Chapter VIII

Conclusions, Problems and Suggestions

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Conclusions, Problems and Suggestions

8.1 Introduction:

In the previous chapter some aspects of selected villages of seven tahsils have been analysed. Particularly irrigation, livestock, agricultural implements, general landuse agricultural landuse and agricultural problems of the selected villages have been discussed in detail. In the second part of the seventh chapter agricultural development regions of the study region also discussed in the last chapter.

The main purpose of this chapter is to sum up main conclusions of the study (presented in the previous second to seventh chapter) to get comprehensive view on the bases of these conclusions. Agricultural problems are also discussed in this chapter. Some remedies or suggestions will be suggested to solve the agricultural problems in this chapter.

8.2 Conclusions:

The following important conclusions are drawn from second to seventh chapter.

1) The lowland region is found at the northern part of the district. It is a part of the Godavari valley. The northern lowland has a general elevation from 550 metres in the west to a little under 400 metres in the east, interspread with a number of residual hills of summits over 600 metres. Gonoba hill, the Chitora hill and Narayangad hilly region in lowland region is not suitable for agricultural activities due to unfavourable physical condition.

2) Balaghat range is passes through Beed district. Agriculture is not possible over the both side of the Balaghat range due to rigid topography and steep slope. The entire Ashti tahsil comes in low lying undulating region. Though of lower elevation this region is interspersed with innumerable low residual hills between the valleys of streams rising from about 600 metres in the south to about 750 metres in the north. This Sina basin is more favourable for the development of agriculture.
3) Drainage is one of the most important component of physical environment which affects agriculture directly and indirectly. All the streams of the district drain into one of the three principal rivers viz. the Godavari, the Manjara and the Sina which flow along the northern, southern and the south-eastern boundaries of the district. Godavari river has changed agricultural structure of north Georai and Manjalgaon tahsil. River Lendi, Amrita, Sindhphana, Saraswati, Lendi, Gunwati and Wan the tributaries of Godavari have played important role in the agricultural development of the study region.

4) Manjara, Limba, Yelamchi, Babhti, Kaij, Hol, Rena and Mehekri, these are also rivers and streams of the study region. They are providing water to the agriculture. Most of the rivers and streams which are flowing through the Beed district are seasonal. They are having water in rainy season and some times in winter season. Most of the rivers and streams becomes dry in summer season, hence, they are not useful for irrigation. Even in rainy and winter season some times few streams have no water in their beds. The wells which comes under the jurisdiction of these streams also becomes dry in summer season. Due to the seasonal nature of the rivers and streams the agricultural sector is greatly affected.

5) The climate of this district is one the whole dry except in the south-west monsoon season. May is the hottest month with the mean daily maximum temperature may be as high as 46°C with the advance of south-west monsoon into the district by about the second week of June the temperature falls appreciably and weather is pleasant through out the south-west monsoon. By about the first week of October the monsoon withdraws and the day temperature increases slightly and a secondary maximum is reached in October upto 32°C. Thereafter the temperature begin to decrease gradually. Temperature is quite favourable for the growth of various crops in the study region.

6) The average annual rainfall for the district is 750mm. The rainfall in the district increases from the west to the east varying from 590mm. at Ashti
near the western border to 685mm. at Ambejogai near the eastern border about 80% of the annual rainfall is received in the south-west monsoon period. The eastern zone comprises Ambejogai, Kaij, parts of Manjalgaon and Beed tahsils gets more or less assured rainfall. The central zone comprises, western part of Manjalgaon and east Georai tahsils receive moderate rainfall. The western zone which comprises western part of Georai, west part of Beed, Ashti and Patoda tahsils receives irregular and uncertain rain.

7) It will be seen from table 2.2 that the variability of rainfall in the district ranges between 29.5% to 43.27% in Ambejogai and Georai tahsils respectively. Below 30% rainfall variability was found in Ambejogai tahsil whereas 30% to 40% rainfall variability was recorded in Kaij, Patoda, Ashti and Manjalgaon tahsils during the period of 1970 to 1997. Above 40% rainfall variability was found in Beed and Georai tahsils during the period of investigation. It means that there is no guaranty of crops due to high rainfall variability in the study region.

The south-west monsoon during June to September influences the agronomy of the district to a very great extent. It also affects the agricultural operations, culturable practices and system of crop rotation. The rainfall during the north-east monsoon i.e. October to November, though scanty is very helpful for the rabi crops and also augments water in the wells and tanks. Some showers in the first quarter of the year have also beneficial affects on the growth of rabi crops and summer crops.

8) Crop growth is determined to a considerable extent by the amount of nutrients in the soils. The main factor that has influenced the development of soils in Beed district is the undulating and hilly topography. The soils of varying are to be found throughout the district. Deep black soils covers about 12.76% portion of the Beed district, while medium black soils covers 65% area, coarse and shallow soils covers 22.74% portion of the district.

The shallow soils (7" depth) are found in some part of Georai, Kaij and Ashti tahsils. The shallow soils are Murum Mixed Soils which are suitable for growing crops like bajara, math, chavali etc. The moderate deep soils
are found in hilly and undulating areas of Georai, Naigaon (Patoda) and Ashti tahsils and have varying colours, structure and texture. Like shallow soils, these soils are also of inferior quality due to the lack of nutritious contents in them. These soils requires all kinds of fertilizers.

9) Medium deep soil is found in every tahsils particularly on the banks of various streams. Deep black soils are found in Georai, Ambejogai and Manjalgaon tahsils. Medium and deep black soils are favourable for cotton, sugarcane and other crops. The Ph value of medium soil varies from 8.2 to 8.7 and total soluble salts from 0.2 to 0.3 percent. The contents of calcium carbonate and those of organic matter very widely from 3 to 20% and from 0.48 to 2.16% in the medium black soil of the study region.

Deep black soils are found in the river valleys of Manjara, Sina, Bendsura, Godavari, Chausala, Rena, Kaj, Amrita, Wan, Saraswati etc. There is heavy concentration of agricultural activities in medium and deep black soils region.

10) The Beed district has limited area under forest. Dry deciduous forest are found in the entire study region. The area under forest varies from tahsil to tahsil. Out of the total geographical area below 1% area was recorded under forest in Manjalgaon and Georai tahsils whereas 1% to 2% geographical area was observed under forest in Ashti tahsil during 1992-97. Above 2% geographical area was experienced under forest in Beed, Kaj, Ambejogai and Patoda tahsil during the period of 1992-97.

About 0.02% positive change in forest area was experienced in Ambejogai tahsil between 1970-75 and 1992-97. Below 1% negative change in forest area was took place in Beed, Georai, Kaj, Ashti and Manjalgaon tahsils while above 1% negative change in forest area was observed in Patoda during the period of investigation. Due to population pressure area under forest has been brought under cultivation in Beed, Georai, Kaj, Ashti and Manjalgaon and Patoda tahsil between 1970-75 and 1992-97.

11) During 1997-98 about 10889 hectares of land of the study region was brought under irrigation. After the completion of entire Jayakwadi
Project 41682 hectares of land will be brought under irrigation in Georai tahsil. Villages like Umapur, Rakshasbhuwan, Takali, Antarwadi, Talwada, Kingaon, Kekatpangri, Jategaon, Aherwadgaon, Kelegaon, Rajpimpri and Rampuri are benefitted by Jayakawadi right bank canal. Jayakwadi right bank canal has changed the socio-economic condition of the above mentioned village to a greater extent.

- 12) Villages like Hivra, Takarwan, Waghur, Sadola, Rajgaon, Kitti Adgaon, Manjrath, Chincholi, Gangamasala, Manur, Sawargaon and Wagdari are benefitted by the Manjalgaon project. Manjara left bank canal has changed the socio-economic condition of the above mentioned villages. It has increased irrigation percentage of the Manjalgaon tahsil upto 68.95%.

South-east part of Kaj tahsil and south-west portion of Ambejogai tahsil comes under the influence of Manjara Project.

13) About 15 medium irrigation projects are completed in the study region under Five Year Plans. About 28409 hectares irrigational potential has created by these projects in the study region. All the medium project provides seasonal water to the limited area. It means that they are unable to provide water to agriculture in the summer season.

Out of the total minor irrigational schemes about 20.61% schemes were found in Ashti tahsil in 1997-98. The shares of Kaj, Beed, Patoda, Georai, Ambejogai and Manjalgaon were 17.73%, 16.52%, 16.36%, 13.48%, 10.91% and 4.39% respectively during 1997-98. Total minor schemes have created about 43867 hectares irrigational potentials in the study region. The highest irrigational potentials (20.4%) was created in Beed tahsil while the lowest irrigational potential (7.29%) was created in Manjalgaon tahsil by the tanks.

Actually about 2140 hectares of land was brought under irrigation by the minor irrigation schemes in the Beed district during 1997-98. Most of the tanks becomes dry in summer season.

14) Table 3.4 indicates that study region has shown 32.9% positive change in percentage of net irrigated area to net sown area. The highest change in net irrigated area to net area sown was occurred in Manjalgaon
(65.68%) during the period of investigation. It was found due to the Manjalgaon project. The tahsils like Patoda, Georai, Kaj, Ashti, Beed and Ambejogai have recorded 62.35%, 33.18%, 31.44%, 27.32%, 17.82% and 14.82% positive change in percentage of net irrigated area to net area sown from 1970-75 to 1992-97. It means that the study region has made remarkable progress in irrigation through Five Year Plans.

15) The trend of general population growth rate and rural population growth rate are somewhat parallel to each other but there are remarkable ups and downs in the urban population growth rate during the span of fifty years. The general and rural population growth rates have gradually increased from 1941-51 to 1961-71. During 1971-81 decade reverse trend was found in general and rural population. Then it has shown upward shift during 1981-91 decade.

16) Crude density of population increased in every tahsil during the period of twenty years (1971-1991). The crude density was increased from 117 persons per sq.km. to 172 persons per sq.km. in the study region.

Below 200 physiological density was noticed in Georai, Manjalgaon, Kaj and Patoda tahsils while 200 to 250 persons per sq.km. physiological density was noticed in Ashti and Beed tahsil in 1991. Physiological density was increased in every tahsil due to increase in population and net sown area during the period of investigation.

Agricultural density was increased in every tahsil during the period of twenty years (1971 to 1991). It means that majority population depends upon agriculture. Caloric density of population increased from 169 persons per sq.km. to 202 persons per sq.km. in the study region. It was decreased in Georai, Ashti and Ambejogai tahsils during the period of investigation.

17) Per capita land was decreased in every tahsil during the period under study. Table 3.7 indicates that relative co-efficient of over population was increased in every tahsil during the study period. The highest relative co-efficient of over population was found in Ambejogai (0.81) while the lowest relative co-efficient of over population was observed in Georai tahsil
during 1991.

Nearly 61.73% to 71.13% male population was found literate population in all tahsils during 1991. Female literacy was very less as compared to the male literacy. Below 30% female literacy was found in Georai, Ashti, Patoda and Manjalgaoon tahsils whereas above 30% female literacy was observed in remaining tahsils in 1991.

18) A high rate of population growth is a matter of concern as it hampers the welfare of the people, particularly the rural masses and aggravates environmental problems. This calls for whole-hearted efforts to spread family limitations practices i.e. a targeted reduction in the birth rate rather than the number of births averted. Such an aim can be achieved by laying emphasis on improving the literacy rate, especially among the female population by improving status of women in society etc. Once the female population has become employable productivity, targeted reduction in the birth rate will be observed in the study region. This will help in the implementation of study region’s development programmes in an agricultural area.

19) Table 3.10 indicates that out of the total workers nearly 79.64% workers were engaged in agriculture. Out of the total workers below 70% workers were engaged in agricultural activities in Beed and Ambejogai tahsils whereas 82% to 89% workers were engaged in agriculture in remaining tahsils during 1991. It means that agricultural occupation is dominant in every tahsil. Therefore it is essential to increase agricultural productivity by hook or crook in the study region.

