The agricultural sector in India which contributes nearly half of the national income, provides livelihood to about 3/4th of the population and supplies the bulk of goods and raw materials required by the non-agricultural sectors. Transport, marketing, processing and other aspects of agricultural production and utilization have also a strong bearing on the national economy. Agriculture is not only an important economic activity but also a form of social heritage and a way of life for the millions of Indian farmers. The agriculture in India continues to be an area of vigorous research interest for the social and natural scientists alike. This is understandably so as agriculture absorbs an overwhelmingly large section of the workforce of India. India's planned efforts towards development in agriculture began in 1951, the year when First Five Year Plan was launched; thereafter, Indian agriculture began to progress. In some parts of India, advances in irrigation and farm practices have touched the basic problems of low agricultural productivity and rural poverty. Climate is one of the major physical factors affecting agriculture in India. Due to uncertainty of monsoonal rains agriculture in India is not
developing uniformly besides other constraints like quality of soil and infrastructural facilities. Due to uncertainty and scarcity of monsoonal rains, droughts linger at least thrice in a period of ten years. While floods cause lot of damage to crops, soil, men and material in certain areas of India. It is undoubtedly a well-known fact that the food production in India is not keeping pace with the population increase, where 69 per cent of the working population is engaged in agriculture whose contribution to the national income is about 45 per cent. This is mainly because the agricultural lands are not being coaxed well and the yield efficiency of even major crops are very low compared to the world standard. The problem of food production to feed the growing millions is a complex one. Even though a number of investigations have been made on this particular problem sponsored by the Indian Council of Agricultural Research, Planning Commission, National Council of Applied Economic Research, Ford Foundation Team, Food and Agricultural Ministry, and other organisations and Research Institutes, they have not discussed properly the factors responsible for the regional differentiation of agricultural production. After more than ten years of Green Revolution and substantial increase in production particularly in foodgrains, there still persists acute food
shortage in various parts of the country. It is particularly due to the higher increase in population growth than the growth of the foodgrains, and secondly due to the uneven distribution of agricultural technology throughout the country. The introduction of new technology in agriculture which includes, among others, high-yielding varieties of seeds, fertilizers, irrigation, pesticides and farm machinery have augmented the regional disparities in foodgrains production. But such factors as regional differences in the size of holdings, tenure systems, management and finally, the differences in natural resources like water which is considered to be the most crucial factor determine the output of the foodgrains. Even the regions enjoying the same level of geophysical conditions have varying performance in agricultural production. The present study seeks to examine the various aspects of agricultural development in Bellary. The existing problem in our agriculture is so complicated and complex that a single discipline will not be enough to find out the actual truth. In order to understand the real problem an integrated approach is needed. Therefore, the role played by the geographers, economists, sociologists, and agricultural scientists will be largely helpful in finding out the core of the problem. The complex problem of agricultural development should therefore be
studied under three factors and these are: environmental, technological, and institutional. The environmental factor itself is a complex one as agriculture in India is variously affected by the environmental variations from one region to another. Thus the slope factor, the lie of the land, which decides the limits of the agricultural extension. Secondly the soil is a very complex natural asset as it contains various plant nutrients suitable for the survival of different crops as well as moisture whose retaining capacity varies from one region to another, depending upon the structure and texture of the soil. There will be a continuous fall in the fertility of the soil if not tested. Also the application of manure and water if it is unscientifically carried out will bring destruction to the soil. Thirdly, the climatic abnormalities, especially the erratic nature of rainfall and its variation in space and time are the most crucial factors for the survival and growth of Indian agricultural economy. Needless to say, the study of Indian agriculture will be miserably incomplete if we approach the problem from the point of view of economics alone. Let us give the example of Rajasthan to stress the statement. In Rajasthan the percentage area under cultivation to the total cultivable land is significantly less than in many other parts of India. This is due to the single factor of rainfall and its high
variability. The rains in Rajasthan recede early when the Kharif crops ripen. When therefore, the sowing of the Rabi crops is under way the moisture of the soil has already been reduced considerably. This factor together with the traditional system of ploughing which prevails in Rajasthan is completely ignored by the economists, when they study the problem of the extension of land under cultivation. The institutional factors also play their role in the development of agriculture. The institutional factors are also being studied with reference to the agricultural development by a number of disciplines but the geographers study this problem in terms of spatial and temporal variations. The unit of study by the economists may be different from those of the geographers and sociologists but any study by any discipline will be meaningful and can be made use of by the students of the agricultural development if the avowed aim is social justice. The present study also seeks to examine the role of technological factors in the agricultural development because at present the technological factors are largely responsible for minimising the environmental role in the agricultural development. Before the introduction of the modern methods of irrigation, high yielding varieties of seeds and various kinds of fertilizers the impact of environment on the agricultural production was in despread.
But today its influence has been minimised to a large extent at least in a few pockets in India. Hence for any real breakthrough in the development of agriculture, the role of the technological inputs must be studied from all possible angles. One such angle is the interaction between the technological advance and the institutional-organisational reform which poses problems quite complex in nature. Nobody can deny the necessity of both in transforming the traditional agriculture. However, in the light of the present state of affairs of agriculture in our country as well as the recent extra-ordinary advances made in technological knowledge, Indian agriculture, if it is to develop, must devise its own technology to suit its requirements.

Land and water are the basic infrastructure for agriculture. The cultivated land area (gross area) can be increased by two to three times, if the cropping intensity is stepped up from the present 120 per cent to 200-300 per cent. But that is possible only if water is available to irrigate crops for the second or third time in the year in the same field. The entire available water reserve of about 100 Kmh.m.(million hectare metres) is expected to be harnessed in the next 12-15 years. The total irrigated area at that time will be about 50 per cent of the gross cultivated area of 210 million hectares. The total
agricultural production from a gross area of 165 million hectares now is around 150 million tonnes which means the average yield is less than a tonne per hectare, while in China it is about four tonnes. India must produce about 235 million tonnes by the end of the century to feed an anticipated population of about 950 millions.

Irrigation claims more than 90 per cent of the water available. It is estimated that the allocation of water to agriculture will be reduced to about 77 per cent in the next 12 years because of rising demand for industrial and municipal needs. Since agriculture takes the bulk of the nation's water budget, saving even a small percentage releases a lot of water to meet other needs. The irrigation efficiency in major projects has been projected at about 30 to 35 per cent. Raising the efficiency by 10 per cent will save enough water to supply new areas. The investment per hectare in irrigation projects has been tremendous in the last five to 10 years. The cost which was about Rs. 1,500 a hectare in the First Plan period is presently between Rs. 30,000 and Rs. 40,000 per hectare. Modern methods to economise on water use must be devised to increase productivity and bring more areas under irrigation. This will also minimise the hazards of water logging which renders large areas saline. It is estimated that the average annual surface flow of water is about 180 mhm, of
which only about 70 mhm is harnessable because of terrain conditions, sporadic rains and a dearth of suitable sites for dams. Similarly the annual recharge of ground water is an estimated 50 mhm and the amount utilised about 35 mhm. This utilisable amount depends not only on the quantity of water available, but also its quality. Not all this water (105 mhm) would be available for irrigation as there would be demand for municipal and industrial purposes. Though the irrigated area of 21 mha in 1950-51 is increased to 68 mha at the end of Sixth Plan the entire utilisable water will be harnessed only by 2,000 A.D. In States like Tamil Nadu, all the water resources have been fully used, but the percentage of irrigation is only about 45. In Maharashtra, Karnataka and Gujarat, even after using all the available water, the percentage of irrigated to sown area will be less than 40. Advanced methods of irrigation become essential not only for increasing the area of irrigation but also for more production. The increasing scarcity of water is a matter of serious concern. Only through a major effort at water saving, will it be possible to maintain a reasonable growth rate of that part of the national income dependent on irrigated agriculture in areas where water is a limiting factor.

There is an urgent need to find out ways to increase water supply. Rainfall being constant, the other alternatives
are desalination, salt water utilisation, re-use of water, weather modification and improved water management practices or new irrigation strategies.

Therefore, geographers can certainly play their role in understanding the problems of landuse and agriculture of all the regional levels like micro, meso and macro. In this regard Bellary district which is unique (among the districts of Karnataka) showing drought conditions, irrigation impacts, urban development and mining activities is chosen for study.

The Main Objectives of the Present Study are:

To make a comprehensive and in-depth study of various aspects of agricultural geography of Bellary district such as:
identifying the elements of climate and their influence on agriculture. To understand the various factors and forces that are responsible for spatio-temporal changes (study period 1975-76 to 1985-86) of land use, cropping pattern, crop productivity, agricultural efficiency, levels of agricultural development and regional disparities. To survey the spatial distribution of infrastructural facilities available in Bellary district which can influence on the development of agriculture either directly or indirectly. In order to know the problems and situations of
agriculture at grass root level village studies are undertaken. Thus after examining the multifarious dimensions of agriculture of Bellary district suitable strategies are suggested not only in the 9th chapter but also in the relevant chapters.

**Hypothesis:**

The following hypothesis built for the present study is examined in the thesis:

1) Irrigation if adequately and properly used can enhance the landuse efficiency and crop productivity. If water is misused can reduce the productivity and also cause damage to the soil structure leading to formation of wasteland (this hypothesis is proved).

2) Lesser rainfall than the normal and its oscillation in rainy season in Bellary district can adversely affect the practice and growth of agriculture (this hypothesis is proved).

3) Higher percentage of literacy and urbanisation can lead to the improvements of agricultural productivity (this hypothesis is proved).

4) The increased number/net work of infrastructure can also help to improve the agricultural efficiency (this hypothesis is partly proved in some talukas).
5) Small and very small size land holdings and poor farmers cannot contribute more for the overall growth of agriculture (partly proved).

Therefore, the present study is a humble attempt made by this researcher to bring out spatio-temporal dimensions of the agricultural geography of Bellary district and also draw the inferences. This work is an outcome of exhaustive field work, reference studies, case studies, discussions with farmers, agricultural officers, geographers (when attended geographical congress, seminars, symposia etc.), district planning authorities of irrigation, transport, statistics and industries. The contents of this thesis are the direct outcome of the overall approach made by this researcher. He is aware of the merits and demerits of the techniques/methods adopted in the thesis. The entire study is scientifically divided into four parts consisting nine chapters. The photographs are to be treated as not merely important references but also eloquent evidences of field work. Data analysis is made with appropriate formulae and results are presented on maps. Stepwise regression analysis and correlation matrices are worked out with the help of computer. The sharp results of these techniques are very pinpointing to make the observations more accurate. In relevant chapters suitable
suggestions are added to develop the agriculture of Bellary. More details about the physical setting and minute observations of each taluk are included in the thesis in order to make the things more clear to the foreign examiner (outside India) of this thesis. Thus results of the thesis reveal that agricultural change and development is based not on single factor but on varieties of factors.