CHAPTER - V

TRENDS IN AGRICULTURAL ECONOMY
OF MAHARASHTRA

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CHAPTER - V

AGRICULTURAL ECONOMY OF MAHARASHTRA

[5.1] HISTORICAL PERSPECTIVE -

Agriculture in Maharashtra dates back to the latter parts of Harappan Chalcolithic times i.e. just after 1500 B.C. The early record of sorgham cultivation is from Inamgaon in Pune district during the period of 1370 B.C. - 1025 B.C.1.

Though agriculture was practiced through all the historical eras, record of the measurement of its productivity are not readily available. During Chattrapati Shivaji’s period we find some direct and indirect references about the agriculture productivity. Productivity suffered because of lack of manpower, implements and bullocks. From the land revenue assessment we can draw inferences about the production and productivity.

In middle of 18th century the Maratha rulers encouraged the expansion of agricultural activity. Average output (Yield) per hectare on average land till about the first few years of the 19th century atleast, were not less than those in contemporary England and other European countries.

1: Randhava M.S., 1980 History of Agriculture in India.
According to a survey conducted by Captain Robertson in Pune Collectorate around 1880 the yield of wheat on irrigated best black soil was about 2384 kg/ha. On the average irrigated land it was 1994 kg/ha. On unirrigated black soil it was 1787 kg/ha. (In Scotland this average was 1788 kg/ha.). The average yield of Jowar from unirrigated best land was 1141 kg/ha. In Mawal region yield of rice in 1820 was 2492 kg/ha.2

Mr. Pringle who was Collector of Pune in 1827 had introduced a system of land Revenue which was not very successful and had to be modified. It was first applied in Indapur and later in Western Maharashtra. This was an attempt to assess revenue and productivity; it came to be known as the joint report of 1847. There were five forms of assessment of cropped land viz. 'Bighoti' (Bigha Rate), 'Dhep' (unmeasured lump of land), Mogham (Vague), 'Ardhel' (half share) and Nangar or Koyata.3 In the Berar division (Present - Amrawati, Akola, Buldhana and Yeotmal districts) a more or less uniform system of revenue accounts was established by the Mughals. This gives us some idea of the level of productivity. Later in the 17th century Malik Ambar's System was introduced which considered soil types as well as the crop grown. In British regime new assessment according to survey were made. In Marathwada the system of survey and classification of cropped land was broadly similar to the one followed in the rest of Maharashtra with some alterations according to local conditions.4

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2: Divekar V.D. 1976 Cambridge Economic History of India Vol. 2
Gokhale Institute of Politics and Economics Pune.


4: Vaid Varsha 1989 "Agricultural Productivity of Maharashtra"
(Unpublished thesis of Ph.D. submitted to University of Pune).
Maharashtra as it stands today was declared as an independent State on 1st May 1960. This is state of majority Marathi speaking people. Maharashtra occupies major portion of Indian Peninsula and has central place in Western India. It is bounded on the east-north and the north-east by parts of Madhya Pradesh on south by parts of the Karnataka and Goa, on northwest by Gujarat, on south-east by parts of Andhra Pradesh and Karnataka and on the west by Arabian Sea. The state lies between 15° 45' to 21° 06' north latitudes and 72° 36' to 80° 45' east longitudes. The area of the state is 3,07,762 Sq.km. and occupies 9.36% of the total area of land of India. The east-west length of the state is about 800 km, north-south width is about 700 km. The total length of coastline is about 720 km.

Maharashtra State has three broad physical divisions.

(1) The Konkan Coast land.
(2) Western Ghats or Sahyadris and other hill range.
(3) Platean region.

For administrative convenience the state is divided into six divisions namely Mumbai, Pune, Nashik, Aurangabad, Amrawati and Nagpur. Maharashtra has 31 districts and 315 Talukas. Various parts of Maharashtra are known as Konkan, Western Maharashtra, Marathwada, Vidharbha and Khandesh.

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A short profile of three physical divisions of the Maharashtra is as follows:

(1) **Konkan Coastland**:

A narrow coastal plain stretching from the Damanganga river in the north to the Terekhol river in the south. The region varies from about 45 km to 75 km in width between the Arabian Sea and steep escarpment of the Sahyadris. This is a land deeply furrowed by fast flowing streams from Sahyadris and criss-crossed with highly corded remnant ranges. Konkan is divided into two parts i.e. North Konkan and South Konkan. The area between Dahanu to Shrivardhan is included in the north Konkan. The main rivers are Vaitama, Ulhas and Kundalika. Area between Shrivardhan and Redi is known as the South Konkan. The beaches formed between the two headlands are more or less straight and narrow. Some of the beaches like Ganpatipule and Velas are steeply sloping. Ratnagiri and Vengurla are the districts in this region. Main rivers are Savitri and Vasisthi, these are tidal for considerable distance.

(2) **Western Ghats & Other Hill Ranges**:

This is also called as the Sahyadris. The Sahyadris are main mountain ranges in Maharashtra. This is a long chain of hills northwest to southeast direction. This ghat separates Konkan and Deccan upland plateau (i.e. Desh). The highest peak is Kalsubai near Igatpuri. Other peaks are Salher near Nashik, Harishchandragadh and Saptashrungi. The major passes are Thalghat, Borghat,
Ambaghat and Ambolighat. The Satpudas and Melghat occupy the northern margins of the state.

(3) Plateu Region:

This region occupies nearly nine-tenths of the total area of the State. It lies to the east of Sahyadris and extends from a distance of over 700 km. with its rim on the west. It is 900 m. above sea level.

RIVERS AND RIVER BASINS -

Maharashtra consists of both the west flowing rivers draining to the Arabian sea and the east flowing rivers draining to the Bay of Bengal. The Godavari and the Krishna and the Tapi are the three major river basins of the plateau region. The Godavari and Krishna are east flowing and drain to the Bay of Bengal, after traversing the Andhra Pradesh and the Karnataka. Other major rivers are Bhima, Manjara, Wainganga, Wardha, Prahita, Painganga, Koyna Varna and Panchganga.

CLIMATE & MONSOON -

The climate of Maharashtra is typically monsoonal in character with four months of rainy season followed by eight months of relatively dry period of winter and summer. The annual climatic cycle consists of four well market seasons, namely the cold seasons, the hot season, southwest monsoon and post monsoon season.
(a) The Cold season starts by the beginning of November and continues till
the end of February and during this season fine weather prevails with
strong dry winds. In this season the average daily maximum temperature
varies from 30° centigrade to 33 °, while the mean daily minimum
temperature varies from 3 ° Celsius to 10 ° Celsius. December is the
coldest month. Record of lowest temperature was found in Nashik in the
month of December.

(b) The hot season sets by the beginning of March and extends to the end of
May and the prevailing winds are westerly ones. Places in the eastern
part of the state record a daily maximum of 41 ° Celsius to 46 ° Celsius,
especially in the month of May. The rise in the temperature is more
marked in the plains than in the hilly region. Some places in the
Wainganga Valley like Chandrapur and Brahmapuri in Vidarbha attain
a maximum of over 46 ° Celsius in the month of May.

(c) The southwest monsoon accounts for 85 to 90 percent of the annual
rainfall in the region, which normally begins in the first week of June
and lasts till the end of September. The heaviest rainfall occurs in the
main Western Ghats region of the basin and rapidly decreases to the east
of the crest of the ghats. The decrease in the rainfall from west to east is
steady and remarkable. The southwest monsoon is very important and
more constant in its phenomenon than the post monsoon or the north­
east monsoon. The highest rainfall recorded is 7470 mm. at Amboli in
Western Ghats and the lowest rainfall recorded is 485mm at Phaltan in Satara district so far.

(d) The post monsoon sets in after the withdrawal of southwest monsoon by the beginning of October and continues till the middle of November. October marks the transition from rainy season to winter. There is a sudden change in temperature that produces a familiar phenomenon of "October - Heat" and there is a certain amount of precipitation accompanied by thunder-storms.

The air is highly humid in the four south-west monsoon months, while in the other months it is dry. The dryness is more marked in the plains than in the upland regions. The winds are strong particularly on the hills, in south-west monsoon season. In the rest of the year, they are light to moderate.

**TYPE OF IRRIGATION IN MAHARASHTRA -**

A slow beginning towards the organised irrigation was made by the British rulers in 1870. Many of the irrigation projects appear in the state today are of recent origin. During 2000-2001 about 10% of the cultivated area of the state was under irrigation. It is well known fact that irrigation improves agricultural productivity, hence there is a need to take care of irrigation on the large scale.

**TYPES** - (a) Wells (b) Lakes (c) Lift irrigation (d) Canal irrigation.
(a) **Wells:**

This is the oldest method. To reduce the wastage of water now a days tube wells are dug. In drought prone areas Government gives some financial aid for the work. Due to decreasing ground water levels many of the wells do not carry water throughout the year.

(b) **Lakes:**

Lake irrigation is used mostly in the parts of East Vidarbha. About 15% of land of this area is under lake irrigation. In Western Maharashtra about 1400 percolation tanks are built for irrigation and another 1800 tanks were in progress during last 2-3 years.

(c) **Lift Irrigation:**

Under Government Scheme, rock and concrete bunds of medium height are built on small streams and tributaries. Water from these bunds is lifted up with the help of electric pumps to supply the fields.

The cultivation in Satara, Sangli, Pune and Kolhapur mostly depend on lift irrigation.

(d) **Canal Irrigation:**

About 23% of the irrigation in Maharashtra State is through canal, dams are built on most of the major rivers like Godavari, Bhima, Krishna etc. Canals are taken out through these dams which supply water to down streams areas. Ujani, Jayakwadi, Mula, Koyina, Purna, Pravara, Bhatghar-Nira, Wardha, Darana, Bagh Ghod, Wan, Manjara, Bhandardhara, Venna are the major irrigation projects in Maharashtra.
According to Population Census of India 2001, the State of Maharashtra is second largest state of India in respect of population after Uttar Pradesh. Since formation of the state in 1960 during the last 40 years, the population of the state multiplied by 2.5 times. During the decade 1991-2001, the population of the state increased by 22.6 percent. The growth in earlier decade was 25% percent, which decreased by 3.1 percent. The total population of Maharashtra according to 2001 census is 96752247 (9.67 crores), which is 9.4 percent of the total population of India (102.70 crores). Maharashtra has in total 35 districts (31 plus 4 more new) and 43722 villages. Maharashtra is above the national average of population growth.

