Statement of the Problem

In recent years, especially after the Green Revolution, there has been an increasing focus on agricultural changes at various levels setup in a developing country like India. These changes have improved the use of the agricultural land resource both in horizontal and vertical dimensions and increased the per-hectare yield levels and thus placing agricultural progress on sound lines. The modernisation of agriculture has assumed a greater significance in view of the fact that the country is in a fix to make both ends meet as regards food and industrial raw materials as well as ever-increasing
population pressure and decreasing man-land ratio. Even during the present way of modern economic perspectives and policies of urbanisation and industrialisation of the country, the agriculture still continues to be the main stay and principal economic activity of more than two-thirds of India's population. Today all the developmental efforts, reforms and policies in the agrarian sector have been emphasizing more on modernisation of agriculture and agricultural productivity.

Productivity increase seems to be the only and ultimate too, way for stepping-up the agricultural production, mainly because the extent of virgin land is highly limited (Narotham Singh, 1974); and multiple cropping because of its unique dependence on irrigation and other technological inputs (Beets, 1975), is not easily possible. The intensity of cropping and multiple cropping systems are possible only with the provision of irrigation which seems to be heavily dependent on the vagaries of monsoon (Sen, 1967). Contrary to limited scope for horizontal expansion of agricultural land for production-increase, there seems to be considerably larger scope for 'untapped-yield reservoir' that can gainfully be exploited. The 'untapped-yield reservoir' refers to potential yield minus actual yield. There
is a big gap between the crop yields of India and other countries like Japan and Australia and further in the country itself. A big gap may be noticed in the crop-yields between different regions and between demonstration fields and actual fields (Swaminathan, 1977). The ever-increasing pressure of population, decreasing man-land ratio and increasing demand for food resources i.e., demand on one hand; and the physical environmental constraints on both horizontal and vertical expansions of agriculture i.e., physical limits on the other hand have been pressing upon to raise the agricultural productivity for the benefits of the mankind and the nation as a whole.

Understanding the role of crop productivity-increase in stepping-up gross agricultural production, India has started a number of developmental programmes under the umbrella of so-called 'Green Revolution'. Obviously, the efforts of Green Revolution in the country have broken the chains of inherited agricultural backwardness and allowed the agrarian sector to compete with other economic activities in the capital-gain race. But unfortunately, the fruits of "Green Revolution" have not been shared equally by all areas and by all crops in the country. Resultantly, a few agricultural growth centres
have been emerged as like in the similar case of industrial cells; while many substantial areas continue to wallow in stagnation. In this connection, it may be quoted that "even after more than a decade of 'Green Revolution' and a substantial increase in agricultural production, particularly in foodgrains, Indian agriculture has yet not been above to break the chains of underdevelopment and food shortage still persists in some parts of the country" (Bharadwaj, 1981). "The reasons for such a state of affairs are not far to seek. First, a high population growth has accompanied the growth in the production of foodgrains. Second, the high growth in agricultural production is concentrated in a few pockets" (Bhalla and Alagh, 1978).

It is pertinent to state that the success of new seed-water-fertilizer agro-technology aims to increase the crop-productivity levels which has resulted in differential impact namely, widening the yield-gaps (i) between the crops, (ii) between the holdings, (iii) between the farming communities and (iv) between the areas. As a result, regional disparities in the levels of agricultural development are becoming common place especially in the developing world (Gleave, 1982). A few areas which possessed desirable agricultural
conditions have grown unprecedently into healthy, prosperous and dynamic areas, while some areas which reeling under physico-socio-economic and technological constraints have noticed with disturbed and unhealthy agricultural development. "It is noted that through the process of agricultural growth, inter-regional distances have increased quite significantly and this has engaged the attention of many researchers to identify the weaker areas as well as inferior crops in terms of agricultural productivity (Moonis Raza, 1981).

Swaminathan (1977) has mentioned that increase in the agricultural production in the recent Indian context is, to a great extent, linked with the problem of removal of disparity in yields both in between crops and regions. The present challenging problem effectively boils down as how to increase the per hectare yield levels of certain crops and areas which have so far lagged behind. Perhaps, the answer very often lies in the increased use of inputs and resources required and in overcoming the environmental or ecological problems that often plague them. Diagnostic regional enquiries focussing on the disparity and its causes are an essential steps in that direction (Mukhopadhýay, 1976).
Agricultural Productivity and Agricultural Development

Undoubtedly, crop farming is the most dominant aspect of agriculture in the country and hence traditionally, the crop productivity is normally equated in synonymous with agricultural productivity. Hence, agricultural productivity is one of the important dimensions of agricultural development. It is a truism that agricultural development is a multi-dimensional and much more comprehensive concept, of which, the crop productivity is one of the contributing factors.

Agricultural development denotes the quality of an agricultural system in terms of productivity, diversification and commercialisation confirming to a state of agrarian relation and ecological balance. Agricultural development is thus a holistic concept which recognises the complexity and interactedness of a number of variables influencing the efficiency of agriculture in an area (Gopal Krishnan 1981). It conveys more comprehensive and wider meaning which includes varied systems, practices, productions and performances of agriculture. While the term agricultural productivity is more empirical and denotes the actual performance of land in terms of quantum of return of crop production per unit of land. Agricultural productivity is the
comprehensive and composite index of the aggregate performance of various crops in an area in relation to their output per hectare. It denotes the maximum average physical or monetary output per hectare in relation to input under the prevailing environmental, socio-economic, technological and organisational set up. But more often than not, such a wider and broad meaning of agricultural development is narrowed and as far as to equate it with the level of crop productivity. It is also noticed that in most of the studies, the criteria selected for the measuring of agricultural development pattern is neither defined properly nor they are based on any sound conceptual framework (Gopal Krishnan 1981).

Perflexingly and more intriguingly, the concept of agricultural productivity too engaged the attention of many geographers, economists and planners in defining its meaning and measurement. If we examine the meaning and definition of agricultural productivity, different connotations of agricultural productivity can be derived. Earlier many geographers and economists opined that the physical yield or monetary yield per hectare should be considered to indicate agricultural productivity. This view was later opposed because it considered only land which is just one factor of production while other factors are also responsible like labour and capital. Considering
the all factors of production, Rao (1962) explained that "productivity is a physical rather than a value concept and describes the changing relation between output and one of the major inputs like land, labour and capital". Dewett and Singh (1966) have also opined the same and considered that "productivity expresses the varying relationship between agricultural output and one of the major inputs, like land or labour or capital, other complementary factors remaining the same ......." It may be borne in mind, that productivity is physical rather than a value concept. Shafi (1983) explained that agricultural productivity is the ratio of the index of total agricultural output to the index of total input used in farm production. Pandit (1965) also opined the same and explained it in economic sense that productivity is the ratio of output per unit of input and he further suggests that increase in productivity is generally the result of a more efficient use of some or of all the factors of production namely, land, labour and capital. Horking (1964) defines the term productivity, that it is generally used rather broadly to denote the ratio of output to any or all associated inputs, in real term.

Jasbir Singh (1984) described the level of agricultural productivity, as a concept, means the degree
to which the economic, cultural, technical and organisational variables (i.e., the man-made frame) are able to exploit the abiotic resources of the area for agricultural production. Bhatia (1967) defined agricultural productivity "as the aggregate performance of various crops in regard to their output per acre but the contribution of each crop to the agricultural efficiency would be relative to its share of the cropland". Vijaya Ram Singh (1979) defined agricultural productivity as the "quantum of return from arable land". He argued that "the quantity of produce denotes its intensity and the spatial expansion its spread".

From the preceding discussion, it is observed that any definition, that is attempted to define agricultural productivity is bound to suffer from one weakness or the other. However, several attempts on productivity study in agricultural geography opined that the aggregate output of the crops per hectare in a component areal unit may be considered to represent the agricultural productivity of that component areal unit, and that other factors of production be considered as the possible causes for the variation while comparing it with the other component areal units. But in agricultural economics, the productivity is mostly considered as the output per
unit of input. Above all, it can be stated that the agricultural productivity is a relative measure employed to make comparative studies. It denotes the maximum aggregate agricultural output per hectare in relation to the other factors of production under the prevailing physico-socio-economic technological and organisational milieu.

Undoubtedly, the concept of crop productivity/agricultural productivity is a complex and dynamic as well as spatially variable one. Shafi (1983) has rightly stated that "agricultural productivity is a multi-dimensional concept, which includes technological advancement, effective management of available resources and organisational set up for the agricultural production. These factors in turn affect the relative production in any region". The regional differences in agricultural productivity are certainly be the result of the interaction of both biotic and abiotic environments. The combined influence of these environments manifest themselves in per hectare productivity in any given area. Any change in the components or elements of biotic and abiotic environments certainly brings out an accompanied change in agricultural productivity of the concerned region. Moonis Raza (1981) opined that "the differentiation in the vast hinterland of primary production attendant
on the process of agricultural development in India, is essentially a function of differential doses of technological inputs interacting with environmental constraints of varying severity under the inhibiting influence of institutional factors of different intensities. Where all the three, operate together positively i.e., where institutions are less restrictive, environment more permissive and technological inputs high, it becomes possible to loosen the grip of inherited underdevelopment and a limited break through is achieved in regional agriculture. Where the three work together negatively i.e., where institutions are highly inhibitive, environment severe and technological inputs small—regional agriculture is unable to go beyond the stage of sub-marginal subsistence. Where the three operate in different directions or in the same direction with differing degrees of intensity, regional agriculture plods along at an unsatisfactory pace". In recent times, the Green Revolution strategy has brought out revolutionary changes and marked regional differences in agricultural production in the country.

