CHAPTER - IV

AGRICULTURAL TECHNOLOGY AND
LANDUSE PATTERN

4.1 INTRODUCTION

4.2 LAND UTILIZATION

4.3 TAHSILWISE LAND UTILIZATION

4.4 AGRICULTURAL TECHNOLOGY AND AGRARIAN STRUCTURE

4.5 TEMPORAL CHANGES IN AREA UNDER HYVS OF SELECTED CROPS

4.6 CROP DIVERSIFICATION ANALYSIS

4.7 REFERENCES
CHAPTER – IV

AGRICULTURAL TECHNOLOGY AND LANDUSE PATTERN

4.1 INTRODUCTION

In the preceding Chapter, an attempt has been made to present the type of agricultural technology of the study region. In this Chapter, study has been made to analyze the agricultural technology with context of landuse pattern. Landuse means the surface utilization of all developed and vacant land on specific point at a given time and space. This leads one back to the village farm and farmers to the fields, garden, pastures, fallow land, forest land to the isolated farmsteads as a geography deals with the spatial relationship between these aspects and planning (T.V. Freeman, 1968).

Landuse is the most important natural resource of a country and changes in landuse occurred with the development of agricultural technology. The land surface is fixed and of this only a certain proportion is available for cultivation. It is necessary to ascertain the extent to which land, now lying waste can become available for cultivation (Gurjar, 1987). The study of landuse pattern is of primary concern of geographers to know the relationship between man and natural environment (Tripathi and Viswakarma, 1980). The availability of land and its proper use is important in agriculture for raising the productivity. Generally, topography, soil, climatic condition and manmade factors viz. irrigation facility and high yielding varieties of seeds are affecting on landuse pattern.

There is little doubt that efficient use of land depends as much upon the capacity of man to treat the land and manage it, as upon the system of farming. The nature and intensity of landuse is closely related to the technology adopted by man. It can be changes by using the various technologies in agriculture. Land in India is classified under nine different categories viz. forest, area not available for cultivation, land put to non-agricultural uses, cultivable waste, permanent pastures and other grazing lands, miscellaneous tree crops and groves not included in the net area sown, fallow land, current fallow and net area sown.
4.2 LAND UTILIZATION

Landuse pattern is invariably determined by physio-socio-economic and organizational factors. It represents the use of districts natural resources. It is a dynamic phenomenon as it changes with the introduction of new technology, such as irrigation and other inputs. Such type of study may help in understanding the regional variations, which correspond with the development of agricultural technology. The total geographical area of the district is 1487843 hectares.

There are spatial variations in the general landuse pattern in the study region. The land is grouped into five major types of uses, namely (a) Forest, (b) Area not available for cultivation, (c) Other uncultivated land, (d) Fallow land, (e) Net area sown. But, for the purpose of this study, five categories are grouped in two major classes, viz. (I) Non Arable, (II) Arable. The first three landuse categories are put in non-arable group and the last two categories are grouped under the head of arable land.

Table 4.1: Solapur District: General Landuse Pattern, 1993-94 and 2013-14

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Landuse Categories</th>
<th>Area in Hectares 1993-94</th>
<th>%</th>
<th>Area in Hectares 2013-14</th>
<th>%</th>
<th>Volume of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forest</td>
<td>35078</td>
<td>2.35</td>
<td>31947</td>
<td>2.14</td>
<td>-0.21</td>
</tr>
<tr>
<td>2</td>
<td>Area Not Available for Cultivation</td>
<td>68466</td>
<td>4.60</td>
<td>79217</td>
<td>5.32</td>
<td>0.72</td>
</tr>
<tr>
<td>3</td>
<td>Other Uncultivated Land</td>
<td>90540</td>
<td>6.08</td>
<td>33595</td>
<td>2.25</td>
<td>-3.83</td>
</tr>
<tr>
<td>4</td>
<td>Fallow Land</td>
<td>238193</td>
<td>16.00</td>
<td>205180</td>
<td>13.79</td>
<td>-2.21</td>
</tr>
<tr>
<td>5</td>
<td>Net Area Sown</td>
<td>105566</td>
<td>70.97</td>
<td>1137904</td>
<td>76.50</td>
<td>5.53</td>
</tr>
<tr>
<td>6</td>
<td>Area Sown More Than Once</td>
<td>50120</td>
<td>5.69</td>
<td>80835</td>
<td>6.87</td>
<td>1.18</td>
</tr>
<tr>
<td></td>
<td>Total Geographical Area</td>
<td>1487843</td>
<td></td>
<td>1487843</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table 4.1 reveals that out of the total geographical area, about 13.03 percent of its total area is non-arable in the year 1993-94 as against 9.71 percent in 2013-14. The proportion of arable land is 86.97 in the year 1993-94 and it increases upto 90.29 percent during the year 2013-14. There is marked 3.32 percent increase in the arable land during the period of investigation. Out of the total available land about 76.50 percent (2013-14) is actually cultivated for crops. Some changes in the general land
use have been observed during the period under investigation. The area under forest has decreased (0.21%), where recently agricultural technology particularly irrigation technology is made available. The negative change is also observed in other uncultivated land (3.83%) and fallow land (2.21%) and positive change in area not available for cultivation (0.72%) during the period under consideration. The proportion of net sown area was 70.97 percent in 1993-94 and it has increased by 5.53 percent, where irrigation facilities are extended. The basic benefit of agricultural technology is that it will increase the land under cultivation. There will be less land lying fallow (Singh and Dhillon, 1984). Similarly, it is also seen from Table 4.1 that 80835 hectares (6.87 percent of net sown area) is the area sown more than one.

4.3 TAHSILWISE LAND UTILIZATION

To analyze and interpret the tehsil-wise general landuse of the Solapur district for the period of twenty years is considered. In the present study instead of taking five landuse categories, they are grouped conveniently into three landuse categories as fallow (I) Non-agricultural landuse, (II) Potential agricultural landuse, (III) Agricultural land.

Due to the location, physio-socio-economic conditions and organizations, factors such as new agricultural technology prevails in the district. The general land use differs from tahsil to tahsil. Physical attributes and socio-economic structure put a stop upon landuse in the study region.

Table 4.2 shows the changes in general land use in Solapur district.

I) NON-AGRICULTURAL LANDUSE

Non-agricultural landusecovered about 6.95 percent and 7.46 percent to the total geographical area in the district during 1993-94 and 2013-14 respectively. Non-agricultural landuse included forest and area not available for cultivation, etc. In other words, they include the land, which cannot be brought under cultivation unless at a very high cost (Shinde, S.D., 1974).

The highest non-agricultural landuse is observed in Mohol tahsil (13.13%) and lowest in Akkalkot (0.71%) tahsil in the year 2013-14. Above district average (7.46%) non-agricultural land use is found in North Solapur (8.90%), Mohol (13.13%), Pandharpur (12.90%), Sangola (11.86%) tahsils. Whereas, below district
average non-agricultural land use is noticed in Karmala (7.08%), Madha (3.82%), Barshi (6.11%), Malshiras (2.93%), Mangalweda (7.24%), South Solapur and Akkalkot tahsils during the same year (Fig. 4.1A).

Table 4.2: Solapur District: Tahsil-wise Landuse 1993-94 and 2013-14 (in %)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of Tahsil</th>
<th>Year</th>
<th>Geographical Area</th>
<th>Non-Agricultural Land</th>
<th>Potential Land</th>
<th>Agricultural land</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Karmala</td>
<td>1993-94</td>
<td>159600</td>
<td>10.48</td>
<td>5.38</td>
<td>83.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>159600</td>
<td>7.08</td>
<td>5.07</td>
<td>87.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.4</td>
<td>-0.31</td>
<td>3.96</td>
</tr>
<tr>
<td>2</td>
<td>Madha</td>
<td>1993-94</td>
<td>152600</td>
<td>1.88</td>
<td>3.75</td>
<td>94.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>152600</td>
<td>3.82</td>
<td>5.25</td>
<td>90.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.94</td>
<td>1.5</td>
<td>-3.44</td>
</tr>
<tr>
<td>3</td>
<td>Barshi</td>
<td>1993-94</td>
<td>152200</td>
<td>5.45</td>
<td>6.09</td>
<td>89.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>152200</td>
<td>6.11</td>
<td>4.55</td>
<td>89.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.66</td>
<td>-1.54</td>
<td>0.08</td>
</tr>
<tr>
<td>4</td>
<td>North Solapur</td>
<td>1993-94</td>
<td>68300</td>
<td>3.24</td>
<td>0.43</td>
<td>96.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>68300</td>
<td>8.90</td>
<td>2.04</td>
<td>89.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.66</td>
<td>1.61</td>
<td>-7.27</td>
</tr>
<tr>
<td>5</td>
<td>Mohol</td>
<td>1993-94</td>
<td>131700</td>
<td>14.62</td>
<td>2.17</td>
<td>83.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>131700</td>
<td>13.13</td>
<td>1.68</td>
<td>85.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.49</td>
<td>-0.49</td>
<td>1.98</td>
</tr>
<tr>
<td>6</td>
<td>Pandharpur</td>
<td>1993-94</td>
<td>129400</td>
<td>11.97</td>
<td>1.00</td>
<td>87.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>129400</td>
<td>12.90</td>
<td>1.40</td>
<td>85.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.93</td>
<td>0.4</td>
<td>-1.33</td>
</tr>
<tr>
<td>7</td>
<td>Malshiras</td>
<td>1993-94</td>
<td>160800</td>
<td>3.73</td>
<td>11.82</td>
<td>84.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>160800</td>
<td>2.93</td>
<td>9.82</td>
<td>87.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.8</td>
<td>-1.99</td>
<td>2.79</td>
</tr>
<tr>
<td>8</td>
<td>Sangola</td>
<td>1993-94</td>
<td>159400</td>
<td>6.90</td>
<td>11.91</td>
<td>81.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>159400</td>
<td>11.86</td>
<td>10.78</td>
<td>77.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.96</td>
<td>-1.13</td>
<td>-3.83</td>
</tr>
<tr>
<td>9</td>
<td>Mangalweda</td>
<td>1993-94</td>
<td>114200</td>
<td>8.89</td>
<td>1.05</td>
<td>90.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>114200</td>
<td>7.24</td>
<td>4.16</td>
<td>88.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.65</td>
<td>3.11</td>
<td>-2.25</td>
</tr>
<tr>
<td>10</td>
<td>South Solapur</td>
<td>1993-94</td>
<td>119500</td>
<td>2.17</td>
<td>1.58</td>
<td>96.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>119500</td>
<td>4.43</td>
<td>2.68</td>
<td>92.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.26</td>
<td>1.1</td>
<td>-3.36</td>
</tr>
<tr>
<td>11</td>
<td>Akkalkot</td>
<td>1993-94</td>
<td>140100</td>
<td>1.06</td>
<td>0.50</td>
<td>98.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>140100</td>
<td>0.71</td>
<td>3.68</td>
<td>95.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.35</td>
<td>3.18</td>
<td>-2.77</td>
</tr>
</tbody>
</table>