Table No. 5.1: Shows a clear picture of the Maharashtra's population. It shows a comparative statistics as per Census of population 2001. Male population is 5.03 crores while Female population is 4.64. Its counter parts for India are 53.13 and 49.57 Croes. Male female ratio is 1000:922 and for India it is 1000:933.
TABLE 5.1
ITEMWISE POPULATION STATISTICS AS PER CENSUS 2001

(Figures in Crores)

<table>
<thead>
<tr>
<th>Item</th>
<th>Maharashtra</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>9.67</td>
<td>102.70</td>
</tr>
<tr>
<td>Male</td>
<td>5.03</td>
<td>53.13</td>
</tr>
<tr>
<td>Female</td>
<td>4.64</td>
<td>49.57</td>
</tr>
<tr>
<td>Decaded Percentage Growth (1991-01)</td>
<td>22.60</td>
<td>21.40</td>
</tr>
<tr>
<td>Percentage of Urban Population</td>
<td>42.2</td>
<td>27.8</td>
</tr>
<tr>
<td>Sex Ratio (Females per thousand males)</td>
<td>922</td>
<td>933</td>
</tr>
<tr>
<td>Density of Population</td>
<td>314</td>
<td>312</td>
</tr>
<tr>
<td>Literacy percentage</td>
<td>77.3</td>
<td>65.4</td>
</tr>
<tr>
<td>Percentage of Scheduled Castes &amp; Schedule Tribes</td>
<td>20.57</td>
<td>24.56</td>
</tr>
<tr>
<td>Percentage of main workers</td>
<td>39.29</td>
<td>34.18</td>
</tr>
<tr>
<td>Percentage of Agriculture workers</td>
<td>54.51</td>
<td>58.80</td>
</tr>
</tbody>
</table>


RURAL POPULATION -

According to population census 2001 out of total 9.67 crores population of the state 5.57 crore (57.6 percent) was rural population as against 72.20 percent at all India level. During the decade 1991-2001 the increase in rural population in the State was 15.1 percent, which was less than the corresponding increase 18.01 percent for all India. Thus it was observed that percentage of rural population is declining in Maharashtra.
Agriculture sector occupies an important place in the economy of Maharashtra. Even today 65 percent of the population in the state depends upon agriculture for its livelihood.

During last decade (1991-2000) there appears a rapid growth of industries and service sectors in Maharashtra but still agriculture is an important and dominating activity in the state.

The gross cropped area in Maharashtra is 222558 hundred hectares, out of this area. The area used more than once during the year is only 20.75 percent.

[5.5] **LAND UTILISATION** -

Diagram 5.1

Land Utilisation in Maharashtra

(2000-01)
LAND USE -

The concept of 'land use' is related to the use of land to which it is put in a certain region at a given period of time. The study of land use explains constant interaction between available land resources on the one hand and human needs and efforts on the other. The competition between various types of uses is the result of scarcity of land. Some land is better than other land for a specific use depending mostly on physical characteristics of land to which its suitability for a particular use is related.

Five major categories of land use are noted in the season and crops, reports of the Maharashtra State:

1. Area under forest.
2. Land not available for cultivation including -
   (a) Barren and uncultivable land.
   (b) Land put to non-agricultural uses.
3. Other pastures and grazing lands including culturable wasteland and permanent pastures and grazing lands and land under miscellaneous tree crops and groves.
4. Fallow Lands: current fallow lands and other fallsows.
5. Cropped area including:
   (a) Net Sown Area (N.S.A.)
   (b) Area Sown more than once.
   (c) Gross Cropped Area (G.C.A.)
As compared to India, Maharashtra occupies 9.4% of the area, 12.6% N.S.A., 11.4% Grossed Cropped area (G.C.A.) and only 4.6 percent of the gross irrigated area. Details of the above 5 types are as follows:

(1) Forests -

It is a well known fact that there is a very high degrees of correlation between amount of rainfall received and the area under forests. In Maharashtra concentration of forests occurs in Western Ghats, the Satpudas and the Melghat and the hills in the eastern parts. If area under forests is considered as a percentage of the total geographical area of the district, it will be observed that in Gadchiroli district Forests is the dominant land use i.e. 74 percent, followed by Thane, 47.87 percent, Dhule 38.2 percent, Chandrapur 36.1 percent Bhandara 28.9 percent, Amrawati 25.4 percent and Raigad 23.3 percent, Yawatmal, Kolhapur and Nagpur each account for around 19 percent of the area under forest. Marathwada region is least forested with Latur, Osmanabad and Jalna, not having even one percent of area under forests.  

(2) Land Not Available For Cultivation:

About 5.5 percent of the Land area of Maharashtra is barren and uncultivable. Due to adverse physiographic conditions like rugged hilly area, Western Ghats and the Konkan region which have relatively higher proportions

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6: Mr. V.S. Datye and Amit Dhorde "Agriculture in Maharashtra" 2001 Rawat Publication, New Delhi PP 159.166

7: "Agriculture in Maharashtra" 2001 Pub. by Mr. V.S. Datye & Amit Dhorde Pg. 163.
of these lands. Some of the districts like Nashik, Ahmednagar, Pune and Satara have steep slopes and rock exposures. Ratnagiri district has lateristic cover. Salt affected inter tidal areas are found in the district of Raigad. The Marathwada and Vidarbha regions have very small i.e. below 2 percent of the State area under this category. Maximum percentage of such land is found in the Ratnagiri district i.e. 28.7 percent. Other districts like Nashik, Pune, Ahmednagar, Satara, Raigad etc. are about 13 percent average of such land.

Land put to non agricultural use account for 4 percent of the state area, district Pune has 8.5 percent of such land. Thane, Aurangabad, and Vidarbha has also relatively high proportion of such land. Mumbai has a very high i.e. 75 percent of its geographical lands, which are put to non-agricultural uses like urbanization and industrial uses, roads, railways, water bodies etc. In this way together 9.5 percent of the area of state is not available for cultivation.

(3) Other Uncultivated Land:

In Maharashtra State 2.9 percent land is cultivable wasteland, 4.4 percent which is permanent pastures and grazing lands and 0.7 percent are under tree crops and groves.

High percentage of such land is found in different districts of Konkan area e.g. Ratnagiri district alone has 15 percent of such land out of total area of the state as a whole. Marathwada and Vidarbha region has very less percentage of such lands.
Permanent pastures and grazing lands cover 4.4 percent of the Maharashtra State area. Such lands are called village common lands or "Gairans". Actually these are hilly areas having thin soil cover where cattle are graze. In Mawal and Konkan area such land is called "Warkas". 10 percent of the state pastures are found in Bhandara district. Other districts have smaller percentages. Tree crops and groves occupy a negligible (0.7 percent) area with relative concentration in Konkan districts.

(4) **Fallow Lands**

Fallow land has a share of 7.4 percent in Maharashtra State. Many often fallow area is a part of crop rotation. In other case it relates to scanty rains. Proportion of such land increases in droughts years.

(5) **Net Sown Area (N.S.A.)**

Spatial distribution of these land is largely influenced by variations in relief. (relief means, hills and valleys characteristic). Lands which are densely cultivated are those of river valleys, flood plains, low lands and low plateaus with gentle slopes. 70 percent of land in Vidarbha is under cultivation. Opposite to this mountainous or hilly, or thin soil covered and lateristic lands has relatively smaller portion of land under cultivation. This is true in case of Konkan which has only 25 to 30 percent area under cultivation. In Mumbai district urbanization is the cause of smaller area under cultivation, the same is the case of Thane district. Western Maharashtra has moderate proportion of
such land (51-69 percent). Marathwada and Vidarbha has 70 percent of this cultivated land. But in Gudchirol district it is only 12 percent.

In the state of Maharashtra in some regions more than one Crop is grown with the help of irrigation. This is of vital importance from the point of view of the agricultural and economic development. Such cultivated land in the state is found to be only 14.5 percent which is sown more than once. In some districts like Parbhani, Jalgaon, Kolhapur and Aurangabad 30-45 percent of their Net Sown Area is Sown more than once. Konkan area shows small proportion of 5 percent of such lands. Eastern Vidarbha also has a small proportion as 3 to 9 percent of this type of lands. Proportion of Net Sown Area in Western Vidarbha is moderate upto 15 to 24 percent, while Marathwada shows higher proportion of Net Sown Area more than once i.e. upto 14-45 percent.
[5.6] **TRENDS IN VARIATION IN LAND UTILISATION -**

**1960-61 TO 1999-2000**

*Table 5.2* gives a detailed idea about decadel trend of variation in land utilization in Maharashtra, since 1961-62 to 1998-99.

In spite of spread of new technology, & other aspects of developments the area (net sown area) remain mostly constant. (See column 10)
### TABLE 5.2

**LAND UTILISATION IN MAHARASHTRA**

(Area in '00' hectares)

<table>
<thead>
<tr>
<th>Year</th>
<th>Area under Forest</th>
<th>Barron and uncultivated Land</th>
<th>Land put to Non-agricultural uses</th>
<th>Cultivable waste land</th>
<th>Permanent Pastures &amp; Grazing land</th>
<th>Land under misc. Tree Crops &amp; Groves</th>
<th>Current fallow</th>
<th>Other fallow</th>
<th>Net Area Sown</th>
<th>Area Sown more than once</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-61</td>
<td>53698</td>
<td>17808</td>
<td>6950</td>
<td>9259</td>
<td>14304</td>
<td>1839</td>
<td>11869</td>
<td>12087</td>
<td>177423</td>
<td>9374</td>
</tr>
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<td>62-71</td>
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<td>8227</td>
<td>8196</td>
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<td>72-81</td>
<td>53291</td>
<td>17373</td>
<td>10479</td>
<td>9923</td>
<td>15756</td>
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<td>9981</td>
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<tr>
<td>82-91</td>
<td>17.3</td>
<td>5.6</td>
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<td>5.1</td>
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<td>58.6</td>
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<td>11385</td>
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<td>99-00</td>
<td>17.4</td>
<td>5.5</td>
<td>4.0</td>
<td>2.9</td>
<td>4.4</td>
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<td>3.7</td>
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<td>00-01</td>
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<td>12450</td>
<td>8890</td>
<td>13405</td>
<td>2224</td>
<td>11540</td>
<td>11510</td>
<td>176360</td>
<td>46600</td>
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</tbody>
</table>

**Source:** Geography of Maharashtra - By Jayamala Diddee (Editor) Rawat Publications 2001, New Delhi.

It was 17.66 Million hectare (57.4 percent) in 1970-71 and in 1991-92 it raised to 18.56 Million hectare (60.4 percent) a slight increase of 3 percent is observed. Maharashtra accounts for 12.6 of the country's Net Sown Area. But as a portion of geographical area Maharashtra has more N.S.A. i.e. 57.6 percent than that of India's 43.26 percent as observed in 1995-96 upto the year 2000.

The areas Sown more than once (Column 11) shows an increasing trend over 1960-61. It was 0.93 million hectare (3.1 percent) in 1960-61 and in 1998-99 it grew to 4.42 million hectare (14.5 percent). This means there was about four times growth. This growth can be understood with the help of more irrigation by different sources and spread of new agricultural technology during last two decades.

Gross Cropped area means the sum of net area sown and the area sown more than once (G.C.A.). This also shows increasing trend in last four decades (1960 - 2000). Gross cropped area increased from 18.67 million hectare (61.2 percent) in 1960-61 to 22.15 million hectare (71.1 percent) in 1998-99 and in 1999-2000 it increased to 22.35 million hectare i.e. 72.7 percent. Actually Maharashtra accounts for 11.4 percent of India's G.C.A., but Maharashtra's proportion of G.C.A. with respect to its geographical area is higher i.e. 69.2 percent than that of India's 56.75 percent.
This temporal (Physical) analysis of general land utilization indicates clearly that, on the whole the land use pattern has remained more or less constant or unchanged. Due to the variations in the amount and distribution of rainfall, as the water availability is considered as major factor in crop production, the marginal changes in some categories of land utilization are observed.

