SUSTAINABLE AGRICULTURE DEVELOPMENT IN INDIA: 
A CASE STUDY OF UTTAR PRADESH

ABSTRACT

Agriculture is a critical sector of the Indian economy. It forms the backbone of development in the country. An average Indian still spends almost half of his/her total expenditure on food, while roughly half of India’s work force is engaged in agriculture for its livelihood. Agriculture is a source of livelihood and food security for a vast majority of low income, poor and vulnerable sections of society. Given that India is still home to the largest number of poor and malnourished people in the world. Only a top priority to agriculture will achieve the goals of reducing poverty and malnutrition as well as of inclusive growth in India. Since agriculture forms base for a number of agro-based industries and agro-services, it would be more meaningful to view agriculture not as farming alone but as a holistic value chain, which includes farming, wholeselling, warehousing (including logistics), processing, and retailing. Uttar Pradesh is the most important agricultural state of India, not only it has the highest cropped area of 25,785 thousand hectares, but it has the highest number of over 21 million farm holdings as well. Uttar Pradesh is the largest food grain producing state in the country. It produces more than 41.1 million tones of food grains which is about 20 per cent of total food grains of the country. The state produces 38 per cent of India's wheat, 20 per cent of paddy, 21 per cent of sugarcane, 34 per cent of groundnut, 17.5 per cent of rape-seed, 8 per cent of fruits and 16 per cent of vegetables. Uttar Pradesh is the largest potato producer in the country, contributing 43 percent of the total production. In this backdrop, the study has been undertaken to make in depth analysis of growth performance of agriculture sector in India with special reference to Uttar Pradesh. Taking into consideration the objectives and hypotheses formed in the study, the present work has been planned in the following sequence:

The whole thesis is divided into six chapters. The first chapter is ‘Introductory’ which states the relevance and need of the study in the context of Uttar Pradesh, and outlines the objectives, hypotheses to be tested, database used, and methodology adopted in the study. Second chapter makes an in depth study
of review of literature. Third chapter analyses the agricultural growth in India vis-
à-vis its major states. Trends in agricultural growth in Uttar Pradesh has been
analysed in Chapter four. Fifth chapter is concerned with analysis of various
factors affecting the agricultural growth in Uttar Pradesh. The last chapter i.e.,
chapter sixth presents the summary of findings along with concluding remarks
and suggestions for taking policy measures. Chapter-wise summary of the study
is as follows:

The very first chapter is ‘Introductory’ which states the relevance and
need of the study in Indian context, and outlines the objectives, hypotheses to be
tested, database used, and methodology adopted in the study. In India, nearly half
of the population is dependent on agriculture for their livelihood. India has 328.7
million hectare of geographical area out of which about 58 per cent is cultivable
land. The net area sown is 140 million hectare and gross cropped area is 192.2
million hectare. The net irrigated area in the country is 63.26 million hectare
(2009-10). Agriculture is the mainstay of Indian economy because of its high
share in employment and livelihood creation. The share of agriculture in the gross
domestic product has registered a steady decline from 36.4 per cent in 1982-83 to
14.6 per cent in 2009-10. Yet this sector continues to support more than half a
billion people providing employment to 58.2 per cent of the workforce (2001
census). It also contributes 10.59 per cent to total export of the country. The food
grain production has reached to 218.11 million tones in 2009-10 from 50.82
million tones in 1950-51. In the light of survey of literature the following are the
formulated objectives of the present study:-

1. To make a comparative analysis of agriculture sector in India with respect
to its major states.
2. To evaluate the agricultural growth in India in comparison to other sectors
   of the economy.
3. To assess the level of agricultural development in Uttar Pradesh.
4. To examine regional disparity in agricultural growth in Uttar Pradesh.
5. To analyse the effects of different economic factors on the development
   of agriculture sector in Uttar Pradesh(U.P.).

The study aims to test the following hypotheses:
1. There is considerable inter-state variance in the growth of agriculture sector in India.

2. There is considerable inter-regional difference in the growth of agriculture sector in U.P.

3. Various factors have made a significant effect on the growth of agriculture sector in U.P.

The study is entirely based on secondary sources of data collected from different official documents and websites of Government of India and Uttar Pradesh. Techniques of simple statistics and econometrics have been applied for analysing the data and getting the results to derive logical conclusion. Besides simple statistics like means and coefficient of variations, the study also uses t-statistics to test statistical significance, one-way ANOVA test to see the regional disparity among different regions of Uttar Pradesh, and simple regression analysis to establish functional relationships among the variables. The study also calculates annual compound growth rate for comparative analysis of variables between the two periods.

The second chapter reviews the previous studies. Past studies pave the way for future research project. An acquaintance with earlier pertinent studies has been felt necessary in order to identify the unexplored part of the earlier studies, to develop a better understanding of the problem under present study and to formulate an appropriate research methodology in the light of understanding of the tools adopted by the earlier studies. Hence, an attempt has been made in this chapter to review some of the previous studies on the agricultural development in India. The chapter reviews the past studies undertaken in India to have an idea about the methodologies adopted, their findings and limitations. The review of the previous studies reveals that there has been decline in the growth of the agricultural sector during the 1990s till the recent past. This is accompanied with the recent decline in yield per hectare for a number of food crops. There are vast inter-state differences in growth rate of agriculture and even more so for food grains. It was found that govt. expenditure in agriculture including public investment and subsidy for fertilizer usage and electricity consumption for agriculture are the main factors affecting agricultural production in India. Moreover the state-wise agricultural output at current prices is significantly and
positively dependent on government expenditure on agriculture, fertilizer usage, rainfall and population. There are several limitations of the previous studies. Most of these studies have focused on the effect of economic reform initiated in 1991 on the development of agriculture sector at national level and not at state or regional level. In addition to this these studies have focused mainly on the outcome and consequences of agricultural development of only green revolution areas of the country such as Punjab, Haryana and western Uttar Pradesh. There has not been made any serious attempt to analyse the agricultural development after reform in Uttar Pradesh. In the light of this perspective the present study has great relevance and importance in national as well as regional context.

The third chapter analyses the performance of agriculture in India on regional basis. There has been a structural transformation in the Indian economy during the past few decades since the share of agriculture and allied sectors in total GDP has decreased from 44.3 per cent in 1970-71 to 14.6 per cent in 2009-10. The share of industrial sector has increased from 23.7 percent in 1970-71 to 30.2 percent in 2009-10 and services sector has increased significantly from 32 percent to 55.2 percent during the same period. There is tremendous regional variation in the growth experience of Indian states with respect to the agriculture and allied sector in 1991-92 to 2009-10 as revealed by high coefficient of variation in compound annual growth rate of NSDP agriculture and allied sector in comparison to other sectors of economy. Only Andhra Pradesh and West Bengal have managed to register the growth of NSDP agriculture above the figure of 3 per cent per year in this period, the rest having this figure around 2 percent or below that. Thus, the study accepts the hypothesis that there is considerable inter-state variance in the growth of agriculture sector in India. The share of area under food grains in total cropped area reduced from about 66.3 per cent in 1993-94 to about 63.3 percent in 2009-10 whereas the share of non-food grain in total cropped area in the country has increased from 25.8 per cent in 1993-94 to 29.5 per cent in 2009-10. Thus the cropping pattern shifted from food grain crops towards non-food grain crops like fruits and vegetables, cotton and sugarcane and other non-food crops between 1993-94 and 2009-10.
The fourth chapter analyses the agricultural development in Uttar Pradesh. The average growth rate for overall economy of Uttar Pradesh during the eleventh plan period remained 5 per cent which was below the growth rate achieved by the country during this period. The primary, secondary and tertiary sector registered a growth of 2, 9.1 and 5.4 per cent, respectively. The contribution of agriculture in the state economy is more than 30 per cent. Keeping in view the potential of its growth and critical role of this sector in employment generation and alleviation of poverty in rural areas, the growth rate of this sector has been kept at 5.7 per cent (primary 6.4 percent) within eleventh plan. The shares of agriculture, secondary and tertiary sectors in Uttar Pradesh were 34.2, 20.4 and 42.8 per cent respectively in 1993-94. In 2010-11, the tertiary sector surged ahead and reached 52.4 per cent while the share of secondary sector remained same i.e. nearly 23.4 per cent. The agriculture sector lagged behind during this period and its share declined to 20.8 percent in 2010-11. Among the four economic regions in Uttar Pradesh, Western region has the highest growth rate of 2.4 per cent in agriculture and allied sector followed by Bundelkhand, Central and Eastern region by 2.3 per cent, 1.8 per cent and 1.4 per cent per annum respectively during the period from 1999-2000 to 2009-10. The share of agriculture and allied sector in their respective total Net District Domestic Product (NDDP) has declined almost in all regions between the two periods 1999-2000 and 2009-10. Bundelkhand region has the highest percentage composition of agriculture and allied sector (34.5 per cent) in its total NDDP in 2009-10 followed by Western (30.3 percent), Eastern (26.5 percent) and Central region (24.3 percent).

