.Y.V. seeds.

Thus the availability of HYV seeds in Uttar Pradesh exceeds the demand of it in 2009-10. It is probably due to increase in seed replacement rate in that period for most of the crops in the state. For example the seed replacement ratio for paddy increased to 29.9 per cent from 14.28 per cent during the period 2001-02 to 2009-10. For wheat, this ratio has increased from 15.26 per cent in 2001-02 to 33.7 per cent in 2009-10 (GoI, 2012)\textsuperscript{29}.

Table-5.3: Requirement and availability of H.Y.V. seeds in U.P. (2009-10)

<table>
<thead>
<tr>
<th>CROP</th>
<th>Rabi-Certified/quality seed</th>
<th>Kharif-Foundation seed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Requirement</td>
<td>Availability</td>
</tr>
<tr>
<td>Wheat</td>
<td>3050300</td>
<td>3117686</td>
</tr>
<tr>
<td>Maize</td>
<td>6120</td>
<td>5270</td>
</tr>
<tr>
<td>Barley</td>
<td>50920</td>
<td>64734</td>
</tr>
<tr>
<td>Gram</td>
<td>133600</td>
<td>180353</td>
</tr>
<tr>
<td>Lentil</td>
<td>44530</td>
<td>44059</td>
</tr>
<tr>
<td>Peas</td>
<td>112050</td>
<td>108618</td>
</tr>
<tr>
<td>Toria</td>
<td>8000</td>
<td>14877</td>
</tr>
<tr>
<td>Linseed</td>
<td>2150</td>
<td>1804</td>
</tr>
<tr>
<td>Oat</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Berseem</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3425200</td>
<td>3558816</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: www.seednet.gov.in
However, introduction of such HYV of seeds depends on the availability of adequate irrigation, fertilizers, pesticides and insecticides. Therefore, they have to be launched in the form of a 'package programme'. It may be underlined that the HYV seeds technology continues to escape very important section of the farm economy such as pulses, oilseeds, fruits and vegetables, and hence, there is urgent need to incorporate these crops.

5.4.2. Fertilizers

Optimal use of fertilizers and manures increase the productivity of the soil. Fig-5.9(a) shows the increasing trend of the consumption of different type of fertilisers during the period 1990-91 to 2009-10 in Uttar Pradesh. Among the fertilisers, the use of potassic fertilisers has increased with maximum compound annual growth rate of 10.4 per cent in this period. The consumption of potassic fertilisers stood at 98348 M.T. in 1990-91 which was increased to the amount of 358092 M.T. in 2010-11.

Figure 5.9: Fertiliser consumption in Uttar Pradesh.

The growth rate of nitrogenous and phosphatic fertilisers has been 2.8 and 5.9 per cent respectively during the same period. The consumption of nitrogenous
and phosphatic fertilisers stood at the amount of 1691883 M.T. and 455488 M.T. respectively in 1990-91 which increased to 3476864 M.T. and 1253453 M.T. respectively in 2010-11. The total consumption of fertilizers in the state increased from 93.5 kg/ha in 1991-92 to 167.5 kg/ha in 2009-10 with compound annual growth rate of 3.71 per cent per annum. The figure-5.9(b) shows the percentage of consumption of different type of fertilisers to the total consumption in Uttar Pradesh. The widely used fertiliser is the nitrogenous fertiliser followed by phosphatic and potasic one. Although the percentage of nitrogenous fertilisers has gone down and that of phosphatic and potasic fertilisers has increased during the period 1990-91 to 2010-11. The percentage of nitrogenous fertilisers has got down from 75.3 percent in 1990-91 to 68.3 per cent and that of phosphatic and potasic one has increased from 20.3 and 4.4 per cent respectively in 1990-91 to 24.6 and 7.0 per cent respectively in 2010-11.

5.4.3. Pesticides/Chemicals:

Pesticides are the mixture of substances which helps in preventing, destroying or controlling the pests of unwanted species on plants. Crop losses in the country due to various pests range from 10 to 30 percent each year depending upon the severity of pest attack. Pesticides play an important role in sustaining agricultural production of the country by protecting crops from pest attacks and by keeping the pest population under control. Availability of safe and efficacious pesticides and their judicious use by the farming community is critical to a sustained increase in agricultural production and productivity. Pesticides are also useful in health programmes for controlling vectors responsible for diseases like malaria. Per hectare consumption of pesticide in Uttar Pradesh which can be attributed to the existence of fragmented land holdings, dependence on monsoons, insufficient awareness among farmers, etc. Only 25-30 percent of the total cultivated area in the state is under pesticide cover.
It is evident from Figure-5.10 that consumption of pesticides in Uttar Pradesh has been greater than the demand since 2004-05 and the gap between demand and consumption have been very large during 2006-07 and 2009-10. The pesticides consumption in the state stands at 8839 metric tonnes (MT) in 2011-12 in which 3380 M.T. and 5459 M.T. was utilized in kharif and rabi seasons respectively. A demand of about 8860 MT of pesticides have been projected for the year 2012-13 in the state of which 3363 MT and 5497 MT constitutes for kharif and rabi crops respectively. The use of pesticides in the state has increased at the modest compound growth rate of 2.4 per cent per annum during the period 1999-2012.

