Chapter I

Appraisal of the Problem

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Chapter I
Appraisal of the Problem

1.1 Meaning of Agriculture and Agricultural Geography:

The word 'agriculture' comes from a Latin term 'Agricultura'. Which has its origin in the words 'ager' meaning a field and 'cultura' meaning to culture or cultivate. Watson's Longman Modern English Dictionary (1976)¹ define the word agriculture as the 'science or the art or the practice of large-scale soil cultivation' in order to produce crops.

Agriculture is different from 'Pastoral farming' which is the practice of breeding and rearing of certain herbivorous animals. For lack of an appropriate word, agricultural geographers used the word 'agriculture' to cover both cropping and grazing. Humphrey's American Peoples Encyclopaedia (1965)² mentions under the head 'Agriculture' the production of crops, livestock and their products. It is in such a broad context that the term is used here to include both rearing of animals and raising of crops. The science or art of cultivating soil, growing and harvesting of crops, domestication of animals and raising of livestock is known as agriculture³.

'Agricultural' in agricultural geography implies the subject matter, and 'geography' gives the ways of viewing or investigation the subject matter. Agricultural geography thus means the 'Geography of Agriculture'. Etymologically the expression 'agricultural geography' has Greek and Latin roots. The word 'Geography' is derived from a Greek word 'Geographia' which stems from two words, namely, 'geo' meaning the earth and 'graphia' meaning to describe. To define present-day 'agricultural geography' is a matter of considerable debate among professional geographers. Etymologically, agricultural geography deals with the art and science of domestication of plants and animals. Its definitions are numerous which have changed over the period of time. According to Hillman (1911)⁴ agricultural geography deals with a comparative study of agriculture of countries and continents, given in 1911 it is an obsolete definition. The basic focus of this definition is to compare
the agricultural activities of different countries and continents at a macro level. In reality, the decisions about the cropping patterns and associated activities are taken at the field or macro level. Moreover, this definition does not explain the causes of such spatial variations in agricultural phenomena.

Bernhard (1915) defines agricultural geography as the study of regional variations in agriculture and the factors responsible for them. It is a relatively more rational definition of agricultural geography as it takes into account the regional distribution of agricultural activities. It also attempts to identify the physical and cultural factors which controls the spatial distribution of agricultural pursuits.

Andreasen (1981) opines that agricultural geography is the science of agriculturally transformed earth's surface with all its associated physical, social and economic interrelationships as reflected spatially. The main focus of this definition is on the point that over the period of last over 12000 years, man by his deeds has transformed the natural vegetation. He has modified the natural ecosystems into agricultural ecosystems.

These definitions clearly show that the geographers differ much in their opinions about the definition of agricultural geography. In fact, like all the other disciplines of knowledge, the definition of this sub-branch of geography, is also changing in space and time.

In modern, agricultural geography the major thrust of geographers is to investigate the spatial variability of agricultural activity. Landuse is the most obvious spatial variable and much effort has gone into describing and classifying landuses (crop combinations, crop concentration, crop diversification, agricultural efficiency, landuse survey and land carrying capacity regions).

1.2 Significance of the Study of Agricultural Geography:

Agricultural geography is one of the most highly developed branches of geography of the twenty-first century. In recent years, it has made considerable progress towards maturity as agricultural geographers have began to treat data concepts and interpretation quantitatively. It is now fully alive to
the changing economic, social and political situations which have resulted from progress in science and technology. Its study is considered essential to fulfil man's irresistible desire to know, understand and investigate the arrangement and distribution of agricultural phenomena at spatio-temporal scale. Moreover, the emergence of agricultural geography as an independent, distinct and a leading branch of modern geography is becoming a pivotal event in agricultural land use planning and development. The study of agricultural geography is essential to explain the different types of agriculture, to analyse the operation of farming system, to highlight volume of changes in agriculture, to measure and examine the level of differences between the region and to identify weaker areas in terms of agricultural productivity.

The significance of agricultural geography is that it provides help and guidelines for decision makers and useful for:

1. The agricultural specialist, who wishes to improve the structure of agriculture.
2. The food economist, who wishes to increase the production of foodstuffs.
3. The irrigation engineer, who plans to introduce new irrigation.
4. The regional planner, who is on the lookout for the most favourable location for recreation areas.
5. Transportation engineer, who has to lay the new rail-road lines.
6. The demographic planner, who plans public services and utilities and
7. The numerous other specialists.

1.3 The Place of Agriculture in Indian Economy:

India is predominantly an agricultural country where roughly 62 percent of its population has remained engaged in agriculture. Agriculture forms a backbone of our economy and it also supports to the agro-based industries.

Figures supplied by the National Income Committee and Central Statistical Organisation show clearly that agriculture contributed 57 percent of the national income in 1950-51 but contributed now around 32 percent of the national income². Two important facts must be emphasised here. Firstly,
agriculture contributes even now a major share of the national income in India. Secondly, the share of agriculture in national income, however, has been decreasing continuously and the shares of the manufacturing and service sectors are increasing.

Comparison can be made between the position of agriculture in India with that in the other countries as regards the share of agriculture in national income. In the United Kingdom, agriculture contribute only 2 percent of the national income, in U.S.A. it is 3 percent, in Canada it is 4 percent, in Australia it is 5 percent and so on. The more developed a country, the smaller is the share of agriculture in national output. India, having not yet reached the stage of advanced economy, has an agricultural sector which is still the dominant in the country.

Agriculture dominates the economy to such extent that a very high proportion of working population in India is engaged in agriculture. According to Human Development Report (1993) figures between 62 percent of India’s working population is engaged in agriculture. But in the United Kingdom and United States of America only 2 to 3 percent of the working population is engaged in agriculture, in France the proportion is about 7 percent and in Australia it is about 6%.

