Chapter II

SELECT REVIEW OF LITERATURE AND METHODOLOGY
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INTRODUCTION

Since agriculture happens to be a corner-stone of Indian economy, a relatively greater emphasis came to be laid on this sector. Nevertheless, it was agriculture which had more problems to be tackled than any other single sector of the country's economy. The foremost task before the national planners was, therefore, to review these problems in perspective and suggest effective measures to lift agriculture from its rudimentary stage placing it on a sound footing.

Until the time of attaining Independence, obsolete and traditional modes of production were being used by farmers in India as well as in most of the developing countries. Modern inputs like fertilisers, pesticides, tractors and other farm equipment were used by a very negligible number of farmers. Farmers, to a large extent, used to aim at their subsistence and they were not used to having any interaction with market. Regardless of the price variations for their produce, cropping pattern was dependent on their traditional outlook. This state of affairs prevailing in Indian agriculture took a drastic turn by mid-sixties.

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The introduction of the new technology in Indian agriculture, during mid-sixties, has initiated a process of qualitative transformation, importantly characterised by changes in the outlook and attitudes of the farming community\(^2\). The age old stagnation that prevailed in the agriculture of most developing countries was broken by the 'New Technology' in a significant manner. Many developing countries, including India, were able to attain a break-through in production as well as productivity. This led many of them to achieve self-sufficiency in food\(^3\). Based on these trends, observers like Brown predicted the end of foodgrains problem in less developed countries and beginning of world-wide surplus production\(^4\).

Significant strides and changes came in cropping pattern. As stated by Bandhudas Sen, "The most favourable construction came to be placed on some of the attributes of high yielding varieties - attributes of divisibility, scale-neutrality and labour intensity which hold out a promise of widespread use of these varieties in most developing countries\(^5\). He further states in this regard, "the high yielding varieties appear to be 'engines of change' and they

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\(^2\) Narain Dharam, "Growth and Imbalances in Indian Agriculture", Economic and Political Weekly, March 1972, p.2.

\(^3\) World Bank, World Bank Report (1986); Washington, Oxford University Press, p.78.


would be to the agrarian revolution of the poor countries what the steam engine was to the Industrial Revolution in Europe⁶.

Since mid-sixties, Indian agriculture has been witnessing a remarkably significant effect of science and technology. The rapid strides that took place in science and technology had transformed the primitive and stagnant state of agriculture into a modern one. The introduction of new agricultural technology has brought about significant improvements in the levels and growth of agricultural production, yield and intensity of cropping in many parts of India⁷. Consequently, certain crops were proved to be very much rewarding and remunerative, and, as a result, the cropping pattern underwent major changes. In the light of this, the new agricultural technology was viewed as setting-off a 'Green Revolution' or 'seed fertilisers revolution'.

Despite the fact that new technology was accounted for the remarkable increase in the output and incomes of those crops and those farmers who adapted that new technology, it has left so much to be enquired about its impact on different crops, regions and classes of farmers. There were divergent opinions among the specialists in agricultural economics about the

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⁶ Ibid., p.7.
impact of the green revolution. Sudhir Sen and Kahlon\(^6\) were of the view that green revolution had a salutary effect and they stressed the importance of new seed varieties, modern inputs, land reforms and credit facilities. The critics\(^8\) of green revolution argued that the gains were neither real nor considerable and hence it cannot be attributed to the new varieties. There had been glaring imbalances in the cropping pattern ever since the advent of new technology during mid-sixties. The area under rice and wheat rose; whereas, the area under course cereals, pulses and oilseeds got shrunk. Another development that took place in Indian agricultural scenario was the regional variations in respect of agricultural growth.

In this regard, the Economic Survey stated that the "emerging distortions in the cropping pattern can no longer be ignored"\(^{10}\). Many factors like differential rate of technological change among crops, the spread of irrigation leading to shrinkage of dry crops, market intervention and support by the Government in certain crops and the variations in the prices of different crops were responsible for these imbalances. In order to bring about a balance in cropping pattern, various suggestions were given by different

\(^{a)}\) Sudhir Sen: The Green Revolution in Food and Jobs for All, Tata McGraw Hill, New Delhi, 1975.


\(^{10)}\) Govt. of India, Economic Survey (1985-86).
scholars. They comprised extension of new technology to lagging crops and regions, changes in price policy and improvements in irrigation facilities\textsuperscript{11}.

