PART - III
SUMMARY
CHAPTER X

CONCLUSION AND SUGGESTIONS

Western Uttar Pradesh is a fertile area in the western portion of upper Ganga-Yamuna Plain. It is endowed with adequate resources and good climatic conditions which have favoured the practice of agriculture since times memorial. The growing population of the area engaged directly or indirectly demands more and more foodgrains and the farmers are forced to pay special attention towards the improvement in their agricultural output with an increased use of irrigation, fertilizers, high yielding varieties of seeds and the improvement in infrastructural facilities. There has been an increase in agricultural production but the distributional pattern of all the parameters are not equal in all parts of the region thereby leading to regional disparaties in the agricultural development.

Western Uttar Pradesh, as pointed out earlier is a monotonous level plain composed of old alluvium (bhangar) and new alluvium (Khadar). The region has a well developed drainage system. The rivers Ganga, Yamuna and Ramganga together with their tributaries make the three main systems of drainage. The area has a sub-humid climate because it lies between the dry Punjab plain and the humid eastern plain of Uttar Pradesh within the monsoonal regime of the great plain and naturally partakes the characteristics of the two adjoining regions. The soils of
the region are of alluvial origin and are geologically grouped into three categories, i.e. 1) Khadar, 2) bhangar and 3) tarai.

The development of agriculture is a prime concern of planners, economists and geographers and offers a challenge to them to find out means and ways to bring out its overall reform. The development of agriculture implies optimum use of existing land resources with the help of scientific agricultural practices and the application of modern inputs. The development does not only involve an increase in the land productivity but also concerns with the provision of sufficient raw materials to run a number of allied agro-based industries.

Therefore, the main aim of researchers, planners and economists for the development of agriculture is to achieve the required amount of growth in order to bring out a marked improvement in the standard of living of people. The development of agriculture, beside other things, depends heavily on technological and institutional factors. The technological factors which are bound to bring out an increase in the agricultural production are irrigation, fertilizers, high yielding varieties of seeds, mechanization, use of pesticides and control of diseases. The institutional factors which upto a great extent are bound to affect agricultural production are number of operational holdings, consolidation of holdings, credit supply, cooperative banks and land tenure and land revenue.
There has been a marked improvement in the agricultural production in the region due to the spread and diffusion of technological and institutional factors from 1950-51 to 1990-91. The net irrigated area of the region was 42.42 per cent and total irrigated area was 40.06 per cent in 1950-51 but it increased to 80.08 per cent and 80.16 per cent respectively in 1990-91. The irrigated area by canals was 50.25 per cent in 1950-51 but it decreased to 22.60 per cent in 1990-91 mainly because of the onset of tubewell culture. Tubewell irrigation was unknown in 1950-51 but in 1990-91 it commanded 69.41 per cent of the cropped area. The area under other sources of irrigation has decreased considerably. In the year 1950-51 it was 49.72 per cent but it reduced upto 7.79 per cent in 1990-91 mainly due to the installation of tube wells on a large scale in the region. The high percentage in the net irrigated area was reported in the northern part of the study region and medium range increase was reported in the south central part of the region. The increase in irrigation facilities is the outcome of an increase in the number of pump sets and tube wells. The increase in irrigated area may be seen as a sign of farmers awakening and the beginning of a revolution which is silently taking place in Western Uttar Pradesh.

It has been observed that there has been a considerable increase in the indicators of agricultural development from 1970-71 to 1990-91 in the study area. The total area covered
under high yielding varieties of seeds during 1970-71 was 3,842,541 hectares which went up to 9,185,715 hectares in 1990-91. The use of high yielding varieties of seeds are very common in the northern part and south central part of the study area while the area lying in the eastern part of the region has been slow in adopting this technology.

As far as consumption level of fertilizers is concerned, the NPK consumption is considerably increased in the region in the period of twenty years, i.e. from 1970-71 to 1990-91. The total consumption of fertilizers was 22.37 kg per hectare of cropped land during 1970-71, which shot up to 64.76 kg per hectare of cropped land in 1990-91. The average consumption of NPK is higher in the northern and south central part of the region and low in other part of the Western Uttar Pradesh.