Land under non-agricultural uses has increased (see column No. 4) to a great extent. In 1960-61 it was 0.69 million hectares and in 1999-2000 it was 1.23 million hectare showing a growth of \((12387 - 6950) \times 78.23\%\) hundred hectare. (i.e. 78.23 percent increase). This is consequence of urbanization and industrialization, which increased area occupied under, factories, buildings, roads, railways, water canal etc. Noteworthy changes in the area sown more than once in a year clearly shows additional human efforts made in intensifying of the agriculture. It also clearly indicates the socio economic and technological changes (specially irrigation and use of high yielding seeds and chemical fertilizers) that took place during post independence period in this region.

**SOILS OF MAHARASHTRA -**

Soils are an important natural resource of Maharashtra. They not only form the base of agriculture and sustain forests and pastures, but also provide the material for brick making and other industrial activities. The major
utilization of this resource is, however through agriculture, which under the presence of a steadily increasing demand for higher yield, has adopted sometimes wisely and sometimes unwisely, all new technical means at its disposal.

The agricultural soil in Maharashtra vary greatly in thickness from a few centimeters to few meters in tilth (cultivation) and fertility, and are exposed to losses of erosion, danger of salinization and toxicity. It is difficult to understand and evaluate such large landscape in Maharashtra. This can be explained by the dynamic nature of soils and the many factors involved in determining the character of a particular soil in a particular place.

FACTORS CONTRIBUTING TO THE SOIL DEVELOPMENT IN MAHARASHTRA -

(A) THE PARENT ROCKS -

The parent rocks of soils in Maharashtra are either formed by the older rocks of Archaean Paleozoic age or deccan basalt. It is only in the eastern part of the Maharashtra Plateau i.e. Nagpur region and the Wainganga basin that the older Archaean gneiss, shists and granites, Precambrian rocks of the Dharwad system and Gondawana sediments with lime and sandstones appear. In southern Kokan, the Kaladgi sandstones are quartzites and are exposed in a few locations. The nature of these pretrapean rocks varies over small distances. The rocks are often coarser grained and show a greater resistance to weathering and erosion than the Deccan basalt. They form the parent material of a variety of soils.
Basalt or Deccan Trap of volcanic origin and upper cretaceous to Eocene age, covers the largest area in Maharashtra consequently the parent rocks of most soils of Maharashtra in basalt or derived from basalt, either as loose sediments of coastal colluvial or alluvial origin or as laterite or older or more recent deep weathering profiles. Alluvial deposits of the Tapi basin exhibit considerable thickness. The different types of basaltic Lava flows, appear in beds of variable thickness density and weather ability. Basalt is a fine to medium grained rock which offers variations (kept in mind), medium resistance to weathering and erosion as a result of its constituent minerals, grain size, and vertical and horizontal jointing pattern.

The chemical composition of the deccan basalt gives a high percentage of silica, alumina, iron oxide, specially ferrous (iron) oxide, and calcium and magnesium carbonates.

(B) THE CLIMATE -

A very large area of Maharashtra State is covered by Deccan Trap, but soils are not same throughout Maharashtra. The differences are to a large extent brought about by the differences in climate, especially the amount of rainfall. Maharashtra belongs to the alternating dry and wet tropics.  

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In general the monsoon season of about five months alternates with a dry season of about seven months. If the monsoon is high enough then only solution processes and the translocation of nutrients clay particles and other soil constituents within or out of the soil profile can take place. Climate and rainfall thus is responsible for the differences in the soil. Only if the amount of rainfall received, exceed the rate of evapotranspiration, the important process of leaching (percolation) or selective removal of nutrients can take place. On the basis of leaching rainfall, two major soil regions may be distinguished -

(1) Those characterized by a relatively higher percentage of iron and aluminium Sesquioxides, reddish colour and base status, the Pedalfers of marbut and -

(2) Those where the bases may have undergone solution and translocation but remained in the soil, the pedocals. The climate has deep influence on soil. Favourable moisture conditions equable soil temperatures during the rainy season not only promote a rapid vegetation growth, but also let the micro-organisms, earthworms and other fauna and macrofouna thrive. During the hot summer months, where surface temperatures can rise to 70° centigrade on black soils, and moisture has disappeared, life within soil comes to a near standstill, where micro-organisms may encyst or survive as spores.
The relief (hills and valleys characteristics) and the drainage development are very closely linked. The drainage interacts with the soil development in different ways. The surface and subsurface drainage may be distinguished. In case of surface drainage, one can easily notice its importance during heavy downpours. The water not only rushes down the slopes, it entrains soil particles of different sizes redistributing them over the slope or introducing them into river system thus producing suddenly mud and solute laden stream flows.

Sub-surface drainage is not noticeable, which essentially determines the soil moisture budget. While on the ridges plateaus and escarpments free drainage within the shallow soils shortens the time available for leaching processes to operate, towards the lower slopes increasingly impeded, drainage keeps the wet phase system of the soil for a much longer period of time working. Longer period of soil moisture favour denser vegetation growth which in turn reinforces the soil processes. Changes in the drainage flow and soil moisture contents often favours the formation of calcareous crusts within the soil. (The Kankar horizons). Such effects can be easily recognised by changes in soil colour, textures, phosphorous, organic matter contents, moisture status in the low as well as high rainfall areas of Maharashtra.
Vegetation, micro-organism and soil fauna (animals) play an important role in the soil formation. The natural landscape of Maharashtra was to a large extent a Savana landscape, grass land with trees and forests in higher rainfall areas. Both forests and grass lands take active part in biochemical processes and in nutrient recycling. "The slow transition from the natural landscape into a cultural landscape changed many grass lands, into agricultural lands or altered them through animal husbandry. This brought about changes in the soil structure, fertility, moisture status and increased the rate of soil erosion by 20 to 50 times depending upon the crop as compared to the natural grass land."

In the dry areas of Maharashtra, the activities of termites can be easily observed, they bring soil particles from the lower layers to the surface. During the rainy season, high earthworm activities can be noticed especially in the red soil, churning the soil and leaving many casts on the surface.

Micro organism show different preferences for different soils. Fungi thrive well in laterstic soil, bacteria are most numerous in medium black soil and in alluvial soils, actinomycetes though less in number seem to show less preference for one kind of soil.

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(D) VEGETATION AND SOIL ORGANISM:

Vegetation, micro-organism and soil fauna (animals) play an important role in the soil formation. The natural landscape of Maharashtra was to a large extent a Savana landscape, grass land with trees and forests in higher rainfall areas. Both forests and grass lands take active part in biochemical processes and in nutrient recycling. "The slow transition from the natural landscape into a cultural landscape changed many grass lands, into agricultural lands or altered them through animal husbandry. This brought about changes in the soil structure, fertility, moisture status and increased the rate of soil erosion by 20 to 50 times depending upon the crop as compared to the natural grass land."

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(E) THE ROLE OF HUMANS:

The soils of Maharashtra have been influenced or altered over many generations by man. Deforestation in the past has accelerated the rate of soil erosion, ploughing and mechanization brought about changes in the soil structure, crop residues and irrigation and fertilizers altered the soil chemistry. Some of the measures brought about an amelioration of soil properties and fertility, while others like faulty irrigation caused a deterioration of soil changing them into alkaline or saline soil and thus wastelands. Slopes were changed by bunding and terracing to conserve soil moisture and halt erosion. However, not all erosion was brought about by deforestation and faulty agricultural techniques.

The above described factors of soil development can only partly account for the different soils in Maharashtra. Some soils are closely linked with the landform evolution and this means that the soils have developed when different environmental conditions prevailed like a more humid or arid climate, a greater or lesser forest cover, a different relief energy and at different periods of time, like the tertiary laterites of Maharashtra, or the Pleistocene black soils. But even such inherited soils are undergoing changes in various degrees. Soil dynamics have always operated and continue operating, sometimes in conformity with the inherited processes and sometimes in a divergent direction, while sometimes abrupt changes occur.
Secondly by their self-inverting capacity counteracts the formation of salt accumulation at the surface. They have favourable back saturation. Better than other clays, they stabilize organic substrates which are absent in tropical soils.

The following drawbacks of such soils, which require special skill from the farmers are that, they have greater density and hence require more power to plough them. They become sticky when wet and need a special timing for working them. Wrong irrigation practices can turn them into saline or alkaline soils. They can easily disperse hence more susceptible to erosion.

[5.7] CROPPING PATTERN & CROPS IN MAHARASHTRA -

Agriculture in Maharashtra is mostly of the intensive subsistence type with an emphasis on the production of food grains. Some of the crops which are called commercial crops viz. cotton, sugarcane, oilseeds, vegetables and fruits are also grown.

There are two main cropping seasons, kharif and rabi. The kharif crops are grown with the onset of monsoon and harvested in September - October. The rabi crops are sown in October - November and harvested in February - March. There are some crops like jowar and cotton, which are grown in both the season. Also, Sugarcane stands in the field of 12-14 months spread over both the seasons.

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Maharashtra has a large area which is called as rainfed or jirayat land. In such lands farming is entirely depended upon nature for production of crops. Therefore farmers in such area started practicing dry farming techniques.

Opposite to this lands which have irrigational facilities are called bagayat. In such area labour and water intensive farming is practiced. Irrigation mainly supplements rain whereby main crops grow as it ought to, and moreover it sustains subsidiary crops.

In Maharashtra some of small lands which are under irrigation, generally called as "Malas". Farmers usually grow cash crops like vegetables which gives them good returns, from such Malas.

**SCOPE FOR NEW AGRICULTURAL TECHNOLOGY**

The present cropping pattern can not be said to be an ideal. Therefore there is a scope for new technological adoption at various levels.

**MAIN CROPS AND THEIR PRODUCTION**

Following are some of the main crops of Maharashtra.

(1) **JOWAR**:

Jowar is grown throughout all Maharashtra State. Infact climate of the state is best suited, especially in some of the district of Maharashtra. Crop is grown on variety of soils. Crop of jawar is draught resistant, but it cannot tolerate heavy rains. This crop is grown in both the seasons i.e. kharif and rabi.
In 1990-91 area under kharif and rabi jowar together was 4,55,100 hectare it increased to 505700 hectares in 1996-97 continuously, but after this in 1999-2000 it come down to 446300 hectares. The main reason for such decrease is that, 1997, 1998 and 1999 were three continuous yeas of bad rainy seasons in which much less amount of rains were received. Area shows small growth in 2000-2001 i.e. 459200 hectares.