The big farmers, in the initial stages of green revolution, with their capital potential, were able to step up their farming yields and as a result, their incomes went up more significantly than the small farmers. It was proved by several studies\textsuperscript{12} that the new technology was exclusively responsible for the widening of inequalities between small and big farmers and, as a result, since then the impression that there would be an inverse relation between farm size and yield started disappearing. During the later phase of green revolution, typical trends were noticed in diffusion process of new technology such as spread of new technology to new areas and the increasing adoption by small farmers with the supply of institutional credit and improved extension services. In view of these advantages, small farmers could not cope up with large farmers and as a result the inverse relation between farm size and output per acre started reappearing\textsuperscript{13}.

\begin{itemize}
\item[a)] Dantwala, M.L., Pricing and Cropping Pattern, Economic and Political Weekly, Vol.21, No.8, 1986.
\item[c)] Mruthyunjaya and Pradumna Kumar, Crop Economics and Cropping pattern changes, EPW, Dec., 1989.
\item[a)] Rudhra Ashok, Farm size and yield per acre - A comment, Economic and Political Weekly, Sep. 14, 1968.
\item[b)] Sen Bandhudas, Op. Cit.
\item[c)] Pranab, K., Bardhan, Inequality of farm income : A study of four districts, Economic and Political Weekly, Annual number 1974, pp.301-307.
\item[d)] Saini, G.R., Green Revolution and distribution of Farm incomes, Economic and Political Weekly, March 27, 1976, p.17-23.
\end{itemize}

\textsuperscript{11} Hanumantha Rao, Ch., Technological Change in Agriculture: Emerging Trends and Prospectives, Presidential Address, Golden Jubilee Conference of Indian Society of Agricultural Economics, Bombay, 1989, p.8.
REVIEW OF LITERATURE

There are a quite number of studies carried out on the growth and instability of Indian agriculture. Some of them relate to the instability in Indian agriculture in general, while some relate to the instability in respect of a particular crop or in a particular State. In the following lines, an attempt is made to review select literature on growth and instability in agriculture in general and Indian agriculture in particular.

1) World Bank\textsuperscript{14} in its 'World Development Report' for the year 1986 studied agriculture and economic growth in the context of developing countries. If resources are used more efficiently in agriculture, induced bias can be eliminated and agricultural production can be stepped up in developing countries. The report focusses its attention on the connection between government policy and agriculture and stresses the independence of agricultural policies in different parts of the world. Government policies, to a large extent, affect the growth of agriculture and rural incomes in developed and developing countries as well. It is paradoxical to note that though agriculture accounts for a major share in gross domestic product of many developing countries, due importance is not given for the farming sector by the governments and farmers are often discriminated. On the other hand, the study states that in the industrial countries subsidies are given to agricultural production despite the fact that agriculture accounts for a small share in GDP and employment. The report examines the potential gains to the world economy by removing the above distortions.

2) ‘Food and Agricultural Organisation’\textsuperscript{15}, in its annual report on the State of Food and Agriculture, reviewed the trends in the growth of output in respect of various crops in all the countries. It also examined the reasons for the low production, if any, in certain countries. All countries have been grouped into different categories and separate appraisal has been made about the state of agricultural production in all those blocks or groups.

The study indicates that in the late 80s and early 90s, there have been significant fluctuations in agricultural production across developing as well as developed countries. The study states that except in Africa, in other developing regions, gains in agricultural production were eroded by population growth. It is observed that more than 60 per cent of all developing countries recorded stagnant or declining levels of per capita food production.

3) Nasir Shamsuddin and others\textsuperscript{16} have carried out a study on agricultural issues in Malaysia. The study attempted to identify major issues in the Malaysian factor productivity. The study reveals that the average total factor productivity growth, over the study period 1961-1994 was estimated at 3.3 per cent. The growth in the total factor productivity in the 1960s was high at 5.7 per cent while in 1980s at 3.8 per cent. The growth rates declined again in the early 1990s to 1.9 per cent.

\textsuperscript{15} FAO, State of Food and Agriculture, 1993.

4) Uttamkumar Deb and others\(^{17}\) have studied the production trends in respect of sugarcane in Bangladesh. In this study, the nature and extent of growth in sugarcane area, production and yield was estimated at regional and national level for various periods between 1962 and 1994. The coefficient of variation of area, production and yield of sugarcane was estimated for the same regions. Their analysis shows that sugarcane area and production in Bangladesh have increased over time while the yield has decreased. There was no significant change in variability in sugarcane production, area and yield in succeeding periods in Bangladesh though different regions showed a mixed pattern.

5) Dayal\(^{18}\) carried out a study on the growth rates of agricultural output during 1952-53 and 1962-63 for about 60 countries of the world. Though he analysed the progress of agricultural output in different countries of the world, he did not attempt to give the reasons for inter country differentials in growth rates. He stated that in some countries under study, growth in farm produce was due to changes in farm land surface, double cropping, changes in crop yields and improvements in the cropping pattern. His study found that Israel was topping the list in agricultural production. In four countries under study, the growth in agricultural production was exceptionally high; it was as high as more than 5 per cent. In nine countries, it was ranging between 3.5 per cent and 5 per cent. At the other extreme,

\(^{17}\) Uttam Kumar Deb, Gopal Krishna Bose and Madam Mohan Dey, Growth and Variability in Sugarcane Production in Bangladesh.

nine countries had a very low rate, i.e., less than 1 per cent. In twenty seven countries, average growth rate was varying between 2 and 2.5 per cent.