Indian agriculture has been the source of supply of raw materials to our leading industries. Cotton and jute textile industries, sugar, vanaspati and plantations all these depend on agriculture directly. Many of our small scale and cottage industries like handloom, wearing, oil crushing, rice husking etc. depend upon agriculture for their raw materials together and they account for 50% of income generated in the manufacturing sector in India. But then, in recent years, the significance of agriculture to industries is growing down as many more industries have come up which are not dependent on agriculture. Under the Five Year Plans, iron and steel industry, chemical, machine tools and other engineering industries, air craft etc. have been started. However, in recent years, the importance of food processing industries is being increasingly recognised both for generation of income and for generation of employment.
Importance of Indian agriculture also arises from the role it plays in India's trade. Agricultural products tea, sugar, oil seeds, tobacco, spices etc. constitutes the main items of export of India. Broadly speaking the proportion of agricultural goods which are exported may account to 50% of our export and manufactures with agricultural content (such goods as manufactured jute, cloth and sugar) contribute another 20% or so and the total comes to 70% of India's export.

Importance of agriculture in the national economy is indicated by many facts. For example agriculture is the main support for India's transport system, since railways and roadways secure bulk of their business from the movement of agricultural goods. Internal trade is mostly in agricultural products. Further, good crops implying large purchasing power with the farmers lead to greater demand for manufactures and therefore, better prices. In other words, prosperity of the farmers is also the prosperity of Industries.

Likewise, bad crops lead to a depression in business. Generally, it is the failure in the agricultural front that has led to failure of economic planning. Finally, finances of the government especially of the state Governments, depend, to a large extent, upon the prosperity of agriculture. It is clear, that agriculture is the backbone of the Indian economy and prosperity of agriculture can also largely stand for the prosperity of the Indian economy.

1.4 Agricultural Development in India:

On the eve of the First Plan, agriculture was in a hopeless and deplorable condition. Our farmers were generally in heavy debt to the village money-lenders. They were having small and scattered holdings. They had neither the money nor the knowledge to use proper equipment, good seeds and chemical manures. Except in certain areas they were dependent upon rainfall and upon the vagaries of the monsoons. Productivity of land as well as of labour had been declining and was the lowest in the world. In spite of the fact that nearly 70 percent of our working population was engaged in cultivation, the country was not self-sufficient in foodgrains but had come to depend on imports of foodgrains. Besides, the country had suffered because of parti-
tion in 1947 as it was given more people but less land to support.

To bring about increase in agricultural production and also increase in employment, the Five Year Plans use various programmes such as: Setting up of Community Development Programmes and agricultural extension services throughout the country, expansion of irrigation facilities, fertilizers, pesticides, agricultural machinery, high-yielding varieties of seeds and expansion of transportation, power and marketing and of institutional credit.

To reduce the pressure of population on land, the strategy used was to set up agro-based industries and handicrafts in rural area, to promote rural transport and communications and to encourage the movement of people from agriculture to industries and service sectors.

Finally, to bring about equality and justice in rural India, the strategy used was land reforms which included the removal of intermediaries, the protection of tenants through tenance legislation, ceiling of land holdings and distribution of surplus land among landless labourers and small and marginal farmers.

The pattern of investment in the different Five Year Plans is summarised below:

**Table No. 1.1 : Patterns of Government Outlay on Agriculture in the Plans.**

<table>
<thead>
<tr>
<th></th>
<th>Total plan outlay in Rs. crores</th>
<th>Outlay on Agriculture and irrigation in Rs. crores</th>
<th>Percent of total outlay</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Plan</td>
<td>1960</td>
<td>600</td>
<td>31</td>
</tr>
<tr>
<td>Second Plan</td>
<td>4600</td>
<td>950</td>
<td>20</td>
</tr>
<tr>
<td>Third Plan</td>
<td>8600</td>
<td>1750</td>
<td>21</td>
</tr>
<tr>
<td>Fourth Plan</td>
<td>15780</td>
<td>3670</td>
<td>23</td>
</tr>
<tr>
<td>Fifth Plan</td>
<td>39430</td>
<td>8740</td>
<td>22</td>
</tr>
<tr>
<td>Sixth Plan</td>
<td>109290</td>
<td>26130</td>
<td>24</td>
</tr>
<tr>
<td>Seventh Plan</td>
<td>218730</td>
<td>48100</td>
<td>22</td>
</tr>
<tr>
<td>Eighth Plan</td>
<td>434100</td>
<td>93600</td>
<td>22</td>
</tr>
</tbody>
</table>

*Source: Various Five Year Plans.*

It would be clear that the total outlay in each plan had increased and
correspondingly, the outlay on agriculture and irrigation had also increased. However, the percentage of outlay on agriculture and irrigation to total plan outlay was the highest in the First Five Year Plan viz. 31 percent and was between 20 to 24 percent in all other plans.

**Agricultural Progress Under the Five Year Plans:**

The first plan aimed at solving the food crisis in the country and ease the critical agricultural raw material situation, particularly the acute shortage of raw cotton and raw jute. Accordingly, it gave the highest priority to agriculture by allotting 31% of the total public sector outlay on agriculture, but it fixed rather modest targets of production. As a result of favourable weather conditions and also as a consequence of the successful implementation of the projects included in the first plan, the production targets in the agricultural sector were exceeded for instance, as against the target of about 62 million tonnes, actual production of foodgrains came to nearly 67 million tonnes.

**Progress Under Second Plan:**

The Planning Commission felt that during the First Plan the agricultural base was strengthened, and therefore, it wanted the second plan to lay the foundations of industrialisation and secure equal opportunities for all particularly for the weaker sections of the people in the country. Out of the total outlay about 20% amount was spent on agriculture and irrigation during the period of second five year plan. The progress on the agricultural front was significant. For example, foodgrains, production recorded nearly 80 million tonnes in 1960-61; as compared to 66 million tonnes in 1955-56. Likewise the production of oil seeds, sugarcane and cotton was much in 1960-61 than in 1955-56.

There was, however, a shortfall in the production of all groups of commodities, as against the target fixed, except in the case of sugarcane which there was remarkable progress. The Planning Commission was blamed for the failure on the agricultural front on the ground that it did not give sufficient emphasis to agricultural development and instead turned its attention
to the development of heavy and basic industries.