As far as production of jowar crop, it shows a continuous increase in production since 1960 onwards (it was 2202 thousand metric tonnes in 1960). Production of Kharif Jowar in 1990-91 which was 3817 thousand metric tonnes, in 1996-97 increased to 3957 thousand metric tonnes, and since then it is showing declining tendency e.g. in 1999-2000, when it was only 2539 thousand metric tonnes. This may be due to bad rains during three proceeding years.\(^{11}\)

Production of rabi jowar was 2202 thousand metric tonnes in 1960-61 but it reduced to 670 thousand metric tons in 1970-71 but again since 1975-76 it rose slowly (e.g. in 1975-76 it was 1222 metric tons), in 1990-91 it was 2112 thousand metric tons and it continually increased since then, and in 1999-2000 it became 2153 metric tons.\(^{12}\) Thus the production of jowar crop has increased.

It could not increase more became since 1960 onwards the amount and regularity of rains both are irregular.


\(^{12}\): All statistical readings are from "Epitome of Agriculture in Maharashtra Table No. 9 year 2002 part-I, Pub. : Commissionerate of Agriculture, M.S. Pune-5.
MAIN REGIONS AND DISTRICTS UNDER JOWAR CROP -

Kharif jowar crop is a dominating crop in Khandesh, Latur, Nanded, moreover, Aurangabad, Jalna, Beed and Osmanabad district of Marathwada, where rabi jowar is grown on a very large scale. Kharif jowar also is grown on large scale in Vidarbha. Osmanabad district has more than half i.e. 56.4 percent of its net sown area under jowar crop. In the districts like Ahmednagar, Pune, Solapur, Sangli, Beed and Parbhani 40 percent area (NSA) is covered under jowar. In many places (Kopargaon, Sangamner, Rahuri) jowar crop is taken as a fodder crop. Jowar is not grown in Konkan and Bhandara districts. Average production yield per hectare was 864 kg, 360 kg, 1075 kg, 1379 kg and 1324 kg in 1961, 1977, 1981-1991 and 2000 respectively in Maharashtra.

(2) BAJARA :

Bajara is another important crop. The reason to call it as important is that it is called as the food crop of the poor as well as rich. This crop also can withstand drought conditions to a great extent. This crop is suitable to the areas which receive even 500 mm rainfall. This crop cannot withstand heavy rains. It is grown on the inferior soil where jowar can not be sown. 13

Bajara also is not grown in Konkan and eastern Vidarbha. It is insignificant in Western Vidarbha and some parts of Marathwada.

13: As in Ref. No.
In Nashik district bajra crop is taken upto 44 percent of it NSA, and in Ahmednagar 26.4 percent, Dhule 23.7 percent, Beed 22.7 percent Aurangabad 18.6 percent and Pune 15.3 percent crop is taken.

**PRODUCTION:**

Production of bajri crop is more or less constant since 1960 to 1990 but shows small amount of increase in 1996-97. Average production of bajri in Maharashtra was as follows. In 1960-61, 299 kg per hectare, in 1970-71, 404 kg/ha in 1980-81 447 kg/ha, in 1990-91 it was 575 kg/ha and in 1999-2000 633 kg/ha and in 2000-2001 it was 604 kg/ha. Thus production per hectare shows continuous growth. This may be attributed to use of inputs according to new agricultural technology spread since 1970-71.

(3) **WHEAT** -

Wheat is also an important crop grown in Maharashtra. It very well grows in cool, dry, and clear weather and is taken in the rabi season. It is sown in October-November and harvested in the month of February-March. This crop is taken in almost every district of Maharashtra, but is not taken in Konkan region and Gadchiroli district at all. After the advent of green revolution, the area under wheat crop shows considerable increase in Maharashtra too, as it is observed at national level. In 1960-61 area under wheat in Maharashtra was 907 thousand hectare (India 34130 thousand hectare). In 1970-71 it was 812 thousand hectare (in India 37590 thousand hectare). In 1980-81 1063 thousand hectare (In India 40150 thousand hectare).
In 1990-91 it was 867 thousand hectare (India 42690 thousand hectare). In 1999-2000 it was 1049 thousand hectare. (In India 45160 thousand hectare). 

As far as production of wheat in Maharashtra is concerned following is the statistics since 1960 onwards.

(Figures '000' metric tons)

<table>
<thead>
<tr>
<th>Decadal year</th>
<th>In Maharashtra</th>
<th>In India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-61</td>
<td>401</td>
<td>34580</td>
</tr>
<tr>
<td>1970-71</td>
<td>440</td>
<td>42220</td>
</tr>
<tr>
<td>1980-81</td>
<td>886</td>
<td>53630</td>
</tr>
<tr>
<td>1990-91</td>
<td>909</td>
<td>74290</td>
</tr>
<tr>
<td>1999-2000</td>
<td>1436</td>
<td>89680</td>
</tr>
</tbody>
</table>

It is clear from the above data that total production of wheat in Maharashtra has increased by more than three times in 1999-2000 than in 1960-61. During the last decade (1991-2000) it increased by one and half time. This is impact of new agricultural technology adoption. Since 1970-71 onwards farmers started using High Yielding Variety of Seed, Chemical Fertilizers crop protecting chemical pesticides and scientific way of irrigation to their crop, consequently production has increased, although wheat crop faces competition by other cash crops to some extent.

\[14\] : Abstracted data from -
(a) For Maharashtra - "Epitome of Agriculture" year 2002 (Part-1) Table No. 8 Pg. 48 Pub. Commissionerate of Agriculture, M.S. Pune-I.
(b) For India "Handbook of Statistics on the Indian Economy" Pub: Reserve Bank of India 2002-03.
Cotton is a kharif crop on black soil. This crop can tolerate rainfall 625 mm to 1250 mm. It is not grown in Konkan region. It is an important cash crop in Khandesh, Western Vidarbha and parts of Marathwada. Yawatmal district has more than half of its NSA under cotton, while Buldhana, Akola, Amrawati and Wardha district have 36 to 44 percent of the NSA under cotton. In Khandesh, Jalgaon 43 percent area is under cotton. In Marathwada Nanded and Parbhani districts have around 40 percent of the NSA under cotton. A continuous and fast growth in the area sown for cotton is observed in Maharashtra, since 1960-61. During the period of last four decades viz. 1960-61, 1970-71, 1980-81, 1990-91 and 1999-2000 the area under this crop was 2500, 2750, 2550, 2721 and 3254 thousand hectare respectively. Thus increase in area under cotton is clearly seen.

Production of cotton in Maharashtra (in thousand bales each bale of 170 kgs) was as follows 1670, 484, 1224, 1875, 3099 thousand bales during 1970-71, 1980-81, 1990-91 and 1999-2000 respectively. Here in production also almost two times more growth is observed. This is also an impact of new agricultural technology.

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(5) SUGARCANE:

Sugarcane is also an important cash crop in agricultural economy of Maharashtra. Sugar Industry of Maharashtra depends upon this crop. The N.S.A. under this crop in Maharashtra during last four decades ending 2000 was, 167, 298, 442, 590 thousand hectares respectively. The average production of sugarcane during the above said decades was 14433 thousand metric tons, in 1970-71, 23706 metric tons in 1980-81, 38154 thousand metric tons 1990-91 and 54140 metric tons in 1999-2000. The production almost increased four times in 1999-2000 compared to 1970-71. This crop requires regular ensured irrigation, therefore it is grown on irrigated land only.

Sugarcane is an important crop in Western Maharashtra (includes Ahmednagar district). It's importance can be judged from the strong influence of the sugar lobby on the political economy of Maharashtra State.

(6) RICE -

Rice is a kharif crop, grown in the areas where rainfall is over 1000 mm. It excellently grows on clay loams (clay with sand and humus). Rice crop is abundantly grown in Konkan area and eastern slopes of the Sahyadris and the eastern Vidarbha region. In Konkan rice occupies river valleys and estuarine (area of tidal mouth of river) plains and on the higher slopes, nachni and other inferior millets are grown. In Maval region rice is grown in the river valleys and on the terraces (flat area on slope of cultivation). Over fifty percent
N.S.A. in Konkan is under rice crop except Ratnagiri. Over ninety percent of N.S.A. in Bhandara district is under rice, and in Gadchiroli this percent is eighty of its NSA. The following data shows rate of increase in area under rice in Maharashtra State, and rate of increase in production during 40 years.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Area (000 ha)</td>
<td>1300</td>
<td>1352</td>
<td>1485</td>
<td>1597</td>
<td>1520</td>
</tr>
<tr>
<td>Average yield (kg/ha)</td>
<td>1054</td>
<td>1229</td>
<td>1587</td>
<td>1467</td>
<td>1683</td>
</tr>
</tbody>
</table>


It is clear from the above statistics, that both the area under this crop and production also increased slowly over a period of four decades time. This may be due to soil conservation and use of new high yielding varieties and mechanization.

(7) OILSEEDS:

Crop of oilseeds also occupies an important place in the agricultural economy of Maharashtra State. Net sown area occupied under various oilseeds was 26,976 hectares in Maharashtra state in the year 1999-2000, Out of which soyabean occupies 10553 hectares. Groundnut is mostly grown in kharif season.
Till the seventies groundnut was dominant crop among other oil seeds but during last two decades ending 2000, it is facing competition mainly from soyabean, sunflower etc., oil seeds occupied first rank in Wardha, Nagpur and Chandrapur in Vidarbha. In Kolhapur district groundnut and soyabean are equally important.

Area under kharif season ground-nut in 1990-91 was 627 thousand hectare and in 1999-2000 it was 406 thousand hectare (in Maharashtra). This decrease may be due to the competition that groundnut crop faces, by crops of soyabean and sunflower. Productions of kharif groundnut in 1990-91 was 578 thousand metric tonnes while in 1999-2000 it was 386 thousand metric tons. This shows a reduction in both area sown under groundnut and its production.

Other oilseeds crops are sunflower, safflower, soyabean, sesamum, rapeseed, mustard, linseed and caster seed etc. A slow growth in the area sown as well as production occurs, during last ten years ending 2000.

(8) PULSES:

Pulses crops like tur, mung, gram, udid are produced in Maharashtra, everywhere. Area under these crops show no increase during these years 1990-91 to 1999-2000. While production in 1990-91 which was 704 thousand metric tons increased to almost double i.e. 1538 thousand metric tons in 2000. This growth in production may be due to extensive use of H.Y.V. Chemical fertilizers and pesticides etc. according to new agricultural technological requirements.
In Maharashtra, compared to conventional crops, fruit crops have a very high returns per hectare. The area under fruit crops was 2.42 lakh hectares, in 1991 state government promoted a Horticulture Development Programme, under which nurseries have been established to supply plants of various fruit crops. Government also have granted subsides for selected fruit crops, since 1990-91.

As a consequences of Governments efforts approximately one lakh hectares area is covered under fruit crops every year till the year 2000-2001, and by the end of 2001 the total area increased to 10.06 lakh hectare and 13.36 lakh farmers were benefited.