The compound annual growth rate of area under food grains has significantly decreased from 0.3 per cent per annum in 1991-2001 to 0.1 per cent per annum in 2001-10. The area under non-food grains registered a mild growth; it increased from -2.3 per cent per annum in 1991-2001 to 0.8 per cent per annum in 2001-10. The area under food grains still occupies more than 80 per cent of total cropped area due to the traditional cropping pattern as well as traditional food habits. The area under non-food grains increased since 1991 and occupies 18.7 per cent of the total area under crops in the state during 2009-10. By economic region wise, Area under the rice and wheat in Eastern region remained
highest during the period 2001-02 and 2009-10. Again the Eastern region has been reported to have the highest area under total pulses amounting to 1132.1 thousand hectares in 2009-10. In case of total oilseeds, the Eastern region has the highest area under its cultivation which was 290.9 thousand hectares in 2009-10. The compound annual growth rate in production of food grains showed sharp decline from 2.4 per cent per annum in 1991-2001 to 1.0 per cent per annum in 2001-10. However the production of food grains increased with a rate of 0.9 per cent per annum in the period 1991-2010. The growth in the production of non-food grains decelerated between the two periods with a growth of 0.4 per cent in 2001-10 as compared to 1.1 per cent per annum in 1991-2001. In case of total pulses, the Eastern region has been the highest producing region of the state, production of which has been estimated to be 967.4 TMT in 2009-10. In case of total Oilseeds, the highest production was reported by the Eastern region estimating to be 32 percent in total oilseeds in 2009-10. The yield of food grains has decreased with the rate of 3.22 per cent per annum during the period 2001-2010, as compared to (-)1.02 per cent per annum in 1991-2001 in Uttar Pradesh. The growth rate of yield of non-food grains has improved in 2001-10 (1.9 per cent per annum) over the period 1991-2001 (-0.2 per cent per annum). Among the various crops sugarcane registered first position followed by vegetables, fruits, wheat, rice and total pulses during all the three comparative years, i.e. 1991-92, 2001-02 and 2009-10. By economic region wise, the yield of rice, wheat and barley has recorded highest in Western region in each comparative year. The yield of jowar has been recorded highest in Eastern region in 2001-02 and 2009-10. In case of yield of Pulses, the Eastern region ranks first in the state, this reported the yield of 19.9 quintal per hectare in 2009-10. Among the pulses, the highest yield has been estimated to be 11.9 quintal/Ha for arhar in the Central region. In case of yield of Oilseeds also, the Eastern region has shown the highest value of about 10.5 quintal/Ha and the lowest yield of 4 quintal/Ha was reported in Bundelkhand region in 2010. The agricultural disparity between four economic regions of Uttar Pradesh has overall been assessed by comparing their Index for Agricultural efficiency (IAE). A one-way ANOVA was applied on a time-series data to compare the mean level of IAE of four regions of the state. It was found that there is significant regional disparity in the state. It has been established
statistically that the four economic regions of the state differ significantly from each other in their level of agricultural performance. The Western region showed a mean level of Index for Agricultural Efficiency (IAE), \( M = 1.4 \) which was significantly highest among four regions of Uttar Pradesh. The Bundelkhand region \( M = 0.48 \) scored significantly lowest on IAE score than all three region. Thus, the study accepts the hypothesis that there is considerable inter-regional difference in the growth of agriculture sector in Uttar Pradesh.