**Agriculture in the Third Plan:**

According to the Planning Commission, "In the scheme of development during the Third Plan the first priority necessarily belongs to agriculture. Experience in the Second Plan has shown clearly that the rate of growth in agricultural production is one of the main limiting factors in the progress of the Indian economy. Agricultural production has, therefore, to be increased to the largest extent feasible and adequate resources have to be provided under the Third Plan for realising agricultural production". Out of the total outlay nearly 21% amount was spent on agriculture and irrigation during this plan.

It was during the Third Plan that the Government introduced the new agricultural technology known as Intensive Agricultural District Planning Programme. This was soon followed by a programme of using improved seeds viz. High Yielding Varieties Programme. The new agricultural technology was expected to use in the green revolution. However, as a result of the extensive and serious drought conditions in 1965-66, agricultural production was adversely affected. The actual output at the end of the Third Plan in the case of foodgrains, oil seeds and raw cotton was lower than the output at the end of the Second Plan, indicating that the Third Plan was a wash-out, as far as agriculture was concerned as a consequence of the shortfall in food protection and serious famine conditions in many parts of the country, the Government was forced to import foodgrains expensively.

**Agriculture Under the Fourth Plan:**

The experience of the Third Plan made the Planning Commission realise the bitter fact that economic planning would be a failure unless agricultural production was increased rapidly. Planning Commission has given first priority to the agriculture in Fourth Five Year Plan. Out of the total outlay about 23% amount was spent on agriculture and irrigation.

For foodgrains, the basic strategy of the Fourth Plan was the extension of the high-yielding varieties and multiple cropping programmes. Agricul-
tural production showed a healthy trend in the first two years of the fourth five year plan but on account of adverse weather conditions, the upward trend was reversed. The overall rate of growth of agricultural production during the fourth plan period was only 2.8 percent per annum as against the targeted 5 percent. The unsatisfactory performance of the agricultural sector was the root cause of the stagnation of the Indian economy and the emergence of inflationary pressures since 1972-73.

**Agriculture Under the Fifth Plan:**

The revised Fifth Plan provided Rs. 8,080 crores for agricultural development and irrigation, i.e. 21 percent of the plan outlay of Rs 39300 crores.

There was steady increase in the use of agricultural inputs during the Fifth Plan i.e. in the coverage under the high-yielding variety seeds, creation of additional irrigation potential and significant expansion in total fertilizer consumption. Agricultural production during period 1974-78, however, has been fluctuating widely. The relatively poor performance of agriculture was observed during this plan period. Fifth Plan period (1974-1978) was partly due to poor and unreliable weather conditions and partly due to planning failure.

**Agriculture Under the Sixth Plan (1980-85):**

The Sixth Plan allocated 25 percent of the total outlay on agriculture and irrigation viz. Rs. 24,700 crores out of a total outlay of Rs. 97,500 crores.

The Sixth Plan was hailed as a great success, particularly because of the success on the agricultural front. The Planning Commission had fixed annual growth rate of 3.8 percent for agriculture but the actual growth rate was 4.3 percent. In fact, the aggregate growth target set for the Sixth Plan at 5.3 percent per year could be achieved mainly because of good agricultural performance. The production of foodgrains in 1983-84 was 152 million tonnes and was hailed by the Government as the Second Green Revolution while the First Green Revolution of 1967-68 arose from the introduction of new high yielding varieties of Mexican wheat and dwarf rice varieties, the Second Green Revolution of 1983-84 was said to be from expansion in sup-
plies of inputs and services to farmers, agricultural extension and better management. While the First Green Revolution was confined mainly to Punjab, Haryana and Western U.P., the Second Green Revolution had spread to eastern and central states including West Bengal, Bihar, Orissa, Madhya Pradesh and eastern U.P. These states had made tremendous progress in recent, none of the targets (except in oil seeds) of agricultural production was achieved during the sixth plan.

Agriculture and the Seventh Plan (1985-90):

Despite all the progress made during the first six plans Indian agriculture still displayed certain basic weaknesses which had to be removed during the Seventh Plan. The Seventh Plan allocated Rs. 39770 crores out of a total plan outlay of Rs. 180,000 crores which came to 22 percent. The major programme thrusts in the field of agriculture were; a special rice production programme in the eastern region, national watershed programme for rainfed agricultural, national oil seeds development project, social forestry etc. Ambitions production targets were fixed for the various crops. Though India suffered from poor monsoons and extensive drought conditions during the first three years of the Seventh Plan, she could make up considerably in the last two years of the plan which were excellent years from the point of view of agricultural production.

Agriculture in the Eighth Plan (1992-97):

The basic aim of the Eighth Plan in the sphere of agriculture and irrigation, is the same as in previous plans. Out of the total plan about 21.9% amount was spent on agriculture. During the Eighth Plan, a major effort was made to restore, and improve minor irrigation works. Water management has also improved to the certain extent. Production of total foodgrains increased from 179.5 million tonnes to 199.4 million tonnes between 1992-93 and 1996-97. It means that foodgrains production was increased by 2.22% per annum during the Eight Five Year Plan. Total pulses production was increased by 2.18% per annum where as oil seeds production was increased by 4.28% per annum during Eight Five Year Plan.
Per hectare yield of all crops increased to a greater extent during this plan period i.e. per hectare yield of total foodgrains increased from 1457 kg. to 1614 kg. from 1992-93 to 1996-97. In India, since the cultivable land is limited and almost fully occupied, there is a need to raise the yield of foodgrains in order to feed the teeming millions of its people. In order to achieve this objective, adoption of new package programmes like high yielding seeds, fertilizers, pesticides with irrigation are introduced. This has created a transformation in Indian agricultural sector and this may be termed as agricultural modernization.

1.5 Place of Agriculture in Maharashtra and Marathwada:

The present state of Maharashtra or the old Bombay State prior to independence is not a backward state, excepting certain areas in various corners of the state. Even during the British period, irrigation dams were constructed and irrigation was the single most prime factor which completely transformed the whole landscape from a simple jowar, bajara cropping area into an industrial crop zone i.e. sugarcane. In 1960-61 about 17.9 million hectares of land was under cultivation while in 1996-97 it decreased to 17.82 million hectares. It is on decrease of about 0.45% from 1960-61 to 1996-97.