20) Below 1% negative change in cattle population was recorded in Ashti, Georai, Manjalgaoon and Ambejogai tahsils from 1972 to 1992. Above 1% negative change in cattle population was observed in Beed (12.9%) tahsil from 1972 to 1992. Below 1% positive change in cattle was took place in Kajj tahsil whereas the above 1% positive change was found in Patoda tahsil between 1972 and 1992 (map 3.8B).

Cattle population was decreased in Ashti, Georai, Manjalgaoon, Ambejogai, Beed and Patoda tahsils due to the attitudes of the farmers and
adoption of tractors in their farm. Before 1980 to feed more cattle was prestigious point among the farmers but now a days the farmers are feeding minimum bullocks for their farms. Only cows numbers are more due to dairy development in the study region.

21) Buffaloes population was decreased in Georai, Patoda, Ashti, Manjalgaon, Ambejogai and Kaj tahsils during the period of investigation. Below 2% negative change in buffaloes population was took place in Georai, Patoda, Ashti and Manjalgaon tahsils whereas above 2% negative change in buffaloes population was experienced in Ambejogai and Kaj tahsils from 1972 to 1992. Below 2% positive change in buffaloes numbers was found in Beed tahsil. It was happened due to dairy development in the Beed city.

22) Region's climate is favourable for sheep rearing in the study region. The proportion of sheep in the total livestock was below 1% in Georai and Ashti tahsils while 10% to 20% share of sheep in the total livestock was recorded in Manjalgaon, Ambejogai, Patoda and Beed tahsils during 1992. Above 20% proportion of sheep in the total livestock was found in Kaj tahsil in 1992. About 0.27% to 5.91% positive change in sheep population was experienced in all tahsils of the study region. Rearing of sheep is possible to the poor farmer, hence, its population has increased to a greater extent in the rural area. Dry climate, fallow land, short grass are also supporting factors for the increase of sheep population in the Beed district.

23) Goat was ranking first in the total livestock in Ashti tahsil in 1992. About 0.04% to 2.84% positive change in Goats population was took place in Beed, Georai, Manjalgaon, Ambejogai, Kaj and Ashti tahsils and 0.90% negative change in goats population was experienced in Patoda during the period of investigation.

The highest milch cows and buffaloes per 1000 population was recorded in Kaj tahsil whereas the lowest milch units was found in Manjalgaon tahsil during 1992. Draught force position is quite better in all tahsils of the study region. About 100 to 151 draught force per 100 hectares of land was observed in all tahsils of the study region during 1992.
24) During 1972 below 1% density of wooden ploughs per 1000 hectares was recorded in Georai, Beed, Patoda, Kajj and Ashti tahsils whereas 6 to 12 density per 1000 hectares of wooden ploughs was found in Manjalgaon and Ambejogai tahsil. About 1.53 to 18.55 density of wooden ploughs per 1000 hectares was recorded in all tahsils in 1992. All tahsils have shown positive change in wooden ploughs density during the period of investigation.

In 1972 the highest density of iron ploughs per 1000 hectare was found in Ashti whereas the lowest density of iron ploughs per 1000 hectares was recorded in Manjalgaon. Georai tahsil has recorded the highest density of iron ploughs per 1000 hectares while the Kajj tahsil has recorded least iron ploughs in 1992.

25) Density of bullock carts showed upward shift in Beed tahsil and other tahsils have shown downward shift in bullock carts density during the period under study. Number of bullock carts have decreased in Manjalgaon, Ambejogai, Kajj and Patoda tahsils due to the high cost of bullock carts and increasing importance of tractors.

In 1972 the density of sugarcane crusher per 1000 hectares was 0.14 to 0.39 in all tahsils of the study region. It was nil in Ambejogai, Patoda and Ashti tahsils in 1992.

26) Table 3.13 indicates that oil engines decreased to the greater extent in the study region during the period of investigation. They decreased from 4029 to 2808 between 1972 and 1992. In 1972 the highest density of oil engine was found in Ashti (7.73) and the lowest density of oil engine per 1000 hectare was observed in Manjalgaon (1.89) tahsil.

Oil engines decreased in the study region due to application of electric pumps in the agricultural sector. Electric pump sets increased from 2200 to 35323 between 1972 and 1992. It means that electric pump sets increased by 161 times during the period of investigation.

27) The size of land holding, labour scarcity, education, age, non-agricultural income, family system and mass media are important factors that
control farmers inducement to go for the tractor. The number of tractors increased from 25 to 770 between 1972 and 1992. It means that tractors numbers increased by 30.8 times from 1972 to 1992. There was not a single tractor in Patoda and Ashiti tahsils in 1972. Out of the total tractors about 20.91% tractors were found in Georai tahsil during 1992. The shares of Ashti, Manjalgaon, Beed, Patoda, Ambejogai and Kaj were 17.4%, 16.62%, 16.11%, 10.78%, 10.13% and 8.05% respectively in 1992.

28) Table 3.15 indicates that out of the total district's utilization of high yielding variety seeds nearly 22.76% seeds were utilized in Manjalgaon tahsil in 1996-97. Kaj tahsil stood second in the utilization of improved seeds while Ashti and Ambejogai utilized 18.51% and 16.27% improved seeds during 1996-97. Patoda tahsil was least in utilization of high yielding variety seeds in 1996-97. Use of high yielding variety seeds increased in the study region due to increase in literacy rate, increase in irrigation facilities and economic condition of the farmer.

Table 3.16 reveals that use of chemical fertilizers increased by 12.81 times viz. 6398 metric tonnes to 81973 M.T. from 1970-71 to 1996-97. In 1996-97 Manjalgaon was first in consumption of chemical fertilizer in the study region. Out of the district total consumption of chemical fertilizers nearly 57.98% fertilizers were consummed in Manjalgaon, Ambejogai and Beed tahsils in 1996-97.

Use of pesticides also increased in the study region. It was increased due to more area under cotton in all tahsils of the Beed district.

29) Table 3.18 shows that loan recovery of primary agricultural societies in the Beed district is quiet better. Co-operative movement has changed the agricultural structure to a greater extent in the study region.

Density of market per 1000 hectare was 0.01 in the Beed district during 1998. There are eight agricultural marketing committees in the district. There are eleven submarketing centres in the district. The farmers are not getting suitable price to their agricultural goods. Sugar factories are giving about Rs. 560/- per metric tonne to the farmers. This amount is not suffi-
cient as the cost of production is concerned. Cotton federation of Maharashtra also paid near about Rs. 2200/- per quintal to the farmers. This amount is also less as compared to the production cost. Therefore, it is essential to fix the prices of agricultural products by the Government of Maharashtra.

30) The modern cultivation depends on regular and timely supply of seeds, fertilizers, insecticides etc. therefore, transport facilities are important.

During 1985 the road length per one lakh population was 293.51 kilometres while it was 365.9 kms in 1998. All the tahsils headquarters are connected with district headquarter as well as with one another. The major lacuna in the road development in the study region is the lack of a road link. In the case of a large number of villages in certain hilly areas, approach roads are altogether lacking. Roads in the study region are also qualitatively poor. Most of the roads are unmetalled and are not fit for all weather season. Particularly the village roads become unfit for transport in rainy season.

The total length of railways in the study region as on 31st March 1998 was 47.86 kilometres. This length is not sufficient for the development of agriculture. It is essential to increase transport and communication facilities in the study region.

31) About 0.07% to 0.68% negative change in forest area was took place in Manjalgaon, Georai, Beed, Kaj and Ashti tahsils during the period of investigation. Net sown area was increased in Beed, Georai, Kaj, Patoda and Ashti tahsils, therefore, forest area has shown negative change in these tahsils during the period under study. On the other hand very light positive change was observed in Ambejogai (0.77%) tahsil due to new plantation through social forestry department. It is essential to increase forest area in the study region to maintain ecological balance.

32) About 1.08% to 1.55% positive change in area not available for cultivable land was experienced in Ashti, Manjalgaon and Kaj tahsils during the period of investigation. In Manjalgaon tahsil some net sown area was brought under Manjalgaon major irrigation project hence, area not avail-
able for cultivation has recorded positive change in this tahsil. Other uncultivable land was transferred to area not available for cultivation in Ashti tahsil whereas some fallow land has transferred to this categories in Kaij tahsil from 1970-75 to 1992-97.

33) Tahsils like Georai, Ambejogai, Ashti, Patoda and Beed have shown about 0.83% to 6.27% negative change in other uncultivable land during the period of investigation. Other uncultivable land is potential agricultural land. Other uncultivable land was transferred to net area sown in Georai, Ashti, Ambejogai, Patoda and Beed tahsil, therefore, they have shown negative change. About 0.71% to 3.73% positive change in other uncultivable land was took place in Kaij and Manjalgaon tahsils between 1970-75 and 1992-97. Some land from net sown area was transferred to other uncultivable land in Kaij and Manjalgaon tahsils, hence they have shown positive change in other uncultivable land during the period under study.

34) During 1970-75 the highest fallow land was recorded in Ambejogai tahsil (36.07%) and the lowest fallow land was observed in Beed (13.46%) tahsil. Table 4.1 indicates that, out of the total geographical area below 10% area was found under fallow land in Beed (3.3%) and Georai (5.35%) whereas 10% to 20% geographical area was observed under fallow land in Patoda (11.09%), Ambejogai (15.16%), Ashti (17.27%), Kaij (17.68%) and Manjalgaon (19.58%) tahsils during 1992-97. Fallow land was transferred to net sown area in Beed, Georai, Ambejogai, Kaij, Patoda and Ashti tahsils, hence, these tahsils have shown about 4.72% to 16.78% negative change in fallow land during the period of investigation. Manjalgaon tahsil has recorded 1.06% positive change in fallow land because some area from net area sown was shifted to this categories between 1970-75 and 1992-97.

35) The study region has recorded 10.90% positive change in net sown area from 1970-75 to 1992-97. Net sown area was decreased by 5.84% in Manjalgaon tahsil because net sown area was transferred to fallow land. Other uncultivable land and area not available for cultivation during the period under study. Tahsils like Kaij, Patoda, Ashti, Georai, Beed and
Ambejogai have shown 2.68% to 22.95% positive change in net sown area. Positive change was experienced in above mentioned tahsils because fallow land area was transferred to net sown area categories between 1970-75 and 1992-97.

36) Per capita land was decreased on moderate scale in Beed, Georai, Manjalgaon, Ambejogai, Kaij, Patoda and Ashti tahsil from 1971 to 1991. Patoda and Ashti tahsils were leading in per capita land in 1991. In fact the per capita net sown area has decreased during the span of three decades to some extent. The policy implication of decreasing per capita net sown area is that the pressure of population on land is increasing and ways and means have to be found out to increase productivity of available land for meeting the growing food needs of the region. It is possible through adopting new farm technology in the entire study region.

37) The proportion of potential geographical land (uncultivated land) from 5.83% to 4.83% transferred to net sown area during the period of investigation. There is vast scope for extention of cultivated land by bringing fallow and potential agricultural land under net sown area. Therefore, immediate need is to give more emphasis on intensity of cropping and increasing yield from exist cultivated area. Problem of under use of net sown area, low productivity and risk of crop failure are taxing the rural population, therefore, it is fruitful to investigate the degree of intensity with which the net sown area is utilized.

38) Below 105% landuse efficiency index was found in Ambejogai, Kaij and Beed tahsils and 105% to 120% landuse efficiency was recorded in Georai tahsil during 1992-97. Above 120% landuse efficiency index was recorded in Manjalgaon, Patoda and Asthi tahsils during 1992-97.

Below 5% negative change in landuse efficiency was recorded in Kaij and Beed tahsils whereas 7.1% to 20.16% positive change in landuse efficiency was found in remaining tahsils of the study region. Variation in landuse efficiency are mainly confined to the regions where irrigational facilities are more. Patterns of agricultural practices, physical and non-physical de-
terminants of agriculture are also responsible for the variation in landuse efficiency.

