CHAPTER - X

CONCLUSIONS AND SUGGESTIONS

The main purpose of this chapter is to sum up and give conclusions and suggestion. The present study entitled, "Geographical Perspectives on Population and food system in Solapur district is attempt to findout the relationship between food productions, supply and demand on the one hand and population on the other. There is wide increasing gap between these two variables. Factors responsible for food production and food availability are analyzed.

The topics of research are divided into ten chapters which may broadly grouped into four major units; namely, i) Introduction, ii) Background of the region, iii) Population characteristics and iv) Study of food production, surplus and deficit regions.

The first chapter deals with the introduction of the topic, in which meaning and significance of subject, choice of the topic and selection of the region have been discussed. Justification of the problem and area under investigation has been explained. Hypotheses have also been formulated in order to check them. Objectives are the goals to be obtained by the researcher have also been included in the first chapter. The sources of the data and information, methodology, review of the literature and organization of the work have also been included in the first chapter.

Today, the most alarming problem before the world is accelerating growth of population. Man cannot sustain without food, therefore food is the most important basic need of human being. Due to advanced medical facilities and increasing per capita income and in certain areas secured supply has resulted in high growth of population. The growth rate of population is more than the increasing rate of food production. Agricultural resources are limited and fixed, hence, cannot be further increased, but with intensive use of inputs, food production can be
enhanced up to certain extent to solve the problems of food deficit in the region under study. The rapid growing population of the Solapur district is not keeping the pace, with the growth rate of food production.

The second chapter deals with various backgrounds of the region under study. It includes physical background like location physiography, drainage pattern, Geology, climate, soil and natural vegetation. Besides, the historical, social and economic backgrounds have also been taken into account. The district of Solapur lies entirely in the Bhima-Sina-Man river basin. It is bounded by 17°10’ north to, 18°32’ north latitudes and 74°42’ east to 76°15’ east longitudes. It covers an area of 14878 Sq Kms and has a population of 38, 55,383 according to 2001 census. It is bounded by Ahemadnagar to its north, by Bijapur district of Karnataka State to its south, by Beed and Osmanabad district to its east, by Satara district to its west, by Pune district to its north-west and Sangli district to the south west.

The district of Solapur is well defined to its west as well to its east by the inward looking scarps of Phaltan and Osmanabad plateau. Most of the area of the district belongs to the Deccan plateau region. There are two important hill ranges in the district; namely Mahadev and Balaghat hills. Physiographicaly Solapur district may be divided into three divisions. i) The hilly region. ii) The plateau region, and. iii) The plain region. The hilly region occupied about 10 percent geographical area of the Solapur district. These hilly region are expected to be very poor agriculturally and hence, human settlements are very few and far. In the western and south western region occupies its sizable area by Mahadev ranges and Shukaracharya ranges having average height more than 600 mts. There is another important Balaghat range in the north eastern part of district, having average height more than 600 mts to 750 mts. Almost, 70 percent of total Geographical area occupied by the plateau region;
which has an average height of 450 mts. to 600 mts. Mostly, this region is drained by the river Bhima and its tributaries so the soil of plateau region are fertile and suitable for the production of various kind of crops. The plain area in the Solapur district has 20 percent of the geographical area. The plain region is occupied by Bhima river and its tributaries. The central part of the district lies in the plain region. The soil of plain region is most fertile due to the deposition of eroded material transported by the river Bhima and its tributaries. Bhima river is most significant rain fed river which originate from the Bhimashankar plateau. Bhima and its tributaries are seasonal in character and remain dry during the summer season. The right bank tributaries of Bhima are Nira and Man, while left bank tributaries is Sina river. Bhima and Sina flow roughly south easterly direction while Nira east, and the man northeast direction. Bhima drains in the central part of Solapur and main feeders of river Krishna. It has an average length of 289 Kms and making a shape of crescent near Pandharpur, locally it is called as Chandrabhaga, which is the holiest place in Maharashtra.

Geologically the Solapur district is relatively small in area, and features associated with geology are not expected. Geological sequences in the Solapur district is divided into two main categories, Recent Alluvium and soil covering horizons of calcareous pebble, gravel and silt like material, while volcanic flows are fissures eruption of basalt. The basalt belonging to Deccan trap is in fact of volcanic episode.

The climate of the Solapur district is monsoonal in nature. The climatic conditions of Solapur district can be divided into four seasons namely, cold weather season, hot weather season, Southwest monsoon and post monsoon season. There are regional variations in the climatic conditions in the region under study. The temperature varies from place to place. The month of December is the coolest month with mean daily
maximum, temperature of 29.39\(^{0}\)C and means daily minimum temperature of 14.8\(^{0}\)C. May is the hottest month with the mean daily maximum temperature of 39.9\(^{0}\)C and the mean daily minimum temperature of about 25.2\(^{0}\). Solapur district comes under rain Shadow area, yet the average annual rainfall of the district is about 584.3mm. Most of the rainfall is received during the south west monsoon during the months of June to September. This rainfall account for about 75 percent of the normal annual rainfall and about 17 percent of the rainfall in the district is received during post monsoon or retreating monsoon season of October and November. The rest about 8 percent annual rainfall is received during the pre-monsoon, along with thunder storm. There are wide variations in the amount of rainfall through time and space. The maximum rainfall is about 690 mm. at Akkalkot in the south eastern border of the district while the minimum amount of rainfall is recorded about 448.8mm at Akluj near the western border of the district. In the monsoon season, the winds are mainly from direction between southwest to north east. During the period October to December winds blow from North-East to South west direction. In the next four months winds vary in directions. In the month of May winds are mostly blowing from North-East to South-West direction.

Soils of the Solapur district are essentially derived from the Deccan trap, which are of the predominant rock’s formation. In the district, calcareous (KANKAR) and nodules are commonly associated with these soils. In the region under study the forest cover is very poor. The forests of Solapur district Occupy 357.9. Sq Km area in which 345 Sq. Km forest is classified and 12 Sq. Km is unclassified forest. In other wards, 157 Sq Km is under revenue department, 188 Sq. Km is under forest department and on an average 12 Sq Km is unclaimed forests. Surprisingly, these, scattered poor forests constitute only 0.94 percent of the total area of the
district. In the past, the forests were comparatively dense of predominant of curbs forest on the range of hills and with growth of Babul and Neem, Lower down in the plains. At present, forests are mainly observed in patches in Malshiras, Sangola, and Barshi tahsils on hills slopes and low lying areas elsewhere. Most of the forest produce of the district is consumed by the local people.

The history of Solapur can be traced back to the early centuries of the Christian era (BC-90 to AD-300): Solapur most probably formed part of the territory of the Shatakrni or Andrabhritya dynasty, whose capital was Paithan on the river Godavari. A Sanskrit inscription dated Shaka 1238, after the downfall of Yadavas; this town+ was a Sonalipur, later on called as Sonalapur. Hence, it is probable that during census time, the name Solapur was involved by dropping ‘na’ from the original name Sonalapur. During the 900 years ending with Muslim by over throwing of the Devgiri Yadavas in the beginning of the fourteenth century. Solapur lies in the neighboring, district of Ahmandnagar, Bijapur and Pune and was held by the early western Chalukyas from 550 to 760 A.D. by the Rashtrukulas to 973, by the revived or western Chalukyas up to 1184 and by the Devgiri Yadavas till the Muslim Conquest of the Deccan in about 1300 A.D. The Solapur district was formed in 1838 and although, it was abolished in 1864, it was revived in 1869. AS a result of the merging of the states in 1949 to new tahsils namely Akkalkot and Malshiras were formed and added to Solapur district with the reorganization of the state in 1956, the Solapur district was included in the larger bilingual state of Bombay. Since 1st May 1960 it forms a part of Maharashtra of uni-lingual state.

The district of Solapur is influenced by different social aspects such as language and traditions. The social, structure of the district is made up of various religious communities like Hindu, Muslim,
Buddhists, Though Majority of the people Speak Marathi, the language is at certain extent mixed with the language of adjacent states, and tone, in which their speak is also influenced and that is the reason. People from this area can easily be identified.

The growth of population for the district as a whole is represented. Since the beginning of the 20th century it was than 8 percent, for the decade, 1901-11. During the period 1911-21, the growth rate was extremely low due to the impact of a epidemic diseases. During 1931-51 the growth rate was maximum which increased to more than 22 percent, again it started declining gradually and became 16 percent in 2001. The highest percentage of 24.96 was recorded for north Solapur tahsil and similarly the density of population was highest for north Solapur tahsil. On the other hand, the lowest population density was recorded for Karmala.

Economic background of the region occupies significant positions, since many other sectors are influenced by the level of economy. The data regarding the classification of the total area of the district according to various needs of land utilization not only reflect the extent of development of agricultural activities in the district but also represents the cultivation potential of the region. As stated earlier, the total geographical area of the district is about 14878 Sq. Km. The area under forest is only 2.14 percent of the total geographical area. This is an index to understand the place of Solapur district within Maharashtra and India. In India forest cover of total geographical area is about 20.2 percent, in which 6.8 areas is covered by good forest and 13.4 percent area is covered by open degraded forest. Ecologically required forest cover is 33 percent of the total geographical area. Net required forest cover is 12.6 percent of the total geographical area in our country. The Solapur district has much less percentage of forest than that of the country, partly due to the fact that
Solapur belongs to drought prone area of Maharashtra. Land used for non agricultural purposes in the Solapur district is below one percent the land which is under fallow category, is 4.0 percent of the total geographical area, while pastures land is about 2.74 percent of the total geographical area.

The proportion of irrigated land is relatively poor due to physical constrain and scarcity of water. The surface irrigation shows only 3.21 percent areas, while the well irrigation is as high as 7.21 percent of the total cultivated land in Solapur district. Total grossed area irrigated is 12.23 percent of the total cultivated area of the district. Net irrigated area is 9.86 percent of the total cultivated land and total irrigated land is about 11.58 percent of the cultivated land of the district.

In terms of railway, the Solapur district is quite fortunate to have sizable length of total railway lines. At present the district has the total length of railway lines of 452.60 Km within the district, yet, 12690 Km is under construction from narrow gauge in to Broad gauge. Unlike railway, roads provide door to door service. In terms of roads transportation, the Solapur district is better off, since it has total length of roadways of 14108 Km, out of this, 188 Km belongs to National Highway, 173 Km, major state highway, while 1332 Km state highway. Apart from this, the major district roads have the length of 3039 Km, while other district roads, and occupy 2238 Km within the solapur district.

The third chapter deals with general growth of population in the region. The most important problem before the country, today, is the one created by population explosion. Solapur district during the period of 1901 to 2001 also experienced enormous increase in total population which increased from 0.87 million to 3.8 million in 2001.

The growth of population is one of the significant factors associated with mans occupancy. The growth of population in any area is
determined by three basic factors namely, human fertility, mortality and human mobility. The difference between human fertility and mortality is called, natural increase of population. The trends of population growth are basic to the change in the overall geographic personality of any area.

The purpose of this topic is, to examine the dynamic of population numbers in the study region during the period 1901-2001, along with their broad implications contemporary demographic situation in the study region but it will also provide clues about the likely trend in this regard in the years to come. Then we have discussed the taluka-wise growth of population which is of great significance.

It reveals that the trends of general rural and urban population growth rates vary from rural to urban areas during the span of 100 years (1901-2001). The trend of general population growth rate and rural population growth rate, by and large, are lower than the urban growth rate except during 1951-1971 periods. But, there are remarkable ups and downs in the urban population growth rate during the span of hundred years (1901-2001).

The general population growth rate and rural population growth rates have gradually increased up to the year 1961, on the contrary 1911-1921 and 1931-1941 decades showed reverse trends. There was severe toll of life due to influenza epidemic (1981) and other severe diseases. During the 1911-1921 decade, there were 93766 deaths (out of 96,961 births) due to plague, cholera, fevers, bowel complaints and other many more causes. Same case was recurred in 1931-1941 decade, where 89,008 deaths (out of 115520 births) occurred. The heavy toll of life was experienced in the rural areas as compared to the urban areas. After the independence period, huge medical facilities have been provided to rural areas, which helped in controlling the epidemics and other diseases in the study region.
The population in the study region has experienced consistent acceleration in growth, since 1921, the increase in rural and urban population reveals differing trends, while during 1921-1951 the rural population was increasing at practically uniform moderate rates of about 16 to 19 percent. During 1961-2001 decades, the rural and urban growth of population both for rural as well as for urban areas in the district declined due to the impact made by family planning programs and increase in literacy rate. It is Solapur district which had 93.50 percent of growth rate of population that varies enormously within the district. The Barshi taluka recorded highest growth rate, while Pandharpur taluka recorded lowest growth rate during 1961-2001. Within the district the Barshi, Akkalkot and Karmala talukas have recorded the growth of population above the average for the region. The Madha, Mangalwedha, South Solapur and Mohol talukas of the study region fall in medium population growth rate category. Sangola, North Solapur, Malshiras and Pandharpur talukas belong to low population growth rate category.

Birth rates for the region was 22.64 percentage in the year 1981 and Karmala, Madha, Mohol, Malshiras, Sangola, Mangalwedha and south Solapur have shown, birth rates below from the district average, while north Solapur, Barshi and Pandharpur have shown, birth rate above the district average. In 2001, the tahsils which have recorded birth rates lower than the district average are Karmala, Madha, Mohol, Pandharpur, South Solapur and Akkalkot, on the other hand, tahsils which have shown higher birth rates than the region average, are north Solapur, Barshi, Malshiras, Sangola and Mangalwedha.

In 1991, the birth rate for rural areas for district as a whole was 16.82 percentage and for the urban areas it was 36.95 percentages during the same period. The highest birth rate for rural sector was for the Mangalwedha tahsil while the lowest was for the Malshiras tahsil. For
2001 the average birth rate was 15.50 percentages, the highest for Malshiras, while the lowest for North Solapur. In the year 2001, the urban birth rate was 31.46 percentages for district as a whole, the highest for the Karmala and lowest for the North Solapur.

Death rate is another important factor influencing the growth of population in a region. In the year 1981, the highest death rate was recorded for Barshi on one hand and lowest 3.94 percent for the Malshiras tahsil on the other. Similarly, in the year 1991, the death rates were calculated for all the tahsils in Solapur district, average death rate was 5.08 percent, for the region as a whole, while; highest death rate was recorded for Mangalwedha and lowest for Malshiras tahsil. The average death rate was found 5.35 percent for the region as a whole. The highest death rate was recorded of 6.78 for North Solapur tahsil and the lowest death rate of 3.68 percent was observed for south Solapur and Barshi tahsil while all the other tahsils have shown death rates much lower than the region average.

For year 2001, the average death rate for the district as whole was 3.88 percent per 1000 of population, surprisingly; it increased to 24.38 percent for the year 2001 in rural areas of Solapur district. The highest death rate was for the Mangalwedha tahsil, while it was lowest for Malshiras tahsil in the south western for Solapur district. For the year 2001, as stated earlier the average death rates for the district as a whole, was 4.38 percent per 1000 of population. The highest death rate was found in Akkalkot tahsil, while it was lowest for Karmala tahsil within district of Solapur.

There are three tahsils, namely Mohol, Malshiras and South Solapur where there in no urban settlement. The highest death rate for urban areas was for Madha tahsil while the lowest was for the Sangola tahsil. The average death rate of Solapur district as a whole was 7.43 per
1000 of population due to improvement in better medical facilities secured food supply has resulted in decline death rate in 2001. The highest death rate was recorded for Madha tahsil while the lowest for Sangola in year 2001.

The infant mortality rates have been calculated for the year 1981, 1991 and 2001 for different tahsils of Solapur district. In 1981, the infant mortality rate was 0.81 for the Solapur district as a whole, which declined to 0.28 in the year 2001. For the year 1991 and 2001, average infant mortality rate for the district was 0.36. For the year 2001, the average infant mortality rate was calculated 0.28. The highest, for north Solapur and lowest for Mangalwedha tahsil, with slight fluctuation the infant mortality rate was recorded below 0.5 for almost, all talukas, except for north Solapur.

The fourth chapter deals with density and distribution of population in the region. Distribution of population is very commonly represented by two types of maps, one using dots for numbers and other using different density categories based on ratios of number of people to area. The dot map is very effective in representing spatial distributional pattern that cannot be clearly shown on density maps. The term, density of population on the other hand refers to a ratio between population and land area. It is, generally expressed in terms of number of persons per unit of area. The density of population is expressed in different ways such as arithmetic density, physiological density, nutrition density, agricultural density and economic density. Land and people constitute the two vital elements of an area.

Arithmetic density is a ratio between total population and total area is expressed in terms of persons per square mile or kilometer of the area. It cannot be used, as a measure of population pressure on land because it merely gives a simple quantitative relationship between man and land.
Physiological density is a ratio between total population and total cultivated or cropped area. It is expressed in terms of number of persons per square mile or kilometer of cultivated area. Sometimes it is also called nutritional density. Another measure of man-land ratio is devised quite frequently is known as agricultural density. In this measure, only agricultural population is correlated with the total area under cultivation. It is expressed of the cultivated area. The relationship between man and land is, therefore, complex and interact. Economic density is a relation between man and land by working out an economic density of population. We took into account both, the index size of population and the index of production. Economic density is expressed = 100 P/p where 'P' is index of population and 'p' is the index of population.

The factors, which determine the pattern of population distribution and density, are very complex and varied. These three major factors such as geographical factors, economic and social factors and demographic factors, in geographical factors, which influence population distribution, are physical conditions, nature and degree of fertility of the soil, nature of surface and climatic conditions. The more complex a society becomes, the less directly physical factors, influence the distribution of its population. The techniques of productions are intimately related to the types of economic activities. The steps taken to implement, the social policies related to the distribution of population also depend upon the spatial pattern of population. The demographic factors are influenced by the variations in birth and death rates in different areas and variations in volume and nature of migration between the areas.

For district as a whole, and tahsil levels, density of population were calculated for the year 1971, 1981, 1991 and 2001. In the year 2001, the total density of population for the region as a whole was 258 persons per square kilometer. In the year 1971, the total density of population was
only 150 persons as compared in 1981; the density of population was 173 which is low. In 1991, the total density of population has increased as 217 persons per square kilometer.

The table 4.1 reveals the density of population for various tahsils of Solapur district. In the year 1970, as expected, it was highest for the North Solapur tahsil and lowest for the Karmala tahsil. The Barshi and North Solapur show higher density than the region average. In the year 1981, the average density for region as a whole, was 173 persons per square kilometer. In this year highest density for North Solapur tahsil is expressed to 825 and lowest for the Karmala and Mangalwedha is expressed same for both 102 persons per square kilometer. In the year 1991, for region as a whole density were 217 persons per square kilometer for Solapur district. For North Solapur tahsil the highest density was expressed to 1124 and lowest for the Karmala tahsil was 123 persons per square kilometer. The spatial variation in the density of population for the Solapur district in 2001 varies, from one tahsil to another. As expected, highest for the North Solapur tahsil was expressed to 1287 and lowest for Karmala tahsil where, it was as low as 145 persons per square kilometer. In the year 2001, the region as a whole, the density of population was 258 persons per square kilometer. There are number of factors responsible for the variation in the density of population. Such factors are nature of terrain, proportions of land under agriculture degree of urbanization and industrialization.

The density of rural population for the region under study as well as, for different tahsils for the last four decades was higher. The rural density of population for the year 1971 was 112 persons per square kilometer, which is much lower than the total density for the region as a whole. The lowest, rural density was observed for the Karmala tahsil was 87 and highest for the Malshiras tahsil was 149 persons per square
kilometer. In the year 1981, the rural density of population region as a whole was 123 persons per square kilometer. It was highest for Malshiras tahsil of 175 and lowest for Karmala tahsil, represented 94 persons per square kilometer. In the year 1991, the rural density of population for the region as a whole was 156 person per square kilometer as against 217 persons for the total density of population. In this year the density was also highest for Malshiras and lowest for Karmala tahsil. In the year 2001, the rural density of population was 180 persons per square kilometer. The reasons behind it are the higher geographical area for Karmala and lower development of secondary and tertiary sectors. Here, for Malshiras tahsil, the reasons for higher rural density are attributed to entire rural population of Malshiras tahsils which treated inspite of more than 50000 population of Akluj. Since, it is divided into several grampanchayats.

The density of urban population for the region under study as well as for different tahsils, have also been found out for the last four decades. The urban density for district as a whole was, 1767 in 1971 and 2200 in the year 1981, further 2664 in the year 1991 and lastly in 2001, the urban density of population was 3512 persons per square kilometer. The urban density of population has increased year by year, because of rapid rate of industrialization and consequent urbanization. During the period 1971-2001, the urban population has doubled for the district as a whole. At the very outset, it should be mentioned that three tahsils namely Mohol, Malshiras and South Solapur have no urban settlements throughout the period under consideration. In the year 1971, North Solapur had the highest urban population which is expressed to 13918, and lowest for Akkalkot tahsil is expressed to 1050 urban population per square kilometer. For the year 1981, the highest urban density was for North Solapur tahsil and lowest was for the Mangalwedha tahsil. The year 1991,
also shows, the similar trend of the year 1981. For last decade of 2001, the urban density of population had shown the highest for North Solapur tahsil and lowest for Mangalwedha tahsil. In Akkalkot tahsil, there are three urban centres such as Akkalkot, Maindargi and Dudhani etc.

The density of population is expressed in different ways, such as, arithmetic density, physiological density, nutrition density, agricultural density and economic density. The physiological density is also known as nutritional density, which is high for industrial and urbanized regions of North Solapur tahsils, while lowest for the Karmala tahsil. The physiological density represents the relationship between man and actual cultivated area, this shows that low physiological density have much cultivated area per person, while the high physiological density, the lower is cropped area per person in the district of Solapur.

In Solapur district, the region under study, the population, though largely depends on agriculture but does not depend entirely on agriculture. The working population has been grouped into various primary, secondary and tertiary workers. Of these the primary workers, particularly engaged in cultivation and as agricultural labors, are the workers concerned in agricultural density. The ratio in agricultural population thus, arrived and are a under agriculture is called as agricultural density. This density shows a realistic picture of the pressure of population on land. The North Solapur tahsil represent the highest value of agricultural density due to relatively low percentage of people engaged in cultivation.

The critical density is another method to express man land ratio. The ratio between, cultivated area and follow land on the one hand, and per capita planted acreage and percentage of cultivable land. For the district as a whole, the critical density was computed to 10.87. It was found higher for Mangalwedha and lowest for Barshi tahsil. Economic
density is the relationship between man and economic production by working out. In Solapur district Madha, Pandharpur and Mohol have the economic density, more than 4.5. It means in such tahsils the indices of population are high in relation to indices of production. The higher economic density means, the overall exploitation of the natural resources in relation to population in that particularly region. Lower the economic density the poor is the exploitation of natural resources by the people and high economic density means the maximum utilization of resources in the region.

The distribution of population in Solapur district is affected by different factors such as relief, soil, transportation, industries, rivers etc. Along the river have relatively thicker population. In Solapur district Barshi, Pandharpur, North Solapur has much thick population due to increase industrialization and urbanization. The nature of distribution of population in Solapur district has been studied with the help of location quotients. The highest value of location quotients for North Solapur tahsil, which is highly urbanized, represents the values of 4.72 for the year 1981 and 4.99 for the year 2001. It shows that there is high concentration population is found in North Solapur tahsil. On the other hand Karmala tahsil represent minimum lowest values of location quotients, shows the extent of low concentration of population.

In order to understand the relationship between the percentage of area and the population a lornze curve has been prepared which indicates the district of Solapur has 5 percent area which is almost 25 percent of population of the district. Apart from this, almost 75 percent area has 85 percent of population. This shows that the cumulative of each tahsil, with the area and population gives an idea of the total geographical area in percentage on one hand and percentage of population on the other.
The information about the average area per village and average number of villages per 100 square kilometer area gives more clear picture of land and population. For the district as a whole, the average area per village in a square kilometer is estimated to 7.82 square kilometer, for district as a whole, owing to the existence of city of Solapur in North Solapur tahsil, the lowest area of 5.62 square kilometer has been computed per village. This clearly indicates that larger the area per village, lower the concentration of the village. The highest number of villages varies which was associated with Akkalkot tahsil, while lowest number of villages for the North Solapur tahsil. The size of villages in each tahsils of Solapur tahsil has also been studied. The size average population for the district as a whole was 2306. In Malshiras tahsils, it has the highest population per village. As a matter of fact, Malshiras tashil, though entirely rural, in it, the Akluj having population, more than 50,000 positively influencing the size of population per village. Higher the population per village represents high density of population. Since, there is close correspondence between geographical area and total number of people. For instance Karmala has the lowest population per village, infact, have higher geographical area than many tahsils of Solapur district.

The fifth chapter is concerned with the age and sex composition of population. The important characteristic of population is age and sex ratio. Of the demographic characteristics, the sex composition of a population is the most basic, the marriage and growth rate of population. Sex ratio is an index of socio-economic conditions, revealing in an area and is useful tool for regional analysis. In India sex ratio is generally expressed in terms of number of females per 1000 males.

According to 2001 census, the sex ratio of Solapur district is 935 per thousand males as compared higher than the Maharashtra state as
represent 922. In the year 1901 sex ratios for Solapur district is 985, which is related higher than the state of Maharashtra. In the 1961 the sex ratios were equal for the state of Maharashtra and Solapur district. In 1991 more or less sex ratio was equal for the both of the regions. It may be concluded that there have been wide variations in sex ratio during last ten decades. This imbalance in sex ratio may be attributed to high female mortality particularly of infant females. Secondly the male selective migration for the better employment opportunities in the state of Maharashtra in general and Solapur district particularly. The reason for the lowering of the sex ratio during the last 10 decades is improvement in medical facilities, the choice preference for male children, and the impact of sonography adversely affected birth rate of female children.

A spatial variation in sex ratio in Solapur district for the period 1971-2001, it was calculated for each tahsils of the region understudy. For the year 1971, sex ratio for district was 933. It was highest for Pandharpur tahsil, while lowest for North Solapur tahsil. It is higher for the tahsil, which are having higher percentage of out-migrants particularly of males to the city like Solapur and lower for the region which have higher percentage of rural population. During 1981 year sex ratio is 942 for the district as a whole. In the year 1991 situation was totally different as the sex ratio declined because it may be probably due to improvement in decentralization of industries and spread of urban population different parts of region. In the year 2001 sex ratio for the district as a whole was 936 per thousand males.

The rural sex ratio was 927 for the district as a whole in the year 2001. It was highest for the Akkalkot tahsil and lowest for Pandharpur tahsil for rural areas. For the lower rural sex ratio in different tahsils of the Solapur districts may be attributed to the high infant mortality among the females as a result of less availability of medical facilities and very
much negligence of female children as regard to medical facilities in rural areas of the Solapur district. The urban sex ratio for the district as a whole sex ratio for the Akkalkot tahsil it was highest and for Mangalwedha tahsil it was lowest. The medical facilities are much better in urban areas resulting in the low infant death. Secondly the high percentage of literate people give equal attendance forwards both male and female children.

The temporal variations in rural-urban sex ratios for the district as a whole have been taken into consideration for the last 10 decades. As expected, the rural sex ratios are higher than the urban sex ratios expect the year 1991 and 2001. This may be probably due to rural-urban migration for the better employment opportunities, available in the urban areas, particularly for the working male, who leave their families behind at home in rural areas. During the year 1991 and 2001 the urban sex ratios were recorded higher than the rural sex ratios, perhaps due to better medical facilities and lower infant death rate of female in urban areas. Now a day due to social awareness and high rate of literacy in urban areas of Solapur district might have resulted in the higher sex ratios in urban areas of the district of Solapur.

Age composition is one of the most basic characteristic of a population. Age composition is an important consideration in planning, the educational and military and welfare programme of a region, mortality is low for younger as well as older age groups. Thus, age composition of a region is influenced by fertility, mortality and the pattern of migration to a significant extent. In addition to these, wars, natural calamities and government population policies also influence age composition of population of a region to a certain extent.

The age group population gives an idea about the working and non-working population. For the Solapur district the percentage of population belonging to 0-14 years and above 60 years which are non-working
population and 15-59 age group of population is working population. In the year 1971, the proportions of children below 14 years were 42.96 percent of the total population and 6.02 percent were old people and rest of 51.96 percent were young and matured persons who were engaged in economic activities. It is interesting to note that in comparison to urban areas, the rural areas of district the proportions of children below 14 years was high due to high birth rate in rural areas, due to low literacy rate, where as the working population between 15-59 age group was much lower in the rural areas of the Solapur district, perhaps due to rural-urban migration for the better employment opportunities. In the year 1991 the proportions of children declined from the previous decades, while increased for the working population as well as for the old age people. In the year 1991, the pattern of population belonging to different three age groups was the magnitude of 36.38 for children below 14 age and 56.02 percent for young and matured and 7.59 percent for old age people for the district as a whole. For the year 2001, the percentage of children has declined for children tremendously form 42.96 percent in 1971 to 33.80 percent in the year 2001. This is probably due to decline in birth rate due to social awareness and the implementation of family planning programmes on the contrary for the total percent in the year 2001. Due to improvement in medical facilities, the expectancy of life has increased both rural and urban areas. As a result of it the proportions of old age people has remarkably increased from 6.02 percent in the year 1971 to 9.65 percent in the year 2001. The comparison between rural-urban age group indicates the same pattern, higher for children in rural areas and much higher for old age people of in rural areas. To a certain extent, the proportions of working population the correspondingly increased form urban areas during the last four decades.
The dependency ratio gives true picture of the burden on the society, in order to understand the dependency burden for the district of Solapur as a whole. The dependency ratios calculated for the year 1971, 1981, 1991 and 2001 for the rural urban and total in 1971, the dependency ratio for Solapur district. This is probably high birth rate in rural areas and the out migration of the rural population belonging to rural working population to urban areas for better employment opportunities. For the year 1981, dependency ratio was 46.25 percent which went on declining for the next two decades and became as low as 43.56 in the year 2001. Both rural and urban dependency ratio as compare it has been found higher for rural areas of the Solapur district for all four decades. But one thing should be noted that the dependency burden in continuously decline both for rural and urban areas during last four decades. Probably this may be because of declining trend in birth rate and death rate, secondly, the change in the definition of working population. Now a day's permanent worker, have affected the positively the pattern of dependency ratio is region under study. Many persons even after retirement area engaged in economically active population. All these factors are responsible for the declining ratio of the dependency burden of the Solapur district.

The fifth chapter deals with the literacy and occupational structure of population. Proportions of economically active population influence the nature and volume of production. Rapid growth of population creates a higher supply of labour than its demand, leading to unemployment. The working population of a region gets distributed in different professions broadly group into primary, secondary and tertiary sectors of the economy. The census authorities have classified workers into nine industrial categories.
The table 5.1 concerned, gives the proportions of workers broadly group into primary, secondary and tertiary workers for the year 1971, 1981, 1991 and 2001, for the district as a whole and its various tahsils. In the year 1971, there were 70.56 percent workers in the primary sectors, which declined and became as low as 62.90 percent in the year 2001. This decline in percentage is due to industrialization and consequent urbanization during last four decades. This may be the reflection of least priority to primary sectors due to increase in the literacy and educational attainment and better job opportunities in secondary sectors. In the year 2001, spatial pattern of primary workers have shown variation in North Solapur only 15.76 percent people working in primary sectors; while highest primary sectors workers in Mohol tahsil as range 87.20 percent.

The proportion of secondary workers has also been calculated for the year 1971, 1981, 1991 and 2001. The proportions of secondary workers 12.97 percent for the region as a whole, as expected it was highest for the North Solapur tahsil and lowest for Mangalwedha for the year 1971. In the year 1981 decline the percentage of secondary workers in North Solapur tahsils due to closing down off cotton textile mills and spinning mills in an around the Solapur city. After the year 1981, next decade 1991 and 2001 increased in proportions of secondary workers in North Solapur tahsil.

The tertiary workers are engaged in the services, trade, transportation and construction. For the year 1971, the percentage of tertiary workers for the district as a whole was 16.46 percent, which was doubled in 1981. And another next decade percentage of tertiary workers was declining due to out-migration of the people in other parts of Maharashtra. In 2001 once again increase in percentage of tertiary workers due to attracting people for different services in a large urban centre in Solapur district.
Definitions of literacy vary from country to country. In India all those persons who can read as well as right in any language of the world are classified as literate. Many factors influencing on literacy pattern, the percentage of literates to the total population for the year 1971, 1981, 1991 and 2001 have been calculated for total rural and urban areas. In the year 1971, only 33.90 percent literate were recorded, while in rural areas 28.20 and urban areas 49.10 percent respectively. It is expected that due to the availability of educational facilities in urban areas, the proportions of literate are higher, while the rural area due to lack of educational facilities the percentage of literate was low. In the year 2001, district as a whole of literacy is 71.25 percent, while rural areas 68.26 percent and urban areas educational facilities are available and government policies also useful for increase in percentage of literates.

For different tahsils of Solapur district the percentage of literacy were also calculated for the last four decades. The average literacy for the region as whole was 33.90 percent for the year 1971, being highest for the North Solapur and lowest for Mangalwedah tahsil. Similar trend was also found in the year 1981 but region average increase 40.69 percent. But in the year 1991 highest literacy in North Solapur and lowest literacy recorded for the Akkalkot tahsil. In the year 2001, highest literacy is North Solapur and lowest literacy recorded for the Sangola tahsil, but region as a whole literacy rate was increased 71.25 percent. The literates rate has increased due to primary education facilities are being made compulsory by the government.

In the year 1971, the percentage of male literacy was calculated to 46.40 percent. The highest percentage of male literate was for North Solapur tahsils, while lowest was recorded for Mangalwedha tahsil. In North Solapur tahsil literate are high due to number of educational institutional are increasing Barshi and Pandharpur also high percentage of
male literates. In the year 2001, due to improvement in educational facilities, there has been substantial increase in most of the tahsils of the Solapur district. As the percentage of male literates for North Solapur tahsil being 86.04 percent and lowest for Mangalwedha and Sangola tahsil.

After the independence of India the performance has been given to female literacy, numbers of facilities has been provided by the government to primary education both male and female. At present government has furnished the scheme of free education for female till 12th standard. Apart from this the free noon food supply to the children up to seventh standard. This has resulted in the improvement of female literacy even in Solapur district. It is clear from the fact that in the year 1971 the percentage of female literates was 20.49 percent for the district as a whole, which was consisting went on increasing for the next three decades and finally it became 58.84 percent in the year 2001. Again over this entire trend increase in the percentage of female literacy has also been observed for all the tahsils within the districts for all four decades.

In short it may be concluded that the equal importance given to female by government has open the way for the female to in the race of progress hand in hand with male. This has been shown by the spatial and temporal variations in the female literacy in the Solapur district. As a matter of fact, females are also participating in physically in all sectors of economic activities as well as political sectors. This is revealed by the table concerned.

The sixth chapter deals with general land use of the region. It includes meaning and importance of land use; land classification such as forest land area not available for cultivation, other uncultivable land excluding fallow land, Fallow land and Net sown area. The district has a very limited area under forest which is occupies about 2.14 percent. Mostly, out of the total geographical area in the district being lower than
the average of Maharashtra account 17.28 percent in 2001. During the period 1991-2001, forest land has tremendously decreased and became 2.1 percent in 2001. This decrease is due to growing pressure of population; forest lands were converted into agricultural land and some were denuded by vegetation and soil.

Areas which are not available for cultivation cannot be brought under cultivation but for a very high price, it can be brought under cultivation. About 5.3 percent of area belongs to this category which is much less as compared to Maharashtra’s average of 8 percent. It must be noted that during 1990 to 2001, area not available for cultivation slightly increased by 0.08 percent. This increase in the area, not available for cultivation may be attributed to shifting of land for other production of the crops, area for housing purposes and industrial establishments. Other uncultivable land excluding fallow land is 5.1 percent, which is much less as compared to Maharashtra average of about 7.2 percent in 2001. During 1990-91 to 2000-01, other cultivated land was as low as 5.1 percent. The reason behind it may be attributed to several uses of the land in the sectors of housing, industries and development of Solapur Corporation boundaries, since number of villages were merged in the Municipal Corporation during 2001-05.

The Solapur district has a Substantial proportion of fallow land with an average of 24 percent of the total geographical area. This is much more of the state average of 7.2 percent in 2001. Now a days, there is tendency among the farmers to get high yield per hectare from the agricultural land, this has been reflected from the fact that during last decades, the land under fallow category is consistently increasing.

Net sown area is 59.6 percent; which is much less in 2001. The net area sown, therefore, declined gradually during the last decade, this may
be due to the shifting of land in the other categories such as land for housing, industrial establishment and various other purposes.

This chapter also deals with Agricultural land use and crop combination region of Solapur district crops such as food crops and non-food crops, of the region under study. The cultivated area is normally sown; every year and the food grain dominate the cropping pattern. The area under kharif cropping is less in comparison to Rabi cropping. Sugarcane and Jawar is main crops grown in all the talukas of the region. The other cereals crops of the region are bajra and wheat, but these are insignificant in the overall cropping pattern of the region. Pulses are also significant in regions for cropping pattern. Tur is the leading pulse crop covering substantial area in the east. Gram is another important pulse crop in the south east and northern part of the region. The banks of rivers of Bhima, Sina, and Man Sugarcane is the major cash crop where as in Malshiras talukas, it is cultivated with the irrigation facilities provided by Nira right bank canal. Thus, with the development of co-operative sugar factories and irrigation facilities, the area under sugarcane is increasing recently. Oil seeds particularly groundnut is the most important cash crop of the region and is concentrated in the eastern part of the district.

The district of Solapur, which belongs to the rain shadow area, and hence, area under rice has been slightly fluctuating from 0.6 percent in 1970-71 to 0.7 percent in 2000-01. Out of the total gross cropped area below one percent was under rice in North Solapur, South Solapur, Mohol, Mangalvedha, Pandharpur, Sangola and Madha tahsils. While one percent to three percent gross cropped area was found under rice in Akalkot and Malshiras tahsils. Above three percent gross cropped area, was observed under rice in only Barshi tahsil during 2000-01 periods. Wheat crop is fluctuating from 2.3 percent in 1970-71 which tremendously increase to 10.4 percent in 2000-01. Out of the total gross
cropped area of the region below 5 percent area was found under wheat cultivation in Madha and Mangalvedha tahsils, where as 5 percent to 10 percent area under wheat in sangola, Akkalkot, North Solapur, South Solapur, Mohol and Barshi tahsils. Above 10 percent whet area was observed in Malshiras and pandharpur tahsils, during 2000-01. Jawar is the second most important crop in Solapur district. Out of the total cropped area, about 22.6 percent was found under Jawar crop during 2000-01. The proportion of Jawar is less than 15 percent in South Solapur and Malshiras tahsils. More than 30 percent Jawar was observed in Madha and Sangola tahsils. The proportion of area under all the pulses in the region is 8.2 percent during 2000-01. The principal pulses growing areas are Karmala, Sangola and Mangalvedha tahsils. Sugarcane is the principal crop in the cropping pattern of the region. Sugarcane is tremendously increased in land use pattern during 1970 to 2001. The taluka of Malshiras recorded 42.7 percent, area under sugarcane which is followed by pandharpur and south Solapur tahsils. The lowest area is recorded in Madha, Sangola and Mangalvedha tahsils. Oil seeds constitute an important group of cash crops. Oil seeds crop is fluctuating from 0.6 percent in 1970-71 to 0.9 percent in 1980-81 and suddenly declined to 0.01 percent in 2001. Groundnut is a Kharif crop. The average area of groundnut in this region is 6.8 percent.

The changes in cropping pattern have occurred due to many factors. The major changes have occurred in cereal crops particularly for jawar. The declining crops are mainly other non food crops. The changes in agricultural land use pattern have occurred in areas where irrigation water is available. Based on the major crops of the region, the district is grouped into four crop combination region; by maximum positive deviation method of Raffiullah is applied.
Maximum positive deviation method by Raffiulla is applied for crop combination in the region of Solapur district. There are four combinations, out of eleven tahsils; six talukas recorded two crop combinations. In the remaining tahsils monoculture is observed. Changing in the crop combinations regions resultant from this method shows some significant changes in some tahsils, in Solapur district.

The seventh chapter deals with Agricultural productivity and marketing of Solapur district. There are regional disparities in the levels of agriculture productivity. The physical conditions of the region particularly, rainfall play an important role in determining the agricultural productivity. So the agricultural productivity of the region is the outcome of agricultural inputs and local physical conditions. The high productivity is seen in middle part of the region where as the south western part may be regarded as a weaker zone in respect of agricultural productivity. There is a considerable scope to increase the agricultural productivity, if the farmers are provided, the necessary irrigation facilities. The surplus agricultural production is sent to the local market centers. The marketing system in the region is of three types namely, regulated retail, wholesale and periodical. Regulated and wholesale market centers are located at the taluka headquarters and in other urban centers of the district. Barshi and Solapur are the important market centers of the region and they are famous for tur dal and jawar marketing. Every market centre besides, agricultural commodities also regulate the livestock trade.

The average productivity of jawar region as a whole is 449 Kg per hectare during 2000-01. The average productivity of wheat in the region is 1100 Kg per hectare. The average productivity the bajra in the region is 415 kg per hectare. Identification and delimitation of various areas of agricultural productivity have been attempted by three methods such as
Kendal’s ranking co-efficient method; Yield index method and Bhatia’s method have been used for the measurement of agricultural productivity.

This chapter also deals with the agriculture production and irrigation and technological determinants of agriculture in Solapur district. The proportion of irrigated land to total cultivable land due to the improvement in irrigated land was very impressive which accounted 25.7 percent. As a result, irrigated farming was important in many parts of the district. The percentage of irrigated area in Malshiras and Pandharpur taluka is greater, where as in other parts of the district the proportion of irrigated area is very low. With the development of Ujani project, the area under irrigation has increased in the district. There are many tanks such as Ekruk, Buddehal, Gheradi, Tawale, which are the main source of surface irrigation in the region under study. Wells are the principal source of underground irrigation. The density of wells is high in the low leveled to moderate undulating terrain of the district than the hilly terrain. The largest number of tube wells is found in Pandharpur tahsil. Wells and tanks are the major sources of irrigation in the region.

Surface irrigation includes river, tanks, lakes, canal and small dams. The total surface irrigation area was about 24.2 percent in 1970-71. There after it increased to 40.8 percent in the year 1990-91. This is clearly indicated by the proportion of surface irrigation which increase due to Government of Maharashtra and Zilla Parishad Solapur have constructed number of percolation tanks and canals in this region under the employment Guarantee scheme. During 2000-01, surface irrigation has tremendously declined due to improvement of underground water irrigation like tube wells; hence the area under surface irrigation was 24.1 percent in 2000-01. Tube wells are the major source of underground water irrigation in the solapur district. The total underground water irrigation in the region was about 75.8 percent of the total net irrigated
area in 1970-71. Thereafter, it has slightly increased by 75.9 percent due to improvement of tube wells in the region. This irrigation has enabled the farmers to accept the new innovations. These include the use of fertilizers, improved seeds pesticides and agricultural machinery. The farm credit facilities provided the opportunity to the farmers to dig the wells, to install pipe lines and pumping sets. These new innovations are responsible in breaking the old structure of farming in the region. Due to these technological determinants farmers are making the changes in allocation of land to different crops.

The implements and machineries used in the regions are ploughs, crushing machine, seeds driller for sowing, etc. Besides, oil engines, electric pump, carts, and tractors for many purposes are also used. The Irion ploughs have declined due to the increase in the number of tractors in the region. The number of oil engine declined due to increase in electric pump in the Solapur district. Electric Power is available for irrigation purpose with the increasing rural electrification. This shows that electric pumps are more in number in several tahsils of Solapur district. The improved varieties of food grain crops evolved by the department of the agriculture give about 10 to 15 percent increase yield over the local varieties of seeds. The cultivators, therefore, have started applying the chemical fertilizer extensively in order to enhance the cop production. It is observed that numbers of agricultural credit societies are increasing gradually in recent time. However, there is increasing trend in respect of their membership.

Relationship between population and availability of food has been the subject matter of geographers since ancient time. Rate of intensive population growth rises, the pressure on food production. This increasing pressure is not sufficient to produce requested for the population. Food sufficient is very essential term in relation to population and food. The
term food sufficiency refers to the levels of human satisfaction in respect of production of food stuff in areas occupied by a group of human individuals. In the food productivity, we are concerned with the amount of food stuffs, produced per unit of farm land or per worker engaged in its production. The level of food consumption refers to power of the human individuals of a community to consume the available food products. It affords, the estimation, the amount of food stuffs which actually find access to human diet. They may be produced locally or may be imported from elsewhere. Availability of food means, the amount of food products which becomes available for human consumption in the edible form.

Within the state of Maharashtra, the Solapur district occupies a very important position both in terms of area and population. Solapur district is also relatively industrialized part of the state of Maharashtra, hence, the gap between food supply and population growth is increasing day by day. In order to understand the availability of food, requirement, surplus and deficit food in the region understudy is found out. Similarly the availability of food per capita per day is also calculated, the surplus and deficit areas have also been found out. The availability, demand, surplus and deficit regions of calories and per capita per day calories have also been calculated for different parts of the district.

In order to understand the relationship between population growth on the one hand and growth of food production on the other, the table 8.1 has furnished information for both, the period 1971-2001. It will be more convenient; if step by step we take into consideration, the growth rate pattern of population first, then secondly, the growth pattern of food production. In the year 1971, the population of Solapur district was 2.3 million which has increased to 3.9 million in the year 2001. This shows that the population rapidly increased due to industrialization and consequent urbanization. This has resulted in attracting large number of
inmigrants to the region under study. During the period 1971-2001, the growth of population for the district as a whole was recorded 71.00 percent. However, this growth rate of population was not uniform for the various tahsils in the district. The highest growth of population was recorded for the Pandharpur tahsil, while the lowest was for Barshi tahsil. This may probably due to the impact of poor people belonging to low economic group having high birth rate, while for Barshi the reason may be high income group relatively educated and having better opportunity in tertiary sector, resulting in the low birth rate.

Now, it is necessary to give simultaneously, the information about food production for the region under study for the last three decades. It is noted from the Table 8.1 that the food no doubt, has also increased for the same period only to 10.2 percent, which is much lower than the growth of population for the district as a whole. This is because of the land resources are same and further can not be expanded. In case, if they are expanded than the forest land is converted into agricultural land which is not desirable at all in the present situation, because land under forest is already negligible. The food production is increasing at much lower rate than population growth. In a region like Solapur there is only 2.4 percent area under good forest, hence, there is no scope of increasing land for higher production of food. Apart from this, there is no sufficient rainfall to raise agricultural productivity for the district as a whole the total food was produced 34516 tons in the year 1971, which increased to 38047 tons in the year 2001.

Similarly, the growth pattern of food was also observed for different tahsils of the Solapur district. It was recorded highest for Madha tahsil because of better irrigation facilities and lowest for South Solapur tahsil as a result of low irrigation facilities. The growth rate of food production varies enormously within the region. Karmala, North Solapur,
Mohol, Pandharpur and Akkalkot tahsils have shown higher growth rate of food production than the average for region. Barshi, Malshiras, Sangola, Mangalwedha and South Solapur tahsils have shown lower growth rate of food production than the region as a whole.

In short, it may be concluded that during the last three decades, the population of Solapur district has increased more than seventy percent, while food production has increased to only ten percent during the same period. This gap between the population growth rate on the one hand and food production on the other hand is quite remarkable. It must be considered as a alarming problem before the region under study, as it is clear from the fact, that there has been almost sixty percent deficit of food supply in the region under study.

According to the economic survey of Solapur district (2007-2008), nearly seventy percent of family population is suffering from iron deficiency. Death rate in children of below five years is caused due to malnutrition, and it is maximum in the region under study. According to Dastane (Glimpses of Maharashtra) nearly fifty seven percent rural populations and fifty five percent urban populations is not able to get, minimum standard requirement of calories even today. Low per capita income, decreasing food production and faulty distributional pattern of food grains are the important reasons behind it.

Food crop production in an area, is not hundred percent available for human consumption. According to F.A.O (1957), a large segment is subjected to the losses, due to feeding, to animals, seeds storage manufacturing, extraction and other miscellaneous wastages.

If we take into account, the total produced food in tons, and then it is going to give misleading picture and can not be grasped by a common person very easily. Nevertheless, on the basis of total food production, when it is transformed into percentage of production, than it gives very
clear picture of each crop for the Solapur district. Different crops, together, give the total value of 38047 tons for entire region understudy for the year 2001. The highest production was obtained from the wheat which comes to about thirty four percent; it is followed by Rice and Jawar respectively for the total production to thirty four percent for the Solapur district.

The total produced food by deducting from it, seed storage grain, which makes the food availability for the entire region. For Solapur district fifteen percent from Jawar and about seventy percent of the total produce from the Rice, Bajra and Wheat come to eighty percent and fifteen percent for other crops respectively for the Solapur district for the year 2001.

Another important point to note here is the net food available after extraction. It must be made clear, that in certain cases food is also consumed without extracting it from the region. Quite in with standing the gross food, about thirty percent of rice is available in the Solapur district for direct consumption. It must be noted, that the net food available after all process being done from Jawar production. Similarly, Bajra and Wheat contribute for net consumption about nine and thirty three percent respectively. Among pulses, Tur as well as Gram have also outstanding position in this net food available, because these share, together more than twenty percent of the total produced food in Solapur district, remaining food is obtained from all other grains together make a share of only ten percent of total food produced in Solapur district for the year 2001. Again it must be made clear that per person per day, the availability of food is calculated; to about two hundred seventy four kilogram as a average for district of Solapur for the year 2001.

Tahsilwise food production of different crops per acre in kilogram has been calculated for the year 1971 and 2001. Important crops which
are used for daily diet are Rice, Wheat, Jawar, Bajra and different kinds of pulses.

There are wide variations, spatially and temporally within the region under study due to variations in climatic conditions, soil types and irrigations, Mangalwedha has the highest production of Jawar per acre in kilogram, while Akkalkot is having the lowest production for both the year 1971-2001 apart from this Pandharpur, Mohol, Barshi and Karmala have higher production than the region average in the year 1971. Higher production than the region average was for Mangalwedha, Barshi and Mohol in the year 2001. Rest other tahsils have shown much lower production of Jawar than the region average for the both the years 1971 and 2001.

The availability of cereals per capita per day as stated earlier is 261 and 752 grams for the years 1971 and 2001 for district as a whole. However, there are wide variations within the region. The highest value of cereals was recorded for the Barshi tahsil, where it was as high as 500 gram per person per day in the year 1971. It, further, increased substantially to 562 gram per person per day for the year 2001. Barshi is relatively better in soil and climatic condition to grow various kinds of food grains.

On the other hand the lowest availability of cereals was recorded for South Solapur tahsil, where it was as low as 44 grams per person per day in 1971, which tremendously increased to 422 gram for the year 2001.

In the year 1971, North Solapur, Malshiras, Sangola and Akkalkot recorded the availability of cereals per person per day much lower than the region average. On the other hand, Karmala, Madha, Barshi, Pandharpur and Mangalwedha tahsil recorded much higher cereals per person per day in grams than the region average.
For the year 2001, the availability of cereals per person per day were 752 grams, which tremendously increased during the last thirty years. Mangalwedha occupied the first rank as far as the availability of cereals is concerned. It is followed by the Karmala tahsil. As expected the North Solapur tahsil, due to existence of Solapur city, the availability of cereals was lowest, that is only 83 grams per person per day Karmala, Madha, Barshi, Mohol, Pandharpur, Malshiras, Sangola, South Solapur and Akkalkot have shown the availability of cereals much lower than the region average. Rest other tahsils have shown higher availability of cereals per person per day. There may be no general rule, for the variations in average of cereals, per capita per day, because the density of population has great bearing upon the variations in the availability of cereals in Solapur district. Higher the density of population, lower is the availability of cereals per capita per day. The average availability of cereal per capita per day varies enormously, from one tahsil to another, depending upon the degree of urbanization and process of industrialization. The proportion of land, under agriculture is resulting in low average availability of cereals within the region under study. The standard requirement of cereals is 400 gram per person per day.

Average amount of pulses, as stated earlier, per capita per day average in grams has been calculated to 42 gram and 35 grams for the year 1971 and 2001 for the region as a whole. Pulses are most needed as an important part of diet in day to day life. Hence, their spatial pattern of availability per person per day is also calculated for different tahsils of Solapur district. In the year 1971, the average availability of pulses was calculated to 42 gram. The standard requirement of pulses per person per day is 30 grams.

The standard requirement of food per person per day is assumed only 450 grams. For the region as a whole, the total availability of food is calculated both for 1971 and 2001 and for its different tahsils.
In the year 1971, there was availability of food of 303 gram per person per day which substantially increased to 787 gram for the year 2001 for the region as a whole. This increase must be attributed for the modernization of agriculture, use of high yield variety seeds, fertilizer and increase in area under irrigation. In the year 1971, the Barshi recorded the highest value of food, where it was as low as 56 gram per person per day, Karmala, Pandharpur and Mangalwedha, recorded higher availability of food per person per day. Rest all other tahsils of the Solapur district have recorded much lower value of food than the region average.

For the year 2001, the availability of food was recorded to 787 gram per person per day. It was highest for Mangalwedha tahsil, where it was 1003 gram per person per day. It was followed by Mohol tahsil, where it was 819 grams per person per day. Rest, all other tahsils of the district, recorded lower availability of food per person per day in grams. The overall increase in certain areas of the district may be attributed to increase in area under irrigation and use of fertilizer and high yield variety seed. Hence, the per capita availability of food has been increased during the last thirty years. The diet in Indian conditions may consist of cereal and pulses. The minimum requirement of food is four hundred and fifty grams, in which four hundred gram of cereals and fifty grams is of pulses.

For the year 2001, the surplus food per person per day was 337 gram for the district as a whole. There are wide variations in the surplus food, since it was highest for the Mangalwedha tahsil where it was as high as 553 gram per person per day. It was followed by the Mohol tahsil where it was recorded 369 gram per person per day. Besides, Barshi, Karmala, Sangola, South Solapur and Akkalkot have also recorded surplus food per person per day in the year 2001. Madha, North Solapur,
Pandharpur and Malshiras have represented deficit food within the district of Solapur. It may be stated that the surplus and deficit food may be attributed to the level of agricultural development. The area like North Solapur, Barshi and Pandharpur, which are relatively much urbanized, show much deficit food. In such area, the proportion of people who do not produce their own food is relatively high. Secondly, the inmigrant of the people is also relatively high in such regions. Agricultural predominate area are also better in primary activities and hence, there is surplus food in such rural dominated tahsils.

Nutrient availability is mainly concerned with the caloric availability. Now, the question arises, that what are the calories which are obtained from the food taken in nutritional form. "One caloric the amount of heat, required to raise the temperature of one kilogram of water by one degree centigrade". A device for measuring the amount of heat is called calorimeter. Calorie content of particular food stuff is calculated by burning a certain quantity of it in the calorie meter. The heat produced is measured by the rise in temperature in water surrounding the chamber in which the food is being burnt.

Further, at attempt has been made to findout, the total calories produced by adding the total calories from the locally produced cereals and pulses. As attempt has also been made to calculate, total calories locally produced and the total requirement of calories for the year 1971 and 2001. Moreover, surplus and deficit regions, on the basis of total calories produced and needed have been found out for each concerned tahsil of the Solapur district.

In order to understand, the magnitude of the problems more precisely, the availability of calories per person per day has also been calculated for each tahsil of the Solapur district for the year 1971 and 2001. In the similar way, on the basis of standard requirement of calories,
per person per day, which is 2200 in Indian condition and Solapur is no exception to this rule both for 1971 and 2001 years.

By taking this amount of calories as a standard requirement to satisfy the required energy per person per day, from it, the availability of calories per person per day were deducted and surplus and deficit calories per person per day were found out for each tahsil in Solapur district. Let us first, at the very outset, take into account the total calories produced in each tahsil of the district. But before, giving the total calories produced for each tahsil, it would be more appropriate to through light on the method and criteria adapted to find out, the total food produced into calories. It has been consulted from the book entitled "Facts and figures of agriculture", in which the standard rule for conversion of hundred gram food grain, contain almost three hundred fifty five calories. By applying this system, the entire food grain produced in each tahsil of Solapur district as a whole, was converted into calories.

The total need of calories, for each tahsil and for the district as a whole, were computed by taking into consideration total population for each tahsil and multiplied by two thousand two hundred, which is the standard requirement of calories per person per day. Similarly, surplus and deficit calories which are also in million for each tahsil were computed by subtracting total calories locally produced from the total need of calories in each concerned region.

Let us now turn our attention, towards the spatial pattern of total calories produced in each tahsil of Solapur district. In the year 1971, the total calories produced in for the region under study was 2425 million, which substantially increased to 10756 million calories for the year 2001. There are many differences in the production of total calories from one tahsil to another. The highest calories produced by converting the total food for the Barshi tahsil in the year 1971. It was followed by the
Pandharpur tahsil. The lowest calories were recorded for Sangola tahsil, perhaps it is the driest region in Solapur district.

Similarly, calories were also calculated for the year 2001 for all the tahsils of the district. Further, Barshi stood in the first rank as far as the total calories are concerned. It was followed by Mohol tahsil, which is better off in irrigation facilities. In the year 2001, the north Solapur tahsil recorded the lowest calories produced due to low area under cultivation. In other tahsils of the district, the calories vary according to the development of agriculture and percentage of area under cultivation.

In order to understand, the nature of problem very clearly, calories locally available per person per day, were calculated for district as a whole, as well as for different parts of the region for the year 1971 and 2001. In the year 1971, for region as a whole 1076 calories per person per day were available. It should be remembered that, the minimum requirement of calories per person per day is two thousand two hundred.

This clearly shows that calories available per person per day were much lower than minimum requirement. It is estimated that about 1124 calories per person per day were deficit for the the region as a whole. This may be one of the reasons for high incidence of certain diseases and poor health of the people resulting in high mortality. Within the region, calories locally available per capita per day varied enormously in the year 1971, from as high as 2134 for Barshi tahsil to as low as 198 calories for South Solapur tahsil.

Similarly, the calories were also calculated for the year 2001 for the district as a whole and its various tahsils. For the region as whole the availability of calories per person per day was 1951. This shows that there were 249 calories in deficit per person per day. Within the region under study, the Mangalwedha tahsil produced 3561 calories per person per day, which was the highest in 2001. It is followed by the Karmala
tahsil where calories were recorded to 2694 per person per day. Due to higher percentage of urban population in North Solapur tahsil as a result of Solapur city, the availability of calories per capita per day was the lowest in 2001.

The availability of calories was deficit as the minimum requirement of calories per person per day was two thousand two hundred. For the year 1971, one thousand seventy six calories were available per person per day for the region as a whole, which tremendously increased to 1951 for the year 2001. Both the years have shown much lower calories than the minimum requirement which 2200 per person per day. Though the situation relatively improved for the year 2001 per person per day

It would be better, if we considered both the decades separately, in order to understand the surplus and deficit regions within the district of Solapur. In 1971, for Solapur district as a whole, 1124 calories were deficit within the various tahsils of district.

The calories per capita per day differ from south Solapur to as high as 2002 deficit calories to 66 for Barshi tahsil in the year 1971. It is a matter of astonishment that in the year 1971, due to poor economic development in general and agriculture in particular has resulted quite high deficit of calories for the all the tahsils of Solapur district. It must be borne in mind that this deficiency of calories for all the tahsils of Solapur district is compensated by other products like vegetable, fruits, milk, fish and meats of animals.

Similarly, surplus and deficit calories are also calculated for the year 2001. In spite of efforts are being made by the government to improve the agricultural production in the state of Maharashtra by providing subsidies in fertilizers, seeds and irrigation. However, the
region under study could not get the momentum to reach the expected level.

Therefore, 2049 calories per person per day were found deficit in year 2001. The area which are predominantly agricultural, have shown better agricultural output. For example, Mangalwedha tahsil have shown the maximum surplus calories per person per day which is accounted to 1361. It is followed by Mohol tahsil due to better irrigation facilities and fertile soil, resulted in the high production in agriculture. Mohol has shown 707 calories surplus per person per day. Karmala in the north western part of district have also shown 494 surplus calories per person per day. In the south part of the Solapur district Sangola has also provided surplus calories because of the low percentage of urban population and relatively low density of rural population. Barshi in north eastern part of the district have shown only one calory per person surplus per day. Rest all other tahsils of the district such as Madha, North Solapur, Pandharpur, Malshiras, South Solapur and Akkalkot have much deficit calories per person per day.

It is necessary to explain the factors behind the deficit of calories in such regions. North Solapur tahsil represents 1891 deficit of calories per person per day in 2001, due to increasing urban population of Solapur city. Secondly, the proportion of area under agriculture is quite low in North Solapur tahsil. Madha is agriculturally poor due to low irrigation, Pandhapur and Malshiras have high percentage of the people who do not produce their own food, because secondary and tertiary sectors are also relatively developed in such regions. South Solapur tahsil and Akkalkot tahsils have also represented deficit calories per person per day due to poor agricultural production, low level of irrigation and poor fertile soil.

It may be concluded that spatially and temporally the availability of calories per person per day were deducted from 2200 which is the
standard minimum requirement of calories per person per day. The variation from one tahsil to another depending upon the geographical condition such as rainfall, temperature and soil type, better irrigated areas and technological advanced region of the district have shown surplus calories per person per day. The most important regions for deficit calories are the rapid growing population in each tahsil of the district.

In Solapur district though, the food production has been increasing, in its non consumption needs, losses of different stages of production and uneven distribution, leave several sections of population under nourished. With the combination of table 8.5 and 8.6 it can be concluded that 400 gram cereals and 50 gram pulses are required for human beings to get energy of 2200 k calories in a day. According to study of Prof. A. K. Shrivastav, Chairman CTREE, in rural areas as many as eighty five percent households do not get the minimum required food grains and daily calories. The range of hunger category in rural areas is nearly 43 percent and in urban areas, it is nearly 27 percent. Uneven, region wise distribution of food intake, takes place not only at the macro level but also at micro level. In case of food shortages, which are often in some families in Solapur district, men have preferential access to food. It is also known that children's diet can be up to 20 to 30 percent than their needs.

This vicious cycle of under nourishment, from generation to generation, could have effect upon the regions, agriculture and economy and on social development. Some areas in Solapur district are found to have even highest percentage of people with this deficiency. A segment of population still considered as "food insecure" consuming less than eighty percent of the minimum energy requirement.

In Solapur district there are very few areas where availability is greater than the recommended requirement which are classified under the surplus category while those, where it is lower than the recommended
requirement are arranged under the deficit category. Surplus and deficit areas; are determined with the consideration of balanced diet and requirement of an average food factors per person per day in the Solapur district, with the combination of this two tables, we can conclude that 159 gram cereals and 50 gram pulses are required for human beings to get the energy of 2200 calories in a day. According to this, every person requires 450 grams cereals and pulses per day. On the district level; the availability of food grains than required amount of food is 303 and 548 grams per person per day in the year 1971 and 2001.

Areas of food surplus and deficit have been mapped by making use of data at tahsil level. The recommended requirement of food grain, for Indian person is taken as standard. The areas where availability of food grain is more; that areas are considered as surplus areas and deficit areas are considered with the level availability of food grain than the requirement.

There are four types of areas according to food availability in Solapur district.

1) Slightly surplus areas
2) Highly surplus areas
3) Slightly deficit areas
4) Highly deficit areas

1. Slightly Surplus Areas:

This category includes Barshi, Sangola, South Solapur and Aakkalkot tahsils of the Solapur district. In these tahsils, below 300 gram per person per day food was surplus. The minimum requirement of the person is taken 450 gram per day.

2. Highly Surplus Areas:
In the category of highly surplus region, where more than 300 gram food grain was available per person per day are the Karmala tahsil in north western part of the Solapur district. In the central part of the district, Mohol tahsil also possesses more than 300 grams food grain per person per day. In the south part of the district, Mangalwedha tahsil also represent more than required food per person per day. (Fig. 8.10)

3. Slightly Deficit Areas:

Slightly deficit areas represents below 300 gram food per person per day. It includes Madha, Malshiras and Pandharapur tahsils of the Solapur district. Madha and Malshiras are the two dry tahsils of the district having relatively low production of the crops, resulting in low availability of food per person per day. On the other hand Pandharapur is having large number of immigrants, and high proportion of urban population.

4. Highly Deficit Areas:

Highly deficit area consists of North Solapur tahsil in the district. It should be remembered that this tahsil is relatively smaller in geographical area. The city of Solapur belongs to this region. The city of Solapur has more than ten lacs population resulting in the low per capita food; because the proportion of the people, who do not produce their own food is comparatively high. The secondary and tertiary sectors are better developed. The area under agriculture is quite small in this tahsil. As a result of it the region of North Solapur has highly deficit food per person per day which is more than 300 grams per day.

The ninth chapter deals with correlation matrix of the variables, influencing growth of population in Solapur district. The growth of population is influenced by the number of factors in a particular region.
The important factors such as the demographic factors, economic factors, social factors and physical factors all of them have great bearing upon the growth of population. There are a number of statistical techniques and quantitative analysis like mean, medium, mode, standard deviation, mean deviation, principal component analysis and co-efficient of correlation, here an attempt has been made to find out the relationship between growth of population on the one hand and different social-economic, physicals variable on other hand.

In an economically backward region, like Solapur, demographic factors such as birth rate, death rate and infant mortality rates were expected to influence the variation in the growth rate of population in a very significant manner. When co-efficient correlation was calculated between the growth rate of population and birth rate for entire district, the value ‘r’ (0.77) was found to be positive and significant. The birth rates are higher influencing the higher growth rate of population. The backward regions predominantly agricultural, where more than 70 percent people are still engaged in primary sectors.

The correlations between growths of population infant mortality rate have a positive relationship. This means that with increase in infant mortality rate, that are the children below one year of age or children during sucking period, this has resulted in high growth rate of population in a country like India in general and Solapur district in particular. When the correlation co-efficient between the growth of population and literacy were calculated by using the tahsil level data for Solapur district. The value of ‘r’ may be interpreted in a region like Solapur that literacy has not still influenced the growth rate. The proportions of the people belonging to lower economic strata group, still do not believe fully in the family planning program and small norm of the family.
The impact of male literacy rate on the growth of population is the same as it was for total literacy rate. Hence, by the value of ‘r’ which is -0.25 makes clear that the impact of male literacy influence the growth of population negatively. As a matter of fact, it is desirable that with social awareness among the people, particularly among the males the birth rate is controlled and family planning programs are readily accepted. The growth of population and female literacy gives a negative value ‘r’ -0.021. It means with growing female literacy weight is given to negative on the growth of population. It is a generally found, that with per capita of female literacy the awareness among the people for higher standard of living, higher per capita income and small family norms become most significant factors.

The percentage of rural population to total population shows a negative relationship with the growth of population in Solapur district. The growth of population should increase the value of ‘r’ is calculated to -0.73 between the tow, which shows that with high percentage of rural population in a particular region, the rate of growth of population declines, significantly. This may by partly due to out-migration of the rural people in search of better employment in the urban areas of the district. This is how the urban population growth is considerably reflected upon the growth population.

The value of co-efficient of correlation between growth rate of population and percentage of urban population was 0.75. It is quite significant and positive. It clearly reveals that with high percentage of urban population, the growth of population rapidly increases. Generally, it is believed that in urban areas the growth of population should be lower than that of rural areas. However, here the situation is found in other way round. In case of Solapur district, the rural-urban migration has great bearing upon the growth of population. Most of the urban places, in fact,
are the centre of economic activities, most of the literate and illiterate people who come to the urban places in search of better employment opportunities. This is how the urban population growth is considerably reflected upon the growth population. Therefore, it may be concluded that rural-urban migration has influenced the growth of population positively in Solapur district. The process of urbanization and consequent industrialization are intimately related. The spread of one leads to overall development of jobs. It has been supported by the positive and significant value of ‘r’ in Solapur district between the percentage of urban population and growth of population.

The proportions of workers in agriculture on the one hand and the growth of population on other depicts the value of coefficient of correlation of -0.697. This is quite significant but negative. The natural increase of population is the total number of births deducted by the total number of deaths in rural sectors. Hence, the proportion of workers in agriculture has inverse relationship between workers in agriculture and growth of population. The out migration from the rural areas to urban places for the handsome wages even workers generally go to the nearby urban places. Hence, the proportion of workers in agriculture and growth of population may be interpreted that with the high percentage of workers manufacturing increase their per capita income to sub part their families. Therefore, literate and educated peoples are associated with the manufacturing activities in the urban centre of the district, which in turn positively affect the growth of population in the region under study.

It is human tendency that in order to enhance their income, people desire more hands of population. The economic condition is the important means to leave comfortable and without worry. The economy of any region is major factor to improve the high standard of living of people where the natural resources such as water, availability, fertile soil for
agriculture, favorable land for settlement were available. Even today most of the river valleys and plain areas are densely populated due to the availability of plenty resources. Solapur district is by and large, located in the homogeneous region drained by the Bhima, Sina, Man and Bori river. There are many other socio-economic and demographic reasons in case of developed and advanced societies in the world, where despite, high sex-ratio, the growth of population is low. But in the case of developing regions like ours where sex-ratio considerably low and female mortality in particular is significantly high. It means that if the age at marriage for female is increased, than the growth of population should decline as a common rule. But in this case, the situation is in other way round. Here, the age at marriage for male has positive relationship with the growth of population in Solapur district.

In order to understand, the fact of age at marriage for female, a correlation between population growth and age at marriage for female has positive relationship with the growth rate of population. Now the question arises while it is so, the age of marriage for female is for those, who are highly literate and educated. The proportion of Muslim population shows a positive relationship with the growth of population in Solapur district. It clearly reveals that with the high percentage of Muslim population the growth rate of population increase considerably in Solapur district. It is generally observed that Muslim society wants to increase the number of children per couple, in order to increase the total number of Muslim population. It can be understood by the fact, that Hindus are relatively more conscious to live a high standard life by controlling the small size family. Hindus population have inverse relationship a negative relationship with the growth of population in a country like India and Solapur district is no exception to this rule.
The accessibility is considered as the lifeline of the economy in a particular region. The means of transportation and communication, no doubt influence the economic activities to a greater extent. The concentration of industrial development and other economic activities are found in areas which are easily connected with the roads railways and airways. For the purpose, to know the impact of road density on the growth of population, a correlation was calculated between the two. The calculated value of ‘r’ was found to be negative and most insignificant. It means that in a region like Solapur, the road density has not significantly influenced the growth of population. The region under study is predominantly agriculture where more than 70 percent people are still engaged in primary activities. Therefore, the accessibility of the road density does not shows any effect upon the growth of population in the region under study. The movement of the people within the region has not made any impact upon the growth of population. Though, it is a matter of fact, that with high density of the road the concentration of population becomes higher and higher resulting in the high growth of population. But in the case of Solapur, the situation is in other way around.

The proportion of schedule caste to total population has a negative relationship to the growth of population. In case of Solapur district, the proportion of schedule caste population is high in comparison to state of Maharashtra. The value of ‘r’ -0.394 indicates that with increasing the proportions of schedule caste, the growth rate of population declines. The literacy rate among the schedule caste population is relatively low. Hence, the workers from this caste migrate to nearby district like Pune, Ahmadnagar, Bijapur, and Bidar in search of work. This has resulted in the inverse relationship to the growth of population in Solapur district. This is again contrary to expectation; with high proportions of illiterate
people belonging to schedule caste should have shown positive relationship with the growth of population. With poor economic condition, of the standard of living becomes poor and lack of luxurious life’s, lack of recreational facilities would have encourage them to have more number of children per family healthy. But due to their migration from the source region have shown opposite relationship with the growth of population.

Like schedule caste population, the percentage of schedule tribe also shows negative relationship with the growth of population. In Solapur district the percentage of schedule tribe is insignificant. Hence, the impact of schedule tribe on the growth of population is negative and insignificant. Schedule tribe belongs to the lower strata of the society. Their economic condition is very poor since such people are associated with the primary economic activities. The value of ‘r’ is calculated of -0.191 between schedule tribe population and growth rate. The growth of population declines with high percentage of schedule tribe population. It means, the schedule tribe who are born in the different tahsils of Solapur district are enumerated somewhere else. This results in the opposite or negative growth rate of population in the district.

It is a matter of commonsense that with large size of family, there is a possibility of high birth rate. The correlation between person per household and growth rate of population shows positive 0.185 but insignificant relationships to a certain extent. Though, the persons per household means, if the family is a small, the growth of population will be lower and if the size of family is large, the growth of population will be higher. There is a saying of a slogan by the family planning department that “HUM DO, HAMARE DO”. To a certain extent this has also positively affected and controlled the growth rate particularly among the highly educated people. But in our nearby country namely China
which is most populous in the world has made a policy regarding the family planning program in order to control the growth rate of population they accepted and implemented in their life a slogan like “HUM DO, HAMARA EK” means we are two-ours is one. The government policies of China award such small size family by providing them better employment opportunities and many other benefits are provided to them. India should also apply such family planning programme to control the growth rate of population. In Solapur district, the size of the family and growth rate of population shows positive relationship as it is shown by the value of ‘r’.

It is only a death, which reduces the population over the surface of the earth. Perhaps, if there would not have been deaths, the size of population would have remained by and large constant. While discussing the impact of birth rate over the growth rate of population, it was found that in a country like India in general, and the Solapur district in particular, the birth rates are high on account of high death rates. In order to examine the impact of death rate on growth rate of population in Solapur district, the value of ‘r’ is calculated between the two. It is 0.733 positive and very significant. In a region like Solapur, the growth rates of population are higher on account of high death rates. Because, of insecurity, people do not like to take risk by having only one or few children. In case of accidental death of their children, the danger of old age security, allow them to go far many more children. Hence, the value of 0.733 shows a strong and positive relationship of death rate with the growth rate of population in Solapur district. In other words, with high death rate, there will be high decline of population growth and with lower death rate there will be increase in the growth of population.

This chapter also deals with a co-relation matrix of the variables influencing agriculture in Solapur district. An attempt has been made to
find out several problems associated with the agriculture production and its future oriented prospects to implements for the improvement for agriculture production. A co-relation matrix has been prepared for different social and economic variables to establish relationship between agricultural productivity and different variables. Various coefficients of co-relation values with productivity and fertilizer inputs, cultivable land, irrigated area, and plough numbers of engines, bullock cart, tractor, roads and rural population have influenced agricultural in Solapur district directly or indirectly to some extent.
RESULTS AND FINDINGS:

1) The population of India is increasing at exponential growth rate in India in general and Solapur district in particular.

2) Different backgrounds of the region such as physical, social, historical and political have great bearing upon social and economical characteristics such as population and agricultural in the region understudy.

3) The growth of population except 1921, is rapidly increasing.

4) Density of population is higher than urbanized areas of the district.

5) Literacy and occupational structure have positive impact upon per capita income.

6) Land use pattern is changing from food crops to cash crops in Solapur district.

7) Percentage of irrigated land is increasing in the district of Solapur.

8) Agricultural productivity per acre is also increasing due to technological development.

9) The requirement of food per person per day estimated to 450 grams in Indian condition.

10) The requirement of pulses per person per day is 50 gram.

11) Availability of cereal per capita per day is 261 gram and 752 gram in 1971 and 2001 respectively.

12) The availability of pulses is to 42 gram and 35 gram in 1971 and 2001 respectively.

13) Barshi is the only surplus tahsil in 1971, while Karmala, Barshi, South Solapur, Akkalkot, Mangalwedha and Sangola are surplus tahsils food in 2001.

14) Total calories produced in the district in million, were 10756 million, while requirement was 8469 million calories for the district as a whole.
15) An availability of calorie is per person per day 2794 in 2001 for district as a whole.

16) There are four types of areas of food surplus and deficit in Solapur district as shown in the table 8.11.

**SUGGESTIONS**

1) Solapur District belongs to drought prone area hence; there is a scarcity water of both for irrigation as well as for domestic purposes. The water availability should be enhanced by arresting rain water and tube wells facilities should be provided.

2) The land use pattern should be given preference for food crops in order to produce more food grains.

3) Population growth should be checked by reducing birth rate.

4) Availability of food per capita per day should be enhanced by producing more cereals crops and pulses.

5) Deficit region in food should be given subsidies by government in fertilizer, pesticide herbicide hybrid seeds and electricity etc.

6) The degree of mechanization in agriculture sectors should be enhanced.

7) The marketing systems should be made available even in rural areas to purchase food grains at reasonable rate.

8) The growth of food should be enhanced per acre and growth of population should be checked to minimize the gap between food and population growth.

9) Calories per person per day should be maintained by taking other food stuffs like milk, fish, mutton and fruits.