During the Third Five Year Plan Rs. 62.34 crores were spent on the development of agriculture in the state of Maharashtra. During Fourth Five Year Plan 196 crores were spent on agriculture and allied services. During the Seventh Five Year Plan about 614 crores and in Eighth Five Year Plan about Rs. 1750 crores were spent on agriculture and allied services. Maharashtra Government has also made remarkable agricultural progress through five year plans. During 1991 about 1.85 crores people were engaged in agricultural activities in Maharashtra state.

In 1961 there were 2319 tractors in Maharashtra while in 1992 the number of tractors increased to 46631 in the state. It means the number of tractors increased more than twenty times in the state of Maharashtra. During 1960-61 about 12 lakh hectares of land was under irrigation but in 1996-97 about 25.7 lakh hectares of land was under irrigation in the state of
Maharashtra. About 991 metric tonnes chemical fertilizers were use in 1960-61. Whereas in 1996-97 nearly 1327849 metric tonnes chemical fertilizers were used in the state. It means that use of chemical fertilizer is increased by 1339.91 times from 1960-61 to 1996-97.

The area under total foodgrains increased from 129.55 lakh hectares to 137.98 lakh hectares between 1960-61 and 1996-97. Cotton area was also increased from 25 lakh hectares to 30.85 lakh hectares from 1960-61 to 1996-97. The area under sugarcane increased by 3.09 times from 1960-61 to 1996-97. Area under oil seeds increased from 17.08 lakh hectares to 26.89 lakh hectares between 1980-81 and 1996-97. Due to the increase in population pressure area under various crops increased to a greater extent from 1960-61 to 1996-97.

The production of total foodgrains increased from 77.44 lakh metric tonnes to 145.89 metric tonnes between 1960-61 and 1996-97. Cotton production was increased by 1.88 times while sugarcane production was increased by 4.9 times from 1960-61 to 1996-97. Use of chemical fertilizers, high yielding variety seeds, tractors and increase in irrigation facilities are the responsible factors for the growth of production.

As far as the development of agriculture is concerned we found that some areas are still backward in agricultural development in the state i.e. Konkan region. Kolhapur, Nasik, Pune, Sangli, Solapur, Ahmednagar districts have made good progress in agricultural sector as compared to the other districts of Maharashtra.

Marathwada region is situated at the central part of the state. It includes eight districts and seventy four tahsils. Agriculture forms the backbone of the region's economy. Nearly 70 to 75% population is directly engaged in agricultural activities.

Agriculture, including soil conservation, minor irrigation, agricultural production, drought prone area programme, dairy development and power was given the topmost priority in the plan because without a substantial increase in the production of food and basic raw materials for industry it
would be impossible to sustain a higher tempo of industrial development in the region. In Third Five Year Plan nearly 30% amount was spent on agriculture and allied activities. In Eighth Five Year Plan nearly 27.5% amount was spent on the agriculture and allied activities in the Marathwada region.

At present there are seven major and 78 medium irrigation projects in Marathwada region. About 1316 minor irrigation schemes are found in this region. Most of the minor schemes becomes dry in the summer season. Number of tractors increased from 530 to 6084 between 1972 and 1992. Use of chemical fertilizers and HYV seeds increased to a greater extent in the region. The production of total foodgrains increased from 19.02 lakh metric tonnes to 39.20 lakh metric tonnes between 1960-61 and 1996-97. Out of the total foodgrains production of Maharashtra about 13.16% production was obtained from Marathwada region. About 28.91% total pulses production was obtained from the Marathwada region to the state in 1996-97. It means that Marathwada is leading in pulses production in the state of Maharashtra. Out of the total oil seeds production of the state nearly 23.06% oil seeds production was received from the Marathwada region in 1996-97. It means that Marathwada region has greater potentials for the agricultural development.

1.6 Choice of the region and Topic:

The choice of the area and the topic under investigation has been influenced by several considerations.

Firstly, Beed district comprising the eleven tahsils of Maharashtra state has a significant location on Maharashtra plateau. But for the study only seven tahsils are considered. New tahsils like Parli, Dharur, Wadwani and Shirur are not considered for the study due to the non-availability of data. Except Balaghat range and river basins, majority part of the district comes under plateau region. The region under study has a major portion under flat topography, hence it supports high concentration of agriculture. As a result, these characteristics make this region a distinct physical entity and homogeneous unit for geographical investigation.
Secondly, there are 1280 villages in Beed district. Out of the total villages 13 villages are uninhabited. Entire district region comes under drought prone area. About 80% of the annual rainfall is received in the south-west monsoon period. July is the rainiest month. The variation in the annual rainfall from year to year is fairly large. There are 16 medium projects and advantage of three major projects to the study region. There are 660 minor irrigation projects in the Beed district. Out of the total cultivated area about 35.97% area was under irrigation during 1996-97. It means that there is wide scope for agricultural development in the study region.

Thirdly, this region has black, loamy, alluvial and murgad soils. Agriculture is developed in the region of deep and medium black soils because they are having huge irrigational facilities.

Fourthly, the pressure of population on agriculture land was more in 1991. During 1991 the per capita cultivated land was only 0.48 hectare. It varies from tahsil to tahsil.

Fifthly, out of the total geographical area about 88.97% area was agricultural land area but only 82.41% area was under cultivation in 1996-97. Agricultural land varies from tahsil to tahsil. If the highest (93.98%) in Manjalgaon tahsil whereas it is the lowest (82.58%) in the Georai tahsil. There is a wide scope to increase agricultural land in even tahsil. It is felt that study of the system of agricultural production offers a helpful approach to obtaining a more complete understanding of the problems of agriculture in a region. Moreover, the composite circumstances that contribute to the existing problems facing agricultural activities today have a time and space perspective that may be appreciated.