It has been observed that there is a considerable increase in the use of agricultural implements and machinery from 1970-71 to 1990-91. The average number of tractors in 1970-71 was 30.86 per 10,000 hectares of cropped land but it went up to 114.10 tractors per 10,000 hectares of cropped area in 1990-91. This indicates that the level of agricultural development is sharply increasing in the study region.

The number of cooperative banks in Western Uttar Pradesh has increased from 6.02 per lakh of population in 1970-71 to 38.94 cooperative banks per lakh of population in 1990-91.
The number of operational holdings are increasing owing to increasing pressure of population and the prevalent laws of inheritance responsible for the sub-division of holdings amongst the heirs. It is found that two categories of holdings, viz. below one hectare and those with 1 to 2 hectares in size constitute about more than 82 per cent of the total holdings in Western Uttar Pradesh. The other three categories with 2 to 4 hectares, 4 to 10 hectares and above 10 hectares in size constitute only 18 per cent of the total number of holdings in the study region.

There has been a considerable increase in percentage of literate persons to the total population in the study area. The percentage of literate persons to the total population during 1970-71 was 19.01 per cent and increased to 34.90 per cent during 1990-91.

The growth rates in area, production and yield in the region indicate that among all the crops, cereals are the leading crops. The area under cereals increased in all the quinquennial periods except in 1985-90 when it decreased by 396,951 hectares (8.73 per cent). But there is an overall increase in area under cereals to the tune of 1,007,753 hectares (32.08 per cent) from 1950 to 1990. The production of cereals recorded a continuous rising trend in all the quinquennial periods except in 1970-75 when it decreased by 218,899 metric tonnes (4.16 per cent). The production increased manifolds by
6,812,857 metric tonnes (284.64 per cent) during the study period. The yield also shows a continuous increasing trend during this period. The overall increase in yield of cereals was recorded as 191.20 quintals per hectare. The phenomenal increase has been achieved owing to the introduction of better seeds, expansion of irrigation facilities, use of fertilizers and pesticides and mechanization. The application of modern agricultural strategy is highly suitable for cereals cultivation. The production of cereals, however was affected by the prevailing dry conditions during 1970-71 owing to which production suffered a loss.

The areal extent of pulses suffered heavily in forty years. The area under pulses shows a continuous declining trend except in two quinquennial periods of 1955-60 and 1980-85. In all the forty years it decreased by 781,120 hectares (67.48 per cent). The production of pulses in the first ten years increased but later it started declining. The total loss was of 424,382 metric tonnes (50.74 per cent) during the study period. The yield of pulses, however shows a mixed trend. The yield during the period of 1950-55 was 1.14 quintals per hectare (15.78 per cent) increased slightly to 3.72 quintals per hectare (51.52 per cent) in 1990-91. Pulses are the main source of protein and therefore, in the light of their decline year after year, require serious attention of the farmers and governmental agencies. Efforts should be directed towards the increase of
area and production of pulses. It can be achieved through the adoption of new varieties of seeds and by safeguarding the interests of the farmers.

A continuous positive growth rate in area and production of cash crops shows that the region, after getting self-sufficiency in the production of foodgrains has turned into commercialised agriculture. It is observed that the area which previously was under the cultivation of pulses is being replaced by the cash crops mainly due to the increase in price of sugarcane and potatoes and creation better storage and transport facilities. The total increase in area under cash crops was 369,395 hectares (74.69 per cent) during the study period while the production increased by 25,881,932 metric tonnes (189.81 per cent) in the forty years. The yield of cash crops increased manifolds during the same period. During the period 1950-55 the yield of cash crops recorded an increase of 12.75 quintals per hectare but it went up to 181.69 quintals per hectare during the study period, an increase of 65.89 per cent.

The area under oilseeds recorded a linear growth of 254,882 hectares (247.40 per cent) while its production increased by 218,319 metric tonnes (355.08 per cent) in the forty years. The yield of cash crops increased by 21.97 per cent from 1950-1990.

The study of the spatio-temporal development with special reference to crop productivity reveals that in Western
Uttar Pradesh the productivity of cereals, cash crops and oilseeds has increased during the study period, i.e. from 1950-51 to 1990-91. The areal extent of high productivity region of cereals has increased by 496.03 per cent and medium productivity region by 44.01 per cent of the area under these categories in 1950-51. While the area under low productivity region of cereals decreased by 71.49 per cent of the area during the same period. The decrease of area under low productivity of cereals is due to the fact that most of the area has become an area of high and medium productivity in 1990-91.

The areal extent of pulses has decreased heavily under high and low productivity region categories. The area of pulses under high productivity region has decreased by 462,659 hectares (85.31 per cent) and under low productivity region by 391,390 hectares (70.50 per cent) during the study period. But it gained a little area under medium productivity region, increasing by 50,147 hectares (69.31 per cent) since 1950-51 to 1990-91. The decrease in area under pulses is a matter of concern, since pulses constitute the chief source of protein for the population of the study region. The low yield of pulses shows that it has not been benefited by the modern inputs. The use of indigenous seeds, lack of financial resources and non-use of chemical fertilizers make the yield static or even lead to its decline. The improved quality seeds like T-21 and T-44 need to be
introduced which can thrive well with less irrigation and give higher net return to the farmers.

The areal extent of cash crops in all the three productivity regions have increased considerably. The area of cash crops under high productivity region increased by 46,305 hectares (16.51 per cent) during the study period. The highest increase in area of cash crops was recorded under medium productivity region whereas it increased by 403,926 hectares (452.64 per cent) and under low productivity region by 98,774 hectares (145.00 per cent) from 1950-51 to 1990-91. The increase in area under cash crops is due to the decrease in the area of pulses during the study period. It has been observed that the area of pulses in replaced by the production of cash crops in the study region.

The areal extent of oilseeds has increased in all the three productivity regions from 1950-51 to 1990-91. The study reveals that the areal extent of high productivity region of oilseeds has increased by 161,184 hectares (1749.71 per cent), medium productivity region by 177,304 hectares (1027.19 per cent) and low productivity region by 30,097 hectares (52.77 per cent) from 1950-51 to 1990-91. It shows that farmers of the study region are cultivating oilseeds for commercial purposes instead of pulses which showed a continuous decrease in area during the study period. The increase in area under oilseeds is
mainly due to better farm management, use of good quality seeds and higher net-return.

There is an overall increase in area under high and medium productivity regions from 1950-51 to 1990-91. Its areal extent under high productivity region increased by 884,870 hectares (79.52 per cent) and by 1,877,254 hectares (126.40 per cent) under medium productivity regions from 1950-51 to 1990-91. The areal extent of low agricultural productivity in Western Uttar Pradesh has decreased by 122,537 hectares (53.00 per cent) during the same period. The reduced area of low agricultural productivity region is at the cost of high and medium productivity regions which have increased their area. Thus it gives a rising trend of overall agricultural productivity of the Western Uttar Pradesh.

The impact of modern technology on agricultural development is seen by firstly, determining the inter relationship between independent variables and secondly, by determining the precise role of various indicators of agricultural development through factor analysis from 1970-71 to 1990-91. The study reveals that there exist inter relationship among independent variables. The results of the analysis for 1970-71 indicate that each variable when considered as a dependent variable has high positive correlation with about 70 per cent of the variables selected. The cooperative banks are having very weak positive correlation with all the variables,
size of land holdings is having negative correlation with all the variables except iron plough and agricultural workers & cultivators. while agricultural workers & cultivators have negative correlation with all the other variables except with size of land holdings and iron plough.

While studying the inter-relationship among independent variables for the year 1990-91, it is found that each variables is having a high degree of positive correlation with about 74 per cent of the variables selected. Nearly all the variables have negative correlation with size of land holdings and agricultural workers & cultivators.

The results of the factor analysis for the year 1970-71 show that 75.34 per cent of the total variance is explained by two factors. Factor I explains 61.10 per cent of the total variance explained. The highest positive loading is shown by high yielding varieties of seeds (0.903) followed by tractor power (0.897), irrigation intensity (0.879), tube wells & pumping sets (0.865), seed drills (0.844) and fertilizer consumption (0.840). Factor II accounts for 14.24 per cent of the total variance explained and is strongly loaded with about 28 per cent of the variables selected. The highest positive loading is shown by size of land holdings (0.886) followed by agricultural workers & cultivators (0.796) and iron plough (0.712).
The factor analysis for the year 1990-91 shows that 84.97 per cent of the total variance is explained by three factors. Factor I accounts for 62.53 per cent of the total variance explained. The positive sign of variables is associated with the higher development of agriculture and infrastructure. Irrigation (0.942), fertilizer (0.965), tractorization (0.941), tube wells & pumping sets (0.901) and high yielding varieties of seeds (0.822) are all loaded high and positive on this factor.

The positive relationship among these variables of agricultural development is because the use of fertilizers and HYV seeds require high doses of irrigation. Mechanization constitutes an increasing ingredient of modern agriculture.

Factor II accounts for 13.65 per cent of the total variance explained and is closely related with variable of cooperative banks (0.915).

Factor III which explains 8.79 per cent of the total variance explained and is positively loaded on size of land holdings (0.916), agricultural workers & cultivators (0.732) and seed drills (0.455).

The results of the factor analysis performed for three agricultural productivity regions in Western Uttar Pradesh for the year 1990-91 shows that the rotated factor matrix for each of the three regions recorded two factors but the per cent of the cumulative variance explained are dissimilar. In the high productivity region, the total variance explained is 79.23 per
cent. Factor I recorded 58.90 per cent of the total variance explained and have positive loadings on about 66 per cent of the total variables selected. These are tube wells & pumping sets, tractor power, fertilizer consumption, high yielding varieties of seeds, irrigation intensity, rural electrification, cooperative banks and literacy rate.

Factor II explained 20.33 per cent of the total variance explained and has high positive loading on about 16 per cent of the total variables. These are seed drills and tractor power.

Medium productivity region recorded 75.02 per cent of the total variance explained by two factors. Factor I explained 48.33 per cent of the total variance explained and is strongly loaded on about 33 per cent of the total variables. Factor II recorded 26.68 per cent of the total variance explained and has high positive loadings on seed drills (0.768) and tractor power (0.909).

Low productivity region explained 75.40 per cent of variance by two factors. Factor I which explained 30.15 per cent of the total variance is strongly positive loaded on about 25 per cent of the variables. Factor II recorded 45.25 per cent of the total variance explained and has high positive loadings on about 25 per cent of the total variables.

In the high productivity region, the combination I comprises of tube wells & pumping sets, tractor power,
fertilizer consumption, high yielding varieties of seeds, irrigation intensity, rural electrification, cooperative banks and literacy rate. This combination is ideally suited for the development of agriculture in Western Uttar Pradesh.

In the medium productivity region, there are two combinations, i.e. combination II which is comprises of tube wells & pumping sets, fertilizer consumption, high yielding varieties of seeds and irrigation intensity and combination III comprising of the variables of seed drills and tractor power.

In the low productivity region, combination IV comprised of the variables of tube wells & pumping sets, high yielding varieties of seeds and irrigation intensity and combination V which is combined with the variables of seed drills, fertilizer consumption, size of land holdings and agricultural workers & cultivators are well suited for agricultural development in the study region.

The results of the study indicate that the impact of independent variables is less significant for agricultural development of Western Uttar Pradesh as a whole comparison to the three regional productivity areas of this plain. The results further substantiate that the regional sensitivity of packages of variables have different influence in different agricultural development regions. This does not mean that these packages will not have similar effects in the region, instead it reveals causes of variables in regional development of agriculture.
The levels of agricultural development in the region are seen in three respects, i.e. the changed cultivated area is correlated with the change in modern technology; the changed agricultural production is correlated with the change in modern technology; and finally the changed agricultural productivity is correlated with the change in modern technology. The study reveals that about 50 per cent of the districts have increased their agricultural area between the grade of 0 to +100,000 hectares and about 14 per cent above 100,000 hectares in 1990-91. About 35 per cent of the total districts have decreased their agricultural area between the grade of 0 to -100,000 hectares except Meerut district in 1990-91. When the change in cultivated area is correlated with the change in technological variables, it is found that about 33 per cent of the variables are directly proportional to the changed area. Only the size of land holdings has a high positive correlation.