Source: Compiled by Author Based on Socio-Economic Review and District Statistical Abstract
There is little positive change (0.51%) over a period of twenty years in non-agricultural landuse of the study region. Positive changes are experienced in Madha (1.94%), Barshi (0.66%), North Solapur (5.66%), Pandharpur (0.93%), Sangola (4.96%), South Solapur (2.26%) and Akkalkot (0.35%) tahsils during the period of investigation. Whereas, negative changes are registered in Karmala (-3.4%), Mohol (-1.49%), Malshiras (-0.8%) and Mangalweda (-1.65%) tahsils during the same period (Fig. 4.1B).

II) POTENTIAL LAND

The land for the purpose of extension of cultivation can be found only in this category, which could be used for cultivation but has not been under cultivation owing to certain reasons. It generally consists cultivable waste land and permanent pasture and grazing land and area miscellaneous trees, crops and groves.

During 1993-94, about 90540 hectares’ land was potential land. This land decreased from 90540 hect. to 33595 hectares in the study region from 1993-94 to 2013-14. It means that about 3.83% negative change was observed in this group during the period under consideration.

The highest area under potential landuse is marked in Sangola (10.78%) tahsil, followed by Malshiras (9.82%), Barshi (6.11%), Madha (5.25%), Karmala (5.07%), Mangalweda (4.16%), Akkalkot (3.68%), South Solapur (2.68%), N. Solapur (2.04%), Mohol (1.68%) and Pandharpur (1.40%) tahsils during 2013-14.

Both positive and negative changes in area under potential landuse is marked in the study region. Positive changes are observed in Madha (1.5%), North Solapur (1.61%), Pandharpur (0.4%), Mangalweda (3.11%), South Solapur (1.1%) and Akkalkot (3.18%) tahsils between 1999-2000 and 2013-14. While negative changes are experienced in Karmala (-0.31%), Barshi (-1.54%), Mohol (-0.49%), Malshiras (-1.99%), Sangola (-1.13%) tahsils during the same year.

III) AGRICULTURAL LAND

Agricultural land is the land regularly ploughed and includes the tillage (NSA) and fallow land (Shinde, 1974). The term fallow is applied to the lands not under cultivation at the time of reporting, but has been sown in the past (More, 1995). The fallow land includes current fallow and other fallow. Whereas, net sown area
represents the extent of the cultivated area actually sown during an agriculture year. The distribution of net sown area provides a very useful and good index for evaluating the capability and capacity of the land.

Out of total geographical area district having 86.97 percent and 90.79 (Table 4.2) percent of agriculture land during 1993-94 and 2013-14 respectively. The highest increase in agriculture land use is marked in Akkalkot (95.65%) tahsil and lowest in Sangola (77.36%) tahsil in the year 2013-14.

During the year 1993-94, the highest area in agriculture land is registered in Akkalkot (98.42%) tahsil followed by N. Solapur (96.33%), South Solapur (96.25%), Madha (94.37%), Mangalwedha (90.05%), Barshi (89.46%), Pandharpur (87.03%), Karmala (83.89%), Mohol (83.21%) and Sangola (81.19%) tahsils. On the contrary this, in the year 2013-14, whereas the highest area under agriculture land is found again in Akkalkot tahsil (95.65%) and lowest in Sangola (77.36%) tahsil. Whereas Karmala, Madha, Barshi, North Solapur, Mohol, Pandharpur, Malshiras, Mangalweda and South Solapur tahsils are registered 87.85 percent, 90.93 percent, 89 percent, 89.06 percent, 85.19 percent, 85.70 percent, 87.25 percent, 88.60 percent and 92.89 percent area under agriculture in 2013-14 (Fig. 4.1).

The positive changes are observed in Karmala (3.96), Barshi (0.08), Mohol (1.98), Malshiras (2.79) tahsils during the period of investigation. The negative changes are found in Madha (3.44), North Solapur (7.27), Pandharpur (1.33), Sangola (3.83), Mangalweda (2.25), South Solapur (3.36) and Akkalkot (2.77) over the period of fifteen.

The induction of modern technology in the district has brought a change in general land use, but is not uniform in time and space due to variations in environmental, techno-economic and socio-institutional conditions. The area under non-agricultural land has increased by 0.51 percent. The negative in potential agricultural land is marked during the study period. The proportion of agricultural land area was marked 86.97 percent and 90.79 percent and it has marked 3.82 percent increase during the period of investigation. The increase in agricultural land is marked in those tahsils, whereas agricultural technology is extended during the study period. The basic benefit of new technology, is that it will increase the land under cultivation. There will be less land lying fallow (Singh and Dhillon, 1984).

100
4.4 AGRICULTURAL TECHNOLOGY AND AGRARIAN STRUCTURE

Green Revolution in India has changed the traditional subsistence farming system to market-oriented production system. It has resulted in multi-facet socio-economic changes in rural areas. The concept of increasing returns per unit of area and per unit of time is the basic consideration. The traditional native farming technology was replaced in Green Revolution areas in the country, which has been instrumental in some structural changes in the agrarian set-up. The technological inputs in the form of tractor and associated implements, tube wells and pumping sets, etc. has resulted in positive gains everywhere. Associated biological, chemical and water technology led to continuously increasing volume of harvest. Structural changes in the agrarian sector encompasses a cross-section of inputs and outputs closely related to various types of farming. Consequently, the resultant influence will be different in various areas. These changes have also brought pattern of crop specialization in the region. Because the infrastructural development proved favourable for particular type of crops, while restrictive for others.

In the present study, the author has attempted the spatial dynamism in cropping pattern occurred due to technology for the period 1999-2000 and 2013-14. It is proposed to formulate the hypothesis as technology is instrument in bring about the changes in cropping pattern. In order to test this analysis, for two periods (1999-2000 and 2013-14) has been considered.

4.4.1 CHANGES IN CROPPING PATTERN: AN INTER-TEMPORAL ANALYSIS

Cropping pattern is a dynamic concept, as it changes over space and time. Of course, all changes in the cropping pattern cannot be said to be irrigation introduced. Some shifts in cropping pattern do not take place on account of economic and institutional factors, such as urbanization, changes in food habits of people, input requirements of crops, relative price movement of the agricultural products and change in technology. It is often seen that irrigation technology is the most important factor that determines to such changes in the cropping pattern and makes possible the production of more remunerative crops.

Table 4.3 reveals the changes in general cropping pattern during the period 1993-94 and 2013-14, the percentage of land under different crops and the temporal
change in the cultivated area of individual crops. The gross cropped area during the period 1993-94 to 2013-14, has been increased by 9.23 percent (103053 hectares). It may be attributed to the fact that the agricultural technology has played significant role in the horizontal as well as vertical expansion of crop land in the Solapur district.

Table 4.3: SolapurDistrict: Major Crops and Their Percentage to Gross Cropped Area (1993-94 and 2013-14)

<table>
<thead>
<tr>
<th>S. N.</th>
<th>Crops</th>
<th>Area in Hectares</th>
<th>Volume of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rice</td>
<td>3150</td>
<td>-0.11</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>48400</td>
<td>0.25</td>
</tr>
<tr>
<td>3</td>
<td>Jowar</td>
<td>739785</td>
<td>-10.05</td>
</tr>
<tr>
<td>4</td>
<td>Bajara</td>
<td>25114</td>
<td>1.05</td>
</tr>
<tr>
<td>5</td>
<td>Maize</td>
<td>27119</td>
<td>0.47</td>
</tr>
<tr>
<td>6</td>
<td>Other Cereals</td>
<td>393</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>Total Cereals</td>
<td>843961</td>
<td>-8.38</td>
</tr>
<tr>
<td>7</td>
<td>Gram</td>
<td>31908</td>
<td>1.21</td>
</tr>
<tr>
<td>8</td>
<td>Tur</td>
<td>13309</td>
<td>0.43</td>
</tr>
<tr>
<td>9</td>
<td>Other Pulses</td>
<td>11895</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td>Total Pulses</td>
<td>57112</td>
<td>2.75</td>
</tr>
<tr>
<td></td>
<td>Total Food grains</td>
<td>901073</td>
<td>-5.64</td>
</tr>
<tr>
<td>10</td>
<td>Sugarcane</td>
<td>70704</td>
<td>1.5</td>
</tr>
<tr>
<td>11</td>
<td>Condiment Spices</td>
<td>5366</td>
<td>0.4</td>
</tr>
<tr>
<td>12</td>
<td>Fruit &amp; Vegetables</td>
<td>48961</td>
<td>1.44</td>
</tr>
<tr>
<td>13</td>
<td>Cotton</td>
<td>4392</td>
<td>0.37</td>
</tr>
<tr>
<td>14</td>
<td>Groundnut</td>
<td>5874</td>
<td>0.33</td>
</tr>
<tr>
<td>15</td>
<td>Sunflower</td>
<td>40668</td>
<td>1.36</td>
</tr>
<tr>
<td>16</td>
<td>Other Oil Seeds</td>
<td>17995</td>
<td>0.27</td>
</tr>
<tr>
<td>17</td>
<td>Total Oil Seed</td>
<td>64537</td>
<td>1.96</td>
</tr>
<tr>
<td>18</td>
<td>Other Crops</td>
<td>20653</td>
<td>-0.04</td>
</tr>
<tr>
<td></td>
<td>Total GCA</td>
<td>1115686</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Compiled by Author, From Socio-Economic Review and District Statistical Abstract of Solapur District in 1993-94 and 2013-14
The overall cropping pattern of the district was dominated by food grains during 1993-94. As much as 80.76 percent of total gross cropped area was under these crops during the same period. After the gap of twenty years, i.e., 2013-14, few changes in cropping pattern is noticed in the study region. The percentage share of cereal crops was 75.64 percent (1993-94) and 67.26 percent (2013-14) of the total gross cropped area. It means 8.38 percent decrease in area under cereal crops was registered during the period under consideration. With the introduction of agricultural technology, where farmers have done more investment in agriculture. Though, taking only cereal crops is not affordable to them. That’s why they show more interest in commercial or cash crops cultivation. Commercial or cash crops occupy 17.35 percent and 23.02 percent during 1993-94 and 2013-14 respectively of the total gross cropped area.

Jowar is the main cereal crop of the district, which cover about 66.30 percent during 1993-94, as against 56.25 percent during 2013-14. Among the cereal crops, wheat rank second, which cover about 4.33 percent and 4.58 percent of total gross cropped area respectively in 1993-94 and 2013-14. Bajara is another cereal crop in the study region, which occupied 2.25 percent during 1993-94 and 3.30 percent during the year 2013-14. Whereas, the area shares of Jowar declined substantially in the district. Total hectares area under Wheat and Bajara are increased during the study period. The percentage share of area under maize increased from 2.43 percent to 2.90 percent during 1993-94 and 2013-14 respectively in total gross cropped area. The percentage share of area under other cereal crops declined from 0.03 percent to 0.02 percent during 1993-94 and 2013-14 respectively.

The percentage area shares of pulses taken together, increased consistently from 5.11 percent during 1993-94 to 7.86 percent in 2013-14, the increase being the sharpest in the case of all selected pulses.

Although the share of area of individual oil seeds is very small, except sunflower, it is encouraging to note that area share of sunflower showed considerable increase over the period of time. The percentage share of area of sunflower increased from 3.64 percent to 5 percent during 1993-94 and 2013-14 respectively. The share of cotton crops increased from 0.39 percent to 0.76 percent between 1993-94 and 2013-14, in total gross cropped area.
Among the important cash crops, area share of sugar cane, fruit and vegetables and condiment and spices are increased from 6.33 percent to 7.83 percent, 4.38 percent to 5.82 percent and 0.48 percent to 0.88 percent during 1993-94 and 2013-14 respectively. Table 4.3, Fig. 4.2 shows that the change in cropping pattern in the study region during the period under consideration. The positive change was found for the crops like Wheat (0.25%), Bajara (1.05%), Maize (0.47%), Gram (1.21%), Tur (0.43%), Other Pulses (1.11%), Sugarcane (1.5%), Fruit and Vegetables (1.44%), Cotton (0.37%), Sunflower (1.36%). The negative change was observed for the crops like rice and jowar, other cereals, and other crops and change was 0.11 percent, 10.05 percent, 0.01 percent, 0.04 percent. Jowar is the only crop, which indicates rapidly decrease. The change was 10.05 percent to the total gross cropped area. All over, it may be concluded that the changes in cropping pattern shows that changing the farmer’s attitude and impact of agricultural technology are responsible for this. (fig.4.2)

4.4.2 SPATIAL ANALYSIS OF MAJOR CROPS

The spatial distribution of crops is various from tahsil to tahsil in the study region. Share of individual crops in gross cropped area at two points of time (1993-94 & 2013-14). The brief account of spatial analysis of major crops are as follow.

1) RICE

Rice is raised in Kharif season and requires annual rainfall over 100 cm. A rather warm temperature 21°C. or above is needed for entire growing period. Clay or silt loam is considered a good soil for rice. Rice accounts for a relatively smaller coverage i.e. 2130 hectares in the district, which is 0.17 percent to the total gross cropped area during the period 2013-14. Almost all tahsils of the district have recorded decrease in rice cultivated area except Madha tahsil.

Out of the total gross cropped area below 0.8 percentage area was found under rice in Malshiras (0.7), Pandharapur (0.5), Mohol (0.3), Mangalweda (0.2) tahsils, while 0.8 to 0.16 percent was registered under rice crop in Madha (0.15%) and North Solapur (0.13%) tahsils during 2013-14. Above 0.16 percent cultivated area under rice was experienced in Barshi (0.17%), South Solapur (0.19%) and Akkalkot (0.17%) tahsils during the same year (Fig. 4.3A).
SOLAPUR DISTRICT

A) Rice Hectarage 2013-14 as the percentage of total cropped area

Fig. No. 4.3 A  District Average : 0.17%

B) Volume of Change in Rice Cultivation 1993-94 to 2013-14

Fig. No. 4.3 B
Fig.4.3.B reveals that below 0.10 percent positive change in area under rice was marked only in Madha tahsil. Below 0.10 percent negative change in rice area was found only in Malshiras tahsil and 0.10 percent to 20 percent negative change was observed in Barshi and Pandharpur tahsils during the period of investigation. Above 0.20 percent negative change in rice cultivated area was marked in Akkalkot, South Solapur, North Solapur, Mohol and Mangalweda tahsils between 1993-94 and 2013-14. No change in rice cultivated area was found only in Sangola tahsil in the same period.

2) WHEAT

In 1993-94, wheat occupied about 4.33 percent of total gross cropped area of the district, whereas in 2013-14, wheat covered an area of 4.58 percent of the total gross cropped area of the district. During the last twenty years, the cultivated area under wheat has increased by 0.25 percent (7490 hect.). Wheat ranks second among the cereal crops of the study region. It is grown every tahsils, more or less proportion, but core of the concentration is in Ujani Major Irrigation command area of the district, where, highest percentage of total gross cropped area is devoted under wheat.

Out of the total gross cropped area below 4 percent area was marked under wheat crop in Sangola (3.10%), Mangalweda (2.10%), South Solapur (2.90%), Akkalkot (2.10%), Madha (2.80%) and Barshi (1.50%) tahsils in the year 2013-14. About 4 to 8 percent of area under wheat was observed in Mohol (5%) and Karmala (6.10%) tahsils. Above 8 percent of total gross cropped area under wheat was registered in Pandharpur (11.50%) and Malshiras (10.20%) tahsils during 2013-14 (Fig. 4.4A).

Both positive as well as negative changes in cultivated area under wheat is marked in the district.

Below 0.5 percentage of positive change was noticed in Mangalweda and Barshi tahsils, whereas 0.5 to 2 percentage of positive change was experienced in Malshiras, Madha, Sangola and Akkalkot tahsils since 1993-94 to 2013-14. Above 2 percentage of positive change in area under wheat was observed in N. Solapur and Pandharpur tahsils during the same period. Below 0.5 percentage of negative change in area under wheat was found in South Solapur and Karmala tahsils and above 0.5 percentage of negative change was experienced in Mohol tahsils during the period under consideration (Fig. 4.4B).
SOLAPUR DISTRICT

A) Wheat Hectarage 2013-14
as the percentage of
total cropped area

Index
Above 8%
4% to 8%
Above 4%

Fig. No. 4.4 A
District Average: 4.58%

SOLAPUR DISTRICT

B) Volume of Change in
Wheat Cultivation
1993-94 to 2013-14

Index
Above 2%
0.5 to 2%
Below 0.5% Increase
Below -0.5% Decrease
Above -0.5%

Fig. No. 4.4 B
3) **JOWAR**

Jowar is a major staple food-grain in the region and its straws are used as fodder for livestock. It is grown widely throughout the district in both seasons due to suitable climatic conditions. The Jowar occupies the first rank in the cropping patterns of the district. During the study period, Jowar area has recorded a decline and as a result, its share in the total cropped area in the study region has shrunken to about 56.25 percent in 2013-14, compared to 66.30 percent in the year 1993-94.