All these considerations motivated the author to turn his attention to this region and its agriculture.

1.7 Aims and Objectives of the Present Study:

The specific objectives of the present study are:

1. To study the availability of infra-structural and geographical factors on which the development and growth of agriculture depend.
2. To study the population characteristics and its effect on agriculture.
3. To analyse and map the spatio-temporal distribution of irrigation facilities and its effect on cropping pattern.
4. To asses the effect of use of high yielding variety seeds, mechanical and bio-chemical inputs on agriculture.
5. To study the role of other non-physical determinants.
6. To study the general and agricultural landuse and its variation in the region.
7. To asses the trends of production and yield in the study region.
8. To findout agricultural productivity and its variation.
9. To study landuse and cropping pattern of selected villages and markout the agricultural regions of the study area.
10. To draw conclusions and findout the agricultural problems and suggest suitable remedies to solve them.

1.8 Data Base and Methodology:

As this work has to be done single handedly, author hope the readers will take into consideration its limitations. The data collected and used for the period 1970-71 to 1996-97 comes both from primary and secondary sources. The primary data is the raw data collected through different sources for which special questionaries were designed and information collected through various offices. Questionnaires were used for the data collection of sample villages of old seven tahsils. It was not possible to select various villages from every tahsil, therefore, only two villages from each tahsils were selected for the study.

The broad picture of present pattern of non-physical determinants of agriculture, land utilization, cropping pattern, trends of production and yield is prepared with the help of secondary data obtained from Socio-Economic Review, District Census Handbook, Gazetteers, Agricultural Epitomes, Periodicals, Season and Crops Reports published by the Department of Agriculture. Data regarding consumption of fertilizers, high yielding variety seeds, pesticides were obtained from Zilla Parishad Beed.
For Micro-Study two villages from every tahsil were selected. Same criteria was applied in the case of selected villages. A micro-level study includes plot to plot survey of the land, covering information of relevant aspects such as sources of irrigation, agricultural implements, livestock, area under various crops, general landuse and agricultural problems.

The data thus collected through primary and secondary sources were processed and represented by statistical and cartographic technique. As the study purports to be geographical in spirit the geographic and chorologic methodologies have been adopted. These involve the description and interpretation of the regional patterns revealed through choropleth method. For studying the pressure of population on agricultural land, various land densities such as crude rural agricultural, caloric and nutritional densities are computed. These densities are computed by using variables viz. area and population. For measuring the actual pressure of population on agricultural land the relative co-efficient values of over population are computed by taking into consideration the standard hectares namely 0.4047 hectare. Using this as a criteria, the relative co-efficient of over population is computed by dividing the unit of 0.4047 of a hectare by per capita land.

For studying the changes in landuse pattern five major landuse categories i.e. area under forest, area not available for cultivation, other uncultivable land, fallow land and net sown area are considered. In order to smooth but unusual fluctuations five years average data for the years 1970-75 and 1993-97 are used. Percentage of area under each category of land to the geographical area is computed. For studying the landuse efficiency the index of landuse efficiency is calculated by dividing gross cropped area by net sown area into hundred. The changes in cropping pattern and annual area variations in crop area and indices of selected crops are calculated only for the entire study region. For the calculation of indices 1970-71 year is selected as base year. The quinquennial average area under different crops and the relative share of each crop in gross cropped area has been deployed for the study of cropping pattern in the study region. For the study of trends in area
at district level the five years average data for the years 1970-75 and 1993-97 are used. For the study of trends in area at district level compound growth rate is calculated. Weaver's and Doi's methods are used to calculate the crop combination of the various tahsil. Bhatia's method is used for index of crop concentration and Jasbir Singh's Method is used for the calculation of crop diversification indices.

Annual average trend rates of production judged by three years 1970-71 to 1972-73 and 1993-94 to 1996-97 of selected crops of the district. Annual rates of growth of output of selected crops in Beed district from 1970-71 to 1996-97 are calculated for the study of trends in production in the region. The indices of production of selected crops is also computed for the study of trends of production in the region from 1970-71 to 1996-97 (base year 1990-71). For the study of trends of some selected crops compound growth rate is calculated (From 1970-71 to 1996-97). For the study of tahsilwise production trends from 1970-71 to 1996-97 the five years average data for the years 1970-75 and 1993-97 are used.

For the study of trends in yields of selected agricultural crops indices are computed. The co-efficient of variation is computed for the study of variability in yields of the selected crops. The trends of yield is also analysed by the compound growth rate. To get a clear picture of productivity and spatial imbalances "The crop yield and concentration indices ranking co-efficient" technique introduced by Jasbir Singh et al (1982) is used.

1.9 Review of Literature :

*Majid Hussain (1969)*

Studied 'The Geographical Basis of Tubewell Irrigation in the Upper Ganga, Yamuna Doab'. In this paper the geographical factors helpful in the drilling of tube-wells in the area have been assessed and the effect of tubewell irrigation on the changes in the landuse pattern have been shown. The paper included four maps, showing the surface configuration of the area, the area under command of canals and tube wells. The proportion of the cropped land irrigated by tube wells also have been depicted in a map. The study can be
utilized for the further extention of canals and small irrigation projects in
the area.

*Ali Mohammad (1975)*:

Studied 'Agricultural Landuse and Nutrition in Kheri Sitapur and
Barabanki District (U.P.).' The entire study is divided into four sections con-
sisting of fourteen chapters. In the first part researcher has endeavoured to
make a comprehensive study of the natural environment (Physiography, Cli-
mate, Soil) of the region with a view bringing out the extent of influence of
these factors on the existing crop landuse. A study has also been made on
spatial patterns of general landuse, agricultural landuse and crop combina-
tion regions. The principles of the selection of villages for intensive study of
landuse and pressure of population have been logically discussed in one
chapter.

