CHAPTER-VII
CONCLUSIONS, PROBLEMS AND SUGGESTIONS

7.1 CONCLUSIONS

The purpose of this chapter is to give the summary and conclusion of the analysis done in all the chapter of the concerned study. At the same time, this chapter also includes the important findings and results emerging from the analysis.

- On the basis of physical setup, the district is divided into three basic physiographic divisions-
  i) The Lowland Region
  ii) The Plateau Region
  iii) The Hilly Region

The lowland region occupies 11.21\% of the area of the region, the plateau region covers about 64.65\% of the area of the district and the hilly region covers about rest of 24.14\% area of the Nanded district.

- Broadly, the climate of Nanded district is monsoonal in nature. The year can be divided into four seasons. The hot season, begins in March and extends upto the five weeks of June. This is followed by the south-east monsoon, which lasts till the end of September-October and the first half of November constitute the post-monsoon season and is followed by cold season, which lasts upto February. May is generally the hottest month with the mean daily maximum temperature at about 41.6$^\circ$C and mean daily minimum temperature at about 25.6$^\circ$C. The heat during summer is intense and the maximum temperature sometimes goes on about 45$^\circ$C. With the onset of the south-west monsoons by about the second week of
June, there is an appreciable drop in temperature and the weather remains pleasant through the south-west monsoon season.

- Climatically the entire region comes under rain-shadow zone. An average annual rainfall of the district is about 813 mm. and of it about 82.19% of rainfall occurs during the monsoon season (June to September) and about 17.81% during the rest of months. The variation in the annual rainfall from year to year is large due to unpredictable and erroneous nature of monsoon.

- Co-efficient of rainfall variability ranges from 25% to 38% in the district. The highest co-efficient of rainfall variability was recorded in Biloli (38.54%) tehsil and lowest in Kinwat (25%) tehsil during the period of investigation.

- During the monsoon season from June to September, the humidity is recorded more than 75%, while during the rest of the year, humidity is below 25%. The driest part of the year in the summer, particularly April and May, when the humidity is below 15%. Winds are light to moderate during the period of May to August. In the south-west monsoon season, winds blow from south-west to north-east, while during October to January winds blow from north-east to south-west direction.

- As far as the drainage pattern of the region is concerned, the river Godavari is most significant, originate in the Sahyadri range near Tryambakeshwar in Nashik district. The Asna, the Siddha, the Sita are important left bank tributaries of the Godavari. The Asna runs for about 20kms. Through the district and joins the Godavari about 8 kms. East of Nanded city. The Sita river runs for a distance of about 12 kms. Through the district and joins the Godavari to the east of Asna. The Manjara is the right bank tributary of the Godavari. The river Manjara forms district boundary to the south-
east of the district about 40 kms. upto its confluence with the Godavari. The Manyad and Lendi are important tributaries of the Manjara. The Penganga is a major tributary of the Wardha drainage system and drains the northern part of the district. The Penganga is the largest river (286.40kms.) of the district, followed by the Godavari (140.98 kms.) and the Manyad (122.69 kms.) river. The Sita runs only 12.87 kms. distance in the district. The Lendi, the Manjara and the Asna also run shorter distance in the study region.

Soils of the district can be broadly grouped into three types-

i) Coarse shallow soils

ii) Medium Deep Black soils

iii) Deep Black soils

Coarse soils are noticed in Hadgaon, Bhokar, Kinwat, Kandhar, Mukhed and Deglur tahsils. This soil is inferior in quality and used mostly for the cultivation of the kharif crops. Its depth is found upto 23.5 cms., Medium deep black soils covers most of the areas of the district. It is observed in Nanded, Biloli, Muked, Deglur, Bhokar, Hadgaon and north-western part of the Kinwat tahsils. The depth of soils ranges between 23.5 cms. To 45.00 cms. Kharif as well as rabi crops are cultivated in the soils. Deep black soils are found in a narrow strip of land on the banks of Godavari and its tributaries. The soils of Nanded tehsil is mainly rich, black, fertile, alluvial soil. The Biloli tehsil fertile soil is found along the banks of the Godavari, Manjara and Manyad rivers. The depth of the soils is more than 45 cms. Overall, the farming factors, topography shows a dominating influence on soils variation in the district.

In the Nanded district, the forest cover is not significant. During the 1991-92, the highest percent of area is under forest was found in Kinwat (28.47%) tahsil and lowest in Biloli (0.94%) tahsil.
In the year 2011-12, Kuinwat tahsil (26.56%) again rank first and
Deglur tahsil (1.38%) ranks last in area under forest. Whereas, Hadgaon, Nanded, Bhokar, Biloli, Loha, Kandhar, Mukhed tahsils were marked 7.22%, 1.86%, 12.17%, 2.28%, 2.77%, 3.46%, 3.05% area under forest respectively. Negative change in forest area was marked in five tahsils namely, Kinwat, Hadgaon, Nanded, Bhokar, Mukhed, tahsils whereas, positive change in forest area was noticed in Loha, Biloli, Kandhar and Deglur tahsils during the period of investigation.

- The growth rate was calculated for the total rural and urban area of Nanded district for the last six decades. The trend of general population growth rate and rural population growth rate by and large are lower than the urban growth rate, except during 1951-61 periods. The trend of general population growth was increased by 7.27% during the decade of 1961-71, during 1971-81, it was decreased by 4.26%, where, in 1981-91 it was increased by 8.02% and was decreased by 9.64% in 2001. Rural population was decreased by 5.08% during 1971-81. It was increased in 1991 by 6.73% as compared to 1981. Urban population growth was low in 1951 (12.23%). The highest urban population growth rate was noticed in 1991 and it was 54.57%.

- During 1991-2011, the highest growth rate of population was registered in Nanded (104.89%) tehsil, while Bhokar (42.66%) tehsil has shown the lowest growth rate. Population growth rate of Kinwat, Hadgaon, Biloli, Kandhar, Mukhed, and Deglur tahsils were 49.45%, 50.00%, 52.43%, 56.79% and 54.32 respectively. The rate of population growth in Nanded tehsil is above the district average and remaining tahsils are below the district average.
The term density is represented in different ways to understand the population resources relationship. These ratios have been designed as rural density, crude, physiological, agricultural and caloric densities. Different types of densities have been represented through chloropleth maps for different tahsils for Nanded district. The rural density per sq.km. was 177 in 1991 which increased to 212 in 2011 for region as whole. For most of tahsils the rural density has increased during last two decades. Crude density for the district as a whole, it has increased from 222 persons/sq.km. in 1991 to 273 persons per sq.km.in 2011. Physiological density per sq.km. was 322 in 1991, which increased to 400 in 2011. Agricultural density per sq.km. was 108 in 1991, which decreased 96 in 2011. The highest caloric density was marked in Mukhed (343/sq.km.) tehsil in 1991, while highest caloric density per sq.km. was registered 334 in Nanded tahsil during 2011.

Literacy is considered as a relevant index of the socio-economic planning and development of region. The variations in literacy many times indicate the place of society is getting transform. Rural literacy has been studied in detail for the last two decades. The percentage of literates to total rural population in the district has gone up from 42.49% in 1991 to 65.28% in 2011. There is wide spatial variation in population of literate people in rural area. It is as high as 46.69% in Hadgaon and as low as 38.17% in Bhokar tehsil during 1991. In 2011 it is high in Kinwat (68.79%) tehsil and lowest in Biloli (61.23%) tehsil.

During 1991-92 the lowest group (owing up to 0.5 hectare of land) consisting of 8.33% of households, accounted for only 1.18% of area owned. In 2011-12 the same group consisting of 6.70% of households account for 1.34% share of land, which indicates that
marginal (less than 1.00 hect.) farmers share in number of holdings has decreased but their relative share in area has slightly increased in the year 2011-12. The small holding farmers (1.00 to 2.00 hect.) group consisting of 35.04% of households and accounted about 24.88% of area owned during 1991-92. On the contrary, in 2011-12 the same groups consisting of 28.18% households and are decreased and their share in area has increased during the period of investigation. The largest group owning more than 10 hectares accounting for 0.68% of households in 1991-92, claimed 4.23% of land owned. In 2011-12, the same group 0.54% of households claimed 4.81% of owned land.

- There are 990 agricultural credit societies in the Nanded district. Out of the total credit societies about 17.99% (169) societies were observed in Biloli tehsil, whereas, 8.28% credit societies were noticed in Kandhar tehsil as on 31st March 2012. In loan advanced Biloli tehsil was ranking first, whereas Mukhed was least. Highest loan recovery was experienced in Kandhar tahsil (99.50%). On the other hand lowest loan recovery was registered in Biloli tehsil (45.06%). Loan recovery of Kinwat, Hadgaon, Nanded, Bhokar, Mukhed and Deglur were 55.18%, 46.66%, 50.52%, 57.19%, 53.78% and 53.38 as on 31st march 2012.

- Transportation facilities are considered as the life time of the economy in a particular region. In 2011-12, it is found that total length of transport system of district was increased about 1789 kms. from 1991 to 2012. Among the transport system, Village Road marked highest share (41.96%) followed by Major District Road (20.92%), Other District Roads (12.08%) and State Highways (11.49%), Other Village Road (10.50%). Highest positive change in road length was recorded under Other District
Road (2.4%), while lowest positive change was registered under National Highways (0.32%). The highest negative change was marked under State Highways (3.89%), On the other hand lowest negative change was recorded under Village Road (0.05%). Total length of railways route was 208 kms.

- The proportion of cattle in the total livestock was ranked first in 1992, as well as 2012 in the study region. Total number of livestock is marked 18.48 lakhs during 1991-92 as against 22.62 lakhs during the year 2011-12. There is recorded 22.36% increase in total number of livestock during the period of investigation. The low category of cattle population (below 45%) was recorded in Deglur (37.63%) and Biloli (44.94%) tahsils, Moderate category (45% to 55%) was registered in Hadgaon, Nanded, Loha, kandhar, Bhokar and Mukhed tahsils. Whereas, high category was experienced only in Kinwat during 1991-92. During 2011-12, three tahsils namely, Hadgaon, Bhokar and Biloli indicated change in higher categories. No one tahsils indicated change in lower level of category. While no change in category was made only in Deglur tehsil. The percent contribution of buffaloes to total livestock population was 16.59% and 16.36% during the year 1991-92 and 2011-12 respectively.

- District have 25.13% and 21.38% share of goat in total livestock population during 1991-92 and 2011-12 respectively. The low category (below 22%) was found in Kandhar and Nanded tahsils, while moderate category (22% to 25%) comprises only Bhokar tehsil and high category (above 25%) was marked in Kinwat, Hadgaon, Loha Biloli, Muked and Deglur tahsils during 1991-92. During 2011-12 five tahsils registered changes in categories i.e. Hadgaon, Bhokar, Loha Mukhed and Deglur registered lower shift.
in category. Whereas, no change in the level of category was noticed in Kinwat, Nanded, Kandhar and Biloli tahsils during the same year.

- Sheep have about 3.26% and 2.99% total livestock units of the district in 1991-92 and 2011-12 respectively. During 2011-12, only one tehsil namely Mukhed has changed the category. Mukhed tehsil registered lower shift in category, while remaining all tahsils were marked no change in the level of category during the period of investigation.

- The proportion of cattle population density per 100 hectares of net area sown in 1991-92 was 98 as against 133 cattle in 2011-12, district as a whole. The average density of cows per 100 hectares of net sown area was recorded 16 during the year 1991-92 as against 77 during 2011-12. The average density of bullocks per 100 hectares of net sown area was 35 bullocks in the year 1991-92 as against 31 bullocks during the year 2011-12. The density of buffaloes was marked 33 and 26 per 100 hectares of net sown area during the year 1991-92 and 2011-12 respectively. Whereas, density of sheep per 100 hectares of net sown area was declined from 6 to 5 sheep per 100 hectares of net sown area during the year 1991-92 and 2011-12 respectively. The density of goats per 100 hectares of net sown area was marked increase from 50 to 52 during the year 1991-92 and 2011-12.

- There is observed transformation in agricultural implements in the study region. The numbers of traditional agricultural implements like wooden ploughs, bullock carts etc., are decreased during the period of investigation. Only 2 (per 1000 hect of GCA.) tractors were found in the district in 2012. About 44 (per 1000 hect. of
electric pumps were used for lifting water to agriculture in the study region.

- In the district there are four types of important means of irrigation, namely canals, wells, tanks and other sources. It is seem that during the period of investigation, the net irrigated area of the district was increased from 62852 hectares to 135242 hectares and marked 115.17% increase in net irrigated area from all irrigation sources. It is observed that the greatest contributor in the share of irrigation in the district are wells. During the year 1991-92, the share of wells in net irrigated area was 68.63% as against 66.38% in 2011-12. Whereas, the share of canals in total irrigation was 20.15% during 2011-12. There was marked 2.09% increase in area irrigated by canals during the period of investigation. Other sources share in net irrigated area was marked 6.13%, 2.82% and 8.79% in 1991-92 and 2000-01, and 2011-12 respectively.

- There are three major irrigation projects i.e. Shankarrao Chavan Vishnupuri Project; Lendi Project and Shankarrao Chavan Vishnupuri Project High level Bandhara. Total irrigation potentials of the project are about 96462 hectares. Nanded, Kandhar, Mukhed etc. Tahsils are benefited from these major irrigation projects.

- The highest number of medium irrigation projects are found in Kinwat (03) tehsil and lowest in Mukhed, Deglur, Bhokar, Loha Tahsils (each one). About Rs.63356.48 lakh amount was spent for construction and development of canals. The highest canal length was marked Vardamanar medium irrigation projects, followed by Kardkhed, Loni projects, Peth vaduj project, Kudala project and the Dongargaon project. The total irrigable area of these medium projects are registered about 21136 hectares.
During 1991-92 there were 20646 irrigation wells, whereas, in 2011-12, it was increased upto 24295. Out of the total wells about 97.93% well were in use. On the other hand 2.07% well not in use 1991-92. Numbers are wells in use were decreased upto 94.89% in 2011-12 and numbers of wells not in use were increased by 5.11%. Out of the total irrigation wells in Nanded district, below 92% wells were used for irrigation only in Deglur tehsil in the year 2011-12. About92% to 94% wells was used for irrigation in Hadgaon (93.62%), Biloli (93.40%), tahsils during the same year. Above 94% wells were used for irrigation in Kinwat (94.58%), Nanded (95.90%), Bhokar (94.44%), Loha (95.59%), Kandhar (95.19%) and Mukhed (95.94%) tahsils in the year 2011-12.

The intensity of irrigation for the district as a whole was about 16.36% during the year 2011-12. Below 8% intensity of irrigation was registered in five tahsils namely, Kinwat (7.75%), Loha (7.11%), Kandhar (5.16%), Mukhed (5.22%) and Deglur (6.88%)tahsils during 2011-12. About 8% to 16% intensity of irrigation was recorded in Hadgaon (14.28%) and Bhokar (9.23%) tahsils and above 16% intensity of irrigation was observed in nanded (22.77%) and Biloli (20.97%) tahsils during the same year. All tahsils in the district are marked positive change in the intensity of irrigation. Below 3% positive change in the intensity of irrigation was marked in Nanded, Kandhar, DEeglur and Biloli tahasils, whereas, about 3% to 6% positive change was noticed in Mukhed, Hadgaon and Kinwat tahsils since 1991-92 to 2011-12. Above 6% positive change was found only in Bhokar tehsil.

The study region had about 92700 hectares (8.97%) of its area under forest during 1991-92. It decreased from 92700 hectares (8.68%) from 1991-92 to 2011-12. This shows that there was
(-0.29%) decrease in forest areas during the period of investigation. Belo 2% positive change in forest area was noticed in four taluks namely, Loha (1.13%), Kandhar (1.48%), Biloli (1.28%) and Nanded (1.6%), while below 2% negative change in forest area was experienced in Kinwat (-1.93%), Hadgaon (-0.59%), and Mukhed (-0.54%) between 1991-92 to 2011-12. Above 2% negative change was registered only in Bhokar (-2.13%) taluks during the period of investigation.

- Area not available for cultivation has decreased from 5.53% in 1991-92 to 5.04% in the year 2011-12. Out of the total geographical area below 4% area was registered under this category in Deglur (1.77%), Biloli (3.67%), taluks and 4% to 8% area was under area not available for cultivation in Mukhed (4.38%), Kandhar (6.66%), Nanded (5.00%), Bhokar (4.80%) and Kinwat (5.21%) taluks during the year 2011-12. Above 8% geographical area was recorded under this category only in Loha (8.12%) taluks during the same period.

- In 1991-92 total cultivated land was 76700 hectares (7.42%). It declined up to 32400 hectares (3.14%) in 2011-12. The main reason of this decrease is the reclamation of such lands for cultivation. Out of the total geographical area below 3% area was observed under uncultivable land in Mukhed (1.74%), Kandhar (1.48%), Bhokar (1.41%), and Hadgaon (0.67%) taluks during the period 2011-12. About 3% to 6% area was noticed under uncultivable land in Deglur (3.25%), Kinwat (3.18%) and Nanded (3.50%) taluks during the same period. Above 6% area under this landuse category was registered in two taluks namely Biloli (6.54%) and Loha (7.26%) taluks during the year 2011-12. All
tahsils were marked negative change in this land use category during the period of investigation.

- During 1991-92 about 95600 hectares (9.27%) land was fallow land. This land decreased from 95600 hectares to 33900 hectares in the district since 1991-92 to 2011-12. It means 64.53% negative change was observed in this land use category between 1991-92 to 2011-12. Out of the total geographical area below 2% area was found under fallow land in Kinwat and Kandhar tahsils and 2% to 4% area was experienced under this land use category in Mukhed, Bhokar, and Hadgaon tahsils during 2011-12. Above 4% of geographical area was noticed under fallow land in three tahsils namely, Deglur, Biloli and Nanded tahsils. Positive change in fallow land was recorded in Bhokar (0.36%) and Nanded (0.70%) tahsils, whereas, negative change in this land category was marked in Kinwat (-1.82%), Nanded (-1.3%), Biloli (-2.21), Hadgaon (-7.75%), Loha (-9.36%), Kandhar (-11.71%), Mukhed (-5.56%) and Deglur (-7.68%) tahsils between 1991-92 to 2011-12.

- In the study region more than three fourth (79.98%) of the geographical area was net sown, which was more than the state average of 56.7%. The proportion of net area sown ranges between 64% in Kinwat tehsil to 88.59% in Deglur tehsil. Whereas, net sown area has increased from 68.81% in 19991-92 to 79.98% in the year 2011-12. Below 10% positive change in net sown area was marked in Bhokar tehsil, while 10% to 15% positive change in this land use category was experienced in Deglur, Mukhed, hadgaon and Kinwat tahsils from 1991-92 to 2011-12. Above 15% positive change was noticed in Kandhar and Loha tahsils during the same era. Below 2% negative changes in net are sown was found in Nanded and Biloli tahsils since 1991-92 to 2011-12.
Table 4.3 indicates that very high degree of dynamism (above 15%) was found in Loha and Kinwat tahsils. Moderate volume of change (10% to 15%) is registered in Mukhed, Hadgaon and Kinwat tahsils. In all these tahsils transformation of land especially other cultivated land and fallow land for agriculture is more significant. Low magnitude of change (10.5%) was noticed in Deglur, Biloli and Bhokar tahsils. Very low magnitude of change (below 5%) was noticed in Nanded tehsil. It shows that tehsil has shown considerable amount of stability in their land use pattern.

Table 5.1 indicates that significant changes have taken places in the areal strength of selected crops. The cereals group has experienced a sharp decline with only wheat and maize having recorded an increase. The pulses proportion on the contrary, has gone up due to arise in the area of tur, gram, and mung. Among the oilseeds group, cultivated area under groundnut (0.63%), safflower (0.53%) have recorded decrease, while cultivated area under jowar and other oilseeds, which involves the sunflower, soyabean etc., have registered an increase from 1991-92 to 2011-12. Commercial crops like sugarcane and cotton area have marked an increase during the period of investigation. Shares of all the remaining crops have also recorded an expansion. The patterns at the end of the study period were modified.

The highest variability was noticed in other oilseeds area (109.29%) and lowest variability was marked in cotton area (6.07%). The variability in the area of these crops ranges from 6% to 109.29% during the period of investigation. Below 30% variability was experienced in jowar (21.05%), bajra (26.02%), mung (10.77%), udid (23.66%), other pulses (25.53%), sugarcane (10.69%) and cotton (6.07%) in the study period. About 30% to
60% variability was found in rice (46.14%), wheat (38.20%), maize (69.33%), chilies (59.03%), fruits and vegetables (44.09%), groundnut (32.40%), safflower (35.67%), javas (36.90%) crops, while above 60% variability was registered in maize (69.33%), gram (84.63%), tur (81.52%) and other oilseeds (109.29%) crops during the period under study.

- Table 5.2 indicates that area of six crops out of nineteen selected crops have shown negative compound growth rate since 1991-92 to 2011-12. Rice, jowar, bajra, other pulses, groundnut and safflower have shown negative compound growth rate in their area between 1991-2012. The highest negative compound growth rate was observed in safflower (5.10%) crop area where the lowest negative compound growth rate was found in rice (0.20%) area from 1991-92 to 2011-12. The highest and lowest compound growth rate were recorded in case of other cereals (6.40%) and chilies (1.09%) crops respectively during the period of investigation.

- Table 5.3 indicates that below 25% gross cropped area was found in area under total cereals in Kinwat, hadgaon, Bhokar tahsils whereas, 25% to 30% gross cropped area was marked under total cereals in Biloli, Loha, Deglur tahsils during the year 2011-12. Above 30% gross cropped area was registered under cereals in Kandhar and Mukhed tahsils during the same year. All tahsils were shown negative change in total cereals area during the period of investigation. Below 13% negative change in total cereals was observed in Kinwat, Nanded, Biloli and Deglur tahsils, while 13% to 15% negative change was noticed in Bhokar, and Mukhed tahsils between 1991-92 to 2011-12. Above 15% negative change was found in Hadgaon, Loha and Kandhar tahsils during the period of investigation.
In every tahsils of Nanded district, where pulses were dominant crops during 1991-92 and 2011-12. Out of the total cropped area below 20% area was marked under total pulses in Kinwat, Hadgaon, Bhokar tahsils and 20% to 25% area was noticed under pulses in Nanded, Biloli, Loha, and Kandhar tahsils during 2011-12. Above 25% total cropped was registered under pulses in Mukhed and Deglur tahsils during the same year. All tahsils had shown positive change in pulses area. Below 3% positive change in pulses area was experiences in Kinwat, Hadgaon, Kandhar, tahsils since 1991-92 to 2011-12. About 3% to 6% positive change was marked in Bhokar, Loha, and Deglur tahsils and above 6% positive change in area under pulses was noted in Nanded, Biloli and Mukhed tahsils between 1991-92 to 2011-12.

Sucane is used as raw material for sugar and gur factories of the district. Out of the cropped area below 1% area was noticed under sugarcane in Deglur and Mukhed tahsils and 1% to 2% area was registered under sugarcane in Kinwat, Hadgaon, Bhokar, Loha, and Biloli tahsils during 2011-12. Above 2% area was experienced in Kandhar and Nanded tahsils during the same year. Below 1% positive change in sugarcane area was marked in Kinwat, Hadgaon, nanded, Biloli and Kandhar tahsils since 1991-92 to 2011-12. Below 1% negative change was registered in Bhokar, Loha, Mukhed tahsils and above 1% negative change was recorded in Deglur tahsils.

Out of total cropped area below 0.50% area was found under fruits and vegetables in Mukhed, Biloli and Kinwat tahsils, whereas, 0.50% to 1% area was noticed in Deglur, Loha, Hadgaon and Bhokar tahsils during 2011-12. Above 1% area was experienced in Kandhar tehsil during the same year. All tahsils were shown
positive change in area under fruits and vegetables except Bhokar tehsil.

- Out of the total cropped area below 20% area was found under cotton only in the Nanded tehsil. About 20% to 40% area under cotton was registered in Hadgaon, Loha, Kandhar, Mukhed, Biloli and Deglur tahsils in 2011-12. Above 40% area under cotton was noticed in Bhokar and Kinwat tahsils during the same year. Below 5% positive change in area under cotton was took place in Mukhed and Bhokar tahsils, and above 5% positive change was observed in Loha and Kandhar tahsils between 1991-92 to 2011-12. Below 5% negative change was marked in Biloli, Hadgaon and Kinwat tahsils and above 5% negative change under cotton was experienced in Nanded tehsil during the period of investigation.

- Out of the total cropped area below 11% area under oilseeds was found in Kandhar, Mukhed, and Deglur tahsils during the year 2011-12. About 11% to 15% are under total oilseeds was found in Kinwat, Bhokar tahsils, while above 15% area under oilseeds was found in Hadgaon, Nanded, Biloli and Loha tahsils during the year 2011-12. All tahsils had shown positive changes in oilseeds are except Mukhed tehsil during the period of investigation. Below 5% positive change in area under oilseeds was registered in Kandhar, and Deglur tahsils and above 5% positive change in oil seeds area was marked negative change (1.05%) in area under oilseeds between 1991-92 to 2011-12.

- Gross cropped were negligible in the study region during the study period. Area under gross cropped area increased in Kinwat, Hadgaon, Nanded, Bhokar and Biloli tahsils whereas, it was decreased in Loha, Kandhar and Deglur tahsils during the investigation period.
Table 5.4 reveals that the crop combination in the Nanded district experienced considerable change during the period of investigation. Monoculture was absent in the study region. During 1991-92, two crop combinations were observed in Hadgaon and Bhokar tahsils, but it was not noticed any tahsils in the year 2011-12. Three crop combinations were found in three tahsils in 1991-92, but it was observed in one tehsil in 2011-12. The six crop combination was observed in all tahsils of the district by applying Weaver’s Method in first and last quinquennium.

According to Rafiullah’s Method two crop combination zones were noticed in Loha and Mukhed tahsils, where, jowar and cotton, which make combination with one another. In 2011-12, two crop combination zones were experienced in Kinwat and Bhokar tahsils. Three crop combinations were marked in Kinwat, Hadgaon Bhokar and Kandhar in 1991-92. On the other hand three crop combination was registered in Hadgaon, Mukhed and Deglur in 2011-12. Four crop combinations zones were identified in three tahsils (Nanded, Biloli and Deglur) during 1991-92. In 2011-12 Nanded, Biloli and Loha tahsils were noticed four crop combinations.

Table 5.8 indicates that the lowest degree crop concentration (0.18%) was found in area under wheat in Mukhed tehsil and the highest crop can concentration (2.75%) was experienced in area under mung in Deglur tehsil during 1991-92. The lowest crop concentration (0.09%) was marked in area under rice in Hadgaon tehsil and highest crop concentration (2.22%) was experienced in area under wheat in Nanded tehsil during 2011-12. Spatial variation in degree of concentration in crop production are found to be the result of the differential interaction between various factors.
i.e. physiographic, climatic, hydrological, socio-economic etc. in the study region.

- Nanded tehsil has shown a high diversification in crop, whereas, Deglur, Mukhed, and Biloli tahsils indicated moderate diversification of crops during the year 1991-92. Low diversification was observed in Kinwat, Hadgaon, Bhokar, Loha and Kandhar tahsils during the same year. Changes were marked in crop diversification from low to high in Hadgaon, moderate degree of diversification was noticed in Mukhed, and Deglur tahsils throughout the study period. Biloli tahasil was indicated moderate to high, Bhokar tehsil low to moderate of crop diversification during the period under consideration. No change in crop diversification was found in Nanded, Kinwat tahsils between 1991-92 and 2011-12.

- Table 6.1 indicates that the yield of gram in 1991-92 was 385kg/hect., where it was registered 343kg/hect. and 640kg/hect onward 1997-98, 2002-03, 2006-07 and 2011-12 respectively. The yield of tur in the district ranges from 248kg/hect. To 420kg/hect., whereas, yield of udid ranges between 248kg/hect. the yield of mung was recorded 187kg/hect. to 300kg/hect. during the year 1991-92 and 2011-12 respectively.

- During 1991-92, the yield of rice was marked 301kg/hect. As against 390kg./hect.in 2011-12. The yield of wheat increased from 950kg./hect. (1991-92) to 1510kg./hect. (2011-12). The yield of jowar and maize in the study area ranges from 677 kg./hect. to 1170 kg./hect. and 875kg./hect. to 1230kg./hect. respectively. Whereas, the yield of groundnut has increased from 629 kg./hect. to 704 kg./hect. While the yield of javas and safflower crops were
recorded 112 kg./hect. to 102 kg./hect. and 100 kg./hect.to 190 kg./hect. in 1991-92 and 2011-12 respectively.

- The average yield of sugarcane increased from 46597kg./hect. To 55000kg./hect. During 1991-92 and 2011-12 respectively. The yield per hectare of cotton was 5400 kg./hect to 14400kg./hectares during the year 1991-92 and 2011-12 respectively. The average yields of principal crops have increased during the last twenty years. This has been due to an increase in irrigation facilities, consumption of fertilizers and use of improved seeds.

- From the table 6.2 it can be observed that rice and javas crops showed negative annual change during the year 1991-92 and 2011-12. The highest positive change was noticed in udid output, whereas, the lowest positive change (0.8) was noticed in safflower crop during the same year.

- The production recorded an increase in all the principal crops in the district, except rice and javas crops during the study period, its extent varying from less 9% in safflower to over 10 times in udid. Besides udid, the increment was also large (over 100%) in wheat, maize, gram, tur, mung, and cotton. The production of food grains increased from 233.3 thousand tonnes in 1991-92 to 426 thousand tonnes in 2011-12, recording 82.59 % increase in twenty years. The growth rate of food grains was marked 4.12% per annum during the period under study. Among the cereals crops rice was marked decrease in production from 1991-92 to 2011-12. Wheat production of the district has increased from 15.3thousand tonnes in 1991-92 to 52.4 thousand tonnes in 2011-12. Jowar production was 56.50% of the total production of food grains and 80.17% of the cereals in the district. The production of maize increased from
0.7 thousand tonnes in 1991-92 to 2.1 thousand tonnes in 2011-12, recording an increase of 200% during the period of investigation.

- The first ranking pulse crop gram, occupying 7.88% of cropped area and producing 5.75% of the food grains, records an increase of 27.75% in area and registered growth of 255.07% in production during 1991-92 and 2011-12. The production of tur has gone up from 17.1 thousand tonnes to 39.2 thousand tonnes during the period. Rapid rise in udid and mung crops are healthy trend.

- Production of oilseeds except javas which declined. Increased at slower rate (average 1.2%) and these trends owe less to increasing area, but more to increasing yield rates. Cotton occupies about 31.01% of the total cropped area in the study region. Cotton is gradually increasing in area and production. Sugarcane is following the same path.

- Very high level of rice productivity was found in Nanded tahsil, high productivity marked Hadgaon and Bhokar tahsils, moderate productivity in Deglur tehsil, while low and very low levels of rice productivity was recorded in Biloli, Kinwat, Loha, Kandhar and Mukhed tahsils in 1991-92 respectively. Very high levels of wheat productivity was marked in Nanded tehsil, high productivity in Hadgaon tehsil, moderate productivity in Biloli tehsil, whereas, lo and very low levels of wheat productivity was found in Deglur and Kinwat, Bhokar, Loha, Kandhar, and Mukhed during the same period. During 1991-92 very high level of jowar productivity was registered in Mukhed tehsil, high productivity in Loha and Kandhar, moderate productivity in Biloli and Nanded, Low productivity in Deglur and Bhokar, whereas, very low level of gram productivity was identified in Kinwat and Hadgaon tahsils. Very high level of gram productivity was noticed in Hadgaon and
Nande tahsils, moderate productivity was not observed any tahsils. Low and very low level of gram productivity were registered in Biloli and Loha and Deglur Mukhed, Kandhar, Bhokar, Kinwat tahsils respectively. In 1991-92 high level of tur productivity was marked in Loha and Kandhar, moderate productivity in Nanded tehsil, low productivity in Deglur, Biloli, Bhokar and Hadgaon.

- Table 6.4 reveals that very high level of groundnut productivity was marked in Biloli, high productivity in Bhokar tehsil, moderate level of productivity in Hadgaon, low level of productivity in Nanded tehsil, very low levels of groundnut productivity was experienced in Deglur, Mukhed, Kandhar, Biloli and Kinwat, very high level of safflower productivity was noted in Deglur, moderate in Nanded and Bhokar, while low productivity in Biloli tehsil, low and very low level of sugarcane productivity was recorded in Deglur, Kandhar, Loha, Hadgaon and Kinwat tahsils respectively. The cotton productivity was very high in Bhokar tehsil and high productivity was noticed in Nanded tehsil, moderate productivity was marked in Biloli, Hadgaon tahsils and very low level of cotton productivity was experienced in Mukhed, Kinwat and Deglur, Kandhar, Loha tahsils respectively.

- During the year 2011-12, changes in the level of rice productivity observed in the study region. Whereas out of the nine tahsils, five tahsils have changed their level of productivity, Biloli tehsil registered upward shift, while Hadgaon, Nanded, Deglur, and Bhokar tahsils marked downward shift. Kinwat, Loha, Mukhed, Kandhar, tahsils did not indicate any change. In the level of wheat productivity five tahsils were marked upward shift, while remain tahsils i.e. Nanded, Biloli, Kandhar, and Mukhed did not indicate any change in 2011-12. Changes in the level of jowar productivity
whereas, eight tahsils whoed change in productivity level. Hadgaon, Nanded, Bhokar, Biloli and Kandhar tahsils indicated upward shift and Mukhed, Loha, and Deglur registered downward shift. In the level of gram productivity, Kinwat, Hadgaon and Kandhar did not any change during 2011-12, while five tahsils indicated upward shift and one tehsil marked downward shift during the same period.

- In the level of groundnut productivity Kinwat, Nanded, Loha, Kandhar and Mukhed indicated upward shift, while Biloli and Bhokar indicated a downward shift, Deglur tehsil did not indicated any change in their level of productivity in 2011-12. In the level of safflower productivity Hadgaon, Biloli, Loha, Kandhar, and Mukhed registered upward shift, where Nanded and Bhokar tahsils marked downward shift. During 2011-12, in the level of sugarcane productivity Kinwat, Hadgaon, Biloli, Loha and kandhar tahsils were marked upward shift, while Bhokar and Deglur tahsils marked downward shift during the same year, whereas, in the level of cotton productivity Kinwat, nanded, Biloli, Loha, Kandhar, Mukhed and Deglur were marked upward shift, while Hadgaon tehsil was record downward shift during 2011-12.

- Very high level of overall productivity was marked in Nanded, Biloli tahsils, high level overall productivity was noticed in Bhokar tehsil, the moderate level of productivity was marked in Hadgaon tehsil, low and very low level productivity was experienced in Deglur, Loha and Kinwat, Mukhed tahsils respectively during 2011-12.

- High level development region was registered in Nanded and Biloli tahsils, while medium level of agricultural development was noticed in Hadgaon, Bhokar, and Loha tahsils. Low level
development region was observed in Kandhar tehsil and very low level of agricultural development was registered in Kinwat, Mukhed and Deglur tahsils during the investigation period.

- According to table 6.8 below 5% of the net sown area under irrigation was noticed in Bozgaon, Gumtur, Shekhapur, Kherda and Malhnoor villages, while 5% to 10% area under irrigation to net sown area was observed in Lakhapur, Rawangaon, Ujada, villages during 2011-12. About 10% to 15% area under irrigation was found in Chikole village and above 15% area under irrigation to net sown area was registered in Bharaswad, Liboti, Nagapur and Kolgaon villages. All the selected villages had shown positive change in irrigated area. About 1% to 22% positive change took place in irrigated area of the selected villages.

- The population rate between 1991-92 to 2011-12 for selected villages as whole was marked 21.15%. Among the all selected villages Rawangaon, has the highest decadal growth rate (39.84%), whereas, lowest decadal population growth rate was registered in Chikole village (13.89%). While the rest of the selected villages recorded decadal growth i.e. Lakhapur 22.74%, Bharaswad 19.13%, Liboti 16.63%, Bozgaon 18.87%, Gumtur 20.56%, Ujada 35.80%, Shekhapur 27.67%, Kherda 23.70%, Nagapur 26.92%, Kolgaon 30.17% and Malhnoor 16.27% during the investigation period.

- Out of the geographical area of the selected villages below 7% area under this landuse category was found in Bozgaon, Rawangaon, Gumtur, Ujada, Chikole, Shekhapur and Nagapur villages. While 7% to 14% area was marked in Lakhapur, Bharaswad, Liboti and Malhnoor in 2011-12. Above 14% area was found in Kherda and Kolgaon villages during the same year. Out of thirteen selected
villages Bozgaon, Rawangaon, Shekhapur and Malhnoor villages were marked positive change in area under forest, while Gumtur, Ujada, Chikole, Lakhapur, Bharaswad, Liboti, Kherda, Nagapur and Kolgaon villages registered negative change in area under forest between 1991-92 to 2011-12.

- Out of the total geographical area of the selected villages, below 7% area under area not available for cultivation was marked in Bozgaon, Rawangaon, Gumtur, Ujada, Chikole, Shekhapur and Nagapur villages and 7% to 14% area marked in Lakhapur, Bharaswad, Liboti, and Malhnoor villages and above 14% area was recorded in Kherda and Kolgaon during 2011-12. Among the selected villages, the highest percent of area under cultivable land was marked in Bharaswad (13.27%) village and lowest in Bozgaon (1.29%) village in 2011-12. The negative change in area of other cultivable land was marked in Lakhapur, Liboti, Bozgaon, Kherda, Nagapur and Shekhapur villages between 1991-92 to 2011-12. Out of thirteen selected villages three villages were shown positive changes and ten villages marked negative changes in area under fallow land. Net sown area ranges from 47.99% in Bharaswad village to 87.86% in Gumtur village in 2011-12. Out of the thirteen villages four villages had shown negative change in percentage of net sown area i.e. Rawangaon, Gumtur, Chikole and Malhnoor villages.

- The highest percentage of area under jowar was marked in Nagapur (22.77%) village and lowest in Gumtur (5.81%) village during 2011-12. Out of thirteen selected villages, three villages had zero percentage area under bajra crop in 2011-12. Villages like Lakhapur, Liboti, Chikole, Shekhapur, and Ujada showed positive change in area under bajra, whereas, Bharaswad, Bozgaon,
Rawangaon, Gumtur, and Nagapur villages showed negative changes during the investigation period. All selected villages showed positive changes in area under maize between 1991-92 to 2011-12. Only one village among the selected villages showed positive change in area under tur and it was Malhnoor village. Out of selected thirteen villages seven villages such as, Lakhapur, Bharaswad, Liboti, Bozgaon, Ujada, Chikole and Kolgaon had showed positive change in area under mung, whereas, Rawangaon, Gumtur, Shekhapur, Kherda and Malhnoor had recorded negative change between 1991-92 to 2011-12. Among selected thirteen villages nine villages marked negative changes and four villages were recorded positives changes in area under cotton during the investigation period. In the area of sugarcane below 2% positive change was marked in Lakhapur, Liboti, Bozgaon, Rawangaon, Gumtur, Shekhapur, Nagapur and Malhnoor villages and above 2% positive change was marked in Bharaswad, Ujada and Kolgaon villages. Below 2% negative change was marked in Chikole village and above 2% negative change was found in Kherda village between 1991-92 to 2011-12.

7.2 PROBLEMS AND SUGGESTIONS

In view of the findings stated above and the problems of agricultural development regarding the study region. Most of the problems are linked to the questions of agricultural research and training. Some useful suggestions are made here to improve the agriculture in the study region.

- Nanded district is located in the rain-shadow region to the east of Western-ghat, where water scarcity is a serious problem for agricultural development. Out of the total annual rainfall about
85% rainfalls receive from south-west monsoon. But the monsoon rains in the study region are often marked by some important variations from the normal, like climatic uncertainty, uneven distribution, often expressed in the commonly held view that ‘agriculture’ in India is a gamble against the monsoon is the most out-standing problems in this category. Due to ups and downs in the rainfalls cropping patterns and productivity have been affected. It is suggested that the farmers should use the mulching techniques to minimize evaporation. Drip Irrigation system is most useful in getting good yield during the water scarcity period. At present well and bore-well irrigation are the more common sources of irrigation in the district. Therefore, to strength these sources, the water shade development programmes need to be uncompleted and large scale in the study region.

- The resources particularly land resources are limited fixed and cannot be further enhanced. If it is so that will be the cost of deforestation, which is not desirable at all which may dislocate the state of equilibrium. Therefore, burden an available land should be minimized by adopting different methods of utilization and conservation of land resources.

- In the study region forest area is decreased day by day. Out of nine tahsils, six tahsils have shown negative change in area under forest. There was marked about 0.29% decreased in forest area since 1991-92 to 2011-12. In order to increase the forest area in the district, government should be undertaking the social forestry projects. Incentives should be given to the plantation. Effort should be made to bring barren and fallow land under forest. Road-side plantation should undertaking the care should be taken upto the full growth of trees.
Soil erosion is not only a chief cause for decreasing soil fertility but loss of valuable cropped land. The arbitrary cutting of trees, unbridled cattle grazing, faulty landuse practices have greatly helped in speeding up the process of soil erosion. It is suggested that the work of contour banding, land leveling and bench terracing on steep slopes should be undertaken on a priority basis. Grazing of animals should be controlled. Especially sheep and goats are more destructive than cattle. Certain part of the land should be used for rotational grazing.

The unit of land holdings in the study region is too small to be economically viable to promote modern agricultural development. These do not generate enough income to buy new agricultural inputs or make heavy investment. Small sizes accompanied with fragmentation also prevent the use of new farm machineries, which are very essential in today’s agriculture. This problem can be solved by the consolidation of holdings, which means the reallocation of holdings which are fragmented. Former who have very small holdings should give up their land and shift to other occupations in the study region. Government should start cottage industries in rural area to provide employments for peasant and landless labours.

One of the major considerations for the importance of irrigation in the study area is scanty rainfall and erratic monsoon somewhere else. Like India in study region the failure in monsoon is the failure in agriculture. Irrigation not only helps to extend the net sown area in areas of insufficient rainfall but it promotes multi-cropping by making it possible to raise a second crop in the dry season. There are built various irrigation projects in the study region. But most of them are become dry in summer season. A part from this some
irrigation sources are preserve for drinking purpose during the dry season. Therefore, farmers are unable to use water their crops at the time of need. To solve this problem government should regularly repair the old medium and minor irrigation schemes. As well as government should undertake the new medium and minor irrigation schemes in less irrigation development tahsils of the district. New irrigation techniques such as drip irrigation, sprinkler irrigation should be made available to the farmers on subsidy so that most of the farmers can get benefit of it.

- Most of farmers in the study region are still illiterate, who are not aware of new progress in agriculture, new government schemes for improving the lots of the farmers or recent change in government policy towards agriculture. That is why peoples partaking is very poor in agricultural development programmes and most of the subsidies and loans either remain unutilized or goto the heads of untargeted collection. To overcome this problems government should give regular information about schemes and programmes regarding agriculture development to the farmers through media. Gramsevak and talathi should give direct information about the government schemes to the farmers. The information regarding schemes should put on notice board of grampanchayat.

- On the one hand farmers are less open to agricultural innovations on the other hand, most of the agricultural inputs like chemical fertilizers, high yielding range of seeds, insecticides, pesticides etc. are either not accessible in sufficient quantity or their prices are beyond the reach of an common farmers. Due to lack of quality control, there is always possibility of thuggery. It is suggested that work-shops and training programmes should be arranged to make
awareness among the farmers regarding the use of improved varieties. Government should provide high yielding variety seeds to the poor and marginal farmers on concession. Production and sale of sub-standard seeds material, which affect yield, should be controlled by government.

- Nationalize and other banks are contributing credit facilities to farmers, but their impact is only limited to upper and middle classes of the cultivators. The bulk of farming community belonging to the lower section has to still take shelter of big lords and professional money-lenders that charge very expensive interest on loans and soon grab their property making them pauper. To overcome this problem the farmers should come together and form a federation of co-operative societies taking financial assistance from the government organization viz., the National Board of Agriculture Research and Development (NABARD).

- Lack of infrastructural amenities in rural area of the study region. Rural roads are un-surfaced and kachcha cart tracks are not usable during rainy season. Even though a massive drive for road construction has been launched to connect all villages having more than 1500 population with all-weather surface roads but still considered luxury although the government has agreed to provide telephone link to all gram-panchayat of the district. Banking facilities are mostly limited to the urban area. All this has hampered the development of agriculture. Marketing facilities are inadequate and un-satisfactory, regulated markets are limited in numbers and lack of storage, credit and transportation facilities. Farmers are still at the mercy of unscrupulous traders, false weights and payment of inflated commissions. Due to lack of proper pricing policy farmers fail to obtain fair price. For their agricultural
produce, to solve this problem an efficient marketing structure has to be developed in the study region. Availability of village road should be increased. All villages should cannot to the district road or state highway.

- The problems of daily shortage of electricity is very serious, it is suggested that overcome this difficulty the use of fuel engines, solar plants etc. may be made as an alternative to electricity.
- Farmer suicides is burning problem in the study area, hence, to overcome this problem the government should be announced to the minimum support price for the food crops and cash crops, which depends upon estimation of cost production of crops.
- It is noticed from the field study that therefore, technological differences among the farmers regarding the applications of chemical fertilizers, application of irrigation, knowledge of improved varieties and application of compost. Hence, it is suggested that special extension are essential in term of organization of demonstration, meeting discussion, film shows, an farmer’s field and campus training programmes should be organized.

The above suggestions are made to overcome the main drawbacks in the development of agriculture. If these recommendations are adopted by farmers, there will be a bright future for agriculture in the study region as well as in the draught-prone areas of Maharashtra.