6) Khan\textsuperscript{19} has examined the application of biological-chemical technology and its impact on income and employment in Pakistan. He stated that the benefits arising out of green revolution did not accrue to small and big farmers equally. He, after testing the hypothesis of widening or narrowing the income inequalities between small and big farms, established that these benefits have been significantly greater in the already flourishing areas and hence the disparity between small and large farms is greater in the more backward areas.

7) K. Boyce\textsuperscript{20} has surveyed the technological and institutional alternatives in rice irrigation that has taken place in Asia. The main focus of his study is the wide variations in the nature of irrigation development in the region. In many Asian countries 'irrigation' is the main input for the cultivation of rice. He is of the opinion that the pace of irrigation development in the region has been very uneven. Out of total land under cultivation, the area irrigated was the barest minimum of 3 per cent in Kampuchea, while it was 76 per cent in Japan. Besides, the character of irrigation development has varied in a number of dimensions viz., scale, relative factor intensity, institutional arrangements and the extent of control by farmers.

\textsuperscript{19} Khan Mohammad Hosan, The Economics of Green Revolution in Pakistan, Proager Publishers, New Delhi, 1975.

8) Sudhin and Mukhopadhyay\textsuperscript{21}, in their study on "sources of variation in agricultural productivity", have arrived at the conclusion that the sources of irrigation in agricultural productivity were explained by the differences in the level of input use, region and the temporal situation. It was noticed that 41.0 per cent of the instability in output was explained by measured inputs. After segregating the large residuals into two components, i.e., regional effects and temporal effects, it has been found that 95 per cent of the variations of the total differences were owing to the region effects.

9) Raheja\textsuperscript{22} studied the regional variation in the use of high-yielding varieties and their yields. A series of sample surveys were conducted for the assessment of High Yielding Varieties Programme implemented in the year 1973-74. The study covers 88 districts spread over 15 States and it deals with two premier cereals, i.e., wheat and rice. It was noticed that in the case of rice, the adoption of high yielding varieties in different regions was not responsible for their low yield rate. It is because of the deficiency of water supply and other resources of farmers, the regional variations have occurred more in rice than in wheat.

10) Rath\textsuperscript{23} has carried out an in-depth study on the performance of agricultural production in India for a period of 23 years, i.e., from 1955 to 1978. He examined the reasons for the instability in Indian agriculture.

\textsuperscript{21} Sudhin K., and Mukhopadhyay., Sources of Variation in Agricultural Productivity, Mac Millan Co., Delhi, 1975.


\textsuperscript{23} Nilakantha Rath, A Note on Agricultural Production in India During 1955-78, the Study of Growth Rates in Agriculture. Indian Society of Agricultural Economics, Bombay, Oct. 1980, pp.74-103.
Taking 1969-70 as the base, the exponential trends are computed for the undue numbers of overall yield and output of major crops in India for the period 1949-50 and 1977-78. Due attention has been paid to growth rates for the period under study. The period under study was split into two sub-periods, i.e., from 1955-56 to 1964-65 and 1966-67 to 1977-78. The purpose of doing so is to examine the growth rate up to the advent of green revolution and during the post-green revolution period. During the entire period under study, agricultural production recorded an increase of 2.48 per cent per annum. After green revolution, i.e., between 1964-65 and 1977-78, it recorded 2.95 per cent per annum, though there had been a slight drop in few abnormal years.

11) Mohammad Shafi\(^{24}\) made an analytical study find out the factors responsible for spatial variations in agricultural productivity. He had chosen nine agricultural inputs and considered them as independent variables, wheat being the dependent variable. By adopting the standard techniques, productivity index had been constructed in which wheat crop was taken as a dependent variable. He had fitted an equation of multiple regression to study the impact of the nine independent variables on productivity variation. Those nine variables selected are: area irrigated by canals, irrigation by tube wells, irrigation by other sources, area under High Yielding Varieties, fertilisers use, agricultural workers, animal power, tractor power and agricultural credit.

\(^{24}\) Mohammad Shafi, *Agricultural Productivity and Regional Imbalances*, Concept Publishing Company, New Delhi, 1984:
Giriappa and Vivekananda\textsuperscript{25} have carried out a study to assess the impact of new technology on agriculture and to find out the trends in crop pattern, area, production and yield of principal crops and the nature of distribution of land between 1970-71 and 1976-77. Their study reveals that out of various factors, agro-climate plays a vital role in causing yield variation though modern inputs have an inter-related impact on productivity. During 1950-53 to 1974-77, foodgrains production has risen at the rate of 3 per cent per annum; but later, i.e., between 1974-75 and 1981-82, growth in food production declined to 2.84 per cent. The rate of growth in yield has shown a declining trend from 1.9 to 1.74 per cent per annum during the second phase of the period under study. They are of the opinion that the growth of Indian agriculture is affected adversely due to limited extension of modern inputs. It suggests that a speedy diffusing system of development be evolved so that productivity bottle-necks can be overcome and the production process can be modernised.

Mahendra Dev\textsuperscript{26} studied the growth and instability in foodgrains production for 17 major states during 1960-61 and 1984-85. He analysed the factors causing inter-state variations in respect of agricultural growth and instability. He divided the entire period into two sub-periods, i.e., pre-green revolution period (1960-61 to 1969-70) and green revolution period (1970-71 to 1985-86).


For the entire period, the study revealed that the growth rates differ from one region to the other. Punjab and Maharashtra had a growth rate of 6 per cent. It was slightly more than 3 per cent in Uttar Pradesh, Haryana and Madhya Pradesh. In the remaining 12 States under study, the growth rate was less than 2.5 per cent. For the entire period, the extent of instability varied from 7.4 per cent in Kerala to as high as 32.2 per cent in Gujarat. As per the study, the low rain-fall and less area under irrigation are responsible for relatively higher degree of instability in agricultural growth. While adopting a moving period approach on three years basis, the author arrived at the conclusion that the extent of instability varied from a high declining trend in Punjab to an increasing trend in Tamilnadu.

14) Joshi and Kaneda have carried out a study on yields and their variability in respect of four major food crops, viz., i.e., rice, wheat, jowar and bajra. The rate of instability had been quantified by using coefficient of variation around trend line. Since mid-sixties, the mean yields of wheat at the country level had shown higher growth coincidental with lower instability. The variability of rice yields increased over time among the States. Since the advent of green revolution higher growth has been associated with higher growth fluctuations. One of the reasons for more variability in rice output has been the shift of farmers to the commercially lucrative crops.

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15) Dhandekar\(^{25}\), after reviewing the seminar papers on 'Regional Variations in Agricultural Development and Productivity', arrived at the conclusion that the extent of irrigation and use of fertilisers, to a large extent, are responsible for the prevailing variations in agricultural productivity. In addition to these technological factors, the institutional bottle-necks, such as, land tenure and farm credit have been the other factors responsible for variation in productivity.

16) Dhondyal\(^{26}\) in his study, measured the fluctuations in agricultural development and productivity in three regions of Uttar Pradesh. Out of those three regions, he chose three representative districts as sample. He assessed the role of credit, intensive crop enterprises and the influence of irrigation water on differential growth rates. He concluded that the ability and desire to borrow only for productive use was a crucial factor in explaining regional differences in agricultural growth.

17) Bansil\(^{30}\) analysed the regional distribution of production resources after the advent of green revolution in India. The study revealed that the acreage shifts have taken place in favour of cereals. Major gains have been made for wheat, for which the area has gone up by 4.5 million hectares and the area under pulses declined by 1.5 million hectares. The major benefits of green revolution have accrued to States of Punjab, Haryana, Western Uttar


Pradesh and Gujarat. The area under cultivation has gone up considerably in Bihar, Orissa, Madhya Pradesh, Assam and Maharashtra; but, the green revolution has not made much contribution to production in these States.

18) Bhalla and Alagh\textsuperscript{31} have carried out a study on the levels and growth of agricultural output of 19 major crops in India at the disaggregated level of district during 1962-65 and 1970-73. The study has observed that the total output went up more significantly in the already developed districts, whereas the output declined substantially in the low productivity districts. The consequent development is that high level of growth and irrigation are positively related. Many areas are enriched by exploiting the benefits of new technology with assured irrigation. Besides, the study has revealed that modern inputs have come into use only in highly potential or high growth areas.

19) Siddhu and Siddhu\textsuperscript{32} have carried out a study on the various factors responsible for the rapid growth of agriculture in Punjab. While explaining the various factors which explain the success of agriculture in Punjab, they stated that the break-through was brought about by technical, institutional and organisational factors. Besides these factors, social and cultural background of Punjab farmers played a key role. Above all, the appropriate policies and programmes adopted by the Central and State Governments made this achievement possible. The lessons learnt from this experiment,


\textsuperscript{32} Siddhu and Siddhu, "Agricultural Development in Punjab". Agricultural Situation in India: May, '92, published by Directorate of Economics and Statistics, Dept. of Agriculture and Co-operation, Ministry of Agriculture, Govt. of India.

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they felt, are of great interest and significance to other developing States in India and also other developing countries, particularly having similar agro-climate and resource endowments. According to them the land reforms implemented by the Government of Punjab, consolidation of holding, irrigation and infrastructural facilities, power, HYVs, rural credit, fertilisers, consumption, market infrastructure, rural roads, positive price policy, human element, etc., have been responsible for the rapid agricultural development of Punjab.