The entire area has been divided into five homogenous strata and repre-
sentative villages have been selected from each stratum on the basis of the
systematic purposive cluster sampling. Part II which is entirely based on
field work includes the study of land utilization and pressure of population
in the twelve selected villages of the region. A certain classifications about
the selected villages has been studied. A detailed account of the the casting
landuse and the selected villages of each stratum as well as amount of ca-
loric intake per head per day obtained as the basis of cropped area, yield of
crops and the total number of persons dependent on the village produce.
Potential production units calculated on the basis of land productivity have
also been given in each village which show the extent of agricultural devel-
opment as obtained by the present of technological advancement.

The third part deals with the supply of various elements of diet to the
village people, the deficiency or surplus of these elements and the resulting
nutritional deficiency diseases. The work is based on a direct survey of the
sample households chosen on the basis of economic strata of the household.
The work provides a few suggestions for the future development of agricul-
ture and standard of living in the region as in all the villages unbalanced
nutritions has played an adverse role to bring about numerous among the rural population and measures.

Vats P.C. (1977)\textsuperscript{15}:

To study the 'Influence of Mirco-Morphological Units on Landscape and Crop Production' author had selected a village Dundli from Pali district of Rajasthan. The study was conducted with the help of aerial photographs of 1:25,000 scale toposheet of 1:63,360 scale and by the subsequent detailed field surveys. The utilization data and the village maps were obtained from the revenue records. Author has collected a number of soil samples from each geomorphic units and analysed to determine the physical potentialities and limitations of each units. Relationship between landform and landuse were also established by the author. He was divided study area into three geomorphological units i.e. shallow aggraded older alluvial plains, shallow saline depression and study undulating aggraded older alluvial plain. The results of this study reveals that there is good relationship between geomorphological and landuse. Author found that the saline depressions due to the presence of sufficient soluble salts is not suitable for cultivation.

On the basis of field survey, author came to conclusion that geomorphology which controls the distribution of soils, surface and surface water, vegetation and cropping pattern has influenced the crop production. He found that the production of Dundli village was low during the field survey. The major factors which limit the agricultural productivity are shallow soil, saline soil, presence of carbonate pan at shallow depth, shallow granite rock mineralized ground water, wind erosional and depositional hazards.

Das M. M. (1981)\textsuperscript{16}:

Examined 'Landuse Pattern in Assam'. In this paper, the land areas of Assam has been classified according to their various uses and the spatio temporal variations of the different categories of landuse have been identified. The objectives of this paper were (1) to analyse the landuse pattern in Assam for 1965-74 period. (2) to analyse the spatial variations of landuse at
the district level in 1973-74 and (3) to analyse the volume of change in landuse in different districts of Assam during 1969-74 by the Weaver’s index and to identify the region’s dynamic, semi-dynamic and static landuse pattern. In order to achieve the above objectives, the author has considered two hypothesis i.e. 1) The scope for physical expansion of arable land is very much limited in Assam. 2) Areas with best soils are dynamic in respect of landuse changes, while those with poor soils continue to be static.

Author has collected landuse statistics from the official records and Government publications. In order to decipher the spatio-temporal pattern of landuse two maps were prepared one for 1969-70 and the other for 1973-74. For quantitative measurement of the overall volume of change in landuse during the period from 1969 to 1974 in Assam, the Weaver’s index was used with a slight modification. The districtwise indices were classified into three categories dynamic, semi-dynamic and static. He used choropleth maps for representation.

Author observed that a large proportion of the geographical area of Assam is not suitable for agriculture. Whatever land is available for cultivation has already been brought under plough. Extensive areas of the two hill districts are not suitable for cultivation due to unfavourable terrain character. He found that numerous rivers with their overshifting courses, bils, swamps, deep forests and scattered hillocks have rendered a large proportion of land in the plains districts unsuitable for growing crops.

The first hypothesis was proved to be valid. He observed that the landuse change in Assam as a whole is minimal. He suggest that scientific planning is utmost necessary for the development and proper utilization of the most valuable land resource of the state. Instead of exansion, more emphasis should be given on intensive use of the cultivable areas with the help of modern inputs like fertilizers, irrigation, better seeds etc. in order to get optimum level of growth.


Analysed ‘Landuse Capability Studies from Aerial Photo Interpreta-
tion - A case study From Krishna Delta.'

In this paper, an attempt has been made to arrive at the capabilities of lands in the Krishna Delta, based on the study of landform, soils and the existing landuse patterns of the area, with the aid of air-photo interpretation, which helps in understanding the potentialities of different kinds of lands for a better usage. Landform map prepared by the authors for the study of geomorphology of Krishna Delta.

Authors have rectified minor irregularities in soil boundaries and prepare a map based on the fact that usually similar soils develop on similar landforms within a climatic region. Authors have prepared landuse maps of Krishna Delta with the availability of the aerial photos of the area on 1:20,000 scale taken during 1978. Substantiated by very limited field checks and equirries in the field, these photos were used to prepare a fairly accurate landuse map of the area. They have given table of land capability classification of the Krishna Delta. This table includes points like land capability class, characteristics, present landuse, potential landuse and remarks.

Authors concluded that aerial photographs are of great utility in integrated surveys as the knowledge about landforms, soils, existing landuse and other natural resources like ground water potentials of an area can be extracted from them fairly accurately, quickly and comparatively easily. A comparative study of landform map and landuse map of the Krishna Delta reveals that land form of an area controls the crops pattern to a major extent.

Authors concludes that the study of landforms, soil characteristics and existing landuse patterns coupled with the knowledge of certain limitations, imposed by some physical and socio-economic conditions has helped to classifying different kinds of the Krishna Delta to their capability or suitability levels necessary for regional planning and developmental purposes.


They examined 'Crop Concentration of Karimnagar District (A.P.).' This paper assess the changes brought over by the concentration in agriculture efficiency and related aspects connected with agriculture. The main object
of the study was the distribution of concentrated areas in respect of rice concentration. It was also visualized to identify the paroles problems connected with rice cultivation in Karimnagar district.

The data was collected mainly from Bureau of Economics and Statistics, Government of Andhra Pradesh for individual talukas of the district for two points of time i.e. 1973-74 and 1979-80. To make meaningful comparisons for different aspects of agricultural activities the authors have converted data into percentages. He has computed index value of concentration of crops by applying Bhatia's location quotient method. He used the following formula for the calculation of Index of crop concentration.

\[
\text{Index of crop concentration} = \frac{\frac{\text{Area of 'x' crop in component areal unit}}{\text{Area of all crops in component area unit}}}{\frac{\text{Area of 'x' crop in a entire country}}{\text{Area of all crops in the entire country}}}
\]

Authors found that pattern of crop concentration in Karimnagar district will most probably continue inspite of the large scale development of the irrigation facilities. Number of pump sets, net sown area, gross cultivated area, net irrigated area, gross irrigated area, area of high yielding varieties, average yield per acre, total food crops production and concentration of crops revealed an interesting picture.

**K.S. More, and F. R. Mustafa (1984)**:

Studied 'Irrigation Requirements and Development in Maharashtra.' In this paper authors have considered necessity of irrigation development in the state of Maharashtra. The main objectives of the study were as follows:

i) To develop a method by which to quantify the need for irrigation facilities.

ii) To identify the areas of varying irrigation requirements.

iii) To locate the areas of varying degree of development of irrigation facilities.

Authors have used the following equation for the measurement of irrigation requirement.
\[
In = \frac{Pr \times Ac}{R}
\]

Where
- \( In \) = Irrigation need of the area.
- \( Pr \) = % of rural population.
- \( Ac \) = Percentage of cultivated area of the areal unit.
- \( R \) = Annual average rainfall.

Authors have prepared three maps regarding irrigation requirement in Maharashtra, development of irrigation and priority for development of irrigation in Maharashtra. Authors recommended that the disparities in the irrigation development lead to imbalances in the income and food production and this can not be continued or allowed to persist. To achieve an equilibrium in agricultural production and availability of foodgrains in subsistence agricultural region, the imbalances in irrigation facilities must be reduced. Authors suggests that all those areas with low need of irrigation could wait for further irrigation development till all other areas get their due share, as the capital resources are very much limited in our country.

R. S. Dubey (1984):

Studied 'Agricultural Productivity in Madhya Pradesh'. This paper presents an interpretative study of the regional variations and emergent trends of the agricultural productivity in Madhya Pradesh. Author has considered physical and non-physical determinants of agriculture of Madhya Pradesh from the view point of agricultural productivity. Author has chosen four indices: crop yield index, population supporting capacity of the farmland and weighted productivity index viz. productivity per hectare and productivity per worker.

The author's regionalisation of the productivity indices has been based on the grouping of the districts by making use of Kendall's ranking method. He has calculatd productivity patterns by making use of the Spearman's ranking correlation co-efficient method for identifying inter-district variations in the level of agricultural development and those of social well-being for
obtaining an understanding of the socio-economic constraints of the productivity. Kendall's method has also been used to ascertain the level of agricultural development. He has considered use of irrigation, fertilizers, tubewells, irrigation pumps and tractor for the evaluation of the development inputs. The level of social well-being has been identified on the basis of the average value of 2 scores for the districts in respect of the education, health, economy, the living environment and social order. He has given seven maps about crop yield index, productivity based on population, supporting capacity of the cropland, output per hectare, agricultural development regions, output per worker, social well being and agricultural productivity regions in his research paper.

Author has given six productivity regions of Madhya Pradesh. Malwa registered mixed pattern of agricultural productivity. It ranges from low to high productivity. The Madhya Bharat Plateau is one of the best productive part of the state. Medium to high productivity was observed in the Bundelkhand uplands. Mixed productivity was observed in the Narmada Valley. Low to very low productivity was found in Vindhya - Baghalkhand region and mixed productivity was noticed in the Chhattisgarh region.

Shafi M. (1985)²¹:

Examined, 'Farm Power and Productivity in Indian Agriculture'. This paper makes an attempt to examine the productivity of Indian agriculture, deviating from traditional approach of yield per unit area/per unit worker or in terms of monetary or caloric value. It aims to judge the productivity of Indian agriculture in terms of farm power and points out that half the energy in Indian agriculture was supplied by drought animals. Power supplied by human labour was one tenth and only forty percent of the power came from tractors, pumps and machinery during 1970-71. Author concludes that it was not correct to think that with every increase in h/p yield to h/p ratio will increase.

Author found medium, low and very low availability farm power in Rajasthan, North Gujarat, M.P., Maharashtra, Northern and North-Eastern
part of India. Author observed that there are large areas in the country where farm power availability is low and very low and attention should be focussed on these districts for increasing the power availability.

*Sharma S. K. and Jain Ajitkumar (1988)*

Examined 'Diffusion of Innovations in the Cotton Growing Tract of Madhya Pradesh: A Case Study of Pesticides.' The study was based on farm survey of four districts viz. Khargone, Khandwa, Dhar and Ratlam of western Madhya Pradesh. The study of diffusion of innovations was entirely based on the first hand information collected through the structural questionnaire and interview method. Unlike, fertilizers and HYV Seeds, pesticides were sold in towns only. 27 villages were selected for the study.

This survey of cotton growers of the western Madhya Pradesh shows that the knowledge of agricultural innovations had percolated to them. But the channels of arrival of this knowledge and the extent of its utilization vary widely. The size of land holdings had been major determinants. Author found that the improved seeds were brought to the farmers by Government extension department and also by co-operative societies. But the case of pesticides was quite different. Dealers of these chemical had came forward as major source of knowledge.

*A. Bhatt and J.S. Rawat (1989)*

Studied 'Capacity of Channel Run-off in the Agriculture, Central Lesser Himalayan Watersheds.' Two micro watersheds with an area of 0.30 and 0.45 km² in the Nana Kosi drainage basin, central lesser Himalayan were employed as natural laboratories for the investigation by the author. To monitor the channel runoff capacity of Pigmy current meter was used. Water discharge was monitored in each month at the mouth of the experimental watersheds from February 1986 to January 1988. The rainfall data were obtained from the Daulaghat Meteorological Station for the period of 1986-87. Author observed that on an average the agricultural land of the central lesser Himalaya has a capacity to generate water at the rate of 940 m³/km²/day or 343107 m³/km² annually.
A. Krishankumari and E. Swaminathan (1993)\textsuperscript{24}: 

Studied 'Levels of Agricultural Modernization in Nellore District, A.P.' Nellore is one of the 23 districts of Andhra Pradesh located in the south eastern coast and spreads over an area of 13,160 sq.km. The district is divided into three broad physical divisions viz. coastal plains, interior uplands and transition zone. The principal rivers which drain the district seasonally are the Pennar and Swarnamukhi. Major soil groups found in Nellore district are red soil, black soil, coastal sand deltaic and coastal alluvium.

The study is based on secondary data. Authors used 25 variables for the study i.e. area under HYV Paddy, HYV Jowar, HYV Bajara, commercial crops, canal irrigation, well irrigation, tank irrigation, gross irrigated area, consumption of liquid formulations, fertilizers, percentage of literacy, net sown area, yields of jowar, bajara, wheat, groundnut, chillies etc. In the first instance an attempt was made to establish the empirical relationship among the parameters of agricultural modernization by multiple correlation. In order to bring out the spatial patterns of levels of modernization, factor, scores were computed and was subjected to cluster analysis to group the 9 tahsils of Nellore district.

On the basis of intercorrelation matric the authors had drawn the following conclusions. In the canal irrigated areas the gross irrigated area was more, more land was put under HYV Paddy, there was a greater use of farm machinery, more use of fertilizer, higher literacy and the people utilise the banks for the financial support. The dry crops and their yields were increasing during the study period. Authors found that dry crop cultivation is dominant in tank irrigated area.

According to cluster analysis the authors found that high level of modernization in Nellore, Kovur, Kavali, Venkatagiri and Rapur tahsils. Authors concludes that due to the diversity in physical, social, economic and institutional factors, the farming activities and ultimate ouputs are not uniform in the district.
Pradeep Kumar (1996)\textsuperscript{25}:

Examined 'Impact of Water Table on Soil and Crops-case study of a village of Haryana'. In this paper the productivity and protective functions of the soil have been studied in relation to sub-soil water table in a village, where a large part of productive land is turning into saline or alkaline land.

This is a micro level field study based mainly on primary data and field observations, supplemented with secondary sources of data from village Patwari. Author had selected ten wells for the measurement of ground water level in the different rainy periods of the year. These wells were selected on the basis of distance from canal i.e. near canal (with in one km. radius) and away from canal (over 2km., radius). Author has considered factors associated with the gradual rise of water table i.e. drainage, physiography and rainfall. Author observed that many hectares of land of this village degenerated into saline land. This is more serious in that part of the village, where, the water table touches the surface during the rainy season.

The village cropping pattern (Kharif and Rabi) of this village has undergone drastic change. Earlier, where bajara, maize, gram, barely were the main seasonal crops now these are rice, cotton and wheat of high yielding dwarf varieties which are unaffected by water logging and salinisation.

Suresh Phule (1999)\textsuperscript{26}:

Studied 'Agricultural Geography of Marathwada Region'. The author had studied Agricultural Geography of Marathwada region from the view point of the following objectives.

1. To study the physical and non-physical factors from the view point of agricultural development.
2. To study the general and agricultural landuse.
3. To assess the trends of production and yield.
4. To study landuse and cropping pattern of selected villages.

Author was collected primary and secondary data from the various sources. He had collected data for the period of 1970-71 to 1994-95. He has calculated variability of rainfall, various population densities, indices and
compound growth rates of area, production and yield for the entire study period. Author has also used crop combination, crop concentration and diversification methods for the study region.

The entire monograph is divided into eight chapters. First chapter is dealing with introduction, aims and objectives, methodology etc. Second and third chapter throws light on physical and non-physical determinants of agriculture where as, fourth and fifth chapters deals with general and agricultural landuse respectively. Sixth chapter throws light on trends of production and productivity while seventh chapter related with case studies of selected villages. In the final chapter author has drawn sixty nine conclusions. He has given 53 tables 147 maps and 11 graphs for the analysis of data. He has pointed out various agricultural problems of the study region i.e. soil erosion, unequal distribution of rainfall, less use of chemical fertilizers etc.

1.10 Chapter Scheme:

The present study is divided into eight chapters. In the first chapter, meaning of agriculture and agricultural geography, place of agriculture in national economy, agricultural development in India, place of agriculture in state economy and Marathwada, choice of the region and topic, aims and objectives, data base and methodology, review of literature and chapter scheme are considered.

Second chapter deals with location and boundaries of the study region, historical background, physography, drainage, climate, soils and natural vegetation. Third chapter throws light on irrigation, population, livestock, agricultural implements use of chemical fertilizers, high yielding variety seeds, pesticides, agricultural primary credit societies, marketing and transportation these points are considered from the view point of agricultural development of the study region.

Chapter fourth is devoted for the study of general landuse in Beed district. In this chapter an attempt is made to study the concept of landuse, landuse classification, tahsilwise trends in general landuse pattern, tahsilwise
net sown area, volume of change in landuse and landuse efficiency.

Chapter sixth throws light on growth of production in the region, tahsilwise trends of production and yield, variability in yields, trends of yield of selected crops, crop productivity and overall productivity.

As this is a good indicator of agricultural progress to reach to micro-level analysis the agricultural scene in sample villages selected for the case studies from seven tahsils have been scrutinised in the seventh chapter. The second part of the seventh chapter deals with agricultural development regions of the study region. Chapter eight covers conclusions, agricultural problems of the study region and specific suggestions to solve them.

-- References --


5. Bernhard H. "Die Agrargeographie als wissenschaftliche Disciplin" Petermanns Mitteilungen, 61 (1915) pp. 12 and 100-103. (Quoted from Geography of Agriculture, Themes in Research.)


8. Ibid. p. 426.


25. Pradeep Kumar (1996): 'Impact of Water Table on Soil and Crops case study a village of Haryana.'