5.5. Socio-Economic Factors

5.5.1. Population

Uttar Pradesh is the most populous state of India. As per the 2011 census, the population of state was 199.7 million with the sex ratio 908 females per thousand males which is lower than the national average of 940. Out of state’s total population of 199.7 million, more than 44 million people live in urban areas and 155 million people in rural areas. Uttar Pradesh houses 16 per cent of the...
country's total population and its share of land area is 7.18 per cent of the country's total geographical area (Census, 2011b)\textsuperscript{30}.

But the fact remains that due to slow economic development, the urban growth in the state has been dismal. The level of urbanization in the state has only increased from 19.84 per cent in 1991 to 22.28 per cent in 2011. Therefore it is clear that most of the people in the state live in rural areas and their main occupation is cultivation. Due to growing population, land-man ratio in the state has fallen as a result of which production and productivity of foodgrains has declined. Figure-5.11 shows the comparison between the decadal growth rate of population and agriculture in Uttar Pradesh. It is clear from the figure that 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 period. So in the last decade, the agriculture sector and population has witnessed more or less equal percentage growth rate. Therefore, in order to feed the growing population, the agriculture sector needs to grow with faster rate. And also, to sustain the required agricultural growth in the state; the growth of rural population has to be checked. In view of this the agriculture diversification can be used as an effective tool to remove the economic backwardness of Uttar Pradesh.
5.5.2. Literacy Rate

Various studies suggest that education creates awareness among the people to take advantage from the changing market situations. Education plays an important role in the socio-economic development of a state. It is a vital component of human capital which changes people's attitude to accept new and modern technologies without which development is impossible. In the agrarian society, education plays a key role in the sense that it helps in the utilization of appropriate proportion of different agro-inputs like; fertilizers, HYV seeds, uses of insecticides and pesticides. This will not only increase production and productivities of crops but also minimize environmental degradation.

![Fig-5.12: Literacy rate in Uttar Pradesh in different years (in %).]

It is clear from the figure-5.12 that Literacy rate has been on rise in Uttar Pradesh. It 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. In 1991 only 25.3 per cent of females were literate compared to 55.7 per cent of males (Census, 1991) while, in 2011, these rates has increased to 59.3 per cent and 79.2 per cent respectively. An important feature of the literacy profile in Uttar Pradesh, as also in many other states, is the pronounced disparity between urban and rural areas in case of both male and female literates. The literacy rate in rural area of the state is only 67.5 per cent while the urban literacy rate is 77.01 per cent. The highest literacy rate is 85 per cent in Ghaziabad and lowest is in Shrawasti at 49.13 per cent. Rural female literacy rate is as low as 36.14 per cent in Shrawasti. The highest rural female literacy rate is 69.92 per cent in Auraiya.
5.5.3. **Poverty:**

Poverty is the major obstacle in the development of the economy of Uttar Pradesh. Due to low purchasing power of the people, they are unable to purchase adequate and appropriate amount of agricultural inputs at the time of cultivation, which causes low productivity of foodgrains. People are unable to meet their minimum basic needs because of the poverty, which adversely affect the consumption pattern and the standard of living of the people in the state. There are various factors such as rapid rise of population, poor literacy rate, unemployment, agricultural backwardness, lack of industries, infrastructural facilities, unfavorable social environment, recurrence of the floods and droughts, skewed distribution of land, corruption and lastly lack of commitment towards development among the leaders are responsible for the rise in poverty in the state.

It is clear from the figure-5.13 that 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 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. Therefore the progress in reduction of poverty in Uttar Pradesh during such a long period has been very low which is very much disappointing.

![Fig-5.13: Poverty ratio in Uttar Pradesh (in %)](image)

**Source:** Planning commission & various NSSO rounds
This situation of poverty reflects the level of agricultural development in the state that the agriculture sector has progressed very slowly in the state. Because the main source of income of the majority of rural population in the state is one or other farming activities. Therefore it is pertinent for policy makers to focus on agricultural development if the poverty has to be eradicated in the state.

5.6. Agricultural growth and use of modern inputs.

The recent slowdown in the growth of agriculture sector in Uttar Pradesh is attributed to slowdown in capital formation in general and that of capital formation in public sector in particular. Similarly, slow down in supply of institutional credit to agriculture sector is also considered being one of the factors for the plight of poor farmers and slowdown in agriculture sector. Here, we examine the association between the use of some inputs and observed state-level agricultural development in India during the period 2001-02 to 2003-04. A close affinity between the use of inputs and level of agricultural development in Uttar Pradesh is clearly evident from the information.