20) Sampath\textsuperscript{33} has reviewed the area, production and yield during the pre-green revolution period. He observed that achieving substantial growth in production requires greater efforts in terms of putting more inputs and developing the market infrastructure as the chances for area expansion are almost remote during the last decades of this century. The high yields in Punjab and Haryana are primarily due to successful cultivation of high-yielding, fertiliser-responsive dwarf varieties, coupled with judicious use of fertilisers and timely irrigation. The initiative and enterprise of farmers in adopting improved cultivation practices have also been a major factor. The farmers have demonstrated that given the technical know-how and the right type of input, very high yields can be obtained. The variations in yield and production in different States as well as in different areas within the States are on account of many constraints and problems. They are both monetary and non-monetary, which include lack of irrigation facilities, low coverage of area, slow rate of replacement of quality seeds, low dosage of fertilisers, inadequate use of pesticides, insufficient and erratic power supply, higher

prices and non-availability of good quality seeds, fertilisers and other inputs and inadequate credit.

21) Singh's inter-State analysis on yield variability among and across the crops for the period 1971-86, hypothesised that there exists a positive association between yield per hectare and variability in the case of rice as against negative correlation in the case of wheat. The higher average yield and variability in the case of non-traditional rice growing states are due to intensive cultivation and increasing area and yields of rice. Groundnut has the highest yield variability in Gujarat, which is a major producer of groundnut. The measures between yield and variability are not positive and systematic. The analysis recommends regional specialisation to achieve an overall higher and stable production of various crops at national level. The study also advocates the agricultural zoning based on agro-climatic suitability of crops to facilitate cultivation or crops in the areas best suited for their production.

22) Deshpande studied the growth and instability relationship in the State of Maharashtra. He examined the trends in growth and instability across crops between drought-prone and non-drought-prone districts after the advent of new technology. The study also examined the convergence or divergence in the peaks and troughs of yield series. The study reckoned the period from 1951-52 to 1980-81 and further broken it into two sub-periods by taking 1973-74 as cut-off point. Linear growth rates for individual crops and

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34 Singh, I.J., "Agricultural Instability and Farm Poverty in India; Indian Journal of Agricultural Economics, 1989, p.44.

correlations between growth and instability across crops and districts were computed.

Deshpande has used three measures of instability viz., coefficient of variation adjusted for trend, crop loss ratio and probability of failure of yields. Correlations between growth and instability both in the pre and post-technology periods have been worked out to examine the hypothesis whether the growth and instability relation has undergone any change after the advent of High Yielding Varieties. The study reported negative relationship between growth and instability in the pre-new technology period at State level across crops both in drought-prone and non-drought-prone districts which changed to positive and non-significant in post-new technology period. But non-drought-prone districts have shown relatively strong positive association.

23) Suresh Pal and Sirodhi36 examined the instability in Indian crop production. The study aimed at measuring the instability in production and yield in different States of India and identifying the sources of instability and also to study the impact of HYVs on production instability in the pre-GRP (1950-51 to 1964-65) and post-GRP (1967-68 to 1983-84). Area and yield data were determined linearly to remove the systematic component. Instability was measured by the coefficient of variation. The study results show that instability is relatively higher in less irrigated crops and States and yield variability contributed largely to production variance in the case of pulses and oilseeds. But in the case of cereals, share of yields to total production

variance has declined slightly. The study reported higher instability in period II, which can be attributable to sensitivity of HYV technology to weather changes and due to complementarity between HYV inputs and irrigation. The authors opined that there is need for strengthening the efforts towards creation of assured irrigation to stabilise production.

24) Shanmugam has attempted to measure the farm specific technical efficiency of raising major principal crops viz., rice, groundnut and cotton by using the stochastic frontier production function technique. He has tried to identify the factors which determine the technical efficiency of farms in producing these crops. In this study, the farm level data collected under the scheme of cost of cultivation of principal crops has been used. The data refer to the input and output details and other socio-economic characteristics of farm households in Tamil Nadu. The results of this study indicate that land and labour inputs are the significant determinants of output of almost all crops in the State. Fertilisers variable also influences positively the yield levels of rice and cotton crops. The technical efficiency of raising irrigated groundnut is relatively high in own land cultivation as compared to that of leased land cultivation.

25) Raju and Rao\textsuperscript{38}, in their study, have attempted to verify whether agriculture in Andhra Pradesh experienced any instability and the reasons for such instability. In this study the compound growth rates of foodgrains, non-foodgrains and all commodities were estimated by log $Y = a + bt$ equation for three periods in pre-green revolution (1956-57 to 1968-69), post-green revolution period (1969-70 to 1982-83) and overall period (1956-57 to 1982-83). The foodgrains growth during pre-green revolution period observed statistically non-significant negative growth (-6.42), whereas the green revolution period observed statistically significant increase at 2.66 per cent.

26) Singh and Gupta\textsuperscript{39} have carried out a study relating to foodgrains production in India. They have tried to study the performance of foodgrains during 1965-66 to 1994-95 to examine the variability in the pattern of production of foodgrains to work out the growth rates of area, production and productivity of foodgrains, to work out the rate of change of growth during the period, and to discuss the various aspects of foodgrains production and suggest measures for improvement. Their study reveals that 91 per cent variation in acreage as compared to '87-'97 per cent variation in production and productivity. The study reveals that the temporal character of variability has shown variation in production because of variation in yield. The fluctuations in the production are mostly attributed to the zig-zag productivity levels in different years.

\textsuperscript{38} Raju, V.T. and Rao, V.S., "Agricultural Growth and Instability in Andhra Pradesh", Agricultural Situation in India, Govt. of India, May, 1988.

27) Vakulabharanam⁴⁰ in his study analyses the state of agriculture and irrigation in Telangana, especially from the point of view of agricultural growth corresponding to growth in irrigation. Growth rates of agriculture at the district level between 1970-2001 are studied and they are decomposed to throw light on the respective contributions of cropping pattern, yield and area to agricultural growth. Exponential growth rates are computed. The study reveals that there has been growth in irrigation levels in Telangana, during the past three decades although the perception that the region suffers from insufficiency of irrigation resources may still be valid. Most of the growth has come from expansion of well irrigation using private capital which has adverse implications for groundwater levels and is also contributing to the immiserisation of small and marginal peasants.

28) Subrahmanyam and Satyasekhar⁴¹ have examined the pattern of development of Andhra Pradesh agriculture and suggest a perspective for the first decade of 21st century. The growth performance since mid-1950s is reviewed by considering growth of production, total factor productivity, expansion of irrigation, investment in agriculture and growth in fertilisers. The study focuses on growth potential of the sector by examining yields of various crops. According to the study, after a good growth performance of 3.5 per cent per annum for two decades, the agricultural sector of Andhra Pradesh witnessed steep deceleration in output growth in 1990s with the growth rate slipping to 2.3 per cent per annum. The deceleration in output growth has to be attributed to slow growth of public investment in


agriculture. According to the study, the sources with which the rapid growth in agriculture can be achieved are increasing the irrigation ratio, bridging the yield gaps and development of fallow land for crop cultivation or fodder development.

29) Devasena Naidu\textsuperscript{42} has analysed the growth and fluctuation trends in area, production and productivity in Andhra Pradesh for a period of 20 years, i.e., 1955-56 to 1975-76. The study reveals that although the agriculture has experienced an impressive progress it is neither consistent nor smooth. The growth trends have shown ups and downs in area, production and productivity. Ten crops have been selected for the study. The study reveals that the growth has been followed by a higher degree of instability. The niggardliness or vagaries of nature has a major role to retard the growth. All selected major crops in the study, except jowar and bajra, have recorded an increase in output though it is neither constant nor even. Correlation coefficient between area and production indicates more positive correlation than that of rainfall and production.

30) Munikrishnudu\textsuperscript{43}, has carried out a study on the growth of area, production and productivity of important crops in India from 1950-51 to 1985-86 in general and in Chittoor district of Andhra Pradesh in particular. The period under study has been split up into two periods, viz., pre-green revolution period and post-green revolution period. The study aims at finding out whether area or productivity has contributed more for the growth of


\textsuperscript{43} Munikrishnudu, M., Growth and Instability in Agricultural Production in Chittoor District, Dissertation submitted to S.V.University, Tirupati in 1989 for M.Phil degree.
output. It also aimed at quantifying the degree of instability and to focus on the main factors responsible for growth as well as instability in agriculture.

To measure the instability in crop production yield and area, the conventional yardsticks like coefficient of variation or coefficient of instability have been used. The study reveals that the contribution of productivity is more to the growth of agricultural output of important crops during the entire period. In the pre-green revolution period the area effect is more for wheat whereas, for other food crops the area effect is more. During the post-green revolution period, the contribution of productivity is greater than the area to the agricultural growth for all crops under study. As regards the extent of instability, the study observes that the degree of instability of total foodgrains is higher in green revolution period than in pre-green revolution period. Comparing rice with wheat, which are major staple foodgrains, the study reveals that there is high degree of instability in the area and production of rice. Instability is mainly due to metrological factors such as severe drought, cyclone, floods, pests and diseases. Besides, cropping pattern has also caused instability.

31) Chandra Sekhar carried out a study on the impact of new agricultural technology on cropping pattern, input use and yield in Rayalaseema region of Andhra Pradesh with a special focus on Chittoor district. The study reveals that the introduction of new agricultural technology in the form of high yielding varieties, fertilisers, pesticides and modern technology has transformed traditional Indian agriculture into

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modern one. The proportion of area under high yielding varieties to total foodgrains area increased significantly from 8 per cent in 1968-69 to 70 percent in 1991-92. Crop-wise analysis shows that the proportion of area under high yielding varieties increased from 30 per cent to 90 per cent in the case of wheat and from 7 per cent to 64 per cent in respect of rice during the same period. There has been a slight shift in area under foodgrains at the cost of non-food crops from pre-green revolution period to green revolution period. To be more specific, there has been a shift in area towards rice and wheat at the expense of coarse cereals.

32) Raveendra Reddy\textsuperscript{45} has carried out a study on the variance in agricultural production and productivity in Nellore district. The study aimed at explaining the levels and trends of agricultural production and productivity and analysing the degree of variance in production. The study has also aimed at assessing the demand and sources, cost and linkages to farm credit. The study reveals that the operational holdings in Nellore district indicate a higher degree of inequality compared with the entire State. Net area irrigated in the district is 19.1 per cent of geographical area compared with 14.7 per cent in Andhra Pradesh. Canal irrigation is more prevalent than irrigation tanks. Canals account for 33 per cent of irrigation in the district compared with 18 per cent in Andhra Pradesh.

33) Venkata Reddy\textsuperscript{46} studied the growth rates in respect of rice output for three regions of Andhra Pradesh from its formation to 1970-71. He stated that the main determinants of productivity are favourable institutional factors, adjustment of economic factors and application of science and technology. The low agricultural yield in Rayalaseema and Telangana regions is owing to the low percentage of area under high yielding varieties, less consumption of fertilisers, lack of assured irrigation and floods. He has calculated the linear growth rates of area, production and productivity for all the regions. Productivity contribution to rice output was higher during the pre-green revolution period while area contribution was a major factor for higher rice output during the green revolution period.

34) Narender Swamy and Pardhasaradhy\textsuperscript{47} have analysed the spectro-temporal variations in agricultural output in Andhra Pradesh and the factors which have affected growth during 1956-1981. Constant price weights have been assigned to different crops which have accounted for 90 per cent of the total cropped area. The study had revealed that the annual compound growth rate was 10.4 per cent for the overall period, though there had been variations in the annual growth rates for the four sub-periods into which the total period under review was divided. According to the study, the contribution of area to the agricultural growth was negative except in the initial years. The share of yield in the total contribution during the overall period was 62.32 per cent. Cropping pattern has also contributed considerably


\textsuperscript{47} Narender Swamy and Parthasarathy, A.P. Economic Association, Annual Conference held at Kavali, Nellore district.
along with the yield. It is noteworthy from the study that instead of foodgrains, high valued commercial crops like chillies, groundnut, sugarcane, cotton and tobacco have shown high output growth rate.

Present Study

Inspite of the above studies carried out in the related area, very few studies have been pursued on growth and instability at micro-level. No comprehensive study is undertaken to analysis the various factors responsible for unsteady growth of agriculture at regional level, though some studies have been undertaken at country level. Studies of growth rates and the extent of variability coinciding with crop production during pre-green revolution period and green revolution periods at the district levels within a State are very much appropriate for gaining a clearer and deeper insight into the growth patterns and the degree of fluctuations in crop production. An area specific indepth specific study is very much needed in order to understand the nature and causes of instability in agricultural production and productivity and to formulate a perspective and scientific strategy for effective execution of agricultural developmental programmes at district level. The present study makes an humble attempt in this direction with a view to examining critically the growth and instability in agriculture during pre-green revolution and post-green revolution periods in Nellore district of the state of Andhra Pradesh.
Objectives

The present study had been undertaken keeping the following objectives in view, viz.,

1. To examine the growth rates of area, production and productivity of selected crops in different regions of Andhra Pradesh;

2. To study the growth rates of area, production and productivity of important crops in Nellore district during pre-green revolution period and in the green revolution period;

3. To examine the relative contribution of area and productivity to the growth of output in pre-green revolution period and green revolution period.

4. To measure the degree of instability and to identify the major factors responsible for growth and instability in agriculture and suggest measures, in the light of the study, for accelerating the pace of agricultural growth ensuring stability.

Hypotheses

1. The growth of area, production and productivity of major crops in Andhra Pradesh as well as in Nellore district area, is by and large, similar in both pre-green revolution and the green revolution period.

2. The contribution of productivity to the growth of output is not significant during the green revolution period.

3. Instability has not affected the development of agriculture in the state of Andhra Pradesh and Nellore district.
Sources of Data

The study made use of only secondary data for analysis, drawing inferences and arriving at conclusions. The principal sources of secondary data are the publications, such as, Statistical Abstracts, Season and Crop Reports and An Outline of Agricultural Situation of Andhra Pradesh, published by Bureau of Economics and Statistics, Government of Andhra Pradesh, Hyderabad. The publications of Government of India like Economic Survey of India for various years have been used. Indian Journal of Agricultural Economics, American Journal of Economics, Economic and Political Weekly, the Lead Bank reports of Nellore district, Action Plan of the district published by the lead Bank, District Handbook, published by Chief Planning Officer are also consulted.

Tools of Analysis

Compound growth rates of area, production and productivity are worked out for principal crops:


This analysis aims at examining the impact of the green revolution on crop production in Nellore district as well as in India. The graphical presentation is also attempted showing the fluctuations in area, production and productivity of important crops during the period under study.
Compound growth rates have been computed by using the following formula:

\[ Y = AB^x \text{ or} \]

\[ \log Y = \log A + X \log B \]

Where

\[ Y = \text{Index numbers of area / production / yield} \]

\[ X = \text{time} \]

To list the significance of the growth of the area, production and productivity, the 't' test has been used with the following formula:

\[ \text{'t' test} = \frac{^B}{\text{Standard error}} t (n-2, 5\%) \]

Where

\[ ^B = \text{Estimated value of B} \]

\[ \text{Standard error} = \text{Standard error B} \]

To measure the instability in crop production, conventional yardsticks like coefficient of variation and co-efficient of instability were applied by using the following formulae.
Coefficient of Variation

\[
\text{C.V} = \frac{\sigma}{\bar{X}} \times 100
\]

Where

\(\sigma\) = Standard deviation

\(\bar{X}\) = Arithmetical mean

Coefficient of Instability

\[
\text{C.I} = \sqrt{\frac{\sum_{i=1}^{n} (\hat{Y}_i - Y)²}{\sum_{i=1}^{n} (Y - \bar{Y})²}}
\]

Where

\(\hat{Y}\) = Estimated value of Y

or \(Y^\wedge = a + bx\)

\(Y\) = value of output / area / yield

\(\bar{Y}\) = Mean

\(n\) = Sample size
Scope and limitations of the study

The present study made an attempt to examine the trends in area, production and productivity of important crops in the district viz., paddy, sugarcane and groundnut with the assumption that treating the entire district as one unit. The analysis of trends covers the period of 38 years in i.e., from 1960-61 to 1997-98 as well as two sub-periods 1960-61 to 1966-67 (pre-green revolution period) and 1967-68 to 1997-98 (post-green revolution period).

The growth rates of area, production and productivity of the aforesaid three principal crops of the district and instability in respect of these variables are examined to study. As agricultural production is a function of both area and farm productivity, the instability may be due to any one of the two or both of these two factors, put together. An attempt had been made to critically examine the instability in growth of agriculture in Nellore district during both pre-green revolution and green revolution periods. As stated above, this study is confined to three major crops viz., paddy, sugarcane and groundnut. These crops represent both irrigated and rainfed crops and also important food and commercial crops grown in the district. These crops represent 58.5 per cent of the total cropped area in the district during 1995-96.

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This study relied to a large extent, on official statistics available from different publications though time lag is bound to be present in the publication of official statistics. Care had been taken to make use of the latest statistical data available. In computing the growth rates and coefficient of variation and co-efficient of instability over a fairly long period of more than four decades for the entire district as well as for the State, there was no alternative source except to bank upon officially published data. The decennial census reports were also utilised, whenever necessary.

As it has been stated above, the study is confined to an indepth study of a single district and it is based on purely secondary data. This study may not be applicable directly to other areas of the country because of the variations in agro-climatic and socio-economic conditions. Further, the variations in agriculture in particular vary commonly from year to year. Besides the niggardliness of nature, the character of agriculture is subjected to changing price structure and resulting changes in the cropping pattern, which to a large extent, affect production decisions on farming in the short period.

The extent of instability is examined in physical units throughout and not in money terms as the money values fluctuate and may not be objective in a study spread over a long period. The fluctuations in crop production are examined in relation to natural and other factors.

Despite the aforesaid limitations, the study throws some light on certain broad features of Indian agriculture which may be of some relevance.
for the country as a whole. Though this is a micro-level study pertaining to a particular district, the findings and the suggestions arrived at in the study may have some practical implications in the policy formulations for agricultural development in the country in general and in the State in particular.

Plan of the Study

The study has been divided into seven chapters. The first chapter deals with the role of agriculture in economic development. The trends in agricultural production at the global level and at the National level have been analysed in this chapter.

The second chapter reviews the literature relevant to the present study, states the problems, objectives, hypotheses, methodology, scope, source of data studied, tools of analysis, limitations of the study and outlines the chapterisation.

Growth and instability in agriculture in the State of Andhra Pradesh and various issues relating to the agriculture in the state have been discussed in the third chapter. While studying production, productivity and area of various crops, an inter-state comparison is made.

The Agro-economic profile of Nellore district, is sketched out in the fourth chapter and production and productivity of major crops in Nellore district are examined in the fifth chapter.
In the sixth chapter the degree of instability in agricultural production and productivity in Nellore district have been studied. Factors which accounted for such instability have been analysed. Later, an attempt is made to forecast the production trends of three major crops in Nellore district viz., paddy, sugarcane and groundnut.

And finally, in the seventh chapter, major findings of the study were summerised and measures for accelerating the pace of agricultural development with stability were presented.