The chapter five deals with the factors affecting agricultural development in Uttar Pradesh. The average size of land holdings in Uttar Pradesh has been reduced by 6.3 per cent between two census period (from 2005-06 to 2010-11) and reached at very small size i.e. 0.75 hectares in 2010-11. In the state more than 92 per cent of the land holdings consist of small and marginal farmers. The percentage of number of marginal land holdings increased from 73.9 per cent in 1991 to 79.2 per cent in 2010-11. According to input survey of 2006-07, the percentage of credit from Primary Agricultural Credit Societies (PACS) and Primary Land Development Bank (PLDB) to the total institutional credit for agricultural purposes has decreased from 47.9 per cent and 23.2 per cent in 1991-92 to 14.8 per cent and 10.4 per cent respectively in 2006-07. On the other hand the percentage share of Commercial Bank branches (CBB) and Regional Rural Bank branches (RRBB) have increased from 12.3 per cent to 24.6 per cent and 17.8 per cent to 50.2 per cent respectively during the same period. The net sown area (NSA) and gross cropped area (GCA) in the state have witnessed the negative compound annual growth rate of 0.3 per cent and 0.1 per cent per annum respectively during the period 1991-2010. The cropping intensity (CI) in the state has increased from 146.2 per cent to 153.4 per cent during 1991-92 to 2009-10 with the compound annual growth rate of only 0.3 per cent. The net irrigated area (NIA) in Uttar Pradesh has increased from 10661 thousand hectares (Tha) in 1990-91 to 13457 Tha in 2009-10. The mechanization of agriculture in the state has also taken place at a greater scale such as the number of tractors has increased from 0.34 million in 1993 to 0.73 million in 2007. The electricity consumption for agricultural purposes in Uttar Pradesh decreased (in terms of CAGR) with the rate of 15.8 per cent per annum during 1990-91 to 2009-10. The total road length in the state has increased from 71773 kilometer in 1990-91 to 170951 kilometer.
in 2009-10. The improvement in institutional, infrastructural and technological factors has helped the agricultural sector in Uttar Pradesh to develop more rapidly. The double log-linear model with simultaneous multiple regression method was applied in the present study to find the elasticity effect of some input variables on the agricultural growth in the form of increment in GSDP agriculture. The predictor variables used in the model were Cropping Intensity, Irrigation, power consumption, roads, credit, Fertiliser, Pesticides, storage capacity and Public Investment in agriculture and the outcome variable was GSDP agriculture. The 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 which leads us to accept the third hypothesis partially i.e. various factors have made a significant effect on the growth of agriculture sector in Uttar Pradesh.

In view of above findings, there is an urgent need to develop agricultural infrastructure in Uttar Pradesh in order to grow the whole economy in accordance with the target set out in state plans. Setting up storage and processing facilities for our farm products is one big issue that needs to be tackled by the policy makers in the state. Building of rural roads, rural telecom and rural electrification need to be accelerated and coordinated. Farm subsidy can be spent as investment towards the development of infrastructure for the agriculture sector. It is also necessary for strengthening of agricultural research and technology development and institutional support system. It is also required to enhance the physical and economic connectivity of farm to market, post harvest operations including the role of food processing industries and ultimately increase the farmers income, rural employment security and inclusiveness. Reform should be taken up to encourage private sector investment in agriculture.