The effect of various identified inputs and other factors to in the level of agricultural output has been estimated on the basis of following Cobb – Douglas production function for the period 1995-96 to 2009-10. The adaption of this function has also assisted in the estimation of elasticity of production of different factor inputs. The algebraic form of the function used in the analysis is as follows:

\[ Y = a(x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} x_8^{b_8}) \]

In the log form, it becomes,  
\[ \log Y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + b_7 \log x_7 + b_8 \log x_8 \]

Where,  
\[ Y = \text{GSDP Agricultural} \]
\[ x_1 = \text{Cropping Intensity ( in per cent )} \]
\[ x_2 = \text{Irrigation} \]
\[ x_3 = \text{Electricity consumption in Agriculture (in K.W.H. )} \]
\[ x_4 = \text{Length of roads maintained by PWD (in kilometer)} \]
$x_5 =$ Long term total institutional credit to agriculture (Rs Lakh)

$x_6 =$ Fertiliser (N+P+K) consumption (kg per hectare)

$x_7 =$ consumption of Pesticides (M.T.)

$x_8 =$ Public Investment in agriculture (Rs. Crore)

Institutional credit is taken as only long term direct institutional loan advanced during the year by all institutional sources. Public investment in agriculture is taken as a stock of net fixed capital in public sector on March 31 of each year. Fertilizer is measured as the amount of nitrogen, phosphorous and potassium used during a year. Irrigation refers to percentage of gross irrigated area to total cropped area. The underlying hypothesis in this production function is that intensive use of land, irrigation, electric power, credit, fertilizer, pesticides, infrastructural like development of roads and capital stock leads to higher Gross Domestic Product of agriculture in Uttar Pradesh. The OLS estimates of given log-linear regression model have been presented below in the table.

**Table 5.4:** Estimates of regression model analysis.

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Coefficients (b’s)</th>
<th>t value</th>
<th>P value (sig.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>7.747</td>
<td>1.232</td>
<td>0.273</td>
</tr>
<tr>
<td>Cropping intensity (per cent)</td>
<td>0.126</td>
<td>0.113</td>
<td>0.914</td>
</tr>
<tr>
<td>Irrigation (per cent)</td>
<td>0.315</td>
<td>1.514</td>
<td>0.191</td>
</tr>
<tr>
<td>Electric Power (K.W.H.)</td>
<td>-0.005</td>
<td>-0.067</td>
<td>0.949</td>
</tr>
<tr>
<td>Road length (km)</td>
<td>-0.057</td>
<td>-0.202</td>
<td>0.848</td>
</tr>
<tr>
<td>Institutional credit (Rs. lakh)</td>
<td>0.095</td>
<td>0.739</td>
<td>0.493</td>
</tr>
<tr>
<td>Fertilizer (NPK)</td>
<td>0.003</td>
<td>0.009</td>
<td>0.993</td>
</tr>
<tr>
<td>Pesticides (M.T.)</td>
<td>0.305</td>
<td>1.32</td>
<td>0.244</td>
</tr>
<tr>
<td>Public Investment (Rs. Crore)</td>
<td>0.072</td>
<td>0.947</td>
<td>0.387</td>
</tr>
<tr>
<td>Storage capacity (M.T.)</td>
<td>0.05</td>
<td>0.488</td>
<td>0.646</td>
</tr>
</tbody>
</table>

R- squared = 0.

Adjusted R- squared = 0.892

F value = 13.84 ; sig. = 0.005
The simultaneous multiple regression method has been applied here to get the SPSS16 result. The estimates of regression parameters reveal the impact of predictor variables on the growth of GSDP agricultural. The overall regression, including all nine predictors, has been statistically significant, $F(9, 5) = 13.84, p < 0.005$. 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.

All estimated coefficients have straightforward interpretation as production elasticity’s of the respective variables. Estimates show that 1 percent increase in irrigation resulted in 0.37 percent increase in GDP agriculture. Increment of 1 per cent in pesticides and public investment caused an increase in GDP agriculture by 0.34 and 0.13 per cent respectively. Elasticity of GDP agriculture with respect to fertilizer and credit has been estimated to be only 0.017 and 0.032 respectively.

5.7. Schemes and policies on agricultural development

5.7.1. Rashtriya Krishi Vikas Yojana (RKVY)

Rashtriya Krishi Vikas Yojana is a state plan scheme launched in August 2007 with the main objective of incentivizing the states to increase their investments in the agriculture and allied sectors in order to achieve sustainable 4 percent annual growth in the agriculture sector during the XIth Five Year Plan period. It is an additional central assistance scheme in addition to other farm sector schemes to increase public investment in agriculture and allied sectors. Basic features of RKVY are following:

1. It is a state plan scheme.
2. States are required to maintain / increase state plan expenditure on farm sector.
3. Preparation of district agriculture plans (DAP) and state agriculture plan (SAP) is mandatory.
4. It encourages convergence with other central and state schemes.
5. Funding is 100 percent central grant.
Major objectives of RKVY are following:

1. To incentivize states to increase public investment in agriculture.
2. To achieve and sustain at least 4.1 percent growth in farm sector.
3. To ensure preparation of district agriculture plans (DAP) and state agriculture plans (SAP).
4. To reduce yield gaps in important crops.
5. To address agriculture and allied sector in holistic manner.
6. Increase profitability of farmers.

Under RKVY, it was expected by the state to initiate specific projects with clear objectives for agriculture and allied sector under two streams (At least 75% of the allocated amount shall be proposed under stream-I for specific projects while the amount under stream-II will be available for strengthening the existing state sector schemes and filling the resource gaps) within definite specified period. In the State Agriculture Plan, major areas have been identified to increase the productivity and profitability of farming system. The major focus areas of SAP are following:

1. Preparing District Agriculture Plans based on Agro climatic conditions, availability of technology and natural resources;
2. Ensuring consideration of local crops/priorities/needs;
3. Providing flexibility to the Districts in the process of Planning and executing Agriculture and allied Sector Scheme;
4. Reducing the yield gaps in the important crops through focused interventions;
5. Maximizing returns to the farmers in Agriculture and allied sectors;
6. Bringing quantifiable changes in the production and productivity of various components of Agriculture and allied sectors; and
7. Encouraging public investment in Agriculture and allied sectors.

For achieving the desired agriculture growth in the country, it is necessary to adopt area specific strategies for improving the agriculture sector growth in the states like UP. In the above perspective one hundred and thirteen new programmes have been identified for farm sector under Rastriya Krishi Vikas Yojana (RKVY) for Uttar Pradesh. Programmes both in crop sector and livestock
& fishery sector have been proposed for obtaining holistic growth of farm sector considering the available resources of each district and its convergence with resources available from other developmental schemes/programmes. These activities/programmes have been identified based on the primary and secondary data collected from different reliable sources, district profiles and vision statements of individual districts and micro analysis of the district specific requirements.

5.7.2. Establishment of Integrated Nutrient Management (INM) System

Government of India is promoting Integrated Nutrient Management which includes soil test based balanced and judicious use of chemical fertilizers in conjunction with bio-fertilizers and organic manures like farm yard manure (FYM), compost, vermin compost and green manure etc. to maintain soil health and productivity. The scheme has been taken up from 2008-09 with an outlay of Rs.429.85 crore during 11th Plan period. Integrated nutrient management will maintain the desired nutrient pool in the soils to buffer any adverse situations including prolonged drought spells. Balanced use of plant nutrients is essential for sustainable intensification of agriculture. The goal of INM is to integrate the use of all natural and man-made sources of plant nutrients, so as to increase crop productivity in an efficient manner. Ten demonstrations of one forth hectare each will be conducted in each and every block for which an amount of Rs. 5000 per demonstration is needed. It is also proposed to provide an assistance for application of micronutrients @ Rs 1250 per ha as INM package to the farmers. Additional assistance will also be provided for bringing additional area (upto maximum of 2 ha per farmer) under pulses production each season under rainfed farming system. The farmer once given assistance will not be entitled to get the assistance for the same land next year. The programme is proposed to be implemented in all the blocks with a total outlay of Rs 116.496 crore. There are two main projects going on under this scheme.

(A) National Project on Management of Soil Health & Fertility (NPMSH&F):

The main objective of the component is to disseminate information on the balanced and judicious use of chemical fertilizers (N,P,K) with secondary nutrient (Sulphur, Calcium, Magnesium) and the micro-nutrient (Zinc, Iron,
Copper, Boron, Molybdenum, Manganese), in conjunction with organic sources of nutrients. The major activities under the Scheme are:-

1. Setting up/ strengthening of Static/Mobile Soil Testing Laboratories (STLs).
2. Trainings/ Field demonstrations on balanced use of fertilizers for STL staff/extension officers/farmers.
3. Preparation of digital district soil maps.
5. Setting up/strengthening of Fertilizer Quality Control Laboratories.

(B) National Project of Organic Farming (NPOF): The NPOF is a continuing Central Sector Scheme since 10th Five Year Plan, Planning Commission approved the Scheme as pilot project w.e.f. 2004 with an outlay of Rs.57.05 crore. The Scheme is continued in the 11th Plan with an outlay of Rs.101.00 crore with a revised mandate. The major activities under the Scheme are:-

1. Promotion of Organic Inputs on farmer’s field (Manure, Vermicompost, Bio-Fertilizers Liquid /solid , Waste compost, Herbal extracts etc.).
2. Adoption of organic farming through cluster approach under PGS certification. Support to PGS system for on-line data management and residue analysis.
3. Organic Village adoption for manure management and biological nitrogen harvesting.
4. Support to research for development of organic package of practices specific to state and cropping systems.
5. Setting up of Separate Organic Agriculture Research and teaching Departments.
6. Organic farming promotion through market development, awareness creation.
7. Exhibitions, Trade fairs/Seminars etc and publicity through print and electronic media.
8. Promotion and distribution of micronutrients.

Under the 12th Plan, the components of the National Project on Management of Soil Health and Fertility (NPMSHF) and National Project on
Organic Farming (NPOF) are proposed under National Mission of Sustainable Agriculture (NMSA).

5.7.3. Integrated scheme of oilseeds, pulses, oilpalm & maize (ISOPOM)

In order to provide flexibility to the States in implementation based on regionally differentiated approach, to promote crop diversification and to provide focused approach to the programmes, the four erstwhile schemes of OPP, OPDP, NPDP and AMDP have been merged into one Centrally Sponsored Integrated Scheme of Oilseeds, Pulses, Oil palm and Maize (ISOPOM) being implemented from 1.4.2004.

The salient features of ISOPOM are as under:-

1. Flexibility to the states to utilize the funds for the scheme/crop of their choice.

2. Annual action plan to be formulated by the State Governments for consideration and approval of the Government of India.

3. Flexibility to the states for introducing innovative measures or any special component to the extent of 10% of financial allocation.

4. Involvement of private sector by the State Governments in the implementation of the programme with a financial cap of 15%.

5. Flexibility for inter component diversion of funds up to 20% for non-seed components only.

6. Diversion of funds from seed components to non-seed components with the prior approval of the Department of Agriculture & Cooperation.

5.7.4. Agricultural Marketing Information Network (AGMARKNET)

Advancement in Information and Communication Technology (ICT) has made the world a smaller place and a larger market at one go. To fully utilize the new emerging trade opportunities for the benefit of farming community, there is a felt need to establish an ICT based "Agricultural Marketing Information Network' in the country. Towards this end, Ministry of Agriculture has launched the ICT based Central Sector Scheme of Agricultural Marketing Information Network (AGMARKNET), in March, 2000, to link important agricultural produce markets
spread all over the country and the State Agriculture Marketing Boards and Directorates. The project is being executed with the technical support of National Informatics Centre (NIC). The scheme has made rapid strides during 2001-02 and 2002-03. A total number of 810 nodes have been covered under the scheme comprising 735 agricultural produce markets and State Agricultural Marketing Boards/ Directorates etc. Necessary Computer hardware and system software tools (Annexure-II) have been supplied to all the nodes and as many as 500 market nodes have become functional by April, 2003. A user friendly software package 'AGMARK', developed to facilitate organization and transmission of market data, has been implemented in the markets. In order to strengthen interface with farmers and other beneficiaries, AGMARKNET portal (http://agmarknet.nic.in) has been evolved. 300 plus markets are regularly reporting price related data which is being disseminated through the portal. The AGMARKNET portal also serves as a single window for accessing websites of various organizations concerned with agricultural marketing. It provides weekly trend analysis for important markets in respect of major commodities. It is also linked with Online Commodity Exchange of India Limited, providing futures prices in respect of oilseeds, fiber crops etc. International pricetrends of various agricultural commodities available on FAO website are also accessible through the portal. The portal is constantly being enriched.

5.7.5. Terminal Markets Complex (TMC) project.

The present marketing system is characterized by long, fragmented supply chain and high wastages which is also deficient in providing fair share of consumer price to producers and for ensuring high quality and hygiene of produce and hence calls for an alternative marketing structure that provides multiple choices to farmers for sale of produce, along with comprehensive solution to meet key needs of stakeholders. With this in view, the scheme of Terminal Markets Complex (TMC) have been conceptualized and introduced as a new item under NHM, which may be implemented in a Public Private Partnership (PPP).

Main objectives of setting up Terminal Markets Complex (TMC) are:
1. Link farmers to markets by shortening supply chain of perishables and enhance their efficiency and increase in farmers income;
2. Provide professionally managed competitive alternative marketing structures with state of art technology, that provide multiple choices to farmers for sale of their agricultural produce;
3. Drive reforms in agricultural marketing sector resulting in accelerated development of marketing and post harvest infrastructure including cool chain infrastructure in the country, through private sector investment;
4. Bring transparency in market transactions and price fixation for agricultural produce and through provision of backward linkages to enable farmers to realise higher price and higher income.

It has following salient features:

(a) Terminal Market Complex (TMC) can be set up in States, which undertake reforms in their laws relating to agricultural marketing, to provide direct marketing and permit the setting up of markets in private and cooperative sectors.

(b) TMC will operate on a Hub-and-Spoke Format wherein Terminal Market Complex (hub) would be linked to a minimum number of Collection Centres (CC) (spokes) which are essentially required to support the Terminal Market Complex project.

(c) Spokes will be conveniently located at key production centres to allow easy farmer access and catchment area of each spoke will be based on meeting convenient needs of farmers, operational efficiency and effective capital utilisation of investment.

(d) TMC will establish backward linkages with farmers through collection centres and forward linkages through wholesalers, distribution centres, retail cash and carry stores, processing units for exporters etc.

(e) Collection Centres in production areas will integrate producers and retailers, processing units and exporters etc. into market system. The number of Collection Centres shall be determined in each case depending on the size of the market, distance from growing areas and other factors.
5.7.6. **ATMA (Agricultural Technology Management Agency) Programme**

Dissemination of technical knowledge is a very important task. Agriculture Universities and other agencies are involved in the development of new techniques for the benefit of farmers in improving crop production. The knowledge of such techniques has to be transferred to the farmers who are the ultimate users. Through agriculture extension, this information is being disseminated to the farmers. For this purpose, the centrally sponsored scheme “Support to State Extension Programmes for Extension Reforms” more commonly known as the (ATMA Programme) was launched on 7th May 2005. The scheme is presently under implementation in 591 districts of 29 States and 2 UTs of the country. The institutional reforms mechanism in the form of Agricultural Technology Management Agency (ATMA) at the district level was a major intervention in overhauling the extension system for making it farmer driven and farmer accountable.

Then, ATMA takes on the responsibilities for all the technological dissemination activities at district level. The Agriculture Technology Management Agency (ATMA) is based on several objectives which seek:

1. To identify location specific needs of farming community.
2. To setup priorities for sustainable agricultural development.
3. To draw plans which ensure that production activities be undertaken by farmers/ultimate users.
4. To execute plans through training institutions, NGOs, farmers organizations and allied institutions.
5. To coordinate efforts being made by various NGOs, farmers' organizations and allied institutions to strengthen research extension and farmers linkages in the district.
6. To promote collaboration and coordination between various states funded technical departments.
7. To facilitate the empowerment of farmers/producers through making their associations and cooperatives etc. thereby increasing their participation in planning, marketing, technology dissemination and agro-processing etc.
Agriculture Technology Management Agency (ATMAs) has been set up in 32 districts of U.P. and it is proposed to cover the entire state in the near future. ATMA provides a strong platform for convergence of all extension activities for holistic development of agriculture sector. ATMA has proved to be an effective medium of extension where programmes have been prepared in consultation with stakeholders and implemented with their participation.

In order to strengthen farmer-led extension approach, the State has decided to establish 813 farmer's field schools (FFS) consisting of best practicing farmers for the purpose of disseminating and sharing new knowledge with the fellow farmers of the block. During the Eleventh Five Year Plan it is proposed to develop one FFS in each Nyaya Panchayat with proper linkage with departments, KVKs, Research Organizations, Banks etc. This would help in arranging quality inputs as well as ensuring marketing of agri-produce at appropriate price apart from dissemination of new technology.

5.7.7. National Horticulture Mission (NHM)

National Horticulture Mission was launched in 2005-06 for holistic development of horticulture by adopting an integrated approach duly ensuring backward and forward linkages, including marketing. In view of immense thrust being given to development of horticulture and other allied sectors, production of related commodities is likely to see a quantum jump in near future and high levels of production can be sustained only if there is adequate infrastructure for post harvest management and marketing. NHM provides for setting up of different types of markets viz. Wholesale Markets, Rural Markets and Apni Mandis/Direct Markets. National Horticulture Mission (NHM) will be implemented in all the States and Union Territories of India except the North Eastern States, Himachal Pradesh, Jammu & Kashmir and Uttaranchal (for which a separate Technology Mission for integrated development of horticulture exists) to promote holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushroom, spices, flowers, aromatic plants, cashew and cocoa. The main objectives of the Mission are:

1. To provide holistic growth of the horticulture sector through an area based regionally differentiated strategies which include research, technology
promotion, extension, post harvest management, processing and marketing, in consonance with comparative advantage of each State/region and its diverse agro-climatic feature;

2. To enhance horticulture production, improve nutritional security and income support to farm households;

3. To establish convergence and synergy among multiple on-going and planned programmes for horticulture development;

4. To promote, develop and disseminate technologies, through a seamless blend of traditional wisdom and modern scientific knowledge;

5. To create opportunities for employment generation for skilled and unskilled persons, especially unemployed youth.

5.7.8. Public Private Partnership for Integrated Agricultural Development (PPPIAD)

Contribution of private agencies in agriculture has been increasing. Presently, a large number of private companies are providing the agricultural inputs as well as marketing the agriculture produce. They are also engaged in agricultural extension, soil testing and several other agriculture oriented activities according to their business requirement. Therefore there was an urgent need of making the private agencies partner in efficient implementation of government schemes. Also there were challenges and limitations of technical, administrative and financial capacity at the state level to absorb the growing level of funding support under RKVY. As a consequence of this situation, PPPIAD has been conceived of as an alternative mode of implementation of schemes under RKVY. It is proposed as a pilot scheme to be launched during 2012-13 itself, with about 6-8 projects in the first tranche which interested States are willing to sponsor immediately. Its expansion during the XII Plan will be decided based on the experience of the first lot of pilot projects. It will use technical and managerial capabilities of the private sector in combination with public funding, to achieve integrated and sustainable outcomes. It will also achieve value chain integration and additional private investment in agriculture. Main objectives of scheme are:

1. Augmenting the current government efforts in agricultural development by leveraging the capabilities of the private sector by:
2. Addressing all concerns related to production and post-harvest management in agriculture/horticulture and agriculture allied sectors.

3. Enhancing production and productivity, improve nutritional security and income support to farmers.

4. Promote, developing and disseminating technologies for enhancing production and productivity.

5. Assisting states in addressing the entire value chain, right from the stage of pre-production to the consumers table through appropriate interventions.

6. Creating employment generation opportunities for skilled and unskilled persons, especially unemployed youth.

7. Improving value addition and ensuring farmer’s profitability increases.


9. Improving the delivery and monitoring mechanism under RKVY funded projects.

During the Eleventh Five Year Plan there is a need to establish an extensive network between development departments, SAUs/KVKs, other Research Institutions, Private Agencies, Agri-polyclinics, Farmers Field-Schools, Agri-clubs and other Trained Agriculture Graduates in such a way that all the Nyaya Panchayats (8135) and 52027 Gram Panchayats are covered and new technologies as well as quality inputs at appropriate price are available at farmers doorstep. Efforts would be made to ensure that farmers start getting appropriate price for their Agri produce. Public Private Partnership for Integrated Agricultural Development can be ensured in the following areas:-

1. New technology through agriculture demonstration.

2. Organizing Kisan Melas, farmers meets, Gosthis, Crop seminars etc.

3. Soil testing and promotion of balanced use of fertilizers based on soil testing.

4. Use of IT for dissemination of technology (Network of Common service centres, E-Choupals etc.)

5. Large scale availability of bio-agents and bio-pesticides such as *Tricoderma*, *Bavaria*, *Tricocard*, Neem oil etc.

6. Sale of agricultural produce at appropriate price.
7. Availability of other quality inputs at appropriate price.
8. Training of farmers and extension workers.

5.7.9. Promotion of Integrated Pest Management (IPM):

IPM is a Central Sector Scheme Started in 1991. It is a broad ecological pest control approach aiming at best mix of all known pest control measures to keep the pest population below economic threshold level (ETL). It is an economically justified and sustainable system of crop protection that leads to maximum productivity with the least possible adverse impact on the total environment.

In crop production technology IPM is a schedule of practices which starts from field selection till harvest of a crop. The major components in this approach are cultural, mechanical, biological and chemical methods of insect pests, diseases, weeds and rodent control in a compatible manner. Scheme is being implemented in 21 States and one Union Territory with 26 centres. Its salient features are:

1. Popularising IPM approach among farming community;
2. Organising regular pest surveillance and monitoring to assess pest/disease situation and study agro-eco-system to advise timely IPM control measures;
3. Rearing biological control agents for their field use and conservation of naturally occurring biological control agents for control of crop pests;
4. Promoting use of bio-pesticides neem based pesticides, bacillus based biopesticides, insect pathogen as alternative to chemical pesticides.
5. To play a catalytic role in transfer of innovative IPM skills/methods/techniques to extension workers and farmers in all states including the rich.
6. To preserve eco-system and environment;
7. Human Resource Development in IPM by imparting training to master trainers, extension workers and farmers by conduct of trainings and establishment of Farmers’ Field Schools (FFSs).
8. Field releases of laboratory reared bio-control agents for the control of pests;
9. Issuing insect-pest and disease situation bulletins for the benefit of State functionaries and farmers.

5.7.10. National Watershed Development Project for Rainfed Areas (NWDPRA).

Rainfed areas constitute about 57% of the total 140.30 million hectares cultivated in the country. Rainfed agriculture is characterised by low levels of productivity and low input usage. Variability in rainfall results in wide variation and instability in yields. The bulk of the rural poor live in the rainfed regions. Therefore, Government of India accords highest priority to the holistic and sustainable development of rainfed areas through watershed development approach.

The scheme of National Watershed Development Project for Rainfed Areas (NWDPRA) was launched in 1990-91 in 25 States and 2 Union Territories based on twin concepts of integrated watershed management and sustainable farming systems. During IX Plan, the scheme was extended to 3 newly formed States of Uttarakhand, Jharkhand and Chhattisgarh. The scheme of NWDPRA has been subsumed under the Scheme for Macro Management of Agriculture (MMA) from 2000-2001. At present, this scheme is being implemented as a programme of Centrally Sponsored Scheme of Macro Management of Agriculture in 28 States and 2 UTs. Funds are released to the States based on Approved Annual Work Plan. The Scheme is presently being implemented on the basis of Common Guidelines for Watershed Development Projects issued by National Rainfed Area Authority (NRAA). The main objective of the scheme are as under:

1. conservation, development and sustainable management of natural resources.
2. enhancement of agricultural production and productivity in a sustainable manner.
3. restoration of ecological balance in the degraded and fragile rainfed ecosystems by greening these areas through appropriate mix of trees, shrubs and grasses.
4. reduction in regional disparity between irrigated and rainfed areas and;
5. creation of sustained employment opportunities for the rural community including the landless.

5.7.11. The Macro Management of Agriculture (MMA) Scheme

The Macro Management of Agriculture (MMA) Scheme was launched in 2000-01 by integrating 27 centrally sponsored schemes moving away from a programmatic to a macro management mode of assistance to the States in the form of Work Plans prepared by the States and implemented in a spirit of partnership with the States. The scheme was conceived to be a step to provide sufficient autonomy and initiative to State Governments to develop programmes and activities as per their felt needs and priorities. The scheme replaced the schematic rigid approach by a Work Plan based approach in an interactive mode to supplement/complement States' efforts in the agriculture sector.

The MMA scheme was a major step towards decentralization, allowing States the flexibility to choose suitable interventions from the various components in addition to their own efforts towards growth of the agriculture sector. Later, with the launch of the National Horticulture Mission in 2005-06, 10 components relating to horticulture were excluded from the MMA scheme. Thus, the MMA scheme comprised the following 17 components, or sub-schemes, focusing on rice, wheat, coarse cereals, sugarcane, soil health, nutrient and pest management, farm mechanization and watershed development:

1. Integrated Cereal Development Programmes in Rice Based Cropping System Areas
2. Integrated Cereal Development Programmes in Wheat Based Cropping System Areas
3. Integrated Cereal Development Programmes in Coarse Cereals Based Cropping System Areas
4. Special Jute Development Programme
5. Sustainable Development of Sugarcane Based Cropping System
6. Balanced and Integrated Use of Fertilizer
7. Promotion of Agricultural Mechanization among Small Farmers
8. National Watershed Development Project for Rainfed Areas
9. Scheme for Foundation and Certified Seed Production of Vegetable Crops
10. Soil Conservation in Catchments of River Valley Projects and Flood Prone Rivers
11. Reclamation and Development of Alkali Soils
12. State Land Use Board
13. Assistance to Cooperatives of Weaker Section
14. Assistance to Women Cooperatives
15. Non-overdue Cover Scheme
16. Agriculture Credit Stabilization Fund
17. Special Scheme for SC/ST

In the backdrop of launching of new initiatives in 2007-08, namely, the National Food Security Mission (NFSM) and the Rashtriya Krishi Vikas Yojana (RKVY), it became imperative to revise the existing MMA scheme to improve its efficacy in supplementing and complementing the efforts of the States towards enhancement of agricultural production and productivity, in the larger context of broad based inclusive growth highlighted in the 11th Five Year Plan Document as well as the National Policy on Farmers, 2007. In the Revised Macro Management of Agriculture (MMA) Scheme, the role of the scheme has been redefined to avoid overlapping and duplication of efforts and to make it more relevant to the present agriculture scenario in the States to achieve the basic objective of food security and to improve the livelihood system for rural masses.

5.8. Summary

There are various institutional, infrastructural, technological and socio-economic factors that have directly or indirectly affected the agricultural development in Uttar Pradesh. The size of land holdings and the institutional credit have been the main institutional factors whereas the net sown area, irrigation, transportation, electric power and storage capacity were the main infrastructural factors that influenced the pace of agricultural growth in the state. The important technological factors were the high quality seeds, fertilisers and pesticides which were instrumental in improving the status of agriculture sector in the state. The literacy rate, population growth and poverty ratio in the state were the main socio-economic factors which needs attention for the sake of fast growth rate in the agriculture sector. Moreover agriculture sector in Uttar Pradesh
got boosted from various centrally sponsored schemes, more important of them the Rashtriya Krishi Vikas Yojana.

The improvement in different type of institutional, infrastructural and technological factors has helped the agricultural sector in Uttar Pradesh to develop more rapidly. The regression model was found to explain about 96 per cent variation in GSDP agriculture due to predictor variables but none of the included variables turned out to be statistically significant at 5 per cent level of significance. However the overall regression was found to be statistically significant. It means that various factors have influenced the agricultural growth in Uttar Pradesh jointly and not individually.

References:


