CHAPTER - VIII
PERSPECETIVES ON POPULATION AND FOOD SYSTEM IN SOLAPUR DISTRICT

8.1 INTRODUCTION
8.2 COMPARISION BETWEEN GROWTH OF POPULATION AND FOOD PRODUCTION IN SOLAPUR DISTRICT
8.3 INCOME AND THE NATURE OF FOOD
8.4 DETERMINATION OF FOOD GRAIN AVAILABILITY
8.5 CRITERIA TO ESTIMATE FOOD PRODUCTS AND ITS AVAILABILITY
8.6 FOOD SYSTEM AND PRODUCTION IN SOLAPUR DISTRICT
8.7 FOOD BALANCESHEET FOR SOLAPUR DISTRICT
8.8 TAHSILWISE FOOD PRODUCTION OF DIFFERENT CROPS PER ACRE IN KILOGRAMS
8.9 FOOD AVAILABILITY PER PERSON PER DAY IN GRAMS (1971-2001)
   8.9.1 The Availability of Cereals per person per day
   8.9.2 Availability of Pulses per person per day in Grams
   8.9.3 Total food availability in grams per person per day
8.10 FOOD AVAILABILITY, SURPLUS AND DEFICIT PER PERSON PER DAY IN GRAM
   8.10.1 Surplus and Deficit Food per person per day in Grams
8.11 FOOD IN CALORIES
   8.11.1 Total Calories Produced in Million
   8.11.2 Total Production and Availability of Calories per person per day
   8.11.3 Availability of Calories per Capita per day
8.11.4 Surplus and Deficit Calories per person per day (1971-2001)

8.12 EVALUATION OF FOOD SUFFICIENCY IN SOLAPUR DISTRICT

8.12.1 Estimation of food product from different sources

8.13 ESTIMATION OF LOSSES

8.13.1 Seed rates
8.13.2 Extraction rates
8.13.3 Losses from other sources

8.14 FOOD SUFFICIENCY

8.14.1 To yield energy
8.14.2 To build and renew body structure
8.14.3 To regulate internal condition and processes

8.15 ANALYSIS OF SURPLUS AND DEFICIT AREAS:

8.16 SPATIAL DIMENSION OF SURPLUS AND DEFICIT AREAS

8.16.1 Slightly Surplus Areas
8.16.2 Highly Surplus Areas
8.16.3 Slightly Deficit Areas
8.16.4 Highly Deficit Areas
Chapter - VIII

PERSPECTIVES ON POPULATION AND FOOD SYSTEM IN SOLAPUR DISTRICT

8.1 INTRODUCTION:

For quite sometimes, many thinkers are predicting that population explosion might dislocate economic order of many nations. Till the end of the nineteenth century, the rate of population growth was low and problem of population explosion was not that serious. Since the beginning of the twentieth century, however, death rate started declining rapidly, while birth rate continued to remain high in many areas. This is resulting in serious problem of rapidly increasing, population pressure on resources, particularly on food resources. This problem of population explosion in relation to food supply is a serious problem in India and Maharashtra is no exception. The land resources in the region are fixed and limited. Much of the land for cultivation is already brought under cultivation and there is little scope to increase area under agriculture. Despite these, efforts are being made to increase production of agriculture; rate of increase of food production is not keeping pace with the growth of population.

Relationship between population and availability of food has been the subject matter of geographers since ancient time. Thomas Malthus worked the first economist, to raise this issue. He analyzed the relationship between growth of population and food production. 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.

Maharashtra is relatively more industrialized and consequently more urbanized part of India. Hence, the proportion of people who do not produce their own food is relatively more. The region therefore, requires importing food from other parts of the country. Efforts are being to make the region self supporting in food. Despite, increase food productions due to rapid increase of population as a result of substantial contribution made by both high natural increase and net migration, the gap between demand and supply of food is increasing day by day.

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.
8.2 Comparision between Growth of Population and Food Production In Solapur 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 immigrants 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. This was followed by North Solapur tahsil, which is most urbanized part of the district. Large numbers of people migrate to Solapur city in search of better employment opportunities, resulting in the high growth of population for North Solapur tahsil. In Malshiras tahsil, the growth rate of population was higher than the district average because of entirely rural population and low level of literacy. Besides, Mohol and Sangola tahsil have also shown much higher growth rate of population than the district average during the same period. For rest other tahsils, the growth rate of population was recorded much lower than average for the district as a whole (Table 8.1)
Table 8.1
Percentage Change in Population and Food Production (1971-2001)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
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<tr>
<td>Karmala</td>
<td>151493</td>
<td>233316</td>
<td>54.00</td>
<td>3640</td>
<td>4029</td>
<td>10.6</td>
</tr>
<tr>
<td>Madha</td>
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<td>2585</td>
<td>2928</td>
<td>13.2</td>
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<tr>
<td>Barshi</td>
<td>262716</td>
<td>340831</td>
<td>30.00</td>
<td>3485</td>
<td>3816</td>
<td>9.4</td>
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<tr>
<td>N.Solapur</td>
<td>487134</td>
<td>960803</td>
<td>97.72</td>
<td>3321</td>
<td>3667</td>
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<td>Mohol</td>
<td>142334</td>
<td>252586</td>
<td>77.46</td>
<td>3890</td>
<td>4378</td>
<td>12.8</td>
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<tr>
<td>Malshiras</td>
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<td>92.00</td>
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<tr>
<td>Sangola</td>
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<td>75.00</td>
<td>2620</td>
<td>2844</td>
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</tr>
<tr>
<td>Mangalwedha</td>
<td>107823</td>
<td>171261</td>
<td>59.00</td>
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<td>2728</td>
<td>9.6</td>
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<td>Pandharpur</td>
<td>187813</td>
<td>402717</td>
<td>115.00</td>
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<td>10.5</td>
</tr>
<tr>
<td>S.Solapur</td>
<td>133343</td>
<td>210774</td>
<td>58.06</td>
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<td>3544</td>
<td>7.4</td>
</tr>
<tr>
<td>Akkalkot</td>
<td>206678</td>
<td>290037</td>
<td>40.33</td>
<td>2890</td>
<td>3191</td>
<td>10.4</td>
</tr>
<tr>
<td>District Total</td>
<td>2253840</td>
<td>3849543</td>
<td>71.00</td>
<td>34516</td>
<td>382047</td>
<td>10.2</td>
</tr>
</tbody>
</table>

Source: Socio-economic abstract of Solapur district.

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
SOLAPUR DISTRICT

Growth of Population
(1971-2001)

Percentage Change in Population
- Above 75
- 51 - 75
- Below 50

Percentage of Growth in Food Production

Percentage Growth in food Production
- Above 12
- 10.1 - 12
- Below 10

Figure 8.1
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. (Fig. 8.1)

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 an 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.

Agricultural production, inspite of various efforts are being made by the government of India to enhance the per unit agricultural production in order to feed the teeming millions in every decades. No doubt, the region under study is in position to make it, self sufficient in food, due to abundant irrigation facilities are being made available. At the same time subsidies are being made available for farmers to purchase fertilizer and high yield varieties of seed, insuring higher agricultural
production per unit of land. Therefore, the changes in agricultural production for various grains during the successive decades have also shown impressive increase in the growth of food grains.

**8.3 INCOME AND THE NATURE OF FOOD:**

According to a report published by Tata fundamental research centre Mumbai, the variation in income of the population also affects the consumption of food. According to economic characteristics, the population can be divided into four classes as mentioned under:

1) The lower poor economic class having very insufficient diet, subject to serious under nutrition, nearly twenty percent population is included in this class in Solapur district.
2) The poor class consisting thirty percent population is subjected to nutrition.
3) The middle class consists of forty to forty five percent populations in the society; it is assumed that this class enjoys adequate diet without excessive consumption of food. Diet of this class is generally according to the nutritional norms.
4) The rich class consisting only five to ten percent population due to high income, they can afford rich nutritional food from the sources other than food grains.

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.

8.4 Determination of Food Grain Availability:

No doubt, food crops production of a region is subjected to losses arising from animal food, seed storage, manufacturing, extraction and miscellaneous wastages. Any estimation of the amount, available for human consumption would, therefore, involve debating the quantities which fail to be used for human consumption. The desirably involving consideration of the experts, important component of grain mobility however, seem dubious; firstly data on movement of grains are difficult to assemble at any level in the region under study, secondly food grain mobility, does not include any permanent loss of grains, except for a small quantity, which may be lost during their movement from one area to another. As a matter of fact, the important export system is a kind of human arrangement, for affecting the spatial distribution and regulation of food grain from surplus to deficit areas, in order to save the distribution of grain from their non utilization.

Thirdly, if the fundamental purpose of measurement of the availability, is the understanding of the surplus-deficit position of the areas. Then import and export factors will hardly, have any relevance in the availability estimate. The inclusion of import and export factors will perhaps indicates the amount of food grain which might be indeed consumed by the human beings. This will, therefore, furnish measures of the consumption and not that of availability.

Further, the food grain mobility hardly shows any reliable indication of the surplus deficit situation of the areas because of the fact that it may be operating under compelling circumstances. The measurement of availability, must, therefore be, essentially based on the idea of the determining quantity of food grains available in the
consumable form irrespective of the fact that this food grain may be consumed locally or elsewhere of the region. Hence, the proportions of the people, who do not produce their own food, is relatively higher in the region under study. Besides, with increasing degree of industrialization, the per capita income is increasing in the specific segment of the society. In such group of population, the nature of formal diet is also changing, since such group demand for the food stuffs and vegetables is much higher.

In short, it may be stated that the food crop production of any area is not hundred percent available for human consumption, but a sizable portion, as stated earlier, is lost in different manners.

8.5 CRITERIA TO ESTIMATE FOOD PRODUCTS AND ITS AVAILABILITY:

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.

Estimation of food grain losses:

According to R.S. Dube and Misra (1982), there are two methods to find out grain losses, in other words to find out food availability.

1) The one in which some standard rate of losses is adopted on some hypothetical assumption.

Akrayed (1941), Stamp (1958), Shaffi (1960) and Goplan (1980) all these geographers have suggested, that an allowance of ten percent of losses arising from seeds storage, catle field, extraction and wastage at different levels, while Chakravarty is of the view that 16.5 percent losses occurred from food grains.
2) The second method is based on the construction on the food balance sheet. In this sheet separate rate of losses are employed for all the individual grain. Due to separate rate of losses of food; correct estimation of food availability may be obtained.

8.6 FOOD SYSTEM AND PRODUCTION IN SOLAPUR DISTRICT:

Uptil now, we have discussed various criteria to estimate food availability in general. Now it is quite appropriate, to consider individual crop for the Solapur district as a whole for the year 2001. The table 8.2 is associated with the total production in tons, of important crops as listed in the concerned table. As per our discussion, the entire produced food is not directly consumed by human beings, out of total produced; some amount is kept regularly without fail in order to sow far the next crops. Hence, the table is also associated with the seed storage amount for each major crop, at the same time, by deducting seed storage grain from the total produced food grain, the gross food has been also considered in the same table for the important crops. After extraction, the net available food which is directly available for human diet has also been included for the important crops in the table. Finally, after making the estimation of the net available food for the year 2001, for entire Solapur district, the region under consideration, the availability of food per year in kilogram has also been calculated, which is 274 kilograms, at the same time the per capita per day has been also computed for the same year which comes to about 752 gram. Table 8.2
Table 8.2
Total Cereals Production in tons (1971-2001)

<table>
<thead>
<tr>
<th>Tahsil</th>
<th>Production of cereals (in tons) 1971</th>
<th>Production of cereals (in tons) 2001</th>
<th>% Change 1971-2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karmala</td>
<td>3640</td>
<td>4029</td>
<td>10.7</td>
</tr>
<tr>
<td>Madha</td>
<td>2585</td>
<td>2928</td>
<td>13.3</td>
</tr>
<tr>
<td>Barshi</td>
<td>3485</td>
<td>3816</td>
<td>9.5</td>
</tr>
<tr>
<td>N.Solapur</td>
<td>3321</td>
<td>3667</td>
<td>10.5</td>
</tr>
<tr>
<td>Mohol</td>
<td>3880</td>
<td>4378</td>
<td>12.8</td>
</tr>
<tr>
<td>Malshiras</td>
<td>3120</td>
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<td>10.5</td>
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<tr>
<td>Sangola</td>
<td>3175</td>
<td>3474</td>
<td>9.4</td>
</tr>
<tr>
<td>Mangalwedha</td>
<td>2620</td>
<td>2844</td>
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</tr>
<tr>
<td>Pandharpur</td>
<td>2490</td>
<td>2728</td>
<td>9.6</td>
</tr>
<tr>
<td>S.Solapur</td>
<td>3300</td>
<td>3544</td>
<td>7.4</td>
</tr>
<tr>
<td>Akkalkot</td>
<td>2890</td>
<td>3191</td>
<td>10.4</td>
</tr>
<tr>
<td><strong>District Total</strong></td>
<td><strong>34506</strong></td>
<td><strong>38047</strong></td>
<td><strong>10.3</strong></td>
</tr>
</tbody>
</table>

**Source:** Social Economic abstract of Solapur district

There are important crops, which have been taken into consideration for the purpose of human consumption. The rice, wheat, jawar, bajra, maize, gram, tur, mung, udid and kulith are the principal foods grains produced in the region under study.

If we take into account, the total produced food in tons, and then it is going to give misleading picture and can not be grassped 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.

8.7 FOOD BALANCESHEET FOR 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

Table 8.3

Food Balance sheet for Solapur District in 2001

<table>
<thead>
<tr>
<th>Crops</th>
<th>Total production in Kg.</th>
<th>Total Production in tons (10% less)</th>
<th>Seed storage in tons</th>
<th>Net Feed available after extraction in tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>396250</td>
<td>3962</td>
<td>396</td>
<td>3566</td>
</tr>
<tr>
<td>Wheat</td>
<td>630003058</td>
<td>63003</td>
<td>6300</td>
<td>56703</td>
</tr>
<tr>
<td>Jawar</td>
<td>342627360</td>
<td>342627</td>
<td>34262</td>
<td>308355</td>
</tr>
<tr>
<td>Bajra</td>
<td>14923160</td>
<td>149223</td>
<td>1492</td>
<td>147727</td>
</tr>
<tr>
<td>Maize</td>
<td>43162264</td>
<td>43162</td>
<td>4316</td>
<td>38846</td>
</tr>
<tr>
<td>Gram</td>
<td>19144015</td>
<td>19144</td>
<td>1914</td>
<td>17230</td>
</tr>
<tr>
<td>Tur</td>
<td>1624791</td>
<td>1624</td>
<td>162</td>
<td>1462</td>
</tr>
<tr>
<td>Mung</td>
<td>2263482</td>
<td>2263</td>
<td>226</td>
<td>2037</td>
</tr>
<tr>
<td>Udid</td>
<td>1377493</td>
<td>1377</td>
<td>137</td>
<td>1239</td>
</tr>
</tbody>
</table>

Source: Socio-economic abstract of Solapur district.
SOLAPUR DISTRICT

Food balance sheet in 2001

Food Balancesheet

- Total Production in tons (10% less)
- Seed Storage in tons
- Net food available after extraction in tons

Figure 8.2
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. (Fig. 8.2)

In order to understand the food system, it is necessary to take into account the food balancesheet for Solapur district. First of all, it is understudy Rice, Wheat, Jawar, Bajra, Maize, Gram, Tur and Moong are the important food grain grown in the Solapur district. For the region as a whole the total converted into tons.

The table 8.4 clearly depicts the food balance sheet for the Solapur district in 2001. From the total production of each crops ten percent grain is reserved for the showing purpose for the next crops. Remaining food grain is expected to use for the consumption for human being. However, out of this a sizable portion of the grain is used for animal consumption. Apart from this sizable amount is lost for the handling and transporting it from one place to another. (Table 8.3)
In short it may be stated that the entire produced food is directly consumed by human beings because out of the total produced food some amount is kept regularly without fail in order to saw the next crops. Hence, the table 8.3 is also associated with the seed storage. After extraction, the next available food which is directly available for human diet has also been included for the important crop in the table 8.4. Finally, after extraction, the estimation of the not availability, surplus and deficit per person per day is calculated. It must be noted, that the net food available for direct consumption, fifteen percent is available after all process being done from Jawar production. Similarly, Bajra and Wheat contribute from net consumption about nine percent and thirty four percent respectively. Among pulses, Tur as well as Gram have also outstanding position in the 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 the Solapur district.

### 8.8 Tahsilwise Food Production of different Crops per Acre in kilograms:

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. The table 8.4 depicts tahsilwise food production of important crops per acre in kilogram for the year 1971 and 2001. The percentage of change of concerned crops has also been calculated for the same period. Wheat stands the most dominate crops in the region understudy. In the year 1971 Wheat was produced 32.4 percent of total food grains in the district, which increased 33.8 percent; this is followed by Jawar which contributes 31.5 percent of total food production of the district in the year
2001. The total pulses of different kinds contribute 21.5 percent food grains in the district for the year of 2001. Rice is the next important crops grown in the region understudy this contributes 15.6 percent of the total food grain in the Solapur district. Due to unfavorable climatic condition, the Bajra contributes less than 10 percent production of the district.

**Table 8.4**

**Tahsilwise Food Production of Different Crops per Acre in Kilogram**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Karmala</td>
<td>575</td>
<td>674</td>
<td>1510</td>
<td>1605</td>
<td>1100</td>
<td>1180</td>
<td>295</td>
<td>361</td>
<td>950</td>
<td>1048</td>
<td>4430</td>
<td>4868</td>
</tr>
<tr>
<td>Madha</td>
<td>230</td>
<td>259</td>
<td>1020</td>
<td>1139</td>
<td>850</td>
<td>880</td>
<td>170</td>
<td>179</td>
<td>540</td>
<td>610</td>
<td>2810</td>
<td>3067</td>
</tr>
<tr>
<td>Barshi</td>
<td>650</td>
<td>758</td>
<td>850</td>
<td>911</td>
<td>1160</td>
<td>1380</td>
<td>210</td>
<td>221</td>
<td>850</td>
<td>959</td>
<td>3720</td>
<td>4229</td>
</tr>
<tr>
<td>N.Solapur</td>
<td>295</td>
<td>366</td>
<td>916</td>
<td>1071</td>
<td>700</td>
<td>820</td>
<td>595</td>
<td>640</td>
<td>690</td>
<td>709</td>
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<td>3606</td>
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<tr>
<td>Mohol</td>
<td>605</td>
<td>696</td>
<td>1080</td>
<td>1275</td>
<td>1250</td>
<td>1320</td>
<td>510</td>
<td>558</td>
<td>525</td>
<td>563</td>
<td>3970</td>
<td>4412</td>
</tr>
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<td>Pandharpur</td>
<td>795</td>
<td>520</td>
<td>1450</td>
<td>1587</td>
<td>1000</td>
<td>1220</td>
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<td>549</td>
<td>3930</td>
<td>4061</td>
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<td>Malshiras</td>
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<td>222</td>
<td>1420</td>
<td>1596</td>
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<td>1000</td>
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<td>339</td>
<td>535</td>
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<td>3709</td>
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<td>Sangola</td>
<td>405</td>
<td>415</td>
<td>650</td>
<td>790</td>
<td>950</td>
<td>1025</td>
<td>220</td>
<td>236</td>
<td>680</td>
<td>700</td>
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<td>812</td>
<td>875</td>
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<td>1320</td>
<td>1450</td>
<td>205</td>
<td>254</td>
<td>305</td>
<td>343</td>
<td>3200</td>
<td>3820</td>
</tr>
<tr>
<td>S.Solapur</td>
<td>405</td>
<td>450</td>
<td>925</td>
<td>1055</td>
<td>980</td>
<td>990</td>
<td>190</td>
<td>196</td>
<td>990</td>
<td>1042</td>
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<td>3733</td>
</tr>
<tr>
<td>Akkalkot</td>
<td>680</td>
<td>746</td>
<td>490</td>
<td>585</td>
<td>750</td>
<td>820</td>
<td>160</td>
<td>165</td>
<td>1025</td>
<td>1122</td>
<td>3105</td>
<td>3438</td>
</tr>
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<td><strong>District Total</strong></td>
<td><strong>5345</strong></td>
<td><strong>5918</strong></td>
<td><strong>11186</strong></td>
<td><strong>12575</strong></td>
<td><strong>10960</strong></td>
<td><strong>12085</strong></td>
<td><strong>3035</strong></td>
<td><strong>3334</strong></td>
<td><strong>7600</strong></td>
<td><strong>8197</strong></td>
<td><strong>38126</strong></td>
<td><strong>42109</strong></td>
</tr>
</tbody>
</table>

**Source:** The Gazetteers Department of Solapur district

There are wide variations, spatially and temporally within the region understudy 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.

Wheat is the most important crops grown in the region, the per acre production is highest for Karmala tahsil for the both the years of 1971 and 2001 due to unsuitable climatic condition the lowest production was observed for Akalkot. Due to better irrigation facilities Malshiras and Pandharpur have also recorded much higher production per acre than the district average. Madha, Mohol have shown average production per acre during 1971-2001. Mangalwedha, Sangola and Barshi have shown much lower production per acre.

Similarly, Rice has shown higher production per acre for Pandharpur tahsil. It is followed by Akkalkot for the both the years. Rice also varies from tahsil to tahsil as far as the production per acre is concerned. Madha, North Solapur, Malshiras have shown much lower production per acre in Solapur district.

Bajra, though not a very important crop grown in the region under study, even it is grown in certain tahsils by the farmers where rainfall and soil conditions are suitable. The highest out turn is recorded per acre for North Solapur tahsil, while the lowest for the Akkalkot tahsil. The production of Bajra per acre varies from one tahsil to another. The production of Bajra per acre varies from one tahsil to another depending upon the geographical conditions.

Pulses are the most important food grains in day to day life. There are number of Pulses grown in the Solapur district. Tur, Moong and Gram are the chief pulses in the region under study. Akkalkot and Karmala is
the area within the district, where per acre out turn is maximum. Managalwedha on the other hand shows low production of the pulses varies from one tahsil to another depending upon the geographical condition.

8.9 FOOD AVAILABILITY PER PERSON PER DAY IN GRAMS (1971-2001):

In the region understudy, most of the population is vegetation therefore generally non vegetarian products are not considered for the analysis. Though, a sizable proportion of the people also consume other products like fish, meat and other sources of calories. Milk and milk products, are not sufficiently consumed by common people due to poor economic conditions. The products of vegetables and food are consumed to a larger extent. Cost and availability of food put limitation in the consumption by the people. According to 2001 census, in the region under study about twenty five percent of the population is under poverty line and hence, can not afford even consumption of sufficient food grains.

Therefore, foodgrains are important items of diet in Solapur district. These are staple food and people in different parts of Solapur district, live on one or other kind of food grains. These include rather different kind of food grains which are:

1) Cereals and 2) Pulses

The group of cereals includes, Rice, Wheat, Jawar, Bajra and Maize as important food crops in the region under study. Cereals do not defer very much among themselves either in chemical composition or in nutritive value. These are all rich in carbohydrates consequently, their energy value is quite high, the amount of fat is quite small. Their protein contain is rather low. Cereals are also not very rich source of minerals salts like calcium and iron, though they are fairly rich in phosphorus.
Rice does not supply enough substances, which the body needs, hence, it is poor source of vitamins and minerals especially of calcium. Wheat is in some way a better, all round food since it has largest protein contain of all cereals. Wheat also has little more of calcium and richer in the B vitamins than the rice.

Now, let us turn our attention, towards the availability of cereals and pulses, per capita per day for the year 1971 and 2001. In order to understand, the magnitude of the problem associated with the pressure of population on food products and its availability of cereals per capita per day in gram has been calculated for 261 gram and 752 gram for the year 1971 and 2001 respectively. For the pulses, it is 42 gram and 35 gram per capita per day for the year 1971 and 2001 respectively. It will be of great interest to see, the availability of cereals as well as for pulses for district as a whole and for its various tahsils.

8.9.1 The Availability of Cereals per person per day:

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. (Table 8.5)

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.

Table 8.5
Food Availability per person per day in Grams (1971-2001)

<table>
<thead>
<tr>
<th>Tahsil</th>
<th>Availability of cereals per capita per day in gram</th>
<th>Availability of pulses per capita per day in gram</th>
<th>Total food availability in grams per capita per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karmala</td>
<td>297</td>
<td>725</td>
<td>22</td>
</tr>
<tr>
<td>Madha</td>
<td>256</td>
<td>275</td>
<td>20</td>
</tr>
<tr>
<td>Barshi</td>
<td>500</td>
<td>562</td>
<td>101</td>
</tr>
<tr>
<td>N.Solapur</td>
<td>109</td>
<td>83</td>
<td>28</td>
</tr>
<tr>
<td>Mohol</td>
<td>233</td>
<td>627</td>
<td>16</td>
</tr>
<tr>
<td>Malshiras</td>
<td>283</td>
<td>372</td>
<td>102</td>
</tr>
<tr>
<td>Sangola</td>
<td>175</td>
<td>700</td>
<td>3</td>
</tr>
<tr>
<td>Mangalwedha</td>
<td>92</td>
<td>994</td>
<td>2</td>
</tr>
<tr>
<td>Pandharpur</td>
<td>390</td>
<td>372</td>
<td>21</td>
</tr>
<tr>
<td>S.Solapur</td>
<td>44</td>
<td>422</td>
<td>12</td>
</tr>
<tr>
<td>Akkalkot</td>
<td>130</td>
<td>504</td>
<td>42</td>
</tr>
<tr>
<td><strong>District Total</strong></td>
<td><strong>261</strong></td>
<td><strong>752</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

**Source**: Socio-economic abstract of Solapur district.

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. (Fig. 8.3)

8.9.2 Availability of Pulses per person per day in Grams:

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 highest availability of pulses is found in Pandharpur tahsil, where it was as high as 102 gram per person per day. It is followed by Barshi tahsil as far as the availability of pulses per person is concerned. The lowest availability of pulses is found for Sangola and Malshiras tahsils in the year 1971. Except, the two tahsil namely Pandharpur and Barshi, all other tahsils have shown much lower availability of pulses per person per day.
Similarly, in the year 2001, the average availability of pulses per person per day is calculated to 35 grams, which substantially declined from 42 gram in the year 1971. This decline in the availability of pulses may be attributed to high growth of population and transferring of area under other cash crops in the region under study.

Mohol tahsil recorded the highest availability of pulses per person per day in grams in the year 2001, where it was as high as 192 grams. It was followed by Akkalkot tahsil where it was 92 gram per person. North Solapur, Pandharpur, Mangalwedha and Malshiras tahsil have recorded much lower availability of pulses per person per day. This is due to increasing trend in cash crops particularly for sugar cultivation.

8.9.3 Total food availability in grams per person per day:

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. (Fig. 8.4)

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.

8.10 Food Availability, Surplus and Deficit per person per day in Gram:

The minimum requirement of food per person per day as a diet, in Indian condition, may consist of cereals of 400 gram and pulses of fifty grams. The availability of locally produced quantities of food including cereals and pulses is calculated for all the tahsils of Solapur district for both the year of 1971 and 2001. For the district as a whole, the regions under consideration have 303 gram and 787 grams per person per day for 1971 and 2001 respectively. There are eleven tahsils in the district in which all the tahsils have much lower food per person per day in grams. However, in the year 2001, there were six tahsils having food higher than the minimum requirement. These tahsils are Karmala, Barshi, Mohol, Sangola, Mangalwedha and Akkalkot. North Solapur tahsil is the most urbanized and industrialized tahsil of the district. The availability of food tremendously differ from one region to another, being higher for Mangalwedha and lowest for North Solapur tahsil, where it was 1003 gram and 87 gram per person per day in the year 2001. It has also been revealed by the concerned table that there are many differences within the district of Solapur district.
SOLAPUR DISTRICT

Total food Availability in Grams per person per day

1971

Total food Availability in Grams per person per day

2001

Food Availability in grams
- Above 400
- 200 - 400
- Below 200

Figure 8.4
### Table 8.6

Food Availability, food surplus and deficit per person per day in grams in Solapur district (450 grams)

<table>
<thead>
<tr>
<th>Tahsil</th>
<th>Availability cereals per capita per day in gram</th>
<th>Availability of pulses per capita per day in gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karmala</td>
<td>319</td>
<td>759</td>
</tr>
<tr>
<td>Madha</td>
<td>276</td>
<td>312</td>
</tr>
<tr>
<td>Barshi</td>
<td>601</td>
<td>620</td>
</tr>
<tr>
<td>N.Solapur</td>
<td>137</td>
<td>87</td>
</tr>
<tr>
<td>Mohol</td>
<td>249</td>
<td>819</td>
</tr>
<tr>
<td>Pandharpur</td>
<td>385</td>
<td>377</td>
</tr>
<tr>
<td>Malshiras</td>
<td>178</td>
<td>286</td>
</tr>
<tr>
<td>Sangola</td>
<td>94</td>
<td>721</td>
</tr>
<tr>
<td>Mangalwedha</td>
<td>411</td>
<td>1003</td>
</tr>
<tr>
<td>S.Solapur</td>
<td>56</td>
<td>454</td>
</tr>
<tr>
<td>Akkalkot</td>
<td>172</td>
<td>596</td>
</tr>
<tr>
<td><strong>District Total</strong></td>
<td><strong>303</strong></td>
<td><strong>787</strong></td>
</tr>
</tbody>
</table>

**Source**: Socio-economic abstract of Solapur district.

**8.10.1 Surplus and Deficit Food per person per day in Grams:**

Before, entering in the spatial pattern of surplus and deficit food per person per day in grams, it should be made clear at the very outset, that the diet represented for Solapur district and for its different tahsils include both cereals and pulses. Since, Solapur district belongs to draught prone region of Maharashtra, hence it is expected that there should be deficit of food. For the year 1971, there was deficit of food of about 147 gram per person per day for region as a whole. Unfortunately, there was not a single region in Solapur district which represented surplus food. But
due to improvement, in irrigation and use of fertilizer and other means of mechanization, the production in agriculture has tremendously increased during the last thirty years. As a result of it, there was surplus food in the year 2001, which was as high as 337 gram per person per day. (Fig. 8.5)

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 immigrant 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 tahsil. (Fig. 8.6)

8.11 Food in Calories:

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.

Different food stuffs have different values in terms of calories. Human beings can get calories and other nutrients from four groups of food stuffs.

1) Food grains of different cereals and pulses.
2) Vegetables and fruits.
3) Milk and milk products.
4) Meat, fish and eggs.

Among all these food stuffs, as per preceding discussion, food grains are more important in the common people diet in Solapur district.

8.11.1 Total Calories Produced in Million:

Further, an attempt has been made to find out the total calories produced by adding the total calories from the locally produced cereals and pulses. As an 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 (Table 8.7)

<table>
<thead>
<tr>
<th>Tahsil</th>
<th>Year</th>
<th>Population</th>
<th>Total food production or availability of calorie in million (000000)</th>
<th>Requirement of total calories in million</th>
<th>Production or availability of calories per person per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karmala</td>
<td>1971</td>
<td>151493</td>
<td>172</td>
<td>333</td>
<td>1132</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>233316</td>
<td>605</td>
<td>513</td>
<td>2694</td>
</tr>
<tr>
<td>Madha</td>
<td>1971</td>
<td>192710</td>
<td>186</td>
<td>424</td>
<td>980</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>292611</td>
<td>324</td>
<td>644</td>
<td>1108</td>
</tr>
<tr>
<td>Barshi</td>
<td>1971</td>
<td>262716</td>
<td>561</td>
<td>578</td>
<td>2134</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>340831</td>
<td>750</td>
<td>750</td>
<td>2201</td>
</tr>
<tr>
<td>N.Solapur</td>
<td>1971</td>
<td>487134</td>
<td>237</td>
<td>107</td>
<td>486</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>960803</td>
<td>297</td>
<td>212</td>
<td>309</td>
</tr>
<tr>
<td>Mohol</td>
<td>1971</td>
<td>142334</td>
<td>126</td>
<td>313</td>
<td>884</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>252586</td>
<td>734</td>
<td>556</td>
<td>2904</td>
</tr>
<tr>
<td>Pandharpur</td>
<td>1971</td>
<td>187613</td>
<td>257</td>
<td>413</td>
<td>1366</td>
</tr>
<tr>
<td>-------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Malshiras</td>
<td>226480</td>
<td>422600</td>
<td>143</td>
<td>429</td>
<td>498</td>
</tr>
<tr>
<td>Sangola</td>
<td>155516</td>
<td>272077</td>
<td>52</td>
<td>696</td>
<td>342</td>
</tr>
<tr>
<td>Mangalwedha</td>
<td>107823</td>
<td>171261</td>
<td>157</td>
<td>609</td>
<td>237</td>
</tr>
<tr>
<td>S. Solapur</td>
<td>133343</td>
<td>210774</td>
<td>26</td>
<td>446</td>
<td>293</td>
</tr>
<tr>
<td>Akkalkot</td>
<td>206678</td>
<td>290037</td>
<td>126</td>
<td>614</td>
<td>455</td>
</tr>
<tr>
<td>District</td>
<td>2253840</td>
<td>3849543</td>
<td>2425</td>
<td>10756</td>
<td>4958</td>
</tr>
</tbody>
</table>

**Source**: Socio-economic abstract of Solapur district

The figures of calories were calculated in million, and hence these were so large to accommodate in the column of the table. Therefore, the total calories have been given in million (000000) and in the same way it was also applied for the total requirement of the calories which were also in million.

**8.11.2 Total Production and Availability of Calories per person per day:**

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. (Fig. 8.7)

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.

8.11.3 Availability of Calories per Capita per day:

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. In many other tahsil the availability of calories was marginal, such as in Barshi tahsil and Akkalkot. Mohol, Sangola and Akkalkot recorded calories per person per day little more than the requirement in 2001. In other rest tahsil the availability of calories was lower than the minimum requirement per person per day. The production of calories is depending upon the geographical conditions of the tahsil, particularly in terms of soil types, favorable climatic condition of temperature and rainfall. Apart from this the rate of input like fertilizer, proportion of area under irrigation have also affected the agricultural production in general and calories in particular in the year 2001.

8.11.4 Surplus and Deficit Calories per person per day (1971-2001):

So far we have discussed about the total production of calories in each tahsil of the Solapur district for the period 1971 and 2001. For both the years, 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. (Table 8.8)

Table 8.8
Availability of Calories per person per day (1971-2001)

<table>
<thead>
<tr>
<th>Tahsil</th>
<th>Availability of calories per person per day</th>
<th>Deficit and surplus calories per person per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karmala</td>
<td>1132</td>
<td>2694</td>
</tr>
<tr>
<td>Madha</td>
<td>980</td>
<td>1108</td>
</tr>
<tr>
<td>Barshi</td>
<td>2134</td>
<td>2201</td>
</tr>
<tr>
<td>N.Solapur</td>
<td>486</td>
<td>309</td>
</tr>
<tr>
<td>Mohol</td>
<td>884</td>
<td>2907</td>
</tr>
<tr>
<td>Pandharpur</td>
<td>1366</td>
<td>1388</td>
</tr>
<tr>
<td>Malshiras</td>
<td>632</td>
<td>1015</td>
</tr>
<tr>
<td>Sangola</td>
<td>334</td>
<td>2559</td>
</tr>
<tr>
<td>S. Solapur</td>
<td>198</td>
<td>1612</td>
</tr>
<tr>
<td>Mangalwedha</td>
<td>1469</td>
<td>3561</td>
</tr>
<tr>
<td>Akkalkot</td>
<td>611</td>
<td>2116</td>
</tr>
<tr>
<td><strong>District Total</strong></td>
<td><strong>1076</strong></td>
<td><strong>2794</strong></td>
</tr>
</tbody>
</table>

Source: Socio-economic abstract of Solapur 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. (Fig. 8.8)

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.
SOLAPUR DISTRICT
Availability of Calories per person per day

1971

2001

Availability of Calories
- Above 2100
- 1300 - 2100
- Below - 1300

Surplus and deficit Calories per person per day

1971

2001

Figure 8.8
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. (Fig. 8.9)

8.12 Evaluation of food sufficiency in Solapur district:

The evaluation of sufficiency of food production in Solapur district is the purpose of this attempt. The information regarding, the level of food sufficiency in respect of food products, is an important endeavor; for the formulation of food strategy and rational distribution of food products. The knowledge of surplus - deficit situation with respect to food, is important to find out food sufficiency. The term, food sufficiency refers, to the level of human satisfaction in respect of production of food
SOLAPUR DISTRICT
Surplus and deficit Calories (1971 - 2001)

Surplus Calories

Deficit Calories

Surplus and Deficit in year

Fig. No.8.9
stuffs in the areas, occupied by a group of human individuals. Food sufficiency is related to food productivity and consumption. Food productivity is related to the amount of food stuffs produced per unit of farm land or per worker engaged in its production. This is expressed, either in weight or monetary gains from the field. Food consumption refers to the power of human individuals of a community, to consume, the available food products. It is related to the estimation at the amount of food grains, which is actually available to human diet. They may be produced locally or may be transported from elsewhere. Generally, level of food intake for majority of people is mainly related to the available food stuffs within the territory. Food sufficiency is determined by two different ways as given below:

1. Estimation of food products from different sources.
2. Estimation of amount of food which may be available for human consumption locally or elsewhere.

8.12.1 Estimation of food product from different sources:

Food availability is related with different sources. Food availability is mainly concerned with the production of food grains in certain regions.

1. A food of greater segment for population is based primarily on the cereals and pulses.

2. The principal difficulty in the determination of food supply from all the sources of food is the paucity of the data regarding food stuffs, obtained from the sources other than the food stuffs.

3. Other sources are food stuff from animal meat, eggs, milk, fishes and fruits, which are rarely available in statistically record. The data of animals is not sufficient to find out their products as food stuffs, because, average yield cannot be determined very easily. In case of milk production location period varies, which cannot be
determined. Therefore, food grains availability is considered as main source of food stuffs.

4. Resources of food stuffs, other than food grain can be consumed by a certain segment of population. Price of these resources is more and cannot be affordable by the people of middle and low income groups; indeed, it covers a large segment of population. Therefore, locally available food grains are considered as basic source of food stuff on which evaluation of food sufficiency depends.

Estimation of food grain availability; involve debating the quantities, which cannot be used for human consumptions. Food grains, also transported from other areas also are not considered in the availability because:

1. The data regarding transportation of food grains is difficult to assemble at the micro level in our region.
2. During the transportation of the food grains; no permanent loss of food grain is involved.
3. The basic purpose of measurement of availability is related to knowledge of the surplus - deficit position of the areas; the transportation from other areas would hardly have any relevance in availability estimated.
4. If transported food grain from other areas are considered then it can show only the level of consumption, not the relation between production and consumption at regional and local level.

8.13 Estimation of losses:

Generally, actual output of food grain is not totally available for consumption. Different amount of losses, at different stages in various forms, are found from production in the fields, up to the consumption of population. It is commonly accepted facts by the agricultural experts, that
generally; ten percent losses are considered in actual production, before finding access to kitchen. Two important deductions are considered; to estimate food grains available for the consumption.

8.13.1 **Seed rates:** The term refers, to quantity of food grains, kept reserve as a seed for next sowing period. The Famine Inquiry Commission of India; adopted a general seed rate; of six percent for all crops rose in India. Average rate adopted for all crops combined together would be responsible for misleading results. Some experts from Jawaharlal Nehru Agricultural University suggested that seed rate for different crops vary in kilogram per hectare. Even, variations in regional characteristics affect the seed rates. Variations in terrain, soil condition, climatic condition, water supply and use of fertilizers and pesticides also affect seed rates. In this particular study; the seed rates suggested by J.N.U. are considered as standard rates; irrespective of variations in other agricultural factors.

8.13.2 **Extraction rates:** This refers, to the loss of grains in the process of extraction of edible parts from food grains. Extraction rates, vary from one crop to another crop. Different methods are used for calculation of extraction rates; average loss of grains in Solapur district is 12.3 percent. This rate of loss varies from crop to crop. For example in jowar and maize, this loss is only seven percent. In Gram and Tur, this rate of loss is twenty percent. Therefore, actual crop production and loss of extraction is calculated individually for construction of food balance sheets.

8.13.3 **Losses from other sources:** Apart from losses of grains, involved in seed storage and extraction, some amount also suppose to be loosed in cattle feeding, manufacturing and damages occurring through poor management harvesting, fungus storage, poor quality of sacks and containers and un- experienced handling in transport. In this study, losses through these sources are not considered, because, accurate data on
damages are difficult to collect. In Solapur district, the edible part of the grain is rarely used for cattle feeding. The edible part, from the food crop, is used as cattle food, good packages high quality of sacks are using for the transportation of food grain, even transportation becomes efficient and well managed, therefore, percentage of losses through, these sources are not considerably significant in the region under study.

8.14 FOOD SUFFICIENCY:

Sufficiency of food products is standard dietary requirement of an individual and there are three approaches to estimate food sufficiency.

1. Comparison of per capita availability of food stuffs: with the balance dietary composition of an average individual.

2. Conversion of per capita availability of food stuffs into energy and comparison with the standard requirement of, two thousand two hundred calories for an average individual per day.

3. Conversion of per capita availability of food stuffs into various nutritive factors and comparison with their standard requirement of an average person. Composition of balanced vegetarian diet of an average Indian individual; is given in the following table. (Table 8.9)

In the balance vegetarian diet; cereals and pulses are important food stuffs; mainly in poor and middle class people to get standard requirement of energy and nutrients. It gives an idea of food factors obtained by standard vegetarian diet which are essential for the individual.
Table 8.9

Balanced vegetarian diet

<table>
<thead>
<tr>
<th>Food stuffs</th>
<th>Per person per day amount in grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>369.5</td>
</tr>
<tr>
<td>Pulses</td>
<td>68.6</td>
</tr>
<tr>
<td>Leafy vegetables</td>
<td>107.4</td>
</tr>
<tr>
<td>Other vegetables</td>
<td>124.5</td>
</tr>
<tr>
<td>Fruits</td>
<td>37.1</td>
</tr>
<tr>
<td>Milk</td>
<td>178.4</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>37.6</td>
</tr>
<tr>
<td>Sugar and jiggery</td>
<td>46.3</td>
</tr>
</tbody>
</table>

**Source:** Gopalan C: Diet atlas of India: National Institute of Nutrition, Hyderabad.

According to one estimate of FAO, the average energy requirement of Indian person is 2,150 k calories per day. The planning commission, Government of India has worked out 2400 and 2100 k calories as the minimum requirement for an Indian for rural and urban areas respectively.

Now the question arises, that how does food stuffs is transformed into life energy and how does it keep us alive? The chief functions of foods are of three folds.

**8.14.1 To yield energy:**

The main function of food is to provide: fuel for the generation of energy in the human body, this energy is provided by mainly, through
Table 8.10
Food factor: Requirement of an average person in Solapur district

<table>
<thead>
<tr>
<th>Food factor</th>
<th>Standard required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>2400 k calories</td>
</tr>
<tr>
<td>Protein</td>
<td>68 grams</td>
</tr>
<tr>
<td>Fat</td>
<td>60 grams</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>6.05 grams</td>
</tr>
<tr>
<td>Calcium</td>
<td>900 milligrams</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>1000 milligrams</td>
</tr>
<tr>
<td>Iron</td>
<td>17 milligrams</td>
</tr>
<tr>
<td>Carotene</td>
<td>1500 micro milligrams</td>
</tr>
<tr>
<td>Thiamin</td>
<td>1.0 milligrams</td>
</tr>
<tr>
<td>Niacin</td>
<td>12.6 milligrams</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>1.4 milligrams</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>49 milligrams</td>
</tr>
</tbody>
</table>

Source: Gopalan, C: Diet atlas of India, National Institute of Nutrition-Hyderabad.

Carbohydrates and proteins: Carbohydrates are of two kinds: starch and sugar. Starch is obtained from mainly rice and cereals. While sugar is obtained by sugar cane, honey and fruits. Consumption of carbohydrates in the form of sugar; is not affordable by low income group; even not by high income group on large scale, because of its ill effects on health. Therefore, carbohydrates in the form of starch are important for human beings. It means, that rice and other cereals have very special weight age in the daily food of human beings to get energy.
8.14.2 To build and renew body structure:-

The second function of food is to provide materials necessary for the growth and building of the body, as also for its repairs. Proteins help to build and renew body structure. These proteins are to be found both in animal products like milk, eggs, meat, fish and vegetable products like pulses and nuts, to a certain extent in cereals. Animal products are costly and in some areas religious taboos do not allow to eat. Therefore, pulses and cereals are important sources of proteins.

8.14.3 To regulate internal condition and processes:-

For this function certain elements, in food are necessary. They are known to us as vitamins. A name given to them in 1912, from "vita' which means life. Different vitamins have different functions. Generally, these vitamins are available by standard recommended diet. In sufficient diet sometimes, it may caused deficiency of vitamins required to regulate internal condition and processes. According to all this discussion it is very clear that cereals and pulses are more important food factors in Solapur district.

8.15 ANALYSIS OF SURPLUS AND DEFICIT AREAS:

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.

8.16 SPATIAL DIMENSION OF SURPLUS AND DEFICIT
AREAS:

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 (Table 8.11)

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

8.16.1 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.

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Title</th>
<th>Surplus-deficit range per person per day in gram</th>
<th>Tahsil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slightly Surplus area</td>
<td>below 300 grams</td>
<td>Barshi, Sangola, South Solapur, Akkalkot</td>
</tr>
<tr>
<td>2</td>
<td>Highly surplus</td>
<td>Above 300 grams</td>
<td>Karmala, Mohol, Mangalwedha</td>
</tr>
<tr>
<td>3</td>
<td>Slightly Deficit area</td>
<td>Below 300 grams</td>
<td>Madha, Malshiras, Pandhapur</td>
</tr>
<tr>
<td>4</td>
<td>Highly deficit area</td>
<td>Above 300 grams</td>
<td>North Solapur</td>
</tr>
</tbody>
</table>
SOLAPUR DISTRICT

Surplus and deficit area of food availability (2001)
in gram per person per day

Areas of Surplus and Deficit Food Availability

<table>
<thead>
<tr>
<th>Slightly Surplus</th>
<th>Below 300 gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Surplus</td>
<td>Above 300 gram</td>
</tr>
<tr>
<td>Slightly Deficit</td>
<td>Below 300 gram</td>
</tr>
<tr>
<td>Highly Deficit</td>
<td>Above 300 gram</td>
</tr>
</tbody>
</table>

Fig. No.8.10
8.16.2 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)

8.16.3 Slightly Deficit Areas:
Slightly deficit areas represents below 300 gram food per person per day. It includes Madha, Malshiras and Pandharpur 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 Pandharpur is having large number of immigrants, and high proportion of urban population.

8.16.4 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.
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CHAPTER – IX
CORRELATION MATRIX OF THE VARIABLES INFLUENCING GROWTH OF POPULATION AND AGRICULTURE PRODUCTIVITY IN SOLAPUR DISTRICT

A) CORRELATION MATRIX OF THE VARIABLES, INFLUENCING THE GROWTH OF POPULATION IN SOLAPUR DISTRICT

INTRODUCTION
9.1 GROWTH RATE OF POPULATION AND BIRTH RATE:
9.2 GROWTH RATE OF POPULATION AND INFANT MORTALITY RATE:
9.3 GROWTH RATE OF POPULATION AND LITERACY RATE:
9.4 GROWTH OF POPULATION AND MALE LITERACY:
9.5 GROWTH OF POPULATION AND FEMALE LITERACY:
9.6 GROWTH OF POPULATION AND PERCENTAGE OF RURAL POPULATION:
9.7 GROWTH OF POPULATION AND PERCENTAGE OF URBAN POPULATION:
9.8 GROWTH OF POPULATION AND WORKERS IN AGRICULTURE:
9.9 GROWTH OF POPULATION AND PROPORTION OF WORKERS IN MANUFACTURING:
9.10 GROWTH OF POPULATION AND PER CAPITA INCOME
9.11 GROWTH OF POPULATION AND DENSITY OF POPULATION
9.12 GROWTH OF POPULATION AND SEX-RATIO
9.13 GROWTH OF POPULATION AND AGE AT MARRIAGE FOR MALE
9.14 GROWTH OF POPULATION AND AGE AT MARRIAGE FOR FEMALE
9.15 GROWTH OF POPULATION AND PROPORTION OF MUSLIM POPULATION
9.16 GROWTH OF POPULATION AND PROPORTIONS OF HINDU POPULATION
9.17 GROWTH OF POPULATION AND ROAD DENSITY
9.18 GROWTH OF POPULATION AND PERCENTAGE OF SCHEDULE CASTE
9.19 GROWTH OF POPULATION AND PERCENTAGE SCHEDULE TRIBE POPULATION
9.20 GROWTH OF POPULATION AND PERSONS PER HOUSEHOLD
9.21 GROWTH OF POPULATION AND DEATH RATE