CHAPTER VII

TECHNOLOGICAL DETERMINANTS

AND AGRICULTURAL CHANGES
In the foregoing chapters the landuse cropping pattern and changes therein have been analysed in the context of physio-socio-economic factors. But the technological factors have a profound influence on agricultural landuse and productivity also. The main object of this study is therefore to analyse the spatial variations in technological factors which give rise to agricultural development, landuse changes and farm productivity. Before examining these technological factors it would be pertinent to have some idea about the agriculture in the region under study.

The agriculture based on ageold experiences was more common in the region before 1951. Most of the essentials were home produced and outside needs were limited. In the traditional agricultural pattern seasonal crops played a part with less diversification. Mixed cropping was more common than cropping in pure stands. Cultivation by wooden plough was more widespread. Crop-yields were low and fertility was maintained by using cow-dung and composite manures. Transport was inadequate and inefficient and mainly by carts. Marketing facilities were almost not existing. The use of mechanical power in farming operations was almost unknown. The role of Government had largely been limited. Trade too was
unfavourable and middleman made more profits than the cultivators. As a result, the region’s agriculture continued to function as the backward sector in the economy.

But shortly after 1954-55, especially with the growth of co-operative sugar factories which played an important role in the economy of the region, drastic changes took place in the region’s agriculture and these changes are largely the result of technological advances.

A) TECHNOLOGICAL DETERMINANTS:

In the present study they include irrigation, agricultural machinery, adoption of improved seeds, use of chemical fertilizers, pesticides, agricultural credit loans, soil conservation, improvements in means of transport and, above all, the developing spirit of the farmers (Joseph, 1973). These factors which have been introduced in the area quite recently have given rise to many agricultural changes. In order to understand these transformations, the spatial pattern of the technological elements require to be analysed. The data used in this study are abstracted from the socio-economic review and district statistical abstracts of Kolhapur District and their spatio-temporal variations in the region are analysed as follows:
I) Irrigation:

Assured water supply is one of the conditions most essential for a successful crop growth, particularly in areas where rainfall is uncertain and concentrated in a certain period. Where it is plentiful and well distributed over the year, there is no problem of water. Further, irrigation itself determines the use of other agricultural inputs.

The proportion of net irrigated area to net sown area accounts for 14.43 percent in the study area which is higher than that of State average of 8.02 percent. This intensity of irrigation varies in different parts of the district as is portrayed in Fig. 7.1. Very high proportion of irrigated area (over 20 %) is noted only in two talukas namely, Karveer and Shirol. The high proportion (15 to 20 %) is recorded in Hatkanangale, Panhala, Radhanagari and Bhudergad talukas. The talukas having 10 to 15 percent irrigated area is registered in Shahuwadi and Gadhinglaj, whereas in the remaining talukas, the proportion of irrigated is low (10 to 15 %) and very low (below 10 %).

During the period under review the area under irrigation increased everywhere at variable rates (Fig. 7.1.B). The intensity of irrigation increased
Net Irrigated Area
1971-75

Changes in Net Irrigated Area
1951-55 / 1971-75

% of net area sown
Region average = 14.43

% Increase
Region average = 7.85
significantly (over 12 %) in Karveer and over 20 percent, particularly in Shirol taluka. Moderate increase is observed in talukas of Panhala, Hatkanangale and Radhanagari. In Bhudergad and Gadhinglaj the increase is 4 to 8 percent. Elsewhere the increase is below 4 %. Thus, during the last decade the irrigation facilities have been considerably improved in the region under study.

II) Agricultural Machinery:

One of the major technical developments of the post-Independence period has been the application of mechanical power to agriculture. The mechanisation of agriculture in India simply means the use of tractors and power-operated pump sets (Singh, 1979). It is labour and time saving and gives more spare time to farmers to look after other farm activities.

Spatial differences in the use of improved agricultural implements are noted in the region. As they are so closely adjusted to environment such as size of holdings, irrigation and poverty which mainly control the use of modern machinery. The use of agricultural implements also changes on account of changing socio-economic status of farmers linked with the changing cropping pattern. Change in implements is more significant in the areas of commercial
farming. The modern agricultural implements used in the region under study are oil engines, electrical pumps, sugarcane crushers, tractors and others. Fig. 7.2 shows the spatial variation of these in the district.

1) Oil Engines:

The oil engines are used for lifting the water from river and well and they are steadily increasing. There were 2632 oil engines in 1951 which increased six times in 1972. There are now 12398 oil engines in this district (Table 7.1). Fig. 7.2.A shows the distribution of number of oil engines during 1972. Their concentration is seen in northern part of comprising Hatkanangale, Karveer, Panhala, Shiroli, Shahuwadi, Radhanagari and Kagal talukas. This is mainly due to larger area under sugarcane along the river banks. In the remaining talukas this concentration is low.

ii) Electric Pumps:

With the availability of power in the rural areas the use of electric power for irrigation purposes has been increasing. The number of electric pumps increased in the region from 44 in 1951 to 203 in 1961 and 6412 in 1972 (Table 7.1). Electric pumps used for irrigation are
Fig. 7.2

Oil Engines 1972

Electric Pumps 1972

Sugarcane Crushers 1972

Tractors 1972

Numbers

- 1500
- 1000
- 500
- 100

Numbers

- 1000
- 500
- 200
- 50
- 5

Numbers

- 300
- 20
- 50

Numbers

- 400
- 50
- 10
- 5

Fig. 7.2
more in Karveer, Hatkanangale, Shirol, Gadhinglaj and Radhanagari talukas (Fig. 7.2.B). They are 47 in Shahuwadi, 6 in Chandgad, 5 in Ajra and 4 in Bawada taluka.

### Table 7.1
Growth of Agricultural Machinery in Kolhapur District

<table>
<thead>
<tr>
<th>Machinery</th>
<th>1951</th>
<th>1961</th>
<th>1972</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil engines with pumps for irrigation purposes</td>
<td>2632</td>
<td>7560</td>
<td>12398</td>
</tr>
<tr>
<td>Electric pumps for irrigation purposes</td>
<td>44</td>
<td>203</td>
<td>6412</td>
</tr>
<tr>
<td>Sugarcane crushers a) worked by power</td>
<td>1052</td>
<td>1618</td>
<td>1373</td>
</tr>
<tr>
<td>b) worked by bullocks</td>
<td>674</td>
<td>319</td>
<td>41</td>
</tr>
<tr>
<td>Tractors</td>
<td>28</td>
<td>103</td>
<td>954</td>
</tr>
</tbody>
</table>

Source: District Census Handbook and Socio-economic review and district statistical abstracts of Kolhapur District.

iii) **Sugarcane Crushers**:

With the availability of power the use of power-operated crushers has increased. There were 1726 crushers.
In 1951 out of which 1052 were power-operated and only 674 were worked by bullocks. In 1972 out of 1414 crushers, 1373 were operated by power and the remaining 41 were worked by bullocks (Table 7.1). Fig. 7.2.C shows the spatial distribution of power-operated sugarcane crushers in the region. Karveer, Panhala, Chandgad and Gadhinglaj taluka have large number of sugarcane crushers, whereas their number is moderate in Hatkanangale, Bavada and Shahuwadi. In the remaining talukas they are less in number.

iv) Tractors:

With the use of tractors many farm implements driven by bullocks were improved while others were replaced by better and more efficient implements. In the region the use of tractors is increasing. In 1951 there were 28 tractors but in 1961 and 1972 the number increased to 103 and 954 respectively. In eastern talukas (Shirol, Hatkanangale, Karveer and Panhala) particularly in sugarcane farming areas the use of tractors is indeed increasing, with 476 in Karveer, 196 in Hatkanangale, 87 in Shirol and 84 in Panhala. In Radhanagari, Kagal and Gadhinglaj they are 55, 25 and 12 respectively. In the remaining talukas they are from 3 to 8 in number (Fig. 7.2.D).
On the whole a large scale shift from bullock drawn ploughing to tractors is not possible even in the near future on account of socio-economic factors and topography of the region.