39) The area under rice decreased in 15 years out of a time period of 27 years. The highest decrease in area under rice was noticed in 1973-74 (9.5 thousand hectares) followed by 1971-72 (7.25 thousand hectares). The highest increase in rice area was noticed in 1972-73 (12.45 thousand hectares) followed by 1975-76 (5 thousand hectares).

The area under wheat decreased in 12 years during the period of investigation. The highest decrease in area under wheat was experienced in 1986-87 (79.3 thousand hectares) whereas the highest increase in the crop was took place in 1985-86 (59.39 thousand hectares).

40) The area under jowar showed a decrease in 10 years. The highest increase in jowar area was experienced in 1971-72 (1.03 lakh hectares) while it was decreased by 1.85 lakh hectares in 1972-73 due to dry famine in the region.

The bajara area decreased in 14 years during the period of investigation due to variability of rainfall in the study region. The highest decrease in bajara area was experienced in 1971-72 (1.03 lakh hectares) followed by 1974-75 (40.4 thousand hectares).

41) The area under cereals decreased in 9 years during the period under study. The highest decrease (1.43 lakh hectares) was took place in 1972-73 due to dry famine in the entire study region. The area under gram decreased in 11 years out of a time period of 27 years. The highest decrease in gram area was recorded in 1972-73 (44.7 thousand hectares) followed by 1987-88 (25.31 thousand hectares). The highest increase in gram area was took place in 1971-72 (29.69 thousand hectare) followed by 1996-97 (28 thousand hectares). Increase in irrigation facilities is the major reason for the positive change in gram area from 1970-71 to 1996-97.

42) Area under tur decreased in 12 years whereas area under mung decreased in 14 years during the period of investigation. Table 5.1 indicates ups and downs in area under tur, mung, other pulses and total pulses from

The highest positive change in pulses area was observed in 1985-86 (40.19 thousand hectares) whereas the highest negative change in pulses area was found in 1971-72 (57 thousand hectares).

The area under groundnut decreased in 16 years and area under safflower decreased in 13 years from 1970-71 to 1996-97. The area under total oil seeds decreased in 11 years due to physical and non-physical determinants of agriculture.

43) The area under cotton decreased in 14 years out of a time period of 27 years. The highest decrease in cotton area was took place in 1995-96 (20.84 thousand hectares) followed by 1972-73 (17.6 thousand hectares). The highest increase in cotton area was took place in 1992-93 (30.5 thousand hectares) whereas the lowest increase in cotton area was recorded in 1981-82 (3.5 thousand hectares).

Recently area under sugarcane has increased in the study region due to the increase in irrigational facilities and establishment of sugar factories in different parts of the district. Variability of rainfall affects on annual area variation of sugarcane in the study region.

44) Indices of rice were constantly below 100% except few years whereas wheat index numbers were above 100% except 1972-73, 1973-74, 1982-83, 1983-84, 1987-88 to 1990-91, 1994-95 and 1995-96. The highest wheat indices was found in 1986-87 (255.25%) whereas it was observed least in 1994-95 (46.75%).

Jowar indices were constantly above 100% except 1972-73, 1973-74, 1979-80, 1991-92, 1992-93 and 1995-96 while the indices of bajara area were below 100% from 1971-72 to 1987-88 except 1973-74.

45) Indices of gram, tur, pulses, groundnut, other oil seeds cotton, total oil seeds area showed ups and downs during the period of investigation. Indices of sugarcane area showed upward shift except 1971-72 to 1973-74, 1976-77 and 1977-78. The highest sugarcane area indices was observed in 1990-91 (814.81%) whereas the lowest sugarcane indices was noticed in
1976-77 (50%). The physical and non-physical determinants of agriculture are responsible for the change in index numbers of selected agricultural crops during the period of investigation.

46) Table 5.3 reveals that crops like rice, jowar, other cereals, total cereals, gram, other pulses, total pulses, groundnut and safflower have shown −2.62% to 75.58% negative change in their area during the period of investigation. The highest negative change was observed in other cereals area (75.58%) whereas the lowest negative change was took place in safflower area (2.62%) from 1970-71 to 1996-97.

47) The crops like wheat, mung, tur, cotton, other oil seeds, total oil seeds and sugarcane have recorded 21%, 34.28%, 34.97%, 63.89%, 130.3%, 140.18% and 459.26% positive change in their area respectively during the period of 27 years. The highest positive change was recorded in sugarcane area (459.26%) whereas the highest positive change was took place in wheat area (21%) from 1970-71 to 1996-97.

48) The co-efficient of variability in the areas of cotton, other cereals, wheat, mung, groundnut, gram, other oil seeds and tur was 30% to 53.07% during the period under study. Other selected crops areas were having 9.28% to 30% variability between 1970-71 and 1996-97.

On the examination of growth rates presented in table 5.4 it is quite evident that the area of nine out of seventeen selected crops have shown negative compound growth rates from 1970-71 to 1996-97. Crops like rice, wheat, other cereals, gram, mung, other pulses, total pulses, cotton and groundnut have shown negative compound growth rates in their area from 1970-71 to 1996-97. Variability of rainfall is responsible for the negative change in the above mentioned crop area.

49) During the entire time period of twenty seven years, i.e. 1970-71 to 1996-97 the average gross cropped area increased by 1.78 lakh hectares (table 5.5). There were significant increase in area under jowar, bajara, other cereals, tur, groundnut, cotton, condiments, spices, vegetables and sugarcane. The area under wheat, gram, mung, safflower, other fibres and fodder crops
increased during the period under study.

The emerging conclusion is that the share of jowar area in gross cropped area ranged between 37.47% to 45.05% of gross cropped area whereas the relative share of bajara in the gross cropped area ranged between 16.21% to 17.29% during the period of investigation.

50) About 0.15% negative change in rice area was took place in the entire region. Below 1% negative change in rice area was noticed in Ambejogai. Whereas above 1% negative change in rice area was recorded in Kaij and Patoda tahsil. Below 1% positive change in rice area was took place in Beed, Georai, Ashti and Manjalgaon tahsil from 1970-75 to 1992-97.

Below 2% negative change in wheat area was experienced in Manjalgaon and Georai and 2% to 4% negative change in wheat area took place in Beed, Ashti, Patoda and Kaij tahsils between 1970-75 and 1992-97. Below 10% negative change in jowar area was took place in Patoda, Whereas above 10% negative change in jowar area was recorded in Manjalgaon. The area under irrigation is increased in above tahsils, hence, the farmers are attacted towards the other beneficial crops like pulses and oil seeds. About 4.12% to 16.69% positive change in jowar area was experienced in Georai, Ambejogai, Beed and Kaij tahsils between 1970-75 and 1992-97.

51) Map 5.4A gives the idea about the regional variation of bajara area. During 1992-97 the proportion of bajara crop in the gross cropped area was below 15% in Georai, Ashti and Kaij tahsils whereas 15% to 20% proportion was found in Ambejogai and Manjalgaon tahsils. It was above 20% in Beed and Patoda tahsils during 1992-97. All tahsils have recorded negative change in bajara area from 1970-75 to 1992-97.

All tahsils have recorded about 0.62% to 2.68% negative change in gram area during the period of investigation (map 5.5B). About 0.48% to 4.34% positive change in tur area was observed in Ashti, Patoda, Kaij, Georai and Manjalgaon tahsils whereas 0.41% to 1.24% negative change in tur
area was took place in Beed and Ambejogai tahsils. Physical and non-physical
determinants are responsible for the positive and negative change in gram
and tur area.

52) Map 5.8A gives the idea about regional variation of groundnut area in the Beed district. Above 10% gross cropped area was found under
groundnut in Manjalgaon and below 10% gross cropped area was recorded
in other tahsils during 1992-97.

About 0.18% to 8.6% negative change in groundnut area was experi-
enced in Beed, Ambejogai and Kaij tahsils while about 2.07% to 5.56%
positive change in groundnut area was took place in Georai, Manjalgaon,

The importance of other oil seeds is increasing in the study area, there-
fore, the area under safflower is decreasing in all tahsils.

53) The proportion of cotton area in the gross cropped area was below
5% in Patoda (0.18%), Ashti (2.31%), Beed (2.49%) and Kaij (2.63%) tahsils
whereas 5% to 10% proportion was observed in Georai and Ambejogai tahsils
during 1992-97. Above 10% gross cropped area was found under cotton in
Manjalgaon tahsil during 1992-97 (map 5.10A).

Below 1% negative change in cotton area was recorded in Manjalgaon
and Patoda tahsils and below 2% positive change in cotton area was took
place in Beed, Georai, Kaij and Ashti tahsils during the period of investiga-
tion. Above 2% positive change in cotton area was experienced in Ambejogai

54) Irrigated area has increased to a greater extent in the study region,
therefore, all tahsils have shown positive change in sugarcane area from 1970-
75 to 1992-97.

About 0.10% to 1.84% positive change in condiments and spices area
was noticed in Manjalgaon, Georai, Ashti, Ambejogai and Patoda tahsils
whereas 0.30% to 0.71% negative change in condiments and spices area
was took place in Beed and Kaij tahsils during the period under study. About
0.21% to 4.54% positive change in vegetables and fruits area was took place

About 0.20% to 0.68% negative change in fodder crops experienced in Ambejogai, Beed, Georai, Kaj and Patoda tahsils and 0.25% to 2.26% positive change in fodder crops area was found in Ashti, Manjalgaon and Ambejogai tahsils between 1970-75 and 1992-97.

55) Changes in the crop combination region resultant from Doi’s method were found in Beed, Georai, Kaj, Ambejogai and Ashti tahsils during the period under study. Two crop combination to monoculture change was took place in Beed and monoculture to two crop combination change was found in Ashti tahsil from 1970-75 to 1992-97. Three crop combination to two crop combination change was noticed in Ambejogai and Kaj tahsils while two crop combination to three crop combination change was observed in Georai from 1970-75 to 1992-97.

56) After the laps of 27 years Ashti and Georai tahsils have shown low to moderate change and Kaj has registered high to low change during the period of investigation. Beed tahsil has registered moderate to high degree of concentration from 1970-75 to 1992-97.

Tahsils like Ashti, Patoda, Kaj and Beed did not showed any change in wheat concentration between 1970-75 and 1992-97. Ambejogai tahsil registered high to low change, Manjalgaon registered low to high change and Georai showed moderate to high degree change in wheat area concentration during the period of investigation.

57) Patoda tahsil has showed low to moderate shift in jowar concentration whereas Kaj and Beed tahsils registered upward shift from moderate to high concentration between 1970-75 and 1992-97. Georai tahsil has shown high to moderate shift while Manjalgaon tahsil recorded high to low degree of jowar concentration during the period of investigation (map 5.16B).

Manjalgaon tahsil has registered upward shift from low to high degree of concentration under bajara area and Ambejogai showed low to moderate shift between 1970-75 and 1992-97. Tahsils like Kaj and Ashti have registered downward shift from moderate to low degree of concentration in area
under bajara during the period under study.

58) Tahsils like Patoda, Ashti, Kaij, Ambejogai and Georai did not showed any change in tur concentration from 1970-75 to 1992-97. Beed tahsil registered downward shift in tur concentration from moderate to low whereas Manjalgaon tahsil showed upward shift from moderate to high degree of tur area concentration during the period of investigation.

Tahsils like Georai, Patoda and Kaij do not showed any change from 1970-75 to 1992-97. Beed and Ashti tahsils registered downward shift from high to low degree of mung area concentration whereas Manjalgaon registered upward shift from low to high and Ambejogai moderate to high shift of mung area concentration from 1970-75 to 1992-97 (map 5.20B).

Physical and non-physical determinants of agriculture are responsible for the change in level of crop concentration during the period of investigation.

59) Map 5.21B reveals that Beed tahsil showed downward shift from moderate to low whereas Patoda and Ashti tahsils registered low to moderate diversification level during the period of investigation. Kaij and Ambejogai have shown high to moderate level of diversification while Georai and Manjalgaon tahsils did not showed any change from 1970-75 to 1992-97. In the areas where the variability of rainfall is high and adequate sources of irrigation are not available, farmers grow several crops in a season, requiring different quantities of moisture. It is being done mainly to get something from their fields even in the case of extreme weather conditions. In the tradition bound subsistent farming systems the farmers grow several crops to meet the family requirements. Therefore Kaij, Georai, Ambejogai and Manjalgaon showed high diversification during 1970-75. Diversification has usually been done by the farmers to enhance nitrogen in the soil and to replenish the soil fertility i.e. Manjalgaon tahsil.

60) It is seen from the table 6.1 that output of rice crop in 1995-96 (the mid year of the ending triennium) showed an increase of 128.57% in 1971-72 (the mid year of the ending triennium). It means that an annual average
increase of 4.76% in the Beed district. All the selected crops have shown increase in their output during the period under study. The output of sugarcane, cotton and tur crops have shown tremendous changes in their output from 1970-73 to 1994-97. The highest change in production (1188.47%) was observed in sugarcane whereas the lowest change in production (25.56%) was took place in wheat crop between 1970-73 and 1994-97.

61) The output of rice, total cereals, groundnut, gram and wheat showed percentage increase of 128.57%, 105.42%, 42.59%, 39.19% and 25.56% respectively. It means an average annual percentage increase of 4.76%, 3.9%, 1.58%, 1.45% and 0.95% respectively for the crops of rice, total cereals, groundnut, gram and wheat. The broad conclusion of the above analysis is that the output of all crops showed increase from 1970-71 to 1996-97. During the first triennium there was great dry famine over the entire Beed district during 1972-73 hence, the production of all crops decreased. But due to the non-physical factors production of all crops increased in the last triennium.

62) Table 6.2 indicates that production of rice decreased in 12 years out of a time period of 27 years. The highest index number of rice production (335.29%) was found in 1978-79 whereas the lowest index number of rice (2%) was recorded in 1972-73. During 1972-73 there was dry famine in the entire study region, hence, rice production index decreased upto 2%. Rice production index was above 100% in 1975-76 to 1980-81, 1983-84, 1989-90 and 1996-97. It was below 30% in 1971-72, 1972-73 and below 50% in 1974-75, 1986-87 and 1991-92.

Production of wheat decrease in 11 years during the period under study. The highest decrease in wheat production (25.6 thousand M.T.) was observed in 1991-92 whereas the lowest decrease in wheat output was recorded in 1989-90 (1.7 thousand M.T.). The highest increase in wheat production was found in 1977-78 (21 thousand M.T.) While the lowest increase in wheat production was recorded in 1995-96 (2.6 thousand M.T.).
Index number of wheat production was below 100% in 1971-72, 1972-73, 1986-87 and 1991-92. The highest index number (387.4%) of wheat production was recorded in 1977-78 whereas the lowest index number of wheat was observed in 1972-73 (33.86%). Wheat production was increased by 250% from 1970-71 to 1996-97.

63) Jowar production decreased in 15 years out of a time period of 27 years. It was decreased due to shortage of rainfall and economic factors. The highest decrease (2.02 lakh meric tonnes) was took place in 1991-92 followed by 1988-89 (1.21 lakh M.T.) and the lowest decrease in jowar production was experienced in 1971-72 (1.4 thousand M.T.). The highest increase in jowar production (2.18 lakh M.T.) was found in 1992-93 whereas the lowest decrease in jowar production was noticed in 1974-75 (one hundred M.T.). There was great dry famine in the entire study region during 1972-73, hence, indices of jowar output decreased upto 26.24%. Indices of jowar output indicates ups and downs during the period of investigation. Bajara output decreased in 12 years out of a time period of 27 years. The highest decrease was took place in 1971-72 (94.3 thousand M.T.) followed by 1994-95 (65.5 thousand M.T.) and the lowest decrease in bajara production was recorded in 1986-87 (2.2 thousand M.T.) preceded by 1982-83 (6.9 thousand M.T.).

Table 6.3 reveals that indices of bajara production were below 10% in 1971-72 and 1972-73. Indices of bajara showed ups and downs due to erratic nature of monsoon rainfall throughout the entire period of investigation.

64) Production of gram decreased in 12 years out of a time period of 27 years. The highest decrease in gram output (15.3 thousand M.T.) was took place in 1973-74 followed by 1991-92 (8.4 thousand M.T.) and the lowest decrease in gram production was observed in 1978-79 (one thousand M.T.) preceded by 1988-89 (eight hundred M.T.). The highest increase in gram production was took place in 1971-72 (11.4 thousand M.T.) whereas the lowest increase in gram production was observed in 1974-75 (three
hundred M.T.). Table 6.3 indicates that gram production has shown tremendous change in its index number during the period of investigation.

During 1971-72 and 1972-73 index number of tur production was decreased to 18.75% and 40.62% respectively. Index number of tur production showed tremendous positive change throughout the period of investigation. Groundnut production decreased in 9 years from 1970-71 to 1996-97 in the entire study region.

65) The indices of oil seeds production showed tremendous positive change during the period of investigation except 1971-72 and 1972-73. The oil seeds production increased to a greater extent due to the increase in population, increase in irrigational facilities, use of high yielding variety seeds, chemical fertilizers and pesticides. Oil seeds production was increased by 826.37% during the period of 27 years.

Table 6.3 reveals that indices of cotton production has showed tremendous upward trends during the period under study except 1971-72 and 1972-73. It was decreased upto 28.63% during 1972-73 due to prevailing of dry famine over the entire study region. The highest index number of sugarcane production was noticed in 1991-92 (1223.06%) followed by 1995-96 (1103.72%) and the lowest index number of sugarcane production was found in 1972-73 (51.57%) preceded by 1971-72 (66.62%). Sugarcane production increased by 538.61% during the period of investigation.

66) From column 4 of table 6.4 it is seen that the highest variability (76.64%) was present in the production of cotton and the lowest variability (33.10%) was observed in the production of gram from 1970-71 to 1996-97. The variability in the production of sugarcane, bajara, rice, oil seeds, groundnut, tur, wheat, jowar, total cereals and pulses was 70.07%, 69.02%, 62.61%, 55.78%, 51.93%, 48.87%, 49.31%, 38.96%, 34.3% and 34.12% respectively. Table 6.4 reveals that selected agricultural crops are having wide range of production variability due to the combine effect of physical and non-physical determinants of agriculture.

67) During 1992-97 about 55.39% rice production was obtained from
Beed and Manjalgaon tahsils. Actually rice production was decreased in Patoda by 11.61% and 30.51% in Kaj tahsil during the period under study.

About 22.54% wheat production received from Kaj tahsil and remaining from other tahsils. Wheat production increased in every tahsil but percentage share in the district total decreased in Ashti, Patoda and Ambejogai tahsil. These tahsils showed 1.04% to 22.16% negative change in wheat production whereas about 4.13% to 10.41% positive change wheat production was occurred in Beed, Kaj, Manjalgaon and Georai tahsils from 1970-75 to 1992-97.

68) Jowar is dominant food crop in all tahsils. Below 1% positive change in jowar production was recorded in Patoda and above 1% positive change in jowar production was noticed in Georai (5.52%) tahsil between 1970-75 and 1992-97. Below 1% negative change in jowar output was recorded in Ambejogai, Ashti and Manjalgaon tahsils whereas above 1% negative change in jowar production was experienced in Kaj and Beed tahsils from 1970-75 to 1992-97 (map 6.3B).

About 2.41% to 5.69% negative change in bajara production was took place in Ashti, Beed, Georai and Kaj tahsils whereas 1.01% to 7.97% positive change in bajara output was recorded in Patoda, Manjalgaon and Ambejogai tahsils between 1970-75 and 1992-97.

69) Actually gram production was decreased by 15.60% in Manjalgaon and 3.68% in Patoda tahsil from 1970-75 to 1992-97. About 6.81% negative change in gram production was found in Beed tahsil during the period under study. About 2.25% to 12.22% positive change in gram production was found in Georai, Kaj, Ambejogai and Ashti tahsils due to the increase in irrigation facilities, use of high yielding seeds and attitudes of the farmer.

Tur production increased in every tahsil but the percentage share in the district total decreased in Beed, Kaj and Ambejogai tahsils from 1970-75 to 1992-97. About 1.08% to 11.71% negative change in tur production was found in Kaj, Ambejogai (11.71%) and Beed (6.63%) whereas 2.11% to 11.02% positive change in tur production was experienced in Ashti (2.11%),
Patoda (2.72%), Manjalgaon (3.57%) and Georai (11.02%) tahsils between the first and last quinquennium.

70) Out of the total groundnut production nearly 29.97% production was obtained from Ashti tahsil during 1992-97. The shares of Georai, Manjalgaon, Patoda, Beed, Ambejogai and Kaj were 17.87%, 17.24%, 17.10%, 10.13%, 6.21% and 1.48% respectively during 1992-97. About 2.34% to 18.53% negative change in groundnut production was found in Beed (2.34%), Ambejogai (18.35%) and Kaj (18.53%) while 4.37% to 19.24% positive change in groundnut output was found in Georai, Manjalgaon, Patoda and Ashti tahsils due to increased irrigational facilities.

About 0.30% to 6.43% negative change in cotton production was took place in Ashti, Beed and Georai whereas 0.01% to 4.79% positive change in cotton production was recorded in other tahsils from 1970-75 to 1992-97.

71) Table 6.6 gives the idea about three yearly moving averages of yields of selected agricultural crops. All selected crops showed ups and downs in their yield during the period under study. Indices of yields of bajara, groundnut and sugarcane have showed various ups and downs whereas indices of cotton and tur showed tremendous change during the period of investigation. Erratic nature of monsoon rainfall, use of high yielding variety seeds, chemical fertilizers, increase in irrigated area, farmers attitudes and effect of modern technology are responsible for the ups and downs of yields of selected crops.

72) From column 2 of table 6.8 it is experienced that sugarcane had the highest average yield (68 metric tonnes) per hectare and the lowest average yield (198 kilogrammes) per hectare was obtained in case of cotton. The average yield of wheat, rice, groundnut, jowar, bajara, tur and gram was 735, 658, 631, 618, 432, 365 and 363 respectively during the period of investigation.

From column 4 it is seen that the highest variability (107.8%) was
present in the yield of cotton and the lowest variability (5.07\%) was observed in the yield of cotton.

Groundnut showed negative (0.31\%) compound growth rate in its yield between 1970-71 and 1996-97. Fluctuation in monsoon rainfall is the major cause for the negative compound growth rate of groundnut yield. The highest positive average annual compound growth rate was observed in the yields of wheat (3.93\%) whereas the lowest positive compound growth rate was noticed in sugarcane (0.10\%) from 1970-71 to 1996-97.

Average yields of all selected crops increased to a greater extent in every tahsil. Application of high yielding variety seeds, chemical fertilizers, pesticides, literacy rate, increase in irrigated land, high population pressure on land, advanced technology these factors supports to the increase in average yields of selected agricultural crops during the period of investigation.

73) The concept of productivity seems to be a relative term and can not be uniformly applied everywhere. The spatial variations in physical output from the soils are the result of natural circumstances and partly of human manipulations of the land resources. Map 6.13 B reveals that low level of rice productivity was found in Beed tahsil and moderate rice productivity was recorded in Patoda, Kaj, Manjalgaon and Georai tahsils during 1992-97. High level of rice productivity was experienced in Ambejogai tahsil during 1992-97. Beed, Georai, Patoda, Kaj and Abejogai tahsils have showed change in their productivity level from 1970-75 to 1992-97.

Beed, Manjalgaon, Kaj and Ashti tahsils did not showed any change in wheat productivity from 1970-75 to 1992-97. Patoda registered moderate to high level change in wheat productivity during the period of 27 years.

74) During 1970-75 high level of jowar productivity was recorded in Georai, Manjalgaon and Ashti tahsils and moderate level of jowar productivity was noticed in Beed tahsil. Low jowar productivity was experienced in Ashti, Ambejogai and Kaj tahsils during 1970-75 (map 6.15A).

Ashti, Kaj and Manjalgaon tahsils did not showed any change in jowar
productivity whereas Patoda registered low to high jowar productivity change, Ambejogai showed low to moderate change, Beed has shown moderate to high and Georai showed high to moderate change during the period of investigation.

No change was observed in bajara productivity in Manjalgaon, Ashti and Patoda tahsils from 1970-75 to 1992-97. High to moderate change in bajara productivity was found in Ambejogai tahsil and low to high change in bajara productivity was recorded in Beed tahsil between 1970-75 and 1992-97. Kaij tahsil showed upward shift from moderate to high whereas Georai tahsil registered upward shift from low to moderate level of bajara productivity from 1970-75 to 1992-97.

75) Low level of gram productivity was observed in Beed, Georai, Kaij and Patoda tahsils and moderate level of gram productivity was found in Ambejogai tahsil during 1992-97. High level of gram productivity was noticed in Mjalgaon and Ashti tahsils during 1970-75 (map 6.17A).

Tahsils like Georai, Manjalgaon, Ambejogai and Kaij did not showed any change in gram productivity level whereas Beed and Patoda showed low to high level change in gram productivity from 1970-75 to 1992-97 (map 6.18 B).

Low level of tur productivity was found in Ambejogai tahsil and moderate tur productivity was recorded in Beed, Georai and Kaij tahsils whereas high level of tur productivity was found in Ashti, Manjalgaon and Patoda tahsils (map 6.19A) during 1970-75. Ashti, Patoda, Kaij, Ambejogai and Manjalgaon did not showed any change in tur productivity between 1970-75 and 1992-97. Beed tahsil registered upward shift from moderate level of tur productivity to high tur productivity while Georai showed downward shift from moderate level to low level tur productivity from 1970-75 to 1992-97.

76) Table 6.11 indicates that high level of overall food crops productivity was experienced in Ashti and Manjalgaon tahsils and moderate level overall food crops productivity was noticed in Beed and Georai tahsil dur-
ing 1970-75. High overall food crops productivity was found in Ambejogai, Patoda and Kaij tahsils during 1970-75 (map 6.18A).

Ashti, Kaij, Manjalgaon and Georai tahsils did not showed any change in overall food crops productivity between 1970-75 and 1992-97. Beed tahsil registered upward shift from moderate overall productivity to high overall productivity and Patoda tahsil showed low to high overall productivity change whereas Ambejogai has registered low to moderate level overall food crops productivity change from 1970-75 to 1992-97.

77) During 1998-99 out of the total net sown area below 15% net sown area was recorded under irrigation in Namalgaon, Kinhipai, Mundewadi, Waghira and Bhayala villages whereas 15% to 20% net sown area was found under irrigation in Sindkhed, Wadgaon Sushi, Warwati, Daithana Radi and Kewad villages in 1998-99. Above 20% net sown area was observed under irrigation in remaining selected villages during 1998-99.

All selected villages have shown positive change in irrigated area during the period of five years. Efforts of state Government, Zilla Parishad and individual farmers are responsible for this positive change. Below 4% positive change in irrigated area was recorded in Kinhipani, Kharat Adgaon, Warwati, Mudewadi and Bhayala villages on the other hand 4% to 6% positive change in irrigated area was took place in Namalgaon, Sindkhed, Wadgaon Sushi, Nipani Takali, Waghira and Daithana Radi during the period of five years. Above 6% positive change in irrigated area was experienced in Wadgaon Sushi, Kewad, Dadegaon and Ashta villages from 1994-95 to 1998-99.

78) Table 7.2 indicates that livestock numbers are not much increased in all selected villages during the period of five years. Bullock was dominant in the total livestock in Namalgaon, Sindkhed, Wadgaon Sushi, Nipani Takali, Mundewadi, Waghira and Bhayala villages whereas goat was ranking first in the total livestock in Kinhipai, Kharat Adgaon, Warwati and Kewad villages during 1998-99.

Most of the farmers of the selected villages are poor, hence, they are
using bullocks as draught force for agricultural operations. They are unable to use of tractors on large scale for agricultural operations.

79) Table 7.3 indicates that number of wooden ploughs per 100 hectare were below 2 in Ashta, Bhayala, Dadegaon, Waghira, Kewad, Warwati and Nipani Takali villages whereas it was above 2 in other selected villages. In 1994-95 low category of electric pumps density (below 4 per 100 hectare) was found in Warwati and Kewad villages whereas medium density (4 to 8 pumps per 100 hectare) was found in Namalgaon, Sindkhed, Wadgaon Sushi, Kharat Adgaon, Mundewadi, Waghira, Bhayala and Ashta villages. Advanced density (above 8 electric pumps per 100 hectare) was observed in Kinhipai, Dadegaon and Daithana Radi villages in 1994-95.

Villages like Kharat Adgaon, Mundewadi, Kinhipai and Waghira have registered no change in density categories from 1994-95 to 1998-99. Low to medium category change in electric pumps was took place in Nipani Takali, Kewad and Warwati villages whereas medium to advanced shift was found in Namalgaon, Sindkhed, Wadgaon Sushi, Ashta and Bhayala villages during the period of five years.

80) Density of tractor per 100 hectare was very low in selected villages. During 1994-95 about 0.13 to 0.55 density per 100 hectare was observed in all selected villages whereas it was about 0.34 to 1.08 per 100 hectare in selected villages. It means that all the villages are backward in application of modern technology.

About 0.11% to 1.09% negative change in forest area was recorded in Namalgaon, Kinhipai, Sindkhed, Wadgaon Sushi, Kharat Adgaon, Nipani Takali, Warwati, Daithana Radi, Mundewadi, Kewad, Waghira and Bhayala villages during the period of five years. The net sown area was increased to some extent in above mentioned villages, hence, they have shown negative change in forest area between 1994-95 and 1998-99.

81) About 0.09% to 0.48% negative change in area not available for cultivation was experienced in Kinhipai, Sindkhed, Wadgaon Sushi, Nipani Takali, Mundewadi, Waghira and Bhayala villages whereas 0.12% to 4.29%
positive change in this category was took place in Namalgaon, Kharat Adgaon, Warwati, Daithana Radi, Kewad, Ashta and Dadegaon between 1994-95 and 1998-99. About 0.14% to 1.56% negative change in other cultivable land was occurred in Namalgaon, Mundewadi, Nipani Takali, Waghira, Dadegaon and Daithana Radi while 0.11% to 0.48% positive change in other cultivable land was experienced in Kinhipai, Sindkhed, Wadgaon Sushi, Kharat Adgaon, Warwati, Kewad, Bhayala and Ashta villages during the period of five years. Area under this category have transfered in other categories such as fallow land or net sown area, hence, this group has showed negative change in some selected villages.

82) Out of the total geographical area below 80% area was found under net sown area in Ashta and Dadegaon villages whereas 80% to 90% geographical area was observed under this category in Namalgaon, Kinhipai, Kharat Adgaon, Daithana Radi, Kewad and Waghira during 1998-99. Above 90% geographical area was recorded under net sown area in Sindkhed, Wadgaon Sushi, Warwati, Mundewadi and Bhayala villages in 1998-99.

Villages like Ashta and Dadegaon have recorded 3.12% to 3.80% negative change in net sown area between 1994-95 and 1998-99. Net sown area has transfered to other landuse categories in these villages between 1994-95 and 1998-99. Due to increase in population pressure some fallow land brought under net sown area in Namalgaon, Kinhipai, Sindkhed, Wadgaon Sushi, Kharat Adgaon, Nipani Takali, Warwati, Daithana Radi, Mundewadi, Kewad, Waghira and Bhayala villages, therefore, they have shown 0.10% to 2.02% positive change in net sown area between 1994-95 and 1998-99.

83) Jowar was ranking first in cropping pattern in Ashta village where it was second dominant crop in other selected villages during 1998-99. Bajara crop was ranking first in all selected villages except Ashta village. Murmad soil, monsoon rainfall and other non-physical factors supports to the growth of bajara crop in the selected villages.

About 0.01% to 1.57% negative change in bajara area was experienced in Namalgaon, Nipani Takali, Warwati, Kharat Adgaon, Dadegaon, Waghira,
Mundewadi, Kinhipai, Wadgaon Sushi and Daithana Radi while 0.17% to 0.43% positive change in bajara area was took place in remaining selected villages between 1994-95 and 1998-99. Selected villages were having sufficient area under pulses and oil seeds due to favourable geographical condition. But area under pulses and oil seeds varies from village to village due to variation in soil fertility and rainfall fluctuation.

84) Cotton is important cash crop in the selected villages. Moderate rainfall, black cotton soil supports to the growth of cotton cultivation in the study region. Cotton was ranking second in cropping pattern in Nipani Takali, Kinhipai and Daithana Radi villages during 1998-99. It was ranking third in Namalgaon, Warwati and Waghira in 1998-99.

Below 2% negative change in cotton area was took place in Kharat Adgaon, Warwati, Dadegaon, Mundewadi and Ashta villages and above 2% negative change in cotton area was experienced in Kinhipai, Nipani Takali and Kewad villages between 1994-95 and 1998-99. About 0.19% to 3.12% positive change in cotton area was experienced in Sindkhed, Waghira, Bhayala, Wadgaon Sushi, Namalgaon and Daithana Radi villages from 1994-95 to 1998-99. Positive and negative changes in cotton area were took place due to the weather changes in selected villages.

The area under sugarcane is increasing in the selected villages due to increase in irrigational facilities.

85) Selected villages are facing various agricultural problems like irrigation, draught, poor technique of production, discouraging rural atmosphere, less use of chemical fertilizers, high yielding variety seeds, problem of low productivity, low price, lack of training facilities etc. It is necessary to solve these problems so that agricultural economy of the selected villages can be improve in near future. Two tahsils viz. Manjalgaon and Ashti have recorded high level of agricultural development in the study region as they have more favourable physical and non-physical environment. Beed, Ambejogai and Kaij tahsils have shown medium level of agricultural development whereas Patoda and Georai tahsils showed low level of agricultural
development in the study region.

8.3 Agricultural Problems of the Study Region:

The following are the problems of agriculture which are serious in the study region.

1. Uncertain of Monsoon Rainfall:

Out of the total region's annual rainfall nearly 80% of the annual rainfall is received in the south-west monsoon period. The average annual rainfall for the district is 750 mm. The rainfall in the district increases from the west to east varying from 590 mm at Ashti near the western border to 685 mm at Ambejogai near the eastern border.

The monsoon rains in the region are often marked by some important variations from the normal viz. (i) The beginning of the rains may be delayed considerably over the whole or a part of the study region (ii) It may end much earlier than usual causing damage to kharif crops and also make the sowing of rabi crops difficult or uncertain (iii) There may be prolonged breaks of rain lasting over the greater part of July or August when the kharif crops needing plenty of moisture are just growing (iv) The rains may persist more than usual in one part of the region and desist from another part.

A very important aspect of rainfall in the study region is its variability. It is seen from table 2.2 that the variability of rainfall in the district ranges between 29.5% to 43.27% in Ambejogai and Georai tahsils respectively. Below 30% rainfall variability was found in Ambejogai tahsil whereas 30% to 40% rainfall variability was recorded in Kaj, Patoda, Ashti and Manjalgaon tahsils during the period of 1970 to 1997. Above 40% rainfall variability was observed in Beed and Georai tahsils during the period of investigation. It means that there is no guaranty of crops due to high rainfall variability in the study region.

2. Problem of Soil Erosion:

The denudation or the cutting away of soil particles by natural agencies like rain, wind or running water is called the erosion of soil. Several agents are responsible for affecting soil erosion. The concentration of rain-
fall, the general slope of the ground, nature of the soil, nature of plant cover, more use of chemical fertilizers are the agents of the soil erosion.

The problem of soil erosion is a complicated problem. Deforestation, destruction and over grazing of pastures, faulty methods of cultivation, nature of crop grown, economic and social factors are responsible for soil erosion. Soil erosion varies from place to place according to the character of the soil, according to the slope of the ground, according to the vegetation cover, according to the use to which the soil is being put and according to the nature and amount of rainfall.

There is heavy soil erosion on the hills like Gonoba, Chitroba and Narayangad hill. It is also found on the both sides of Balaghat range. More soil erosion has taken place in the river beds and both sides of the rivers like Godavari, Manjara, Sina, Lendi, Amrita, Sindhphana, Saraswati, Gunwati, Wan, Limba, Yelmachi, Babhti, Kaj, Hol and Rena. The very shallow and shallow soils have poor water retention capacity, poor fertility and they are vulnerable to severe soil erosion. These soils do not support to the rabi crops. Such soils are found in Patoda, Kaj, Ambejogai, Beed, Georai and Ashti tahsils.

3. Problem of Discouraging Rural Atmosphere :

The region's farmers, generally speaking are poor, illiterate, ignorant, superstitious, conservative and bound by outmoded customs and institutions such as the caste system and the joint family. Superstition and belief in fate are the curses which keep the farmers fully satified with their primitive system of cultivation. Except for a small group of enlightened farmers who adopted quickly modern techniques of production, vast majority of farmers are not motivated by considerations of economic progress. Besides, they are so poor that they did not have the means to improve their economic conditions. In 1991 nearly 49.82% population was educated in the study region. This percentage was less in rural area. During 1992 the density of wooden ploughs per 1000 hectare was 10.64 whereas iron ploughs density was 38.64 per 1000 hectare. The density of tractor per thousand hectare
varies from 0.20 to 1.11 in the study region. The tractor density is very less in every tahsil. The farmers of the study region area using wooden and iron ploughs on large scale. Their method of cultivation is traditional and out mode.

4. Over Crowding in Agriculture:

Generally speaking, agriculture is a chronically depressed occupation. Besides it is over-crowded. The real problem of the region's agriculture is that there are too many people who depend on agriculture. Since 1961 the proportion of people depend on agriculture has almost remained constant. Above 80% workers were engaged in agricultural activities in Kaij. The shares of Patoda, Georai, Ashti, Manjalgaon, Beed and Ambejogai were 88.28%, 84.88%, 84.19%, 81.65%, 69.30% and 68.49% respectively. Table 3.6 indicates that agricultural density was increased in every tahsil during the period of investigation. It means that majority population depends on agriculture. The natural increase in population could not be absorbed in industries and even those who followed traditional handicrafts had to give them up and adopt agriculture income is not sure due to erratic nature of monsoon rainfall.

5. Inadequate Irrigation Facilities:

Agriculture has held a dominant position in the region's economy. But this major occupation is rendered hazardous by scanty rainfall in large areas and by erratic monsoon elsewhere. Partial failure or even delayed arrival of the monsoon can cause extensive damage of crops. Conscious efforts are, therefore, being made continuously to supplement rainfall and to mitigate the grave consequences of a dry spell by supplying water artificially to parched lands.

One of the basic cause for the weakness of region's agriculture has been that most of the farmers through out the study region have to depend upon rainfall and very few of them can avail the facilities of artificial irrigation. The Beed district has got advantage of three major projects such as Jayakwadi project right bank canal, Manjalgaon project and Manjara project.
The work of 16 medium project is completed through five year plans. These projects provides seasonal water for irrigation. There are 660 minor irrigation schemes in the study region. Out of the total schemes 580 schemes are completed by the Zilla Parishad and only 80 schemes are completed by the state Government. There are 45418 irrigated wells in the study region. Most of the minor irrigation tanks and wells becomes dry in summer season.

Table 3.4 indicates that irrigation position is improved in the study region from 1970-75 to 1992-97. Out of the total net sown area below 35% net sown area was found under irrigation in Beed, Georai, Kajj and Ambejogai tahsil. Other tahsils were having above 35% area under irrigation. But there is fluctuation in irrigated area due to erratic nature of monsoon rainfall. Agriculture is affected due to the shortage of water facilities in the study region except Manjalgaon and some part of Patoda and Ashti tahsils. Many of the regions rivers are not perennial and insignificant flows in the rabi season. Even majority rivers do not flow during rainy season due to scanty rainfall. There is wide disparity in water flow from year to year too.

6. Poor Economic Condition of Agricultural Labour:

Recruitment of labour in all agricultural operations and rural pursuits has a direct and complementary relationship with caste groups. In many cases not only does caste determine the nature of occupation, but different occupations give birth to various sub-castes hither to unknown. Owners cultivators and high class tenants generally belong to high castes whose hereditary occupation has been cultivation e.g. Brahmins, Marathas Muslims, Jains. Field workers are recruited mainly from lower castes which have agriculture as their subsidiary occupation.

The income of agricultural labourers is very low. A large part of their income is derived from wages. Mostly 85% agricultural labourers are having poor economic status. The daily wage for a male agricultural labourer is Rs. 50 and for female workers the wage rate is Rs. 30/- per day. Their wages are much lower than the industrial labour.

The low caste and the depressed classes have been socially handicapped
and they had never the courage to assert themselves. They have been like
dumb-driven cattle. Agricultural workers are still illiterate and ignorant in
all tahsils in the study region. They live scattered in the manner in the vil-
lages. Hence, they cannot easily be organised in unions. Another thing is
that agricultural worker do not have continuous work in farm.

The food taken by the labourers is far from satisfactory. Many do not
get the required quantity nor get the requisite quality. Their diet usually
consists of inferior cereals like hybrid jowar, bajara and millets with some
pulses. Green vegetables are taken only on festive occasions. Ghee and milk
are rarely included in the diet. The labourers as a class are more addicted to
drink than others. They drink country liquor made of rotten barley and mahua
seed. As a result of low income and raising consumption expenditure the
problem of indebtedness is increasing amongst the agricultural labour fami-
lies in the study region.

7. **Problem of Plant Protection :**

Stem-border, Khodkida affects in the jowar crop. The caterpillars are
dirty white with many spots on the body and with a brown head. The cater-
pillars bore inside the stems causing thereby drying of the central shoots
called 'dead hearts'. The beetles feed on the pollen and petals of flowers and
thus the setting of bajara grains. Pink borer, Khodkida affects wheat crop.
Pod-borer, ghatyatil ali diseases are found in gram. They make holes in the
pods and eat the developing seeds by inserting the interior half portion of
their body inside the pods. Pod-catepillar, Pisari Patang or 'turichya shengatil
ali' found on tur. Aphids mava found on groundnut crop whereas gall fly,
pili or Kane found on sesamum. Cotton is affected by 6011 worms. Sugarcane
is affected by stem-borer and Khod ali.

No systematic quantitative studies have been conducted in the study
region so far to determine the losses caused by insect pests and plant dis-
eases except irrigated tract. Pest and diseases are invariably limiting factors
in crop production. The pests and diseases which occur during the various
stages of growth of a plant are well known. During 1996-97 about 18988
litres liquid formulation pesticides were used in the study region. About 3613 quintals granules pesticides and 83 quintals fungicides pesticides were used in the study region for the plant protection. But above mentioned quantity of pesticides is not sufficient for the plant protection from the various diseases. Most of the farmers are economically poor and they are unable to use hunge amount of pesticides for the plants to protect them from diseases.

8. Less Use of H.Y.V. Seeds:

Agriculture in the study region moreover, suffers from the application of inadequate and bad seeds. Usually seeds are laid added and kept unprotected for the next sowing season in the entire study region. Thus the seed is badly affected by the worms and when sown the resulting plants also turn unhealthy. Sometimes, the farmers have to open their seed-sector for consumption and for sowing purpose borrow it from the local grain merchants or Baniya which is bad and unhealthy. Therefore, the yield of agricultural crops is very low as compared to Western Maharashtra. During 1996-97 about 36460 quintal high yielding variety seeds were used in the study region. Table 3.15 indicates that out of the total districts utilization nearly 22.76% improved variety seeds were utilized in Manjalgaon tahsil during 1996-97. Kaij tahsil stood second (20.81%) in the utilization of improved variety seeds whereas Patoda tahsil (5.12%) was least in utilization of high yielding variety seeds during 1996-97. Use of high yielding variety seeds was less in Beed, Georai, Patoda and Ambejogai tahsils, therefore, agricultural productivity is less.

9. Problem of Credit Facilities and Indebtendness:

There are 714 primary agricultural credit societies in the study region. There is uneven distribution of primary agricultural societies in the Beed district. These primary credit societies suffer from different problems.

A) Misuse of Loans:

Diversion and misuse of loan are common practice among borrowers. Nearly 50% of the co-operative credit was diverted to purposes other than those for which it was given. This percentage was 23% in case of short term
loans and 35% in case of medium term loans. This tendency has been high in all tahsils in the study region. The diversion and misuse of loans has been due to (i) weak financial position of the borrowers; (ii) Priority to some other needs over agricultural needs; (iii) deficiency of credit advance (iv) inadequate supervision and unsatisfactory management.

B) Inadequate Deposits :

The credit co-operatives in the region have failed to attract deposits partly because of the poverty of the members and partly because of the lack of confidence of members in these societies.

C) Credit is Neither Adequate Nor Cheap :

The amount of loan given to members is quite inadequate so that members are attracted towards money lenders for getting rest of the need fulfilled. The farmer borrows loan year after year from the money lender but he is not in a position to clear off the loans, either because the loans are larger or because his agricultural output is not large enough to pay off. Therefore, the debt of the farmers goes in increasing this is known as rural indebtedness. It is well known saying in our country that "The Indian farmer is born in debt, lives in debt and dies in debt."

D) High Overdues :

A large proportion of the loans outstanding is represented by overdues in the study region. Proper attention is not paid timely recovery of the loans advanced. It is too easy to distribute agricultural credit but extremely difficult to recover it. Most of the societies in the study region adopt unquestionable practices to conceal overdues. The methods usually followed are book adjustment, renewal of loans and conversion. Table 3.18 indicates that loan recovery percentage was 74.92% in the study region. It was 57.85% in the Manjalgaon tahsil during 1998.

10. Problem of Drought :

Entire study region comes under drought prone area. Extensive areas in Beed district receive moderate and erratic rainfall. There is tendency of frequent failure of crops. Some times region gets heavy rainfall and wet
famine occurs in the region. Some times dry famine previal over the entire region i.e. 1972-73. During 1972-73 there was great dry famine in the study region, hence, yields of all crops decreased to the greater extent. In 1983 and 1998 there were wet famine due to the heavy rainfall in the Beed district. Area under different agricultural crops reduced on large scale. Even there is shortage of drinking water in the various villages during summer season.

\[ \text{11. Problem of Sub-Division and Fragmentation of Holdings:} \]

The problem of agricultural holdings in the study region is two-fold. Not only the average holdings are small but they are also fragmented and are found not in one compact block but in tiny plots scatted all over the village. Each holding consists of many small pieces which are found in different parts of villages.

\textbf{Causes for Small Size of Holding:}

i) Growing population: Population of the study region increased by 2.21 times from 1951 to 1991. With evry increase in population land gets divided and sub-divided among a large number of people and as a result the size of holdings correspondingly goes on diminishing.

ii) The decline of joint family system: The joint family system which was so common a few decades ago, held together a number of natural families. The lands were held in common and all agricultural operations were managed. But now-a-days joint families have broken down in the study region. This has led to division and sub-division of holdings.

iii) Rural indebtedness and indigenous money-lenders: the village money lenders are highly unscrupulous and have only one interest in lending to the needy farmers that is to grab the lands of the latter. They encourage the farmers to borrow, charge them high rates of interest and adopt many unfair practices. They are also responsible to divide land into small patches.

Following are the disadvantages of sub-division and fragmentation of holdings:
i) The fragmented and uneconomic holdings have brought about progressive agricultural deterioration and aggravated the poverty of the masses in the study region.

ii) The cultivation of an unduly small holding entails waste in a variety of ways.

iii) Sub-division progressively reduces the average size of holdings. When the holdings get smaller the proportion of fixed cost to the total costs of cultivation increases.

iv) When holdings are intensely fragmented, much time is naturally lost in moving from one plot to another.

v) Fragmentation creates difficulties in maintaining correct levels and making provision for surface drainage.

Out of the total land holding 7.81% holding was marginal (below 1 hectare), 31.12%, small (one to two hectares), 27.65% semi medium, 15.85% medium and 17.57% large holdings in the study region during 1996-97. This is serious problem in the study region.

12. Lack of Marketing System:

Marketing facilities are very poor in the Beed district. There are eight regulated market centres. There are nineteen sub-marketing centres in the study region. They have very poor facilities. Most of the farmers sell their agricultural commodities in the villages. The following are the chief causes leading to heavy sales in the villages:

i) The most important cause for the high percentage of produce sale the village is without doubt, the indebtedness of the producer ii) The second important factor which is responsible for the high percentage of villages sales is the unsatisfactory nature of communication with nearest market. iii) The marketing possibilities of perishable commodities depend very largely on the rapidly with which they can be transported to the market place. iv) Most of the cultivators are hard-pressed for cash to meet the claim of their creditors and to pay off rent and other charges.

In order to have best advantages in marketing of his agricultural pro-
duce the farmer should enjoy certain basic facilities. (i) He should have proper facilities for storing his goods. (ii) He should have holding capacity in the sense, that he should be able to wait for times when he could get better prices for his produce. (iii) He should have adequate and cheap transportation facilities (iv) He should have clean information regarding market price.

Unfortunately region's farmers do not get above mentioned advantages. Agricultural goods prices are increased by four to thirteen times during the period of investigation. But these prices are not sufficient to fulfill the requirements of the farmers. The following are the general constraints observed in the study region's market.

(a) forced sale (b) lack of organization (c) lack of market intelligence (d) inadequate storage capacity. (e) lack of godowns. (f) superficial middleman. (g) absent of grading and (h) lack of information regarding prices.

13. **Low Price of Agricultural Commodities**:

Nearly 85% interviewed farmers of the selected villages told that they are getting less price to their agricultural produce. Most of the small farmers sale their goods in the weekly markets or to the Baniya.

Agricultural produces, food-stuffs and raw materials, the demand for which in the aggregate is relatively stable in the short run, while the supply of agricultural products fluctuates widely from year to year and from one part of the year to another, on account of the variation in the yields due to (i) seasonal weather condition (ii) variations due to supplies being more abundant in certain months of the year (iii) deliberate variations attempted by the producers and (iv) variation arising out of conditions of marketing. These fluctuating supplies constitute the most important factor responsible for the wide fluctuation in agricultural prices in all market places of the study region. The farmers of the study region do not get proper price during the period of harvesting.

The Government has fixed the prices of cotton and sugarcane crops. The farmers get their prices of cotton by two or three installment. That amount
of cotton did not received at proper time, hence, the farmers have to face economic problems. Sugar factories of the study region also exploit the farmers about the payment of sugarcane. They are giving only Rs. 660/- per metric tonnes to the farmers and this amount is not sufficient as far as the prices of fertilizers and other expenditure of sugarcane is concerned.

14. Large Diversity of Crops :

Beed district’s agriculture is predominantly characterised by the cultivation of a wide variety of food and non-food crops throughout the region and there exist sharp differences among the region with respect to the methods of cultivation. Due to the differences in soil and climatic conditions different varieties of crops are grown which includes kharif cereals, rabi cereals, various kinds of pulses and oil seeds. Cotton is dominant in cash crop. Sugarcane is cultivated on small scale in every tahsil. Its concentration varies from tahsil to tahsil.

15. Problem of Training Centres :

The study region’s farmers generally speaking are poor, illiterate, ignorant, superstitious, conservative and bound by outmoded customs and institutions such as the caste system and the joint family superstition and belief in fate are the causes which keep the farmers satisfied with their primitive system of cultivation. There are only two training centres in Beed district i.e. Bindusara and Manjalgaon. They are unable to give the training to the entire study region. The farmers are aware from the recent agricultural technology.

The region’s farmers have been using old and inefficient methods and techniques of production, since they are tradition bound and also poor. They have not adopted the modern methods which are so widely used in advanced countries. They require particular training for the adoption such modern technique.

16. Problem of Low Productivity :

In general agricultural productivity in the study region average per hectare is low as compared to other districts. It is low because of traditional
agricultural practices, lack of irrigation, less use of chemical fertilizers and HYV seeds/pressure of population, lack of motivation, poor resource base, lack of training facilities and inadequate knowledge. There has been some improvement in recent years, particularly during the plan period. But conditions in agriculture have not changed much. The following are the causes of low productivity in the study region.

i) Reckless deforestation has led to declining flora so that less humus is being added to the soil through normal process. Humus deficiency is resulting in the increasing of temperature and it is making the pre-monsoon cropping more and difficult. This deficiency causing reduction in the capacity of retention of moisture seem to be responsible for reducing the capacity of soils to withstand the effectiveness of some agricultural hazards and thus increasing the losses in output and ultimately resulting in the decline of average productivity.

ii) The serious drainage problem, caused by the increased construction of roads and canals has disturbed the natural drainage system by checking the normal flow of rain water. This results in large scale damage to kharif crops in the study region.

iii) Marginal and sub-marginal lands are being brought under cultivation in entire study region, due to increasing population pressure and such lands are generally inferior and yield less and thus bring about a decline in the crop productivity.

iv) With the depletion of forest resources, fuel supply is becoming scarcer and hence more of cowdung is being burnt, and lesser and lesser quantity of it goes to the field. Moreover, due to a small number of superior cattle, the supply of cowdung is also declining. Thus the most important source of manure is gradually being lost in all tahsils of the study region.

v) Crop-rotations and practice of fallowing are getting disturbed because of the pressure of population for more food and raw materials.

vi) Soil erosion is constantly increasing and in the eroded regions the fertile and the cultivated land is going out of cultivation and is turning into
a barren waste land. Cropping patterns are changing in which superior crops are giving place to inferior ones and crop yields are also declining.

vii) Indian agriculture is "a gamble in monsoon". Agricultural production function in Beed district is highly responsive to the uncertainty of rainfall.

viii) Region's farmers have been using old and inefficient methods and techniques of production. Nearly 85% farmers are using old techniques for the agricultural activities.

ix) Region's agriculture has suffered because of the inadequacy of such non-farm services as provision of finance, marketing etc. Till recently farmers had to depend upon, the village money-lenders and had to pay rates of interest so high that once a farmer had borrowed, he was bound to lose his land and become a landless labourer.

8.4 Suggestions:

I. **Untimely and Unequal Distribution of Rainfall**:

To solve this problem micro-level planning should be done in all tahsils for crop system on the basis of ecology considerations. It is necessary to identify the best cropping system for any local area under the prevailing rainfall and temperature pattern. Many of the wells have insufficient water facilities during the late summer and early monsoon, hence, efficient utilization of water is needed. Minimal irrigation for field crops need to be adopted in all villages of the study region. The farmers should be given training about the minimal and drip irrigation. Similarly drip irrigation system for horticultural crops for optimising water resources and need to be followed. Each and every drop of rain water should be percolated in the soil and extra running water should collected in percolation tanks. More and more percolation tanks, Kolhapur type bandhare's should be constructed in all villages of the Beed district.

Each tahsil might select an area where communications can be so arranged that it is possible for the weather forecast to reach the cultivation on the same day that it is used. This observations could then be made how this
knowledge help the farmer in timing his agricultural operations.

2. **Problem of Soil Erosion**:

To solve this problem the following methods should be adopted to control the soil erosion of the study region.

i) Contour farming system should be followed in the study region in hilly area or eroded area. Under contour farming, are included all operations like tillage, weeding along the contour available in the field. The plough furrows help in holding light rains, and in case of heavy rains the stems of the plant stop the flow of moving water. Contour farming reduces run-off, increase soil moisture for crop production, reduces soil losses and increases crop yields.

ii) Rotation of crops controls erosion, reduces soil loss and preserves productivity because the productive elements, that are removed by one crop are added to the soil by another crop grown in succession.

iii) Mechanical methods are adopted to supplement the agronomic practices. These methods comprise contour-terracing under which a series of properly spaced ridges and drainage channels are formed along contours by construction of suitable mounds of earth.

iv) If all the rain water were absorbed by the ground upon which it falls soil erosion would be reduced to a minimum. Maintenance of good forest cover is essential for agriculture.

v) Cultivation of such crop like jowar, bajara, gram and other legumes and fodder plants on the shifting sand while erosion-inducing and soil-depleting plants like tobacco, cotton maize and potato should be excluded from being cultivated on the eroded land.

vi) Sheep and goats are more destructive than cattle. It is essential to put limitation on the destructive goat and sheep grazing livestock should not be allowed grazing during rainy season because the seed stalks are easten before seed is formed.

vii) The farmers should have increased use of compost manure and chemical fertilizer.
3. Problem of Discouranging Rural Atmosphere:

The region's farmers generally speaking are poor, illiterate ignorant, therefore, they are adopting traditional methods of cultivation. Unless this atmosphere which supports backwardness and stagnation is changed, there is no possibility of agricultural development. We should change these conditions through television programmes, radio programmes and Government efforts. The farmers should have motivated about application of new improved seeds, use of chemical fertilizers, pesticides etc. There is need to give training to the farmers in the rural area or on the field. The percentage of literacy among the farmers should be increased in all villages of the study region.

4. Over Crowding in Agriculture:

To solve this problem the following measures should be followed for the study region.

i) The population of the rural sector in the study region must come down to 55% to 35% very soon. And big farms of the modern type should start immediately with atleast 40 hectares to begin with.

ii) A huge frontal attack on population growth is the first and foremost necessity. When we are having so many compulsions in our economy life why not limit the family to one or two children by law using the various well-known techniques? This formula should be followed in all villages in the Beed district.

iii) Intensive cultivation method should be adopted to increase agricultural productivity in all tahsils.

iv) All tahsils are having maximum agricultural potentials. There is wide scope to bring agricultural potential land under cultivation in all tahsils.

v) Quick industrialisation will help the process of reduction of agricultural labour. This labour force can transfer to the industrial sector.

vi) Fallow land should be brought under cultivation so that agricultural production can be increased.
5. **Inadequate Irrigation Facilities**

To solve this problem the following measures should be adopted in all tahsils.

i) It is necessary to see that region's water supplies are put to utmost efficient use. Water management is regarded as a "must" in agricultural technology of the study region. Water management has to be accompanied by suitable systems of soil surveys, crop patterns and crop rotation, use of high yielding seeds etc. Besides, land preparation, levelling and grading of land and designing proper layout for irrigated farming.

ii) More systematic attention must be paid to the stepping up of the efficiency of minor irrigation works by the installation and energisation of pump sets. Besides, not only the number of minor irrigation works should be increased but the existing ones need also be kept in a proper state of maintenance and those needing repair like silted tanks and irrigation channels, wells with lower water tables, brought into a state of efficiency.

iii) Effective demostration must be given to convince the cultivators of the proper use of water for different areas and crops.

iv) Transit losses can be reduced by improving the conveyance methods. Application losses can be reduced by educating the farmer properly on the proper methods of lay-out of land, proper control of distribution of water.

v) The farmers should be motivated to use drip irrigation system.

vi) In this connection it is necessary to provide better extension services, suitably linked with research organization of scientists and adopted to multi-cropping farming practices in the region.

vii) The surplus surface monsoon flows can be utilized by diverting them to recharge ground water supplies so that water can be available for winter crops.

6. **Poor Economic Condition of Agricultural Labour**

The following suggestions have been made for the improvement of agricultural labour.
i) Regulation of Hours of Work:

The workers have to work for very long hours. These need be regulated. The working hours in no case should exceed 8 hours for female and 10 hours for males and 50 hours in a week. Extra payment should be made if the work exceeds 8 yours. Secondly the fixation of working hours should apply to all agricultural works. Thirdly, there should be a break of atleast one hour between the morning and afternoon working.

ii) Better Implementation of Minimum Wages in Agriculture:

Agricultural workers have been getting very low wages in the study region. It is essential to raise the wages of agricultural labour. Unless this is done it is impossible to raise the economic condition of the agricultural labourers. Minimum wage legislation alone is not sufficient but steps should be taken to enforce it.

iii) Improvement in Conditions of Work:

Sweating with its triple evil of long hours of work, insanitary conditions and low wages is common in agriculture in the study region. Therefore, working conditions need be improved, firstly, only male adults may be allowed to work during rainy season, when liability to disease is high and conditions of work difficult. Secondly women and children should be prohibited from heavy work under unhealthy conditions.

iv) Rehabilitation of Landless Agricultural Labours:

In order to improve the economic conditions of agricultural labour, the landless workers should be provided with land. This can be done in many ways. One way is that the new reclaimed land may be allotted only to them.

v) Protection of Women and Child Labourers:

Measures should be taken to ensure to women employed in agricultural undertakings protection before and after child birth. The work should be stopped two months before and at least one month after child-birth.

vi) Public Works Programme:

One very good method of providing employment to rural labour and of utilizing it fully is the construction of public works by the Government. The
Government can plan its projects in the rural areas carefully, so that the worker who may be unemployed during off seasons may be gainfully employed. Such projects includes the construction of roads, the digging and deepening to tanks and cannals etc.

vii) Unions for Agricultural Labour:
Greatest emphasis should be placed on the formation of unions of farm labourers and the Government should help actively in the formation of such unions.

viii) Provision of Social Amenities:
In order to improve the efficiency and standard of living, it is essential that proper arrangements are made for organising vocational, technical and elementary education; Recreation facilities like that of natak mandlis, akharas, malas, kirtans and radio programmes must be provided.

7. Problems of Plant Protection:
The plant protection measures may be broadly classified as:

i) Chemical control which consists in spraying and dusting the plant by chemicals and poisons or mixing these into soil to kill pest and diseases which inhabit the soil. Some of the important chemicals such as D.D.T., B.S.C. Aldri etc. are used to kill the germs which are present on the plants.

ii) Mechanical control includes eradication of the fields rats mechanically, through traps or fumigation of burrows in buildings, poisoned baits and use of rat repellants etc.

iii) Physical control measures include the application of radiation and manipulation of temperature, humidity etc.

iv) Cultural control includes proper rotating crops, spacing of plants, ploughing, irrigating land at appropriate time and late sowing of crops.

8. Less Use of High Yielding Variety Seeds:
Agriculture of the study region and selected villages suffers from the application of inadequate and bad seeds. During this modern period a number of high yielding varieties of jowar, bajara, rice, wheat, gram, tur, mung, groundnut, safflower etc. have been introduced. The farmers of the study
region should give the knowledge of new variety seeds through work shop or training courses. The Government of Maharashtra should distribute the high yielding variety seeds to the poor farmers without charging any amount. Seed is the carrier of new technology to crop production, propagation and multiplication. Therefore, the farmers should motivated to use high yielding seeds in all tahsils of Beed district. Some refresher courses should be arranged regarding the use of improved variety seeds in every village of the study region.

9. Problem of Credit Facilities and Indebtedness:

The problem of rural indebtedness has two aspects and therefore the solution is also two fold. In the first instance, measures may be devised for cancelling old debts. Secondly, measures should be devised to see that fresh borrowing is limited to the minimum necessary and to the productive type. At the same time it is necessary to control the money lender and regulate his activities.

a) Settlement of Old Debt:

Govt. has enacted appropriate legislation to scale down the debts of small farmers and to discharge non-institutional debts of weaker sections like landless labourer and rural artisans. The difficulty with such legislation is that the farmers and the landless labourers may not take advantage, either because they are ignorant of such legislation or because they are afraid of the money lender.

b) Reduce Dependence on Money Lenders:

In order to reduce the dependence of the rural people on local money lenders, the network of institutional credit structure, comprising co-operatives, commercial banks is being rapidly expanded through the study region to improve timely and adequate credit support to the small farmers.

c) Control of New Loans:

It is sufficient to help in the settlement of old debts. It is necessary to see that the farmers resort to borrowing only for the most essential and productive purposes. Non-productive loans should be avoided, but here the
Government can do very little.

Social and religious functions form an important part of the life of villages in the study region. The expenditure in connection with them, cannot be eliminated so easily be advising farmers.

To solve the problem of loan, it is necessary to sanction more loans to the poor farmers at the lowest rate of interest.

10. Problem of Drought

The major thrust is to reduce severity of the drought effects. It is therefore, necessary to optimise the depleted land resources in connection with maximum use of erratic and unsecure water resources will have to be undertaken in the drought prone area of the region. The agro-forestry, horticulture, livestock development etc. are required to be searched in greater depth as the crop production alone will not be sufficient for farmers subsistance. To solve this problem various percolation tanks and Kolhapur Type of Bandhares should be increased in the region. Drip irrigation schemes should be adopted by the farmers of every village in the study region.

11. Problem of Sub-division and Fragmentation of Holdings:

To solve this problem the following remedies should adopted in the study region.

1. Consolidation of Holdings:

For a long time, it has been realised that the proper solution to the problem of scattered holdings is consolidation of holdings. This formula should be adopted in the study region.

2. Creation of Economic Holdings:

One of the important aspects of land reforms in the study region is the increase in the size of the holdings and the consolidation of scattered holdings. To establish economic holdings, the following measures will have to be adopted.

i) The pressure on land may be reduced by the starting of industries in the rural area to provide employment to the landless labourers and marginal pleasants.
ii) The fixation of ceiling on holdings, so that all those who have more than the prescribed maximum limit in a village will have to surrender their surplus land to the public authorities who will then distribute the same among those who have uneconomic holdings.

3. Co-operative Farming:

According to some authorities as well as the Indian Government a permanent solution to the problem of small and scattered holding is co-operative farming.

12. Lack of Marketing System:

Marketing facilities are very poor in the study region. There are eight marketing centres and nineteen sub-marketing centres in the study region. In order to have best advantage in marketing of farmers agricultural produce the farmers should enjoy certain basic facilities like storing facilities, better prices, adequate and cheap transport etc.

To solve the problems of market centres the following remedies should be adopted in the study region.

i) It is necessary to conduct the marketing survey by the state Govt.
ii) Marketing committees should have provided basic facilities such as water, light, godowns etc.
iii) Market centres should be clean.
iv) It is necessary to start new market centres in the Beed district.
v) It is duty of the Government to set up rural godowns in the study region.

13. Low Prices of Agricultural Commodities:

Most of the farmers sale their agricultural goods to the money-lender cum traders in the village. These persons take agricultural goods at the lowest price. To solve this problem the following remedies should be adopted.

i) In order to protect the farmer from heavy losses due to vagaries of the weather and damage by insect pests and price fluctuations, price should be guaranteed with a view to securing comparative stability of agricultural income.
ii) To safeguard the interest of the consumers, it is necessary that prices should be prevented from rising beyond a prescribed maximum. Such prices should be fixed within a range which would be fair both to the producer and the consumer and capable of being put into practice.

iii) The money-lender purchase system should be stopped in the village area.

iv) The fair price should be such as would leave to the producer an income sufficient to maintain him and his family at a reasonable standard of living. This fair price should cover the cost of production.

v) The minimum price for a commodity should be calculated for principal producing area on the basis of fair average quality of the product. Suitable differentials should be allowed in respect of different grades and qualities.

vi) The fixation of minimum price would require that the Government should guarantee to purchase all supplies offered to it at that price at an adequate number of marketing centres within an easy access to cultivators in order to enforce prices at the minimum level.

vii) The minimum and maximum prices should be fixed up for principal food grains like wheat, bajara, jowar as their prices are likely to influence those of other food grains. The principles of price policy recommended for food crops should also apply to commercial crops and the mode of implementation would have to be modified to suit the special circumstance of each crop.

viii) Marketing societies should be located at the mandi centres and the area of operation should be the hinterland of the markets concerned.

ix) Godowns should be provided by the societies with financial assistance from the Government.

x) There should be organised and regulated markets where the farmers will not be cheated by the dalals.

xi) There should be co-operative marketing society system in the study region. Organization of societies should be on democratic lines. Producer-
cum-trader should be allowed to become full members.

xii) Grading and processing should be developed and produce marketed only after grading and processing is done.

xii) Government should have given warning to the sugar factories regarding the proper prices of sugarcane and its distribution within time to the farmers.

14. **Large Diversity of Crops**:

There is large diversity of crops in all tahsils in the study region. To solve this problem the following remedies should be adopted.

i) It is necessary to increase the rate of irrigation by hook or crook in the study region. Drip irrigation schemes should be adopted by the farmers in the study region.

ii) The farmers should have given information about the specialization of crops.

iii) It is necessary to increase the literacy rate among the farmers so that they can understand recent production technology clearly.

iv) Government should have take responsibility of the farmers crops like sugarcane, jowar, wheat, bajara etc.

15. **Problem of Training Centres**:

There are only two training centres which are located at Bindusara and Manjalgaon in the Beed district. They are also not doing their role well. There is need to start atleast nine centres in the study region. They should have started at tahsil places. The research centres should be developed at every place. So that these centres will collect soil samples from every village for chemical analysis. This report will help to the farmers to use proper manure.

The following workshops and training programmes should be organised in the study region.

i) Monthly workshop should be organised in every tahsil for giving adequate knowledge of agriculture to the farmers.

ii) Pre-season workshops must be organised for two days twice a year
before the commencement of kharif and rabi season in every tahsil.

iii) Some documentary films regarding crops should be shown to the farmers.

iv) Krishi Vigyan Kendras should be started in every tahsil. These kendras will give agricultural information to the farmers.

v) The following should be given to the farmers.

a) Training on use of chemical fertilizers.

b) Training on water management and drip irrigation.

c) Training on new variety seeds.

d) Training on pulses and oil seeds production.

e) Improvement of saline sodic soils.

f) Training on crops diseases.

g) Training on production technology.

16. **Problem of Low Productivity:**

To solve this problem the following measures should be adopted.

i) For better quantitative production, provision of irrigation, high yielding varieties, manures, fertilizers and implements at concessional rate, should prove effective in all tahsils.

ii) For better quality production, attractive prices, based on quality differentials accompanied by better seeds, should prove helpful.

iii) For food crops and for subsistence farmers, provision of cost subsidies should be made.

iv) Farmers should have plough their land by tractor and use compost manure on large scale.

v) Drip irrigation schemes should be extensively adopted by the farmers.

vi) Agricultural productivity can be improved by adopting new farm technology and latest agricultural implements.

vii) Nearly 85% farmers of the study region are poor. Therefore, they should have given agricultural loan at the lowest rate of interest.

viii) There should be proper union of the farmers to fight against the
lowest price of their agricultural goods.

ix) Some workshops should be arranged in every village regarding how to increase the agricultural productivity.

x) If technology, currently known to India could be applied to the region's agriculture it would be easy to increase production substantially.

xi) For crops grown for the market and for bigger farmers, price guarantees may bring better responses in the study region.

xii) In case of competing cash crops measures aimed at higher income at low cost may prove more beneficial to the study region.

xiii) Unless the disabilities and hindrances in the way of agricultural productivity are reduced it seems inevitable that much of the teachings of the form advisory services will fall upon stony ground.