About 40 per cent of the districts which have increased their production in the grade of above 1,000,000 metric tonnes lie in the Ganga-Yamuna doab and in the eastern and north eastern parts of study area. About 20 per cent of the districts fall between the grade of 500,000 to 1,000,000 metric tonnes increase in agricultural production. About 21 per cent of the districts increased agricultural production between the grade of 100,000 to 500,000 metric tonnes and about 14 per cent of the districts have increased their agricultural production in the
grade of below 100,000 metric tonnes. The study reveals that there exist some relationship between the changed agricultural production and change in independent variables but their relationship is weak and not uniform. About 75 per cent of the variables are directly proportional to the development of agricultural production in Western Uttar Pradesh.

While studying the change in agricultural productivity and change in the variables of agricultural development, it is found that about 21 per cent of the districts have decreased their agricultural productivity index between the grades of 0 to -20 quintals per hectare and above -20 quintals per hectare. Nearly 21 per cent of the districts have a marginal positive growth of agricultural productivity between the grade of 0 to +20 quintals per hectare. About 56 per cent of the districts have increased agricultural productivity above 20 quintals per hectare. The study reveals that the changed agricultural productivity has high degree of positive relationship with tube wells & pumping sets, iron plough, tractor power, fertilizer consumption, high yielding varieties of seeds, irrigation intensity and rural electrification.

An overall assessment of the problem reveals large variations in the agricultural development at micro level in Western Uttar Pradesh. The general distributional pattern of agricultural development shows a marked decline from north to south. This pattern is in close conformity with the variations
in the level of agricultural technology. The districts having relatively higher agricultural productivity are technologically more advanced. On the contrary, the districts which have been backward are still lagging behind in the use of modern monetized inputs. The developmental pace in the right direction can however, be accelerated if certain changes are incorporated in the existing infrastructure facilities. Irrigation facilities need to be increased in areas where they are non-existant. The quickest way would be digging of tube wells. The supply of electric power and diesel oil at controlled rate in areas which lack in irrigation facilities will further help the farmers in operating tube wells. Canals do not have adequate supply of water during dry season owing to which crops suffer. If the facility of canal water is provided to the farmers throughout the year it is bound to yield beneficial results. The less developed districts of the region require proper and timely supply of electricity to operate the electric pump sets during the period when the crops require water for their successful growth. Distribution of chemical fertilizers and high yielding varieties of seeds in general and in the districts lagging behind in particular should be distributed only through the cooperative societies on subsidies rates so that the farmers can get it in time and the quality can also be assured. Tractors and other costly agricultural machinery should be provided with
reasonable interest to small and poor farmers so that they can afford to purchase these implements.

The distribution of loans as well as financial assistance agencies are lacking in various districts. The emphasis therefore, should be given to increase per capita loans and establish loan societies. Moreover, the procedure for obtaining loan which is presently complicated and time consuming should be made easy with social justice. The size of land holdings in the region is decreasing year after year due to the increasing pressure of population and the law of inheritance which inhibits the use of modern implements and machinery. The consolidation of holdings is urgently required in all the districts of the region so that the farmers can use modern technology which facilitate multiple cropping and also diversification and commercialization of agriculture. To further improve the condition of agriculture in Western Uttar Pradesh it is necessary to restore the land of actual tiller or manage it through cooperatives.

The present study has succeeded in demonstrating intra-district variations in agricultural development as well as in delineating problem areas in Western Uttar Pradesh. It has also succeeded in confirming the hypothesis of inter-relationship between agricultural development and improvement in technological and institutional facilities. Therefore, in the light of study conducted, the researcher is confident that if
the above mentioned suggestions are adopted, the agricultural development in the region can be achieved in its true sense.