III. Improved Seeds:

The domestic varieties of seeds are unsuitable for the new production techniques. So, high yielding varieties of seeds are used which added new scene to cropping pattern. The introduction of high yielding variety seeds programme indeed marked the beginning of a new era in the field of agricultural development. This rapid adoption was also facilitated by improvements in the supply of irrigation water and successful research in bringing out better varieties. Further, the rapid adoption of high yielding variety seeds was made possible by response of the farmers in this region. The important new varieties grown in this part of the state are IR-8, Radhanagari 185-2, Ratnagiri-24, Jeya, Sona, Karjut 184, Suhasini, Tayachung, Native-1, of rice, CSH-1, CSH-4, CSH-5, CSH-6, of jowar and Co-419, Co-775, Co-740 of sugarcane. They have very successful in this part of the State. Improved seeds of various types to the tune of 1505 quintals were distributed in 1972-73, whereas in 1974-75, 196 quintal seeds of wheat, 2419 quintals of jowar, 599 quintals of paddy, 20 quintals
of gram and nagali and 162 quintals of oil-seeds were distributed in the area under study.

The talukawise utilization of improved seeds in the region is shown in Fig. 7.3.C which reveals that the distribution pattern is closely related to the intensity of irrigation.

IV) Chemical Fertilizers:

Because of the extension of area under sugarcane the use of chemical fertilizers has been very rapid. Ammonium sulphate, Super phosphate and Urea are the main fertilizers used in this region. In 1971-72, 26714 M. tonnes and in 1972-73, 62918 M. tonnes of all types of chemical fertilizers were distributed, whereas during 1974-75 the details of distribution of chemical fertilizers in district were as under:

<table>
<thead>
<tr>
<th>Fertilizer Type</th>
<th>Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium sulphate</td>
<td>1628 M.</td>
</tr>
<tr>
<td>Super phosphate</td>
<td>1620 M.</td>
</tr>
<tr>
<td>Fertilizer mixture</td>
<td>32048 M.</td>
</tr>
<tr>
<td>Urea</td>
<td>14715 M.</td>
</tr>
<tr>
<td>Others</td>
<td>4364 M.</td>
</tr>
</tbody>
</table>

The use of these fertilizers is not the same throughout the district being generally higher in the irrigated areas (See Fig. 7.3.D). The obstacles in the
lesser use of fertilizers are lower intensity of irrigation, lack of finance, high prices, non-availability at the required time and the small landholding size which discourage the use of fertilizers.

V) Chemical Pesticides:

With the introduction of new varieties of various crops which are highly susceptible to pests and diseases, the use of pesticides has become a part of crop production technology. Much of the crop losses (10 to 30%) due to pests and weeds could be reduced by timely and adequate plant protection measures (Singh, 1979). Pests and diseases can seriously damage the crop, if adequate measures are not taken in time.

In 1970-71, 76436 kg. and in 1972-73, 20964 kg. and in 1974-75, 28033 kg. chemical pesticides were distributed in the region. The patterns of distribution coincide with the intensity of irrigation and also the type of crops raised. Their use is significantly high in eastern part of the district. Elsewhere, the use of plant protection materials is small and even negligible due to the limited economic means of the farmers (See Fig. 7.4.A).
VI) **Agricultural Credits**

Credit and finance are essential factors in any changing process, especially in agriculture. The money-lender has been the major source of finance to Indian farmers but the interest-rates of these moneylenders were high and the cultivators always in need of money had to approach these moneylenders who exploited them. So they have always in debt. It is then that the government's attention was pointedly drawn to the question of rural indebtedness as a result of which co-operative movement started. The co-operative movement began to spread in many villages enabling the cultivators to stand on their own feet.