Out of the total gross cropped area below 50 percentage of area was noticed under Jowar in Sangola (45.60%), and Pandharpur (40.80%) tahsils, whereas 50 to 60 percentage of cultivated area was registered in Malshiras (55.10%), Karmala (59.10%), Mohol (54.80%), South Solapur (52.90%) and North Solapur (54.70%) tahsils in the year 2013-14. Above 60 percentage of area was recorded under Jowar in three tahsils, namely Madha (71.40%), Barshi (62.80%) and Mangalweda (72.90%) tahsils during the same year (Fig. 4.5A).

Fig. 4.5B depicted that below 8 percentage of positive change in Jowar area was took place in Karmala and South Solapur tahsils during the study period. While 8 to 12 percentage of positive change was marked under Jowar in Akkalkot tahsil and above 12 percentage of positive change was found only in Barshi tahsil. Below 8 percentage of negative changes was noticed in N. Solapur, Mohol, Mangalweda, Pandharpur and Madha tahsils between 1993-94 to 2013-14. Above 8 percentage of negative change in Jowar area was recorded in Sangola and Malshiras tahsils during the same era.

4) **BAJARA**

Bajara is ranking third areally among the cereal crops in the district. Bajara is generally grown in poor light soils. It is occupied 3.30 percentage (2013-14) of the total gross cropped area. The highest percent of the gross cropped area under Bajara crop was registered in Malshiras (17.40%) tahsil and lowest in N. Solapur (0.30%) tahsil. The district average cultivated area under Bajara crop was marked 3.30 percent during the year 2013-14.

Out of the total gross cropped area below 2 percent of gross cropped area was recorded under Bajara crop in Barshi (1.33%), South Solapur (0.38%), North Solapur (0.30%) tahsils during the year 2013-14. Whereas 2 to 6 percent of area under Bajara crop was noticed in Akkalkot (2.90%), Mangalweda (3.10%), Mohol (4.10%), Madha
SOLAPUR DISTRICT

A) Jowar Hectarage 2013-14
as the percentage of
total cropped area

Index
- Above 60%
- 50% to 60%
- Above 50%

District Average: 56.25%

Fig. No. 4.5 A

SOLAPUR DISTRICT

B) Volume of Change in
Jowar Cultivation
1993-94 to 2013-14

Index
- Above 12%
- 8 to 12%
- Below 8% Increase
- Below -8% Decrease
- Above -8%

Fig. No. 4.5 B
SOLAPUR DISTRICT

A) Bajara Hectarage 2013-14
as the percentage of total cropped area

Index

- Above 6%
- 2% to 6%
- Above 2%

District Average: 3.30%

Fig. No. 4.6 A

SOLAPUR DISTRICT

B) Volume of Change in Bajara Cultivation
1993-94 to 2013-14

Index

- Above 3%
- 1 to 3%
- Below 1% Increase
- Below -2% Decrease
- Above -2%

Fig. No. 4.6 B
(3.70%) and Karmala (4.02%) tahsils during the same year. Above 6 percent of cultivated area under Bajara crop was registered in Malshiras (18.30%) and Sangola (11.90%) tahsils between 1993-94 to 2011-12 (Fig. 4.6A).

Fig. 4.6.B reveals the volume of change in Bajara cultivation. Below 2 percent negative change in area under Bajara crop was recorded in South Solapur tahsil, while above 2 percent of negative change was observed in Sangola and Mangalweda tahsils during the period of investigation. Below 1 percent of positive change in area under Bajara cultivation was found in Akkalkot, N. Solapur, Barshi, Madha and Pandharpur tahsils during the same era. About 1 to 3 percent of positive change was noticed in Karmala and Mohol tahsils and above 3 percent of positive change in area under Bajara crop was marked only in Malshiras tahsil.

5) MAIZE

Maize is ranked fourth among cereals and covers 35,450 hectares or 2.90% of the gross cropped area. Highest percentage of the gross cropped area under Maize crop was recorded in Barshi tahsil (7.40%), followed by Pandharpur (6.30%), Mohol (5.10%) and Sangola (5.40%) tahsils in the district. Above district average (2.90%) gross cropped area under Maize crop was observed in Barshi, Mohol, Pandharpur, and Sangola tahsils, while remaining tahsils have below district average of TGCA under Maize (Fig. 4.7A).

The spatial distribution of volume of change in Maize cultivation was depicted in Fig. 4.7B. Above 3 percent of positive change in Maize cultivation was observed in Karmala, Malshiras, Mohol, Sangola, Pandharpur, Mangalweda and South Solapur tahsils, while below 3 percent positive change in Maize crop was noticed only in Barshi tahsil between 1993-94 and 2013-14. Below 2 percent negative change in area under Maize was marked in North Solapur, Akkalkot and Madha tahsils during the period under observation.

6) PULSES

Pulses include Gram, Pigeon-Pea, Lentil, Black gram, Green-gram, etc. But, in the study region Gram, Tur, Pigeon-Pea, Black-gram, Green-gram are the important pulses. Out of the total gross cropped area 7.86 percentage was under pulses (2013-14). Highest area (14.60%) is observed in Barshi tahsil and lowest area (3.38%) is found in Mangalweda tahsil.
SOLAPUR DISTRICT

A) Maize Hectarage 2013-14 as the percentage of total cropped area

Index
- Above 5%
- 2% to 5%
- Above 2%

District Average: 2.90%

Fig. No. 4.7 A

B) Volume of Change in Maize Cultivation 1993-94 to 2013-14

Index
- Above 3%
- Above 3% Increase
- Below -2% Decrease

Fig. No. 4.7 B
A) Pulses Hectarage 2013-14 as the percentage of total cropped area

District Average: 7.86%

B) Volume of Change in Pulses Cultivation 1993-94 to 2013-14

Index
- Above 8%
- 4% to 8%
- Above 4%
- Below 3%
- Below -6% Decrease
With period of twenty years’ area under pulses is increased 2.75 percent. Normally pulses are cultivated in Kharif season. These pulses are very useful in many ways. They serve as excellent nutritious food for human being, other remaining part of the crop is useful as fodder for cattle.

Out of the total cropped area below 4 percent of total cropped area under pulses were recorded in Mangalweda (3.38%), Pandharpur (3.30%) and Malshiras (3.90%) tahsils during the year 2013-14. About 4 to 8 percent of area under pulses were observed in Karmala (6.10%), Sangola (6.80%), South Solapur (7.10%) and N. Solapur (7.80%) tahsils. While, above 8 percent of area under pulses were marked in Akkalkot (13.10%), Barshi (14.60%), Mohol (10.90%) and Madha (12.00%) tahsils (Fig. 4.8A).

Fig. 4.8B depicted that below 6 percent of negative changes in area under pulses were marked in two tahsils, namely Mangalweda and Mohol during the period of investigation. Below 3 percent of positive in area under pulses were marked in Pandharpur, S. Solapur, Akkalkot and Karmala tahsils, whereas 3 to 5 percent of positive changes found in Malshiras, Sangola and Madha tahsils between 1993-94 to 2013-14. Above 5 percent of positive change was observed in Barshi and N. Solapur tahsils during the period of investigation.

7) SUGARCANE

Sugarcane locally called “Oos” is the important cash crop and rank first among the cash crop in the study region. Sugarcane occupies an important place in the economy of the district. The cultivation of sugarcane is concentrated in the tahsils, where sugar factories are located and have canals and well irrigational facilities. Out of the total cropped area, area under sugarcane crops is 7.83 percent during the year 2013-14. Highest area (19.14%) is found in Sangola tahsil and lowest area in Barshi tahsil (0.68%). Within period of twenty years’ area under sugarcane crop is increased by 1.5 percent.

Out of the total cropped area below 3 percent of area under sugarcane was registered in Akkalkot (1.90%), Mangalweda (2.90%) and Barshi tahsil (0.68%) tahsils, whereas 3 to 6 percent area under sugarcane was marked in Karmala (4.02%) and Madha (5.10%) tahsils in the year 2013-14.
SOLAPUR DISTRICT

A) Sugarcane Hectarage 2013-14
as the percentage of
total cropped area

Fig. No. 4.9 A

District Average: 7.83%

Index

Above 9%
6% to 9%
3% to 6%
Below 3%

B) Volume of Change in
Sugarcane Cultivation
1993-94 to 2013-14

Fig. No. 4.9 B

Index

Above 8%
3% to 8%
Below 3% Increase
Below -2% Decrease
Above -2%
About 6 to 9 percent of area under sugarcane was noticed in Malshiras (7.50%), Mohol (6.80%) and South Solapur (8.07%) tahsils during the same year. Above 9 percent of area was noticed in Pandharpur (16.80%), Sangola (19.14%) and N. Solapur (15.70%) tahsils (Fig. 4.9A).

Fig. 4.9B depicted that below 2 percent negative change in area under sugarcane crop is recorded in Barshi, Karmala and Pandharpur tahsils and above 2 percent negative change was observed in Malshiras and Mangalweda tahsils since 1993-94 to 2013-14. Below 3 percent positive change in sugarcane cultivated area was noticed in Madha, Mohol, S. Solapur and Akkalkot tahsils, whereas 3 to 8 percent positive change was marked in N. Solapur tahsil during the period of investigation. Above 8 percent positive change was registered only in Sangola tahsil.

8) FRUIT AND VEGETABLE

Fruits and vegetables include Mango, Grapes, Ber, Pomegranate, Lemon, Banana, and bean ponds, bitter gourd, brinjal, cabbage, carrot, garlic, gourd, lady’s finger, pea, onion, etc. respectively. Out of the total gross cropped area 5.82 percent area is under fruit and vegetable crops. Highest area (12.40%) is found in Sangola tahsil and lowest area (0.90%) in Karmala tahsil. Within period of twenty years’ area under same crop increased by 1.44 percent during the period under study.

Out of the total cropped area below 2 percent of area was marked under same crops in Akkalkot, Barshi, Karmala tahsils. While 2 to 5 percent of area was noticed in Madha, Malshiras, N. Solapur, Mangalweda and Mohol tahsils during 2013-14. Above 5 percent of cultivated area under fruit and vegetables were registered in Sangola, and Pandharpur tahsils during the same year (Fig. 4.10A).

Fig. 4.10B reveals that below 2 percent positive change was marked in Pandharpur, Madha, and Mohol tahsils, whereas above 2 percent of positive change was marked only in Sangola tahsils between 1993-94 and 2013-14. Below 1 percent of negative change was recorded in Malshiras, Karmala, Barshi and S. Solapur tahsils and above 1 percent negative change was experienced in Akkalkot tahsil during the period of investigation.
SOLAPUR DISTRICT

A) Fruits & Vegetables Cropped area
2013-14
as the percentage of
total cropped area

Fig. No. 4.10 A
District Average : 5.82%

Index
- Above 5%
- 2% to 5%
- Above 2%

SOLAPUR DISTRICT

B) Volume of Change in
Fruit & Vegetable Cultivation
1993-94 to 2013-14

Fig. No. 4.10 B

Index
- Above 2%
- Below 2% Increase
- Below -1% Decrease
- Above -1%
4.5 TEMPORAL CHANGES IN AREA UNDER H.Y.V.S OF SELECTED CROPS

Rice, Jowar, Bajara, Wheat, Maize and Cotton, etc. HYV of seeds area selected for this investigation. Here attempt is made to identify individual share of selected crops to total gross cropped area at tahsil level. The brief description of HYV seed’s cropping pattern is given below.

1) RICE

The district average gross cropped area under HYVs of rice is registered 1.25 percent during 2013-14. The highest share of HYVs of rice was marked in Pandharpur tahsil (4.30%) and lowest in Barshi (0.20%) tahsil during 2013-14. Improved variety of rice generally used in the district are IR8, IR12, Jaya, Vijaya, Jamuna, K-14-7 and Ratna, etc.

Out of the total gross cropped area below 0.75 percent share of HYVs of rice in total cropped area is marked in Akkalkot (0.50%), S. Solapur (0.40%), N. Solapur (0.70%), Barshi (0.20%) and Mangalweda (0.30%) tahsils, whereas, about 0.75 to 1.50 percent share of HYVs of rice is observed in Mohol (1.07%), Malshiras (0.90%) tahsils in the year 2013-14. Above 1.50 percent share of HYVs of rice is noticed in Madha (1.90%), Pandharpur (4.30%) and Sangola (2.07%) tahsils during the same year (Fig. 4.11A).

Both positive and negative changes in share of HYVs of rice in total gross cropped area is marked in the district. Below 0.50 percent positive change is observed in Mohol and South Solapur tahsils, while above 0.50 percent positive change in area under HYVs of rice is marked in Pandharpur tahsil between 1993-94 and 2013-14. Below 0.50 percent negative change is found in Akkalkot, Mangalweda, and Barshi tahsils and above 0.50 percent negative change is experienced in Sangola, Malshiras and N. Solapur tahsils during the period of investigation (Fig. 4.11B).
SOLAPUR DISTRICT

A) Rice Cropped Area Under HyVs 2013-14

Fig. No. 4.11 A  District Average : 1.25%

Index as % of Rice Cropped area

- Above 1.50%
- 0.75% to 1.50%
- Below 0.75%
- Nil

SOLAPUR DISTRICT

B) Volume of Change in Rice Cropped Area 1993-94 to 2013-14

Fig. No. 4.11 B

Index % share of HyVs of Rice in GCA involved change

- Above 0.50%
- Below 0.50% Increase
- Below -0.50% Decrease
- Above -0.50%
- Nil
Table 4.4: Solapur District: Tahsil-wise Gross Cropped Area Under Selected HYVs of Crops 1993-94 and 2013-14 (in %)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Tahsil</th>
<th>Year</th>
<th>Rice</th>
<th>Jowar</th>
<th>Bajara</th>
<th>Wheat</th>
<th>Maize</th>
<th>Cotton</th>
<th>Total Pulses</th>
<th>Sugar-cane</th>
<th>Sunflower</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Karmala</td>
<td>1993-94</td>
<td>20.10</td>
<td>9.27</td>
<td>4.20</td>
<td>1.00</td>
<td>1.40</td>
<td>11.40</td>
<td>3.10</td>
<td>2.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>23.40</td>
<td>15.40</td>
<td>4.80</td>
<td>1.50</td>
<td>2.40</td>
<td>13.20</td>
<td>5.10</td>
<td>3.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>3.30</td>
<td>6.13</td>
<td>0.6</td>
<td>0.5</td>
<td>1.00</td>
<td>1.8</td>
<td>2.00</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Madha</td>
<td>1993-94</td>
<td>1.80</td>
<td>32.50</td>
<td>6.20</td>
<td>3.20</td>
<td>1.50</td>
<td>2.00</td>
<td>8.80</td>
<td>1.20</td>
<td>3.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>1.90</td>
<td>49.20</td>
<td>9.30</td>
<td>4.80</td>
<td>1.90</td>
<td>1.50</td>
<td>12.40</td>
<td>2.10</td>
<td>2.90</td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>0.10</td>
<td>16.7</td>
<td>3.10</td>
<td>1.6</td>
<td>0.4</td>
<td>-0.5</td>
<td>3.6</td>
<td>0.9</td>
<td>-0.3</td>
</tr>
<tr>
<td>3</td>
<td>Barshi</td>
<td>1993-94</td>
<td>0.50</td>
<td>18.20</td>
<td>7.40</td>
<td>2.10</td>
<td>1.00</td>
<td>0.90</td>
<td>9.82</td>
<td>0.90</td>
<td>2.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>0.20</td>
<td>25.40</td>
<td>12.80</td>
<td>0.50</td>
<td>2.00</td>
<td>1.00</td>
<td>14.10</td>
<td>1.80</td>
<td>3.80</td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>-0.3</td>
<td>7.2</td>
<td>5.4</td>
<td>-1.6</td>
<td>1.00</td>
<td>0.10</td>
<td>4.28</td>
<td>0.9</td>
<td>1.3</td>
</tr>
<tr>
<td>4</td>
<td>N. Solapur</td>
<td>1993-94</td>
<td>1.80</td>
<td>17.60</td>
<td>3.10</td>
<td>3.80</td>
<td>2.00</td>
<td>0.80</td>
<td>7.30</td>
<td>10.10</td>
<td>2.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>0.70</td>
<td>24.70</td>
<td>4.20</td>
<td>4.10</td>
<td>2.30</td>
<td>0.50</td>
<td>8.80</td>
<td>6.00</td>
<td>3.42</td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>-1.1</td>
<td>7.1</td>
<td>1.1</td>
<td>0.3</td>
<td>0.3</td>
<td>-0.3</td>
<td>1.5</td>
<td>-4.1</td>
<td>1.4</td>
</tr>
<tr>
<td>5</td>
<td>Mohol</td>
<td>1993-94</td>
<td>0.90</td>
<td>28.10</td>
<td>2.40</td>
<td>3.10</td>
<td>0.80</td>
<td>2.10</td>
<td>11.50</td>
<td>8.50</td>
<td>3.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>1.07</td>
<td>35.20</td>
<td>2.00</td>
<td>4.25</td>
<td>1.30</td>
<td>3.40</td>
<td>9.60</td>
<td>5.80</td>
<td>5.08</td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>0.17</td>
<td>7.1</td>
<td>-0.40</td>
<td>1.15</td>
<td>0.5</td>
<td>1.3</td>
<td>-1.9</td>
<td>2.7</td>
<td>1.98</td>
</tr>
<tr>
<td>6</td>
<td>Pandharpur</td>
<td>1993-94</td>
<td>2.90</td>
<td>16.70</td>
<td>2.10</td>
<td>4.40</td>
<td>2.90</td>
<td>1.20</td>
<td>5.10</td>
<td>15.20</td>
<td>4.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>4.30</td>
<td>28.10</td>
<td>1.00</td>
<td>7.20</td>
<td>3.20</td>
<td>2.40</td>
<td>9.20</td>
<td>18.40</td>
<td>6.50</td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>1.4</td>
<td>11.6</td>
<td>-1.1</td>
<td>2.8</td>
<td>0.3</td>
<td>1.20</td>
<td>4.1</td>
<td>3.2</td>
<td>2.3</td>
</tr>
<tr>
<td>7</td>
<td>Malshiras</td>
<td>1993-94</td>
<td>2.10</td>
<td>12.30</td>
<td>6.20</td>
<td>3.90</td>
<td>0.80</td>
<td>0.70</td>
<td>5.80</td>
<td>14.80</td>
<td>2.90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>0.90</td>
<td>23.40</td>
<td>18.50</td>
<td>5.10</td>
<td>1.20</td>
<td>1.30</td>
<td>7.10</td>
<td>15.60</td>
<td>4.20</td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>-1.2</td>
<td>11.1</td>
<td>12.3</td>
<td>1.2</td>
<td>0.4</td>
<td>0.6</td>
<td>1.3</td>
<td>0.8</td>
<td>1.3</td>
</tr>
<tr>
<td>8</td>
<td>Sangola</td>
<td>1993-94</td>
<td>3.50</td>
<td>21.30</td>
<td>9.70</td>
<td>3.11</td>
<td>2.30</td>
<td>0.80</td>
<td>5.80</td>
<td>12.10</td>
<td>3.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013-14</td>
<td>2.07</td>
<td>32.40</td>
<td>13.10</td>
<td>4.20</td>
<td>4.70</td>
<td>0.90</td>
<td>8.20</td>
<td>14.20</td>
<td>6.40</td>
</tr>
<tr>
<td></td>
<td>VOC in %</td>
<td></td>
<td>-1.43</td>
<td>11.1</td>
<td>3.4</td>
<td>1.09</td>
<td>2.4</td>
<td>0.1</td>
<td>2.4</td>
<td>2.1</td>
<td>2.9</td>
</tr>
<tr>
<td>9</td>
<td>Mangalwada</td>
<td>1993-94</td>
<td>0.80</td>
<td>39.40</td>
<td>2.80</td>
<td>2.80</td>
<td>1.50</td>
<td>1.00</td>
<td>6.20</td>
<td>4.50</td>
<td>5.20</td>
</tr>
</tbody>
</table>
2) **JOWAR**

Jowar is the principal crop in the district, which accounts 31.10 percent of total gross cropped area. A major breakthrough in agricultural research pertaining to the hybrid Jowar has been achieved by the Parbhani Millet Centre affiliated to Panjabrao Deshmukh Agricultural University (Mirchandani, G.G., 1973). Now a day, there are lots of varieties evolved by the agricultural scientists in different institutions of country. Jowar is growing both i.e. in Kharif and Rabbi Season.

Various improved varieties of Jowar used in the district, viz. M-35-1, Yashoda, C.S.H.18, SPV 39, SDV 504, PVK 400 to get accounts for more than 30 percent of total cropped area. All these are the drought resistance varieties and apart from high yielding they also offer more fodder. SPV-1375 high yielding variety of Jowar has been released from the Zonal Agricultural Research Centre, Solapur.

Out of the total gross cropped area, below 25 percent share of HYVs of Jowar in gross cropped area is recorded in Malshiras (23.40%), Karmala (23.50%), N. Solapur (24.70%) and South Solapur (21.50%) tahsils, while 25 to 35 percent share of Jowar is observed in Pandharpur (28.10%), Sangola (32.40%), Mohol (35.00%), Akkalkot (3.50%) and Barshi (25.40%) tahsils. Above 35 percent share of HYVs of Jowar is registered in Madha (49.20%) and Mangalweda (45.30%) tahsils in the year 2013-14 (Fig. 4.12A).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>2013-14</th>
<th>1993-94</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.30</td>
<td>45.30</td>
<td>1.70</td>
<td>3.90</td>
<td>0.40</td>
<td>1.20</td>
<td>8.00</td>
<td>5.10</td>
</tr>
<tr>
<td></td>
<td>VOC %</td>
<td>-0.5</td>
<td>5.9</td>
<td>-1.1</td>
<td>1.1</td>
<td>-1.1</td>
<td>0.2</td>
<td>1.95</td>
<td>0.6</td>
</tr>
<tr>
<td>10</td>
<td>S. Solapur</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1993-94</td>
<td>0.30</td>
<td>14.90</td>
<td>5.60</td>
<td>3.20</td>
<td>1.20</td>
<td>0.50</td>
<td>11.90</td>
<td>4.80</td>
</tr>
<tr>
<td></td>
<td>2013-14</td>
<td>0.40</td>
<td>21.50</td>
<td>7.40</td>
<td>2.30</td>
<td>3.10</td>
<td>0.70</td>
<td>15.80</td>
<td>6.20</td>
</tr>
<tr>
<td></td>
<td>VOC %</td>
<td>0.1</td>
<td>6.6</td>
<td>1.8</td>
<td>-0.09</td>
<td>1.9</td>
<td>0.2</td>
<td>3.9</td>
<td>1.4</td>
</tr>
<tr>
<td>11</td>
<td>Akkalkot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1993-94</td>
<td>0.80</td>
<td>31.5</td>
<td>1.80</td>
<td>2.80</td>
<td>0.90</td>
<td>0.70</td>
<td>9.80</td>
<td>2.10</td>
</tr>
<tr>
<td></td>
<td>2013-14</td>
<td>0.50</td>
<td>33.5</td>
<td>2.10</td>
<td>1.90</td>
<td>0.08</td>
<td>1.80</td>
<td>12.40</td>
<td>3.40</td>
</tr>
<tr>
<td></td>
<td>VOC %</td>
<td>-0.3</td>
<td>2.00</td>
<td>0.3</td>
<td>-0.09</td>
<td>-0.82</td>
<td>1.1</td>
<td>2.6</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Source: Agricultural Department, Zilla Parishad, Solapur
Fig. 4.12B depicted that, all tahsils in the study region are marked positive change in the share of Jowar in total gross cropped area. Below 4 percent positive change is noticed in Karmala and Akkalkot tahsils, whereas 4 to 8 percent positive change took place in S. Solapur, N. Solapur, Mohol, Mangalweda and Barshi tahsils. Above 8 percent positive changes in area under HYVs of Jowar are registered in Madha, Pandharapur, Sangola and Malshiras tahsils from 1993-94 to 2013-14.

3) BAJARA

Bajara is another important food crop in the district. HYVs of Bajara constitute about 5.20 percent of total cropped area in the district. Indian Agricultural Research Institute has developed new varieties of Bajara crops namely ICPT-8203, RHRBH-8609, MLBH-267, Sabhuri, PJH-52, BH-1, HB-2, MH-179, ICMV-87901.

It is found that below 4 percent area under HYVs of Bajara is marked in Mangalweda (1.70%), Pandharapur (1.00%) and Mohol (2.00%) tahsils during 2013-14. About 4 to 8 percent area is noticed in N. Solapur (4.20%), S. Solapur (7.40%) tahsils. Whereas 8 to 16 percent area under HYVs of Bajara is marked in Karmala (15.4%), Madha (9.30%) and Sangola (13.10%) tahsils in the year 2013-14. Above 16 percent area is experienced only in Malshiras tahsils (Fig. 4.13A).

Fig. 4.13B depicted that below 2 percent negative change in area under HYVs of Bajara is registered in Pandharapur, Mohol, and Mangalweda tahsils during the period of investigation. Below 2 percent positive change is marked in Akkalkot, S. Solapur and N. Solapur tahsils and 2 to 6% positive change is found in Madha, Barshi and Sangola tahsils. Above 6 percent positive change is noticed in two tahsils, namely Sangola and Madha tahsils since 1993-94 to 2013-14.

4) WHEAT

Wheat constitute about 3.90 percent of total cropped area. The improved variety of wheat namely Sonalica, Kalyan Sona, 5-331, D.P.-301, MACS-3125, HD-2189, N-59, Lokvan, GW-496, etc. Out of the total gross cropped area, below 2 percent of area under HYVs of wheat is marked in Akkalkot (1.90%), S. Solapur (1.80%) and Barshi (0.50%) tahsils, whereas 2 to 5 percent of area is observed in N. Solapur (4.10%), Mangalweda (3.90%), Sangola (4.20%), Madha (4.80%) and Karmala (4.02%) tahsils in the year 2013-14.
SOLAPUR DISTRICT

A) Bajara Cropped Area Under HyVs 2013-14

Fig. No. 4.13 A  District Average: 5.20%

Index as % of Bajara Cropped area
- Above 16%
- 8% to 16%
- 4% to 8%
- Below 4%

SOLAPUR DISTRICT

B) Volume of Change in Bajara Cropped Area 1993-94 to 2013-14

Fig. No. 4.13 B

Index % share of HyVs of Bajara in GCA involved change
- Above 6%
- 2% to 6%
- Below 2% Increase
- Below -2% Decrease
SOLAPUR DISTRICT

A) Wheat Cropped Area Under HyVs 2013-14

Index as % of Wheat Cropped area

Above 7%
5% to 7%
2% to 5%
Below 2%

District Average: 3.90%

Fig. No. 4.14 A

B) Volume of Change in Wheat Cropped Area 1993-94 to 2013-14

Index

% share of HyVs of Wheat in GCA involved change

Above 1%
Below 1% Increase
Below -1% Decrease
Above -1%

Fig. No. 4.14 B
About 5 to 7 percent share of HYVs of wheat in gross cropped area is marked in Malshiras (5.10%) tahsil and above 7 percent share of HYVs of wheat is found only in Pandharupur tahsil (Fig. 4.14A).

The area under HYVs of wheat varies from tahsil to tahsil in the district. Below 1 percent negative change in area under HYVs of wheat is recorded in Akkalkot and South Solapur tahsils and above 1 percent negative change is registered only in Barshi tahsil during the period of investigation. Below 1 percent positive change took place in N. Solapur and Karmala tahsils and above 1 percent positive change in area under HYVs of wheat is registered in six tahsils, namely, Mangalweda, Mohol, Sangola, Pandharupur, Malshiras and Madha between 1993-94 and 2013-14 (Fig. 4.14B).

5) **MAIZE**

HYVs of maize account only 1.27 percent of total gross cropped area of the study region. HYVs of maize used in the district are Deccan-103, Deccan-105, Trisulata, JK-2492, Bioyo-9681, Mahara, Yuvraj, etc.

Out of the total gross cropped area, below 1 percent of cultivated area under HYVs of maize is found in Akkalkot, and Mangalweda tahsils, while 1 to 2 percent area is noticed in Mohol, Madha, Barshi and Karmala tahsils during the year 2013-14. About 2 to 4 percent of area is experienced in S. Solapur, N. Solapur, and Pandharupur tahsils during the same year. Above 4 percent of cultivated area under HYVs of maize is noticed only in Sangola tahsil (Fig. 4.15A).

Eight tahsils namely Karmala, Madha, Barshi, Pandharupur, Mohol, N. Solapur, S. Solapur and Sangola indicated positive change, where three tahsils like Akkalkot, Mangalweda and Malshiras shows negative change in area under HYVs of maize in the district during the study period (Fig. 4.15B).

6) **TOTAL PULSES**

Improved variety of pulses like Tur Bandapur-2, BSMR-736, BSMR-853, BDN-708, ICPL-8711, etc. Of Mung BM-4, BPMR-145, BM-2002-01, BM-2003-2; Of Udid BDU-1, TU-1, Of Gram BDN-9-3, BDNG-797, ICCV-2, etc.; of Vatana, T—163, KPMR-10 is used in the district. HYVs of total pulses are constitute about 6.50 percent of total cropped area in the district.
A) Maize Cropped Area Under HyVs 2013-14

Index as % of Maize Cropped area
- Above 4%
- 2% to 4%
- 1% to 2%
- Below 1%

Fig. No. 4.15 A District Average : 1.27%

B) Volume of Change in Maize Cropped Area 1993-94 to 2013-14

Index
- Above 1%
- Below 1% Increase
- Below -1% Decrease
- Above -1%

Fig. No. 4.15 B
SOLAPUR DISTRICT

A) Pulses Cropped Area
Under HyVs 2013-14

Fig. No. 4.16 A

District Average: 6.50%

Index as % of Pulses Cropped area

- Above 10%
- 5% to 10%
- Below 5%

SOLAPUR DISTRICT

B) Volume of Change in Pulses Cropped Area
1993-94 to 2013-14

Fig. No. 4.16 B

Index

- % share of HyVs of Pulses in GCA involved change

- Above 4%
- 2% to 4%
- Below 2% Increase
- Below -2% Decrease
Out of the total gross cropped area below 5 percent share of HYVs of pulses crops are observed in Mangalweda, Akkalkot, and N. Solapur tahsils, while 5 to 10 percent share of pulses are found in Sangola, Pandharapur, Malshiras tahsils in the year 2013-14. Above 10 percent share in total gross cropped area is marked in five tahsils, namely Karmala, Madha, Barshi, S. Solapur and Mohol tahsils during the same year (Fig. 4.16A).

Fig. 4.16B reveals that all tahsils are indicated positive change in area under HYVs of pulses crops in the study region, except Mohol tahsil during the period of observation.

7) COTTON

Ajit-11, Nanded 44, F216, F231, H-4, SA-726, ACS-6, L-147, etc. HYVs of cotton are used in the study region. HYVs of cotton is constitute about 0.55 percent of total gross cropped area of the district.

Out of the total gross cropped area, below 1 percent share of HYVs of cotton is marked in S. Solapur, N. Solapur, Barshi, and Sangola tahsils, whereas 1 to 2 percent cultivated area took place under same crop in Akkalkot, Mangalweda, Malshiras, Madha tahsils during the year 2013-14. Above 2 percent share in total gross cropped area is registered in Pandharapur, Madha, Karmala tahsils during the same year (Fig. 4.17A).

Fig. 4.17.B reveals that below 1 percent negative change in area under HYVs of cotton is marked in N. Solapur and Madha tahsils. Below 1 percent positive change in area under cotton crop is recorded in Karmala, Barshi, S. Solapur, Mangalweda, Sangola, and Malshiras tahsils during the period under consideration. Above 1 percent positive change is found in Mohol and Pandharapur tahsils.

8) SUGARCANE

Sugarcane occupies the first position among the irrigated crops of the study region. It covers about 7.60 percent of total gross cropped area. The Sugarcane Research Institute at Coimbatore city in Tamilnadu developed CO-740, CO-86032, CO-8011, varieties. CO-740 has proved record yields of 346 tonnes of cane per hectare with 10 percent recovery in Maharashtra (G.G. Mirchandani, 1973). In 1972 Government of Maharashtra established an Institute for Sugarcane Research.
SOLAPUR DISTRICT

A) Cotton Cropped Area Under HyVs 2013-14

Index as % of Cotton Cropped area
- Above 2%
- 1% to 2%
- Below 1%
- Nil

District Average: 0.55%

Fig. No. 4.17 A

B) Volume of Change in Cotton Cropped Area 1993-94 to 2013-14

Index
- Above 1%
- Below 1% Increase
- Below -1% Decrease
- Nil

Fig. No. 4.17 B
The Institute is located as Padegaon in Phaltan tahsil of Satara District. Different varieties like CO-419, CO-740, CO-7219, CO-7125, CO-7527, CO-8014 and CO-86032 of sugarcane has been developed by the Institute in successive years. Out of the total cropped area below 5 percent share of HYVs of sugarcane in gross cropped area is recorded in Akkalkot, Barshi, Madha tahsils, whereas, 5 to 8 percent share is registered in South Solapur, N. Solapur, Mohol, Karmala and Mangalweda tahsils during the year 2013-14. Above 8 percent share of HYVs of sugarcane is took place in Sangola, Malshiras and Pandharpur tahsils during the same year. It is noticed that the irrigated area of the study region, i.e. Sangola, Pandharpur, Malshiras, etc. tahsils indicates high proportion of area under this crop due to assured supply of water (Fig. 4.18A).

All tahsils show positive change in area under HYVs of sugarcane in the district except N. Solapur tahsil between 1993-94 and 2013-14 (4.18B).

9) SUNFLOWER

During 2013-14, the district average area under HYVs of sunflower is recorded 4.30 percent. Different varieties of seeds for sunflower crop evolved by Zonal Research Institute, Solapur, such as Bhima, SS-56 which are suitable to local environmental condition. Apart from these, Mahabij-504, Surya-3, BSH-1, Modern, SS-56, EC-68414, etc. HYVs of sunflowers are used in the district.

The highest percent area under HYVs of sunflower is marked in Pandharpur (6.50%) tahsil and lowest in S. Solapur (1.80%) tahsil in the year 2013-14. Out of the total gross cropped area, below 3 percent share of HYVs of sunflower crops are marked in S. Solapur, and Madha tahsils, whereas 3 to 5 percent share in total gross cropped area is noticed in Karmala, Malshiras, Barshi, Akkalkot, N. Solapur and Mangalweda tahsils in 2013-14. Above 5 percent share in total cropped area is registered in Sangola, Pandharpur, and Mohol tahsils during the year 2013-14 (Fig. 4.19A).

Fig. 4.19B depicted that below 1 percent negative change in area under HYVs of sunflower is marked in S. Solapur and Madha tahsils. Above 1 percent negative change is registered in Mangalweda tahsil during the period of investigation. Below 2 percent positive change is taking place in Karmala, Barshi, Malshiras and Mohol tahsils and above 2 percent positive change is registered in Sangola and Pandharpur tahsils between 1993-94 and 2013-14.
The study reveals that there is spatio-temporal change in the cropping pattern. Agricultural technology is responsible in bringing about this change. The traditional crops cultivation is reducing and the HYVs of crops are covering more hectares. As such, the spatio-temporal variation in the agricultural technology impact has been considered in the following section. This is done by employing suitable quantitative method like crop combination.

4.6 CROP DIVERSIFICATION ANALYSIS

It is essentially an indicator of multiplication of agricultural activity, the crops compete each other for occupying space. Crop diversification means raising a variety of crops from arable land. The level of crop diversification largely depends on the geo-climatic, socio-economic conditions and technological development in a region. The stronger the competition, the high the magnitude or diversification and lesser the competition the greater will be the index values towards crop specialization. Normally, if any enumeration until occupies large number of growing crops, the diversification magnitude will be higher, crop diversification is very helpful to comprehend the overall geography of crops.

Diversification of crops enables the farmers to provide a reasonable quantity of input to their crops as different crops head different amount of input like irrigation, chemical fertilizers, HYVs, etc. In general, higher the level of agricultural technology in agricultural enterprise, while the poor and subsistent farmers are generally mere interested in the diversification of crops.

Bhatia (1965) proposed the technique of crop diversification with the assumption of ten maximum number of crops in a component areal unit. Jasbir Singh (1976) used the same method with some modification as follows.

\[
\text{Index of Crop Diversification} = \frac{\text{Percentage of Cultivated Area Under ‘n’ Crop}}{\text{Number of ‘n’ Crops}}
\]

Where ‘n’ crops are those, which occupy individually more than five percent of the total cultivated area. The same technique is applied for present investigation.

The three different categories of magnitudes of diversification in cropping pattern have been exhibited and the groups are made by arbitrary selection (See Table 4.5).
SOLAPUR DISTRICT

A) Crop Diversification
1993-94

Index of Diversification
- Below 12% High
- 12% to 14% Moderate
- Above 14% Low

Fig. No. 4.20 A

B) Crop Diversification
2013-14

Index of Diversification
- Below 12% High
- 12% to 14% Moderate
- Above 14% Low

Fig. No. 4.20 B
Table 4.5: Solapur District: Categories of Diversification

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Magnitudes of Diversification</th>
<th>Index Values of Diversification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Diversification</td>
<td>Under 12%</td>
</tr>
<tr>
<td>2</td>
<td>Moderate Diversification</td>
<td>12% to 14%</td>
</tr>
<tr>
<td>3</td>
<td>Low Diversification</td>
<td>Above 14%</td>
</tr>
</tbody>
</table>

During 1993-94, areas of high diversification was observed in Barshi, Malshiras, North Solapur and South Solapur tahsils. These were mostly specialized area in three to four crops. Moderate diversification was noticed in Karmala, Sangola and Pandharpur tahsils during 1993-94. Low diversification was recorded in Mangalweda, Akkalkot, Mohol and Madha tahsils during the same year (Fig. 6.20A).

The crop diversification in the district has changed during 2013-14. The number of crops grown varies from three to seven, thereby indicating the high to moderate index in almost all of the tahsils. Changes were registered in crop diversification from moderate to low in Karmala, high to low in Barshi, low to moderate in Madha, Mohol and Mangalweda tahsils, moderate to high in Pandharpur, Sangola tahsils, in South Solapur tahsil high to moderate. No change in diversification was marked in Malshiras, North Solapur, and Akkalkot tahsils (Fig. 6.20.B).

4.7 CROP COMBINATION

The study of crop combination regions constitutes an important aspect of agricultural geography, as it provides a good basis for agricultural regionalization. The crops are generally grown in combinations and it is rarely that a particular crop occupies a position of total isolation other crops in a given areas unit at given point of time. The distribution maps of individual crops are interesting the useful for planner.

The different methods are applied to show the picture of crop combination in region. In the present investigation, Weaver’s technique is applied (1954). In Fig. 4.21A, the cropping pattern derived with this technique is plotted. For the determination of the deviation, the following formula is used.

\[
\text{Standard Deviation} = \sqrt{\frac{\sum d^2}{n}}
\]

Where ‘d’ is the difference between actual crop percentage in a given areal unit and ‘n’ is the number of crops in a given combination.
In Solapur district (1993-94), there is total absence of monoculture region, which clearly indicate the heterogeneity and complexity of crops in the study region. Two crops combination zones are observed (Table 4.6) in Madha, and North Solapur tahsils. Jowar is dominant crop. There are two crops viz. Jowar-Bajara and Jowar-Pulses, which make combination. It is the zone of moderate to moderate high rainfall. Three crop combination observed in Malshiras, Sangola and Akkalkot tahsils. There are three crops, i.e. Jowar, Sugarcane, Bajra; Jowar, Bajara, Pulses and Jowar, Pulses, Sugarcane respectively make combination. Four combination zones aren’t noticed in the district during the same period. Five and six crop combination zones are found in Karmala, Barshi, Pandharpur, Mangalweda and South Solapur tahsils respectively, while six crop combination zones are found only in South Solapur tahsil during the year 1993-94 (Fig. 4.21A).

During 2013-14, some changes are noted in the crop combination zones of the district (Fig. 4.21B). Two crop combination zones are observed only in Barshi tahsils, there is two crops, namely Jowar, Pulses, which make combination with one or other whereas, Madha tahsil belongs to three crop combination zones. Four crop combination zones are observed in Malshiras and Sangola tahsils.

Table 4.6: Solapur District: Transformation in Crop Combination Over 1993-94 in 2013-14

<table>
<thead>
<tr>
<th>S N</th>
<th>Name of Tahsil</th>
<th>1993-94 Crop Combination</th>
<th>Name of Crop</th>
<th>2013-14 Crop Combination</th>
<th>Name of Crop</th>
<th>Shift</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Karmala</td>
<td>J, W, K, Sug, Gra</td>
<td>6</td>
<td>J, B, Sug W, Sn, GN</td>
<td>5-6</td>
<td></td>
<td>Share of wheat crop has gone down, its place taken by Bajara crop and Sunflower has come in combination.</td>
</tr>
<tr>
<td>2</td>
<td>Madha</td>
<td>J, B,</td>
<td>3</td>
<td>J, Pul, K</td>
<td>2-3</td>
<td></td>
<td>Share of Bajara has gone down, Pulses &amp; Kardi have come in combination.</td>
</tr>
<tr>
<td>3</td>
<td>Barshi</td>
<td>J, K, Pul Gr, W</td>
<td>2</td>
<td>J, Pul</td>
<td>5-2</td>
<td></td>
<td>Share of Kardi, Wheat have gone down.</td>
</tr>
<tr>
<td>4</td>
<td>North Solapur</td>
<td>J, Pul</td>
<td>7</td>
<td>J, Sug, Sn, W, Pul, GN, Gra</td>
<td>2-7</td>
<td></td>
<td>Diversification of seven crops.</td>
</tr>
<tr>
<td>5</td>
<td>Mohol</td>
<td>J, W, Sug, Pul, M, B, GN</td>
<td>5</td>
<td>J, Sug, Sn, W, M</td>
<td>7-5</td>
<td></td>
<td>Sugarcane replaced by Wheat in second position, which was at 2nd position, has gone to 4th position. Pulses and Bajara not in combination.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------</td>
<td>-----</td>
<td>-----------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pandharpur</td>
<td>5</td>
<td>J, Sug, M, W, Sn</td>
<td>7</td>
<td>J, Sug, W, Sn, M, F&amp;V, Pul</td>
<td>5-7</td>
<td>Wheat replaced Maize in second position which was at 3rd has gone to 5th position. Pulses and F&amp;V come in combination, whereas Sunflower replaced by Wheat from 4th position.</td>
</tr>
<tr>
<td></td>
<td>Malshiras</td>
<td>3</td>
<td>J, Sug, B</td>
<td>4</td>
<td>J, Sug, B, W</td>
<td>3-4</td>
<td>Wheat crop come in combination</td>
</tr>
<tr>
<td></td>
<td>Mangalweda</td>
<td>5</td>
<td>J,K,B, Pul, Gra</td>
<td>7</td>
<td>J, Sn, Sug,W, Gra, M, GN</td>
<td>5-7</td>
<td>Share of Kardi, Bajara and Pulses have gone down. Where Sunflower, Sugarcane, Wheat have come in combination.</td>
</tr>
<tr>
<td></td>
<td>Sangola</td>
<td>3</td>
<td>J,B, Pul</td>
<td>4</td>
<td>J, Sug, B, Pul</td>
<td>3-4</td>
<td>Sugarcane replaced by Bajara, Bajara replaced by Pulses from 3rd position to the 2nd position.</td>
</tr>
<tr>
<td></td>
<td>Akkalkot</td>
<td>3</td>
<td>J, Pul, Sug</td>
<td>6</td>
<td>J,Sn, Pul, Sug, W,M</td>
<td>3-6</td>
<td>Sunflower replaced by Pulses from second position, Wheat and Maize have come in combination.</td>
</tr>
</tbody>
</table>

Source: Computed by the Researcher


While five and six crops combination zones are observed in Mohol and Karmala, Akkalkot tahsils respectively during the same year. Whereas, in Pandharpur, N. Solapur, Mangalweda and South Solapur tahsils, belong to seven crop combination.

This changes have resulted due to increasing agricultural technological facilities, which helped to bring several crops under cultivation. It is necessary to produce more crops in an agricultural area, where population density is high. That’s why only a suitable crop combination can satisfy the increasing demand for food, with development of various agricultural inputs, new varieties of crops can be introduced to the traditional unprofitable crop combination.

Central and western part of Solapur district where agricultural development is high, so cropping pattern is complex one. Crops associate with one another. The choice is not exclusively arbitrary and is always a function of the geological setup and cultural factor associated with special dimensions of socio-economic system. A study of crop combination and their regional diversification as such is essentially a probe into the complex of aggregate environment within specific set of condition.
4.7 REFERENCES

Publications