Important horticulture crops are Orange, Cashew nut, Banana, Mango and Grapes.
[5.8] **AVERAGE YIELD OF PRINCIPAL CROPS IN MAHARASHTRA**

Table No. 5.3(a) gives an account of per hectare yield of prominent three crops in kilogram, during each year from 1991-2000 in Maharashtra.
### TABLE 5.3 (a)

**CROPWISE YIELD PER-HECTARE OF PRINCIPAL CROPS IN MAHARASHTRA**

(Figures Kgs/ha.)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td></td>
<td>1467</td>
<td>1689</td>
<td>1769</td>
<td>1621</td>
<td>1674</td>
<td>1680</td>
</tr>
<tr>
<td></td>
<td>(1740)</td>
<td>(1797)</td>
<td>(1882)</td>
<td>(1900)</td>
<td>(1921)</td>
<td>(1986)</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td></td>
<td>1049</td>
<td>1279</td>
<td>1460</td>
<td>897</td>
<td>1289</td>
<td>1370</td>
</tr>
<tr>
<td></td>
<td>(2281)</td>
<td>(2483)</td>
<td>(2679)</td>
<td>(2485)</td>
<td>(2590)</td>
<td>(2778)</td>
<td></td>
</tr>
<tr>
<td>Jowar</td>
<td></td>
<td>1379</td>
<td>1420</td>
<td>1819</td>
<td>1203</td>
<td>1425</td>
<td>910</td>
</tr>
<tr>
<td></td>
<td>(900)</td>
<td>(940)</td>
<td>(1072)</td>
<td>(986)</td>
<td>(1068)</td>
<td>(1034)</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>Total Foodgrain yield</td>
<td>846</td>
<td>877</td>
<td>1058</td>
<td>733</td>
<td>974</td>
<td>930</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1571)</td>
<td>(1703)</td>
<td>(1831)</td>
<td>(1775)</td>
<td>(1856)</td>
<td>(1926)</td>
</tr>
</tbody>
</table>

N.B. (Figures in brackets show national yield per ha)

Sources: (1) "Maharashtra at a Glance" Intellectuals Sandarbh Volume-1 Pg.138
(2) Handbook of Statistics on the Indian Economy RBI 2002-03 Table 17 Pg. 32.

The above table reveals that, there is an increase in overall average yield during these ten years. In production of rice, considerably good progress is noticed. The production has increased slowly to 213 kg/ha (i.e. 1680-1467) in 1999-2000 over 1990-91. This is because new hybrid variety which is used during last decade has a property to yield high average. Agricultural scientists have invented many new seeds of this kind.
### TABLE NO. 5.3 (b)

**CROPWISE INDEX NUMBERS OF AGRICULTURAL PRODUCTION IN MAHARASHTRA**

(Triennal base)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Rice</td>
<td>9.49</td>
<td>87.4</td>
<td>79.8</td>
<td>106.6</td>
<td>106.1</td>
<td>95.6</td>
<td>108.5</td>
<td>113.9</td>
<td>109.0</td>
<td>120.4</td>
<td>118.4</td>
<td>108.4</td>
</tr>
<tr>
<td>ii) Wheat</td>
<td>5.92</td>
<td>80.6</td>
<td>58.4</td>
<td>94.1</td>
<td>93.9</td>
<td>64.8</td>
<td>82.7</td>
<td>108.8</td>
<td>118.8</td>
<td>100.9</td>
<td>120.5</td>
<td>69.3</td>
</tr>
<tr>
<td>iii) Jowar</td>
<td>22.16</td>
<td>95.5</td>
<td>63.4</td>
<td>135.3</td>
<td>121.1</td>
<td>69.0</td>
<td>137.3</td>
<td>121.8</td>
<td>95.9</td>
<td>106.1</td>
<td>127.4</td>
<td>77.2</td>
</tr>
<tr>
<td>iv) Bajri</td>
<td>3.08</td>
<td>64.2</td>
<td>64.6</td>
<td>167.1</td>
<td>154.3</td>
<td>124.4</td>
<td>248.0</td>
<td>167.4</td>
<td>153.3</td>
<td>134.5</td>
<td>253.5</td>
<td>154.9</td>
</tr>
<tr>
<td>v) Barley</td>
<td>0.02</td>
<td>37.7</td>
<td>56.6</td>
<td>15.1</td>
<td>17.0</td>
<td>7.6</td>
<td>15.1</td>
<td>9.4</td>
<td>24.5</td>
<td>1.9</td>
<td>22.6</td>
<td>26.4</td>
</tr>
<tr>
<td>vi) Maize</td>
<td>0.46</td>
<td>36.9</td>
<td>63.4</td>
<td>89.1</td>
<td>105.2</td>
<td>86.7</td>
<td>235.7</td>
<td>295.9</td>
<td>274.3</td>
<td>223.8</td>
<td>421.3</td>
<td>249.7</td>
</tr>
<tr>
<td>vii) Ragi</td>
<td>0.85</td>
<td>92.0</td>
<td>70.5</td>
<td>101.2</td>
<td>98.4</td>
<td>87.3</td>
<td>96.6</td>
<td>81.9</td>
<td>80.6</td>
<td>72.1</td>
<td>72.1</td>
<td>69.4</td>
</tr>
<tr>
<td>viii) Kodra</td>
<td>0.05</td>
<td>73.7</td>
<td>61.9</td>
<td>91.3</td>
<td>66.6</td>
<td>46.6</td>
<td>61.3</td>
<td>56.0</td>
<td>48.9</td>
<td>32.4</td>
<td>47.7</td>
<td>51.3</td>
</tr>
<tr>
<td>ix) Other Serials</td>
<td>0.19</td>
<td>76.7</td>
<td>83.7</td>
<td>163.4</td>
<td>150.8</td>
<td>124.4</td>
<td>135.5</td>
<td>95.6</td>
<td>83.9</td>
<td>75.7</td>
<td>53.1</td>
<td>76.9</td>
</tr>
<tr>
<td>Total Serials</td>
<td>42.22</td>
<td>88.5</td>
<td>66.7</td>
<td>124.2</td>
<td>115.7</td>
<td>79.2</td>
<td>131.3</td>
<td>122.4</td>
<td>107.7</td>
<td>111.0</td>
<td>135.2</td>
<td>90.4</td>
</tr>
<tr>
<td>b) Pulses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Gram</td>
<td>1.47</td>
<td>74.4</td>
<td>80.5</td>
<td>202.7</td>
<td>215.8</td>
<td>125.4</td>
<td>183.3</td>
<td>290.4</td>
<td>277.6</td>
<td>234.6</td>
<td>303.1</td>
<td>176.9</td>
</tr>
<tr>
<td>ii) Tur</td>
<td>5.45</td>
<td>96.1</td>
<td>90.6</td>
<td>176.5</td>
<td>105.2</td>
<td>90.6</td>
<td>148.4</td>
<td>185.2</td>
<td>128.7</td>
<td>152.2</td>
<td>178.2</td>
<td>89.2</td>
</tr>
<tr>
<td>iii) Other Pulses</td>
<td>3.52</td>
<td>112.5</td>
<td>110.3</td>
<td>169.7</td>
<td>160.0</td>
<td>91.3</td>
<td>228.6</td>
<td>236.0</td>
<td>171.1</td>
<td>163.4</td>
<td>198.8</td>
<td>130.7</td>
</tr>
<tr>
<td>Total Pulses</td>
<td>10.44</td>
<td>99.2</td>
<td>95.8</td>
<td>177.9</td>
<td>139.2</td>
<td>95.7</td>
<td>180.3</td>
<td>217.1</td>
<td>163.9</td>
<td>167.6</td>
<td>202.7</td>
<td>115.6</td>
</tr>
<tr>
<td>Total Foodgrain</td>
<td>52.66</td>
<td>90.6</td>
<td>72.5</td>
<td>134.9</td>
<td>120.4</td>
<td>82.5</td>
<td>141.1</td>
<td>141.2</td>
<td>118.8</td>
<td>122.2</td>
<td>148.6</td>
<td>95.4</td>
</tr>
<tr>
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</tr>
<tr>
<td>2. Non-Food Grains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Oil Seeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Ground nut</td>
<td>7.23</td>
<td>71.4</td>
<td>72.4</td>
<td>159.3</td>
<td>158.9</td>
<td>87.6</td>
<td>123.1</td>
<td>123.5</td>
<td>103.2</td>
<td>104.3</td>
<td>122.7</td>
<td>91.8</td>
</tr>
<tr>
<td>ii) Sesamum</td>
<td>0.57</td>
<td>94.2</td>
<td>141.0</td>
<td>184.9</td>
<td>223.7</td>
<td>175.2</td>
<td>303.8</td>
<td>232.3</td>
<td>161.6</td>
<td>162.2</td>
<td>152.8</td>
<td>110.4</td>
</tr>
<tr>
<td>iii) Rape Mustard &amp; Linseed</td>
<td>0.78</td>
<td>73.4</td>
<td>66.0</td>
<td>90.7</td>
<td>86.5</td>
<td>43.5</td>
<td>55.5</td>
<td>71.2</td>
<td>71.1</td>
<td>73.3</td>
<td>77.2</td>
<td>28.6</td>
</tr>
<tr>
<td>iv) Castor seeds</td>
<td>0.01</td>
<td>25.0</td>
<td>83.3</td>
<td>125.0</td>
<td>166.7</td>
<td>166.7</td>
<td>183.3</td>
<td>166.7</td>
<td>58.3</td>
<td>225.0</td>
<td>166.7</td>
<td>241.7</td>
</tr>
<tr>
<td>v) Sunflower</td>
<td>0.57</td>
<td>76.8</td>
<td>170.8</td>
<td>530.1</td>
<td>609.8</td>
<td>231.9</td>
<td>473.6</td>
<td>703.3</td>
<td>573.3</td>
<td>643.6</td>
<td>648.4</td>
<td>282.9</td>
</tr>
<tr>
<td>TOTAL OIL SEEDS</td>
<td>9.16</td>
<td>73.3</td>
<td>82.3</td>
<td>178.1</td>
<td>184.8</td>
<td>98.4</td>
<td>121.0</td>
<td>162.0</td>
<td>133.4</td>
<td>138.8</td>
<td>153.5</td>
<td>99.6</td>
</tr>
<tr>
<td>(b) FIBRES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Cotton</td>
<td>9.89</td>
<td>110.4</td>
<td>61.9</td>
<td>151.3</td>
<td>126.6</td>
<td>79.3</td>
<td>129.6</td>
<td>180.1</td>
<td>162.5</td>
<td>192.8</td>
<td>215.5</td>
<td>120.2</td>
</tr>
<tr>
<td>ii) Mesta</td>
<td>0.04</td>
<td>44.5</td>
<td>44.0</td>
<td>44.5</td>
<td>38.0</td>
<td>33.9</td>
<td>56.8</td>
<td>39.0</td>
<td>39.3</td>
<td>26.7</td>
<td>43.3</td>
<td>43.1</td>
</tr>
<tr>
<td>TOTAL FIBRES</td>
<td>9.93</td>
<td>110.1</td>
<td>61.9</td>
<td>150.8</td>
<td>128.2</td>
<td>79.1</td>
<td>129.3</td>
<td>179.5</td>
<td>162.0</td>
<td>192.1</td>
<td>214.8</td>
<td>119.9</td>
</tr>
</tbody>
</table>
From this table (Table No. 5.3(b)) it is clear that the productivity of agriculture in Maharashtra is growing since 1982-83 onwards from 97.4 in 1982-83 it increased to 162.4 in 1999-2000 when all crops are considered.
DIAGRAM NO. 5.3
INDEX NUMBERS OF AGRICULTURAL PRODUCTION
BASE : TRIENNIAL AVERAGE 1979-82 = 100
MAHARASHTRA

ALL CROPS

FOODGRAINS

NON-FOODGRAINS

Source : Economic Survey of Maharashtra 2001-2002 Graph No. 10
Pub. : Govt.of Maharashtra Mumbai.
Second crop is wheat. In 1990-91 yield per hectare was 1049 kg. Over these ten years it slowly increased to 1370 kg in 1999-2000 means there is an increase of 321 kg per hectare. This is quite satisfactory picture of growth. But if we compare the yield of wheat with national average, it is noticed that yield in state which is less by 1408 kg i.e. almost half. It is equally true that average of nation increases mainly due to the huge production of wheat in some of the states like Punjab and Haryana. But this shows that yet there is a good scope for development in Maharashtra as far as new technology and water management is concerned.

Third crop is jowar. This is one of the main crop as well as food of majority people in the state. Maharashtra ranks first in the production of jowar among the few states which grow jowar crop. Jowar yield is also constantly growing during last decade except in 1999-2000 (it is only 910 kg/ha). This is mainly because of less amount of rains received and bad weather, as this crop maximum depends upon nature.

[5.9] INDEX - NUMBERS -

Index number is a statistical measure which shows changes in the magnitude of variable or a related group with respect to time.

Table No. 5.4 shows details changes in magnitude of production of crops in Maharashtra from 1982 to 2000 the base year is 1979-80.
Table No. 5.4 gives a complete detail idea about distribution and increased use of HYV for some of the important crops, from 1990-91 to 2000-2001.
AGRICULTURAL PRODUCTIVITY

The Table No. 5.3 reflects low productivity in Maharashtra. Low productivity is not a problem only in Maharashtra but it also occurs on a national scenario. This is mainly because, the physical factors in Maharashtra are not very conductive to agriculture. This results into relatively low yields of crop in the state as compared with those in India. ¹⁶

The triennial (1995-96 to 1997-98) average yield of total foodgrains in Maharashtra is 8.91 quintals/ha; (India 15.52 quintal/ha. and Punjab 36.17 quintal/ha.) which is only 1/4th of that in Punjab and about 57 percent of all the India average. In case of total cereals, total pulses and cotton also, the yields are lower as compared to all India average. However exceptionally only in case of Sugarcane the yield is 1.2 times more than the national average.

[5.10] AGRICULTURAL INPUTS IN MAHARASHTRA

The discussion, so far made in few pages, has been an attempt to take a review of last 2-4 decades (upto the year 2000), about various aspects of agriculture viz. soils, rains and seasons, cropping pattern etc.

¹⁶: Dr. K.G. Pathan and Dr. V.S. Mangnale in "Mah. At A Glance"
Intellectuals Sandarbh, Vo. 1 Page 144 Pub.: 2002 Bhopal.
It would now be useful to review the usage of different agricultural inputs, for last few years which will help in studying the trend. These important agricultural inputs are fertilizers, Pesticides, High yielding variety of seeds, irrigation, mechanisation and labour. These are all very important components of New Agricultural Technology, and have bearing upon production and output of all crops to a very high extent.

[1] **FERTILIZERS**

Chemical fertilizers are important agricultural input, for more production of crops. Fertilizers and manures enrich the soil with nutrients by which productivity of land is boosted up, in short period. Because of this property, its importance was realized in the country, as well as in Maharashtra after 1960s.

According to statistics of Fertilizers Association of India (1980), the consumption of total fertilizers in Maharashtra in 1964-65 was only 4.4 kg per hectare of cropped area, and in 1978-79 it rose to 19.4 kg per hectare. This shows a sharp increase during these ten years period.

In 1990-91 consumption of fertilizers in the State was 60.67 kilograms per hectare, this quantity remained more or less constant upto 1996-97. (Compared with Punjab, Andhra Pradesh and other States, Maharashtra was on 7th number in consumption). All India per hectare consumption average was 69.26. This means that Maharashtra State was nearer to the national average
consumption. In 1997-98 the consumption increased to 75.20 kg. per hectare, in 1998-99 because it was 78 kg/ha. in 1999-2000 it increased 88.90 kg/hectare. This clearly shows the rising trend in consumption of fertilizers in Maharashtra, mainly due to continuous increased demand and use.

THE TOTAL ANNUAL CONSUMPTION.

In case of Total annual consumption of fertilizers, Maharashtra state was third highest consumer in 1994-95. First was Uttar Pradesh, Second was Andhra Pradesh. Consumption of Fertilizers in Andhra Pradesh was 16.44 lakh metric tons. In Uttar Pradesh it was 24.80 lakh metric tons and in Maharashtra it was 13.90 lakh metric tons. Rate of consumption in the State remained nearly unchanged up to 1997-98. But thereafter it rose to 16.62 lakh metric tons in 1998-99. In 1999-2000 it was highest i.e. 19.30 lakh metric tons, in most of the Maharashtra state.

Apart from the constantly increasing demand, subsidy granted by the Government is another important reason for the above said sharp increase in demand as well as use of fertilizers in the State.

Chemical fertilizer; though is proved to be a boon for agriculture, it also have a property to deteriorate the fertility of land permanently if excessively and constantly used for cultivation of crops.

\[17\] : Indian Agriculture 2003, Publication : Indian Economic Date. Research Centre, New Delhi (Page No. 77).
Diagram 5.4

Consumption of Chemical Fertilizers in Maharashtra

(2) **HIGH YIELDING VARIETY SEEDS** -

High yielding variety seeds are available in Maharashtra, for almost every crop. Farmers now realised importance of such seeds to maximize crop production. Distribution of HYV is made by both public and private sector. Newly evolved variation are popularized through seed miniskirt distribution programme. Since last two decades the extent of seed the replacement in Maharashtra State is very high. In case of most of the crops it is more than the prescribed rate by Government of India. In case of paddy, seed distribution has gone up from 14012 quintals in 1990-91 to 75474 quintals in 1999-2000. Distribution of soyabean was 5281 quintals in 1990-91, it increased to 282012 quintals in 2000-01. This is a tremendous rise. During 1998-99, 205 varieties for 28 crops were distributed to the farmers. 5.8 lakh quintal of seeds were distributed during kharif season of 1998-99 and during rabi season it was 3.8 lakh quintals.
In 1999-2000 distribution was 3.4 lakh for kharif and 4 Lakh quintals for rabi season.

During the kharif season of 2001, Public Sector distributed 3.8 lakh quintals and private sector distributed 3.2 lakh quintals of H.Y.V. to the farmers.

**TABLE 5.4**

**DISTRIBUTION OF IMPROVED (HYV) SEEDS, DURING 1990-91 TO 1999-2000 FOR IMPORTANT CROPS IN MAHARASHTRA**

<table>
<thead>
<tr>
<th>Name of Crop</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kharif</strong></td>
<td></td>
</tr>
<tr>
<td>1) Soyabean</td>
<td>5281</td>
</tr>
<tr>
<td>2) Hybrid Jowar</td>
<td>148446</td>
</tr>
<tr>
<td>3) Padely</td>
<td>14012</td>
</tr>
<tr>
<td>4) Hybrid Cotton</td>
<td>18973</td>
</tr>
<tr>
<td>5) Hybrid Bajri</td>
<td>8432</td>
</tr>
<tr>
<td><strong>Rabi</strong></td>
<td></td>
</tr>
<tr>
<td>1) Wheat</td>
<td>83764</td>
</tr>
<tr>
<td>2) Gram</td>
<td>23316</td>
</tr>
<tr>
<td>3) Jawar</td>
<td>16880</td>
</tr>
</tbody>
</table>

**Source**: Economic Survey of Maharashtra 2001-2002

In this context, it is important to study the trend in coverage (area covered under H.Y.V.) under Hybrid and High yielding varieties seeds in Maharashtra. Table No. 5.5 gives the details about increase and decrease in the coverage area under H.Y.V. and hybrid seeds in the state during last decade 1990-91 to 2000-01.
### Table No. 5.5

(10 years Kharif & Rabi)

**CROPWISE COVERAGE UNDER HYBRID/HYV SEEDS IN MAHARASHTRA 1990-91 TO 2000-01**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>HYV PADDY</th>
<th>HY/HAV JOWAR</th>
<th>HY/HYV BAJRI</th>
<th>HY MAIZE</th>
<th>TOTAL (Kharif)</th>
<th>HY/HYV JOWAR</th>
<th>HYV WHEAT</th>
<th>HY MAIZE</th>
<th>TOTAL (Rabi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-91</td>
<td>12.00</td>
<td>24.62</td>
<td>14.77</td>
<td>0.80</td>
<td>52.19</td>
<td>16.10</td>
<td>7.31</td>
<td>0.27</td>
<td>23.68</td>
</tr>
<tr>
<td>1992-93</td>
<td>12.29</td>
<td>26.06</td>
<td>17.10</td>
<td>1.40</td>
<td>56.85</td>
<td>14.70</td>
<td>4.89</td>
<td>0.22</td>
<td>19.81</td>
</tr>
<tr>
<td>1993-94</td>
<td>12.50</td>
<td>23.86</td>
<td>16.18</td>
<td>1.70</td>
<td>54.24</td>
<td>18.12</td>
<td>6.85</td>
<td>0.28</td>
<td>25.25</td>
</tr>
<tr>
<td>1994-95</td>
<td>13.00</td>
<td>21.62</td>
<td>16.03</td>
<td>1.91</td>
<td>52.56</td>
<td>17.41</td>
<td>6.81</td>
<td>0.24</td>
<td>24.46</td>
</tr>
<tr>
<td>1995-96</td>
<td>12.57</td>
<td>18.62</td>
<td>15.19</td>
<td>2.13</td>
<td>48.51</td>
<td>23.96</td>
<td>6.25</td>
<td>0.10</td>
<td>30.31</td>
</tr>
<tr>
<td>1996-97</td>
<td>12.64</td>
<td>20.10</td>
<td>18.70</td>
<td>2.55</td>
<td>53.99</td>
<td>27.81</td>
<td>7.41</td>
<td>0.08</td>
<td>35.31</td>
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<tr>
<td>1997-98</td>
<td>12.57</td>
<td>19.04</td>
<td>15.39</td>
<td>1.54</td>
<td>48.54</td>
<td>19.70</td>
<td>6.58</td>
<td>0.32</td>
<td>26.60</td>
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<td>1998-99</td>
<td>12.99</td>
<td>17.99</td>
<td>15.93</td>
<td>1.49</td>
<td>48.40</td>
<td>22.88</td>
<td>9.68</td>
<td>0.49</td>
<td>33.05</td>
</tr>
<tr>
<td>1999-2000</td>
<td>14.08</td>
<td>18.96</td>
<td>16.84</td>
<td>1.60</td>
<td>51.48</td>
<td>29.45</td>
<td>8.85</td>
<td>0.51</td>
<td>38.81</td>
</tr>
<tr>
<td>2000-2001</td>
<td>14.12</td>
<td>18.45</td>
<td>16.51</td>
<td>1.97</td>
<td>51.05</td>
<td>29.23</td>
<td>6.90</td>
<td>0.53</td>
<td>36.66</td>
</tr>
</tbody>
</table>

Foot Note: (Figures are in lakh hectares)

Source: Abstract from 'Epitome of Agriculture in Maharashtra year 2002 part-I, Commissionerate of Agriculture M.S.Pune-1.
The statistical figures in the table reveal that more or less the area under HYV remained constant, although there is a gradual increase. In fact in the decade and half, of 1970-71 to 1985-86 the increase in coverage was extremely high. e.g. in 1970-71 area under HYV rice was 2.12 which jumped to 10.44 lakh hectare in 1985-86, in case of hybrid and HYV Jowar it was increased to 21.94 lakh hectare from 4.87 lakh hectares. Bajri also increased from 4.81 to 10.08 lakh hectares. Thus total kharif crops coverage increased from 11.85 to 42.97 lakh hectare. (All kharif season). Rabi crops Jowar area increased 13 times, wheat by 3 times maize 13 times. In the table (5.5) it is seen that after 1990-91 there is a gradual increase in the coverage of HYV for various Crops.

In kharif season of these ten years, rice shows increase while jowar shows decrease, this is because, jowar is a crop grown on dry lands hence in kharif it yields less than rabi therefore farmers are tempted to sow it in rabi season. Consequently it is clearly seen from rabi column that area under jowar crop increased to little less than double. Area under wheat shows slight decrease which may be due to competition from cash crops like vegetables and trend in prices of wheat. Over all total rabi crops coverage area shows increase i.e. from 23.68 lakh hectare in 1990-91 to 36.66 lakh hectare in 2000-2001.

The reason for such slow growth is that during last decade farmers are realizing that extensive use of chemical fertilizers which are essential for HYV causes damage to productive capacity of land in long run and hence
there is tendency to shift to cash crops or keep the land fallow for some years, this reduces the coverage area.

(3) **PESTICIDES (CROP PROTECTION - CHEMICALS)** -

Plant protection or crop protection is one of the requirement of new agricultural technology. Many often small tiny insects, pests and fungi attack crops, this affects on the yield of crop. To protect them chemical insecticide, pesticides sprays etc. are used in the form of granules, powder, or dust etc. BHC-10, Phorate-10 G. Quinolphos 5% Carbaryl 10% dust, Zink Phosphate are some of the solid forms used as pesticides and insecticides. Moreover some, Chemicals are used in liquid form as pesticides viz. Endosulphan, Phosphomidan Malathian, Methyl Denseton, Thiometon etc. all these are trade names of chemicals. Some of the following fungicides are used viz. Sulphurdust Copper Oxycl 50% Wettable Sulphur etc.

Growth or occurrence of pests, insects, fungi etc. depends upon weather, rain, temperature of the atmosphere. Therefore use of such Chemicals also depends upon these things, hence use of plant protection is made as and when needed. Because of this use of such chemicals differ in quantity each year.

In 1997-98 the consumption of technical grade pesticides was 3478.5 metric tons, in 1998-99 it was 3468 metric tons, during 1999-2000 it was 3209 Metric Tons.
In 1999-2000 net irrigated area in Maharashtra was 25.1 lakh hectare which increased to 29.6 lakh hectare in 2000-2001. Out of this area irrigated by wells was 19.1 lakh hectare. The gross irrigated area in 2000-01 was 36.5 lakh hectares in 1999-2000 it was 33.7 lakh hectare. The percentage of gross irrigated area to gross cropped area in 2000-01 was 16.4 percent. This percentage was 15.2 in 1990-91. Thus there was no much progress during these 10 years period.

The Maharashtra Water and Irrigation Commission in its report of 1999 have estimated the ultimate irrigation potential of the state through both surface and ground water resources as 126 lakh hectares. A number of major medium and minor irrigation projects have been taken up by the State Government to tap the maximum possible area under irrigation.

The irrigation potential created in the state by the end of June 2001 through all types of irrigation projects taken together was 49.02 lakh hectares. The share of major, medium, minor (state) and minor (local sector) irrigation projects in the total irrigation potential created was 49.9 percent, 12.7 percent, 19.2 percent and 22.2 percent respectively. The additional irrigation potential created during 2000-01 was 1.33 lakh hectares showing an increase of 2.8 percent over the cumulative acquirement upto the end of June 2000.

The new policy of State Government (23-7-2001) was formation of Cooperative Water Users Associations, and handover irrigation management
to them for three years; to reduce the gap between irrigation potential created and actual area irrigated. Moreover to increase water use efficiency and to restrict expenditure on maintenance and repairs of irrigation system. So that recovery of water charges will be done effectively. During 2001 in all 273 such associations were in operation with operational area about 98 thousand hectares.


Crops in the Maharashtra State mostly depend upon rains, works of soil conservation have been carried out on the large scale in the state. To encourage dry land forming water conservation works have been implemented in the State since 1983. According to Integrated Watershed Development Programme in all 14165 villages in the state are selected and in 1997 of these villages, works are actually being undertaken in 20460 watersheds. This incurred an expenditure of 144 crore rupees, in 2000-01.

Govt. of Maharashtra has encouraged lift irrigation societies in cooperative sector up to the year 2000-2001 there were 4796 lift irrigation societies having membership of 556000 farmers. With these 580700 hectare

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area comes under irrigation. Pune, Nashik, Kolhapur divisions were leading divisions in the development of lift irrigation.

Agriculture in Maharashtra suffers with a natural problem of uncertain rainfall. Some parts of the state go frequently dry, while other parts under heavy rains. Many times state has witnessed periods of scarcity and droughts. This was realised quite earlier. During 1956-59, 10.7 Lakh hectare was under irrigation and in 1973 it come upto 17.8 lakh hectares. These was an increase of only 7 lakh hectares during these 14 years. This definitely, was not a satisfactory growth. Importance of irrigation was realised after 1960 and many projects were constructed and enough water storage was made available. But it was not utilized fully e.g. it was only 60% upto 1974.

The Central Govt. had appointed a committee in 1972 to study the reasons of such non utilization of water. This committee observed as follows:

(1) No demand of water was for kharif seasons.
(2) Non availability of land development programmes.
(3) Apathetic (indifferent) behaviour of the farmers.
(4) Shortage of labour hands.
(5) Lack of financial aids.

The Govt. of Maharashtra had been doing every thing to overcome all the problems so posed.
The following are some of the major important projects in Maharashtra viz. Bhandardara, Bhatghar, Khadakwasala, Krishna, Ramtek etc. During planning period projects like Vaitarna, Girna, Ghod, Veer, Puna, Sidheshwar, Pools, Itiadoh etc. were completed.

The others are Surya, Tillari, Nandur Madhmeshwar, Upper Godavari, Upper Tapi, Jayakwadi, Manjara, Kukadi, Ujani and Dhom etc. Since last decade drip irrigation is becoming more popular. Requirement of water depends upon type of soil. By using tubes of polythene with fixed tap of smaller size water drops are directly elevated at the roots of the crop. This method is very useful in dry areas and meager water availability. By using Drip system, 60 to 80 percent water can be saved, and additional 60 to 70 percent can be irrigated. This system though useful it is very costly. Government therefore has started giving financial assistance for installation of this system.

Out of total in India, Maharashtra has 60% of drip irrigation in the state. The system is used successfully in Maharashtra for crops like flowers, fruits, and vegetables. There were about 35675 Drip Projects units in Maharashtra at the end of 2000-2001. Sprinkle Irrigation system is also becoming popular in Maharashtra. Sprinkle can save 35% of water and promotes 15% increase in yield. This system is used all over Maharashtra except Konkan area.
(5) FARM MECHANIZATION:

Before the fifties there was no significant use of machines in agriculture of Maharashtra and the same was the position in Indian agriculture. An upward trend was found in the use of various machines in agriculture. This was because of green revolution. Machines which are used on farms are tractors, oil engine pump sets, electrical pump sets, threshers harvesters, etc. Table No. 5.6 gives details.

In case of oil engines use, Maharashtra occupied second rank after Gujarat in 1966. After 1970 farmers in Maharashtra started extensively using machines on the farms. As the supply of electricity through villages increased electrical power driven machines like pump sets, threshers, tillers spray pumps crushers etc. came into use replacing the conventional, bullock driven or hand driven machines and implements.

Mechanization in agriculture saves time and labour both. Moreover ploughing becomes more easy and deep with help of tractors. Trolley attached tractors are used for transportation. Electric water pumps are many times more efficient for irrigation. The same is the case with other machines. Because of such high efficiency demand for machines increased tremendously during last decade.
The number of tractors in Maharashtra has increased by 74.5 percent in 2000 compared to 1992.\textsuperscript{18}

The number of wooden and iron ploughs decreased by 27.9 percent and 36.86 percent respectively during period from 1992 to 2000. This decrease shows an increased rate of farm mechanization in Maharashtra State. Likewise, sugarcane crushers increased by 17.45 percent, plant protection equipments increased by 28 percent and electrical pump sets used for irrigation purpose increased by 12.9 percent in 2000 compared to 1992.

\textsuperscript{18} : "Intellectuals Sandarbha" Maharashtra at a Glance Vol. 1 Pg. 141.
## TABLE NO. 5.6

**YEARWISE INCREASE / DECREASE IN THE NUMBER OF SOME MACHINERY AND IMPLEMENTS USED IN MAHARASHTRA**

(Figures in Numbers)

### 1961 - 1997

<table>
<thead>
<tr>
<th>Year</th>
<th>Electric Pumps</th>
<th>Diesel Pumps</th>
<th>Tractors</th>
<th>Hand Tractors</th>
<th>Power Cane Crushers</th>
<th>Bullock cane crusher</th>
<th>Spray pumps</th>
<th>Wooden plough (000)</th>
<th>Iron Plough (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>7100</td>
<td>63747</td>
<td>1427</td>
<td>N.A.</td>
<td>7155</td>
<td>8647</td>
<td>N.A.</td>
<td>1673</td>
<td>398</td>
</tr>
<tr>
<td>1966</td>
<td>37979</td>
<td>146786</td>
<td>3274</td>
<td>N.A.</td>
<td>7371</td>
<td>10323</td>
<td>N.A.</td>
<td>1765</td>
<td>466</td>
</tr>
<tr>
<td>1972</td>
<td>169778</td>
<td>172003</td>
<td>6199</td>
<td>498</td>
<td>5864</td>
<td>2884</td>
<td>45847</td>
<td>1780</td>
<td>527</td>
</tr>
<tr>
<td>1978</td>
<td>378009</td>
<td>165827</td>
<td>12917</td>
<td>735</td>
<td>7467</td>
<td>2023</td>
<td>117086</td>
<td>1919</td>
<td>575</td>
</tr>
<tr>
<td>1982</td>
<td>448631</td>
<td>137437</td>
<td>24453</td>
<td>704</td>
<td>7228</td>
<td>2604</td>
<td>245177</td>
<td>1927</td>
<td>660</td>
</tr>
<tr>
<td>1987</td>
<td>599649</td>
<td>129537</td>
<td>33821</td>
<td>706</td>
<td>5879</td>
<td>2495</td>
<td>398816</td>
<td>2073</td>
<td>840</td>
</tr>
<tr>
<td>1992</td>
<td>731856</td>
<td>99490</td>
<td>46313</td>
<td>1229</td>
<td>6641</td>
<td>2567</td>
<td>521254</td>
<td>2188</td>
<td>962</td>
</tr>
<tr>
<td>1997</td>
<td>851824</td>
<td>94212</td>
<td>81353</td>
<td>4023</td>
<td>6879</td>
<td>3495</td>
<td>756799</td>
<td>1577</td>
<td>607</td>
</tr>
</tbody>
</table>

**Source**: Epitome of Agriculture Part-I 2002 Table No. 35 Page 155 Pub: Commissionerate of Agriculture M.S. Pune-1.
Number of hand tractors in 1972 was 498. This increased to 4023 in 1997; this means ten times growth. Such tractors are simple, easy to handle and cheaper, therefore farmers buy them. (Column 5). The electric power driven sugarcane crushers (see column 6) in 1961 was 7155 gradually it decreased to 6879 in number by the year 1997. As said earlier that contribution of bullock power declined in Maharashtra. This is clear from the decrease in number to 3495 in 1997 from 8647 in 1961 (Column 7).

Tremendous growth in implements used for plant protection is seen (column 8) in 1972 the number was 45847 and it increased to 756799 in 1997. These are spray pumps and other machines for plant protection purpose. According to new technology, plant protection is unavoidable; hence farmers buy these implements. Moreover, subsidy is available from the government. Another reason is shift to cash crops like vegetables and these crops need more protection.

Wooden plough (column 9) are more or less constant in number. This is because, such plough are useful for superficial ploughing of a very small portion of land e.g. few acres.

Iron plough (column 10) hardly became double in number during four decades. Such ploughs are called 'Balaram' in some regions and are occasionally used in absence of tractors.
CONCLUSION

(a) With an awareness about new agricultural technology the agricultural mechanization growth rate in Maharashtra increased to a very high extent.

(b) Use of draught power of animals has been decreasing very fast since last decade.

LABOUR IN AGRICULTURE (Maharashtra) -

As an indicator of economic development the word 'labour' in agricultural sector is interchangeable with farm employment. Labour is the main and most important factor of production in agriculture too. Farming without labour cannot be imagined. Apart from the farm operations which can be performed by machines, there are many other operations which invariably need human labour. Usual and common operations in farming are, ploughing sowing, weeding (removal of unwanted wild herbs and grass), pruning (sickle work), irrigation, harvesting, threshing etc.

In Maharashtra before green revolution almost every work on farms used to be done by human hands and with the help of animals like bullock, horse or male buffalo.

It is a fact that population of labourers also increased with increase in rural population. But the opportunities of employment in rural areas did not increase with the faster growth rate of population. Consequently, a large
number of rural unemployed people continued to migrate to the big cities of Maharashtra since couple of decades. Some proportion of labour continued to go to the nearby district or taluka places for jobs as casual labour or semiskilled workers. Rest of the labourers joined Employment Guarantee Schemes which state government initiated in nearby vicinity of the villages. The remaining labourers worked on farms of other farmers. Even marginal farmers hired out their labour seasonally.

Mechanization causes displacement or unemployment in agriculture, at least in the following few years of adoption of mechanization. This is a common experience of all developing countries like India. Further adoption of all other components of new agricultural technology, the cropping pattern changes and with intensive use of land and multiple cropping, demand for labour increases. This happened in Maharashtra after 1980s and a shortage of labour was experienced by farmers in rural areas. Cost of hired labour increased causing financial difficulty to the farmers. Today there is hardly any labourer who accept wages in kind.

Annually paid labourer called 'Saldar' or monthly paid labourer called 'Mahindar' are very rare cases today. Inspite more use of machinery, for internal culturing of land women labourers are required. Therefore the number of women labourer has increased in the villages. They are paid wages at the lower rate than the man. Moreover very few women go to nearby cities or towns for wage earning.
Table No. 5.7 shows the trends in farm own labour and hired labour during 1991 to 2001 for Maharashtra vis-à-vis India.

### TABLE - 5.7

**SEXWISE & CATEGORY WISE CLASSIFICATION OF AGRICULTURAL LABOURERS IN MAHARASHTRA STATE & INDIA ACCORDING TO CENSUS 1991 & 2001 CENSUS.**

(Figures in 000)

<table>
<thead>
<tr>
<th>Census Year</th>
<th>MAHARASHTRA</th>
<th>INDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MALE</td>
<td>FEMALE</td>
</tr>
<tr>
<td><strong>1991</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultivators</td>
<td>6231</td>
<td>(61)</td>
</tr>
<tr>
<td>Labourers</td>
<td>3906</td>
<td>(39)</td>
</tr>
<tr>
<td>Total</td>
<td>10137</td>
<td>(100)</td>
</tr>
<tr>
<td><strong>2001</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultivators</td>
<td>6681</td>
<td>(58)</td>
</tr>
<tr>
<td>Labourers</td>
<td>4924</td>
<td>(42)</td>
</tr>
<tr>
<td>Total</td>
<td>11605</td>
<td>(100)</td>
</tr>
</tbody>
</table>

1. Note: Figures in bracket show percentages.

2. Source:


   (b) Basic Population Data - Census of India 2001, Table 00-009 Website : http://wwwconsusindia.net/t00009html.
Data from census 1991 reveals that total number of cultivators and hired labour was 18485 thousand, in census year 2001 this number increased to 22629 thousand in Maharashtra State. In 1991 bifurcation as male and female was 10137 thousand and 8349 thousand respectively. Corresponding numbers in 2001 census it increased to 11605 thousand and 11024 thousand respectively. In India the total number of cultivators and labourers was 185300 thousand in 1991 which increased to 234087 thousands in 2001. Number of male and female which was 134646 thousand and 50654 thousand in 1991 increased to 142745 thousand and 91342 thousand in 2001 respectively. Thus in Maharashtra State and rest of India the number of labourers show increasing trend during this decade. This growth in number indicates increase in farm employment, which is a positive economic impact of new agriculture technology on agriculture both in Maharashtra and India as a whole. Comparison of male and female labourers, as cultivators and hired, shows that, in 1991 in Maharashtra percentage ratios of male cultivators and hired labour was 61:39 and national ratio was 66:34. Percentage of cultivators and hired female labours in the state was 47:53 and in India it was 44:56.

A clear trend is noticed that percentage of hired labour in males was smaller in both cases i.e. state and nation. Contrary to this percentage of hired women labour was higher in both cases.
Comparing the above trend with statistics after 10 years i.e. census of 2001, the same trend is seen again that percentage of cultivator males to hired male labour was higher in Maharashtra i.e. 58:42 and India 60:40. Inference drawn from this is contribution of labour by cultivators was more than hired labour since last 10 years. Trend of females is also found unchanged, on the Maharashtra scenario and the national scenario.

**INFERENCES:**

The statistical analysis above shows declining trend in male cultivators during 1991-2001 as the percentage of cultivators dropped from 61 in 1991 to 58 in 2001 (i.e. 3% drop) and in case of hired labour there is an increase from 39 percent in 1991 to 42 percent in 2001, (exact 3% rise).

This therefore would mean that with higher level of use of technology 3% owners cultivators had an opportunity to shift to more profitable employment related to agriculture and 3% labourer had an opportunity of employment; resulting in full time employment level for both. Before green revolution, disguised unemployment was a main feature of agriculture in India. Use of new technology can do away with this problem to a very great extent.
MALE FEMALE RATIO ANALYSIS:

Further, using census data from table No. 5.7 a separate table was constructed (Table No. 5.8) to study the ratio of male and female in both categories viz. cultivators and hired labourers. Analysis came out with a very peculiar results.

**TABLE NO. 5.8**

**SEX AND CATEGORY WISE RATIO CLASSIFICATION OF TOTAL LABOUR IN MAHARASHTRA & INDIA FOR 1991 & 2001.**

<table>
<thead>
<tr>
<th>Census year &amp; Category</th>
<th>Maharashtra</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male : Female</td>
<td>Male : Female</td>
</tr>
<tr>
<td><strong>1991</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultivators</td>
<td>10:15</td>
<td>40:10</td>
</tr>
<tr>
<td>Labourers</td>
<td>10:11</td>
<td>16:10</td>
</tr>
<tr>
<td>Overall</td>
<td>10:12</td>
<td>26:10</td>
</tr>
<tr>
<td><strong>2001</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultivators</td>
<td>10:13</td>
<td>20:10</td>
</tr>
<tr>
<td>Labourers</td>
<td>10:12</td>
<td>12:10</td>
</tr>
<tr>
<td>Overall</td>
<td>10:10</td>
<td>16:10</td>
</tr>
</tbody>
</table>

(Source : Derived from Table 5.7)

According to table 5.8, in Maharashtra, a very constant antecedent of males as 10 is observed, even at overall level ratio, while female proportion (consequent) continued to decline oddly, between the period of two census. Again it is astonishing to note exactly opposite trend in the national male: female ratios. In India (as a whole) proportion of females (consequent) remained totally constant over the ten years period between two census period.
Comparison of overall total male - female ratio which are 10:10 for Maharashtra and 16:10 for rest of the nation. Shows that in Maharashtra equal number of male and female workers contribute to labour where as in India there are 10 women for every 16 men work together.

There may be two main reasons responsible for the above said trend.

(1) Since 1901 in rural population of the Maharashtra State, sex ratio, females per thousand males declined continuously till 2001. It was 1003 in 1991 and declined to 959 females per thousand males in 2001 i.e. decline of 56 points. This decline is reflected in the decline of female cultivators and labourers, viz the ratio declined from 15 to 10 females during last decade in Maharashtra.

(2) Spread of education in women in Maharashtra comparing to other parts of country is considerably higher, in rural areas. Thus educated new generation of women do not prefer much, to work on the farms. But percentage of labour women slightly increased from 17 to 12 percent. This shows their increased participation.

In case of rest of India the number the female is constant and males is declining; Thus may be due to shift to other cottage industries for more gain, than agriculture.

79: (a) Population census 2001
    (b) Maharashtra at a Glance Intellectuals Sandarbh, Bhopal 2004, Page 96.
The economic analysis of the past data from 1991 to 2000 pertaining to Maharashtra State shows the following results as per the following parameters applied.

(i) Growth in agricultural productivity per hectare is observed.
(ii) Improvement in farm employment was observed.
(iii) Improvement in land use pattern was observed.
(iv) Shift towards higher remunerative crops is seen.
(v) A high level of adoption of New Agricultural Technology as found (As there was sharp growth in new inputs and mechanization).