Significance of the Study

Agricultural productivity is considered to be the most important indicator to discern and describe the
degree of agricultural development of any region. A study of agricultural productivity in its spatio-temporal perspective is essential for differentiating and delimiting the areas whose performances and accomplishments are diverse (Ramanaiah and Reddy, 1984). A study on agricultural productivity is imperative to identify the areas of dynamic, transitional and static in terms of agricultural development and trace the varied factors of production and isolate the determinants which have affected the agricultural development over a period of time. Such a study helps to evolve future orientation in agricultural planning and to lessen regional disparities.

A study on the agricultural productivity is of particular significance in the countries like India, where agriculture continues to be the dominant and population and food problem are acute. It is high time to locate the weaker areas in terms of agricultural productivity on which greater attention is to be paid in the coming years so as to enhance both the per hectare output and gross agricultural production in order to meet the challenging population explosion. In view of the practical significance of the study on agricultural productivity for various perspectives in agricultural planning, the
present study on "Changing Patterns of Crop Productivity Levels and Regional Disparities in Andhra Pradesh" is attempted. It is hoped that this diagnostic study will help to evolve both prophylactic and curative measures ultimately to improve the agricultural economy of the State.

The Study Region

The present study region, Andhra Pradesh is one of the States situated in the southern part of the country. The State accounts fifth rank both in terms of geographical area and population among the State of the Indian Union. About 70 per cent of the working population in the State depends upon agriculture for their livelihood. Hence the economy of Andhra Pradesh is agricultural and the cornerstone of its economic development lies in the development of agricultural economy. Among the four southern States, Andhra Pradesh is the only State which produces surplus foodgrain production off-setting or making good off the deficit foodgrain production of the other three southern States.

Andhra Pradesh has diversified physical and socio-economic conditions to represent diversified land use and cropping systems as well as varied crop productivity levels. It is the only State in India where three important rivers flow building two major deltas
and one crypto delta. The State has an enormous agricultural potential for developing a prosperous and opulent agriculture. In recent years the modernisation of agriculture and irrigation development have brought about a revolutionary change in the increase of productivity levels. But this increase is not uniform and ultimately led to striking imbalances between the areas and crops. It is more appropriate to make an examination of the changing pattern of crop yield levels with emphasis on regionalisation of agricultural productivity which will immensely help to design regional agricultural planning and development.

Objectives of the Study

From the point of agricultural productivity, certain regions in Andhra Pradesh are quite prosperous while certain other regions are deplorably poor. Attempts need to be made to remove not only such regional disparities but also to maximise agricultural production. Certainly, a scientific study on spatio-temporal variations in crop productivity pattern of the State helps to gain insights into the problem and provides the basis of planning and development.
The main objectives of the present study are:

i) to discern and describe the irrigation development, general land use pattern, crop regions, crop combinations and crop diversification,

ii) to examine the spatio-temporal variations in the distributional pattern of the per hectare yield levels of many crops,

iii) to measure the regional differences in the distribution of yield levels,

iv) to find out the changing trend and growth rates in crop yield levels of some important crops,

v) to measure the aggregate agricultural productivity by employing money-value co-efficient method and

vi) to demarcate and describe the hierarchy of agricultural productivity regions.

**Data Base and Methodology**

The present study is completely based on secondary data collected from the Government records. The secondary data pertaining to irrigation, land use, cropping, crop yield levels and wholesale price values of crop production are collected at district level for the two trienniums namely, 1971-74 and 1991-94. In order to correct the distortions, a three year average is used for spatio-temporal analysis. To examine the
changing trends and growth rates in crop yield levels, the continuous data is collected for a period of 30 years i.e., from 1960-61 to 1990-91.

The present study is made both with the help of cartographic and quantitative techniques. Crop combination, crop diversification and crop productivity techniques have been employed in the analysis of the study. The statistical techniques like averages, correlation and regression, co-efficient of determination, growth rates and 't' test have also been used in the present study.