These co-operative movements started with the object of granting loans to cultivators for productive purposes and following these there has been a substantial expansion in the credit societies. Kolhapur district is one of the foremost districts as far as co-operative movement is concerned. There were 780 agricultural credit societies at the end of the year 1962-63 in the district. In 1972-73, 875 primary agricultural credit societies were functioning as against 874 during the year 1971-72. At the end of June, 1975 there were 877 primary agricultural credit societies. Now almost all the villages in the district have been covered by the primary agri-
cultural credit societies and these societies cater to
the credit needs of the agriculturists to a great extent.

The system of advancing loan was on the basis of
land and the loans were provided for production purposes
to different crops in varying proportions depending on
the land being dry or irrigated. During the year 1975-76
the agricultural credit societies advanced loans amounting
to Rs.1911.09 lakhs as against Rs.1633.70 lakhs in the
year 1974-75. Thus, the main function of agricultural
credit societies is to help members by way of providing
short and medium term loans for meeting their agricultural
necessities like improved seeds, fertilizers, agricultural
improved implements etc. The talukawise loans advanced
by these societies for the agricultural necessities are
given in Fig. 7.4.B.

VII) Soil Conservation

The schemes implemented under this head are contour
bundling, terracing of land and afforestation for soil
conservation. Moisture conservation in the soil assumes
particular importance in the low and precarious rainfall
areas. Bunding is specially beneficial to these areas as
it combines in it the triple advantage of prevention of
sheet erosion of land, conservation of top soil moisture
and augmentation of water supply to the water bearing
strata in the underground. In the hilly and heavy rainfall areas located in the western part of the district, terracing and afforestation will be more beneficial for landuse. The medium slopes are terraced and rice fields are prepared. The afforestation in western part of the heavy rainfall areas is helpful to prevent the soil erosion.

The development programme of the district includes bunding of 404.85 hectares and terracing of 809.71 hectares of land in the hilly tract during the period of five years of third plan. During the first three years ending by March, 1964 of the plan-period 401.21 hectares of land was terraced while 521.45 hectares of area was contour bunded. During 1972-73, 2515 hectares of land was bunded, 934 hectares of land was terraced and 374 hectares of land was afforested. While the terracing was done in 487 hectares, bunding in 774 hectares and afforestation in 100 hectares during 1974-75. The spatial pattern of area conserved in the district during 1971-75 is represented on map in Fig.7.4.C.

VIII) Roads:

Roads are one of the most important linkages in the process of change of agriculture. They contribute significantly to mobilization of resources and bring the closer gaps between rural and urban communities. The use of new inputs added new dimensions to agricultural expansion, and
the input factors can be moved easily by roads. This reduced the time between harvesting and marketing. Thus, the roads play an important role in economic life of man.

The importance of roads is more in Kolhapur district where the railway mileage is less than the average for State. The Poona-Bangalore NH.4 passes through the district for 43 kms. The western part of this district is hilly and roads leading to Konkan pass through this hilly area (ghats). The progress of road system was slow in the region. Up to 1951 it had 1078 kms. of roads. The substantial beginning in overcoming the deficiencies of the road system was made in the second plan period. In 1961 the total road length was 1764 kms. and it was 2780 kms in 1971. The road length increased upto 3516 kms. by March, 1973.

Thus, the significant increase in road length of district was due to increase in village roads which keep the access all over the district. Kolhapur city which is the headquarter of the district is now well connected by good road system with all the taluka places and other commercial centres. But generally the road lengths are shorter in western part than in eastern part of district (See Fig. 7.4.D).
B) **AGRICULTURAL DEVELOPMENT** :

Agricultural change cannot be understood separately from the general process of development (Morgan, 1977). Agricultural change could be achieved only through the level of technological development. Agro-technological determinants like irrigation, fertilizers, high yielding varieties of seeds and agricