1. Introduction

Rice is the most important food crop of Asian people. China and India are the leading rice growing countries of the world. Cultivation of rice probably originated in the monsoon areas of South-East Asia. In India rice has been grown for over 3000 years. In Hindu rituals, rice is offered to the Gods, in many social and religious ceremonies. Rice is grown between 8° to 25° N. latitude under widely varying conditions of temperature, rain, altitude etc.

Rice crop ranks first in production among cereals in Karnataka, though it is second ranking in area. Per hectare yield of rice is more than any other cereal crop. Hence rice is the most significant crop in Karnataka (as well as in India). Evergrowing population creates a serious food problem. Cultivation of rice is one of the solutions for the food problem because of its surprising high yields.
Geographic conditions such as relief, slope, rainfall, soil, sunshine, temperature, humidity etc., have a great impact on rice cultivation. Methods of cultivation, distribution, production and yield of rice are influenced by geographic conditions. This hypothesis has been studied by many agricultural geographers in different parts of the world. Some of the methods of those agricultural geographers have been applied in this thesis to study the impact of geographic conditions on rice cultivation, distribution, production, productivity etc.

2. Study Area

The study area covers the entire state of Karnataka, which stretches about 640 Kms. in north-south direction and about 320 Kms. in east west direction. Karnataka has an area of 1,92,204 Sq.Kms. and a population of 37 million.

Geographic location of Karnataka is in between 11° 30' - 19° N. latitude and 74° - 78° 30' E. longitude. The state which came into existence on 1st November 1976, by merging the parts from the surrounding former provinces.
In the present study, the researcher has made an attempt to study in greater detail the spatial pattern of rice cultivation and its production in relation to physical, economic and cultural environment of the state. This study covers a number of the latest modern innovations adapted in rice cultivation in Karnataka. An exhaustive study has been made regarding area, production, productivity problems etc., in greater detail.

Karnataka is one of the leading rice growing states in India. Though rice is the second ranking in area (19.91%) it ranks first in production (36.58%) among the cereal crops in Karnataka. Surprising high yield of rice is the reason for this. Rice is the most important food crop grown in Karnataka. All classes of people in Karnataka use rice in their food. It is produced mainly in southern districts, malnad area and irrigated area in maidan region. Productivity of rice is varying from area to area depending upon the methods of cultivation. In the present work the researcher has made an effort to study the cultivation of rice through geographical approach.
3. Objectives

The broad objectives of the present study is to examine in depth the geographical problems of rice cultivation in Karnataka and also the prospects for future development in rice cultivation. The specific objects of this research programme are:

i. To analyse the agro-climatic conditions in the rice cultivation.

ii. To investigate the factors responsible for growth and development of paddy cultivation in the state.

iii. To examine the capability of land for paddy cultivation.

iv. To assess the suitability of land for paddy cultivation.

v. To demarcate the paddy cultivation region.

vi. To examine the position of modern innovations in rice cultivation.

vii. To assess the potential resource of rice cultivation.

viii. To study the infrastructures of paddy cultivation.
ix. To understand Research and Development in paddy cultivation.

x. To examine the problems and to suggest the remedial measures for future development of rice cultivation.

4. Scope of the Study

This study is concerned with geography of paddy cultivation in Karnataka State, which is an important state in rice cultivation. The following are the points for selection of this study in the present research:

i) This will give clear picture of traditional and modern methods of paddy cultivation.

ii) This will help to understand the potentials of paddy cultivation in the state.

iii) This will help to know the reasons of failure and success in paddy cultivation.

iv) This will give a clear picture of productivity and production of rice in different areas.
v) Finally this would help to suggest the measures of improvement and development in the paddy cultivation.

5. Justification for the Study

Agriculture is an economic activity. Geography is the science of distribution of anything on the earth's surface in relation to time and man. Agricultural geography has interest in the spatial patterns of agricultural activities. Von Thunen's economic location theory was concerned with agriculture. Agriculture has dominated the human landscape and claimed most of man's working hours for several thousands of years. Early Greek and Roman writers - Strabo, Caesar, Pliny etc., have written on agriculture. No systematic studies were made in agricultural geography till the end of the eighteenth century when a true geographic literature on agriculture was begun. Then instead of a raw description researchers began to consider the role of physical conditions in the variation of agricultural areas.
In the nineteenth century, analysis began to give hints of the regional approach. Statistical study of crop regions was made in North America. Kryzmowski wrote an article on the "Scientific position of agricultural geography" in 1911. By 1933 agricultural writings had increased to the point of encouraging Leo Waibel to become the first geographer to devote a methodological work to the "problems of agricultural geography".

There is unanimous agreement on the primary object of study in agricultural geography: the areal variation of agriculture. Reeds defined "Agricultural Geography in its broadest sense seeks to describe and explain areal differentiation in agriculture..." It has its counterpart in Bernhard's (1915) statement "Agricultural geography strives to bring light to spatial variations in agriculture and the reasons for them." Otremba's statement in 1964 "Area as an object of investigation by agricultural geography is understandable only in the perception of the spatial arrangement of its material filling", has a precursor in Hillman's assertion in 1911. Just as we have comparative scientists in other disciplines, so does agricultural geography continue a systematic comparative study of agriculture of the countries and continents."
Friedrich viewed the goal of economic geography as one of describing and explaining the "geographic distribution of economic facts as a spatial phenomena on the earth's surface in terms of historical development, present situation and quantity and quality."

Hetner generally agreed with this allocation of subject matter, although he emphasized the study of variations in the "economic character" of regions as a principal goal of economic geography.

The knowledge of the geographic distribution of individual products or products belongs to the sciences of economic production... and can be designated as a "geographic product information"; economic geography, in contrast, has to do with the economic characteristics and relationships of the various countries and localities.

Schluter also defined economic geography by comparing it to economics. The political economist directs his view towards the economic processes. The kinds of exchanges the means by which they are accomplished, thus, above all, money and trade, the causes and effects of the entire process that inserts itself
between production and consumption of goods - these are the facts that properly concern him, at the same time always with consideration of the practical results, for better or worse. One can also consider these things in their relation to the earth's surface and for example investigate the influence of geographic situation can exert on the battle of competition. But this still brings us only a geographic political economy, which stands in exactly the same relationship to geography as does geographic botany.

Bernhard advocates for greater independence for agricultural geography. For him "Agricultural geography is both agricultural science and geography; from the former it takes its object and from the latter its approach." For Bernhard "there is a little value in undertaking comparative considerations of economic conditions in various world areas if one does not wish to draw on natural and human factors for the explanation of spatial variations." Bernhard states another system of agricultural sciences:
I) Systematic View

A. Fields of agricultural technology
   i. Plant production fields
   ii. Animal production fields
   iii. Allied agricultural technological fields.

B. Agricultural Economics

II) Historic View: Agricultural history.

III) Geographical view: Agricultural geography.

Thus, he argues, the developmental knowledge should begin with the study of agricultural history for "it teaches us to understand the evolution of agriculture with its particular phenomena. After that, agricultural geography should show in a picture of world and regional agriculture "how the subject is related to the associated differentiations." Systematic agricultural science always looks to the future; it should orient itself toward the most successful methods of the agricultural production processes. Agricultural geography provides the agricultural sciences with the missing link for the creation of a methodological whole."
Waibel has described the three parts of agricultural geography: statistical, ecological and physiognomic. Statistical agricultural geography uses statistics to determine the distribution of plants and animals, not only in absolute terms, but ratios, so as to discover the heaviest concentrations of each of these agricultural units, what position each has in the whole farming operation, and where each unit is dislodged by a more profitable one. The statistical approach must be complemented by the ecological, however, which has as its object the study of the different ways in which man combines plants and animals into a farming system within a particular environment. This ecological or functional agricultural geography thus has far more geographic significance than that of the statistical. The capstone of the three disciplines is physiognomic agricultural geography. It is not only an attempt at a complete description of the agriculturally conditioned landscape, including crops, roads, paths, farmsteads and any other material evidences of the farming process; it also seeks to determine the spatial structure and distribution of the various landscapes.
Faucher (1946-49) was also to use the comprehensive regional approach as a justification for setting agricultural geography apart from agricultural sciences. Moreover he was also to claim it as a basis for sub-dividing agricultural geography and making it independent of economic geography. Faucher said "the agriculturist researches the technical conditions of production and the means for improving them." Whereas the geographer is more attentive to the results of cultivation, than to its processes. The nature of the products, the economic conditions for their obtainment, the way of life of the cultivators, the characteristics and transformations of the rural landscape constitute his particular object. But this approach, Faucher warns, should not be confused with the study of world distribution of crops, their volume of production, their use and their movement which was the province of economic geography of agriculture.

Hetner has rephrased his views about possibilitism in more agricultural geographic terms, in his "Allgemeine Geographie des Menschen", published in (1947):
"Nature in its diverse conditions: in the soil, in the water, in the climate and in the natural existence or the transfer of suitable plants and animals, offers in different earth's areas completely different possibilities to which man cannot think himself superior; the knowledge of their geographic distribution and the resulting... potential agricultural zones and regions in the pre-requisite. But whether and how man exploits these possibilities, whether and how far the potential areas gain agricultural reality, depends on his culture and national individuality.

New concepts have continued to arise, and all involve still greater attention to the human side of relationship. Thoman expanded the structure of the relationship by writing of the "interactions of man, culture and nature. Although differences of natural environment play roles in the operation of "technical systems" such as crop rotation or land tenure, still another kind of environment requires consideration, society: "The societal environment has, like the natural environment, great significance for technical processes. More attention to the "social environment is asked by Gregor Otremba has referred to man-economy-nature in which economy is termed a function of society."
This growing concern with the more cultural aspects of man's relationship to his environment has also found its way into methodological statements specially on agricultural geography. Here according to George, one must pay particular attention to three basic sets of relationships: (i) those between the physical environment and agricultural operations; (ii) those between population and available agricultural space and (iii) an ensemble of historical relationships.

McCarty and Lindberg agree with Hillman and Krzymowski. The work of the economic geographer, they wrote, consists of finding solutions for the problems that begin with simple questions such as "why is the phenomena located here?" and proceed to more complex queries such as "where can I most advantageously locate my business?" and "what type of economic development would be most successful in this area?". Further, rigorous standards of research "must, prevail if the discipline of geography is to be of maximum service to mankind". Symons has noted that research worker faces "endless problems of an academic nature", he also is confronted by the "greater problems that best mankind as a whole". Any contribution that agricultural
geography can make to the solving of the greatest of these problems - hunger - is, Symons asserts, "more important than its academic justification."

According to Morgan and Muton "a scientific agricultural geography is not concerned simply with describing the nature of farming in particular places. Although such description must always have some interest for the agricultural geographer, his main objective must be to understand the spatial aspects of farm enterprises, that is crops and livestock, whether considered individually or in groups and of farm operations. The transport and marketing of agricultural commodities must also be of major interest to him. Agricultural geography is a part of economic geography (Coppock 1968). It is concerned at present essentially with production process, in the first instance must seek to classify and comprehend them. Agricultural geography is concerned with choice, but with a special locational aspect. Location of any enterprise is clearly the product of decisions made by many farmers either to develop or not to develop that enterprise or of their ignorance of the ways in which it might fit into their scheme of operations or farm systems."
Since the farm is the decision making unit it should be a major focus of interest to the agricultural geographer.

The scale problem is fundamental in geographical studies (Haggett, 1965). In agricultural geography data are collected and generalizations made most frequently at four major levels:

1. The nation.
2. The agricultural region.
3. The farm.
4. The field.

At national level there is annually published data, information, referring to administrative subdivisions, making possible some regional comparison and reference.

Traditionally agricultural geography has been concerned with describing, classifying and explaining that which exists in areas such studies depend mainly on inductive reasoning using empirical methods in which generalizations were made from features observed. Deductive methods by which hypothesis were first developed and then tested by examination of the facts, have only recently played an important role. Such methods
have rarely been employed, however, to explain that which exists in areas, but more usually to predict that which might have existed had certain assumptions been satisfied. Generally the title deductive theory that has been developed in agricultural geography has been concerned with seeking optimum distributions usually which will give most profit. After carefully studying the above cited and some other books, research papers etc., a frame of guidelines has been prepared to carry-out the present study. Rice is the most important food-crop of Karnataka and there are geographic conditions influencing the distribution, production, productivity of rice. There are three main geographic regions in the state. Thus the topic is fully justified for study.

The area is vast, data is plenty, period of time is about 25 years. All the available secondary data has been used. Some times tertiary data has also been used. Primary data has been collected by conducting detail survey of some selected villages under geographic regions.
6. Hypotheses

In pursuance of the objectives outlined above, the following hypotheses are framed to be tested in the field:

1. The variability in climatic and physical conditions such as temperature, rainfall, relative humidity, soil, slope, elevation and irrigation have their impact on various operations of paddy cultivation.

2. Application of modern innovations and high yielding varieties of rice have impact on the quality and quantity and production and productivity of paddy and its income.

3. Variation in the cost of cultivation of rice production have significant relationship with changes in the output of paddy production and other uses of rice.

4. Improvement in the paddy cultivation has its positive impact on the concentration of paddy-area in the state.

5. Paddy cultivation is more labour influential vis-a-vis agricultural development of the state.
6. The development in the paddy cultivation is providing large scale employment and economic security to the producers.

7. The location of rice mills is mainly depending upon the concentration of paddy cultivation and area.

7. Literature Survey

An attempt has been made to give a brief review of the studies made so far on the problems relating to paddy cultivation and rice mills in India in general and Karnataka in particular. This study includes the contribution of several writers like:


8. Methodology

The study is based on primary and secondary data from different sources. Primary data is based on actual survey and questionnaire and discussion with
respondents concerned with rice cultivation. Secondary data is collected from published material by Government, semi-Government and private organizations, institutions, offices etc. A random sample survey has been conducted by selecting one villages in each district of rice growing region.

It is a combination of the exploratory and descriptive design, because ours is a primarily geographical approach of the study which required a large variety of information.

The data has been analysed with the help of recent statistical research techniques and cartographic methods. Techniques to measure the efficiency of rice cultivation, trend, productivity, crop combination, delineation of rice regions, regression lines for testing correlation between rice cultivation and conditions of environment, economic conditions, agricultural efficiency, levels of agricultural development etc., have been used.
9. Organization of the Study

The study has been organized in 6 Chapters.

Chapter - I : (A) This chapter deals with the introduction, geographical conditions like temperature, rainfall, soil, slope, rice growing regions in Karnataka. (B) Botanical aspects, history and evolution of rice cultivation. Position of Karnataka in rice cultivation in India, types and methods of rice cultivation.

Chapter - II : This chapter deals with varieties of rice grown in the state. Different methods of cultivation in practice; rainfed and irrigated area; R and D studies.

Chapter - III : This chapter covers area, location, production of rice in detail. Trend in rice acreage and production. Delineation of rice regions by using statistical techniques. To correlate trend in production due to climate, soil, slope, fertilizers, topography, irrigation etc.
Chapter - IV : This chapter covers economic significance of rice cultivation, evaluation of rice production, quality, quantity, volume, value, economic conditions of rice farmers, population, labour-force, input, output, per capita production and consumption, need, calorie-requirements, nutrition, health etc.

Chapter - V : This chapter is concerned with the policy of the Government, farmers' attitude towards rice cultivation, innovations, modernization, rural credit, case studies, modern rice mills, distribution of rice markets, transport etc.

Chapter - VI : This chapter summaries the study and covers the problems of rice cultivation, findings, suggestions to develop rice cultivation in the state in future.

The Chapters I, II and III are comparatively larger than the Chapter IV and V. But it was inevitable to have such chapters. Chapter I deals with geographic conditions, history and evolution of rice cultivation, Chapter II deals with varieties and methods of rice cultivation, Chapter III covers distribution and production of rice in Karnataka. The two parts of each of these chapters seem to be better if combined rather than if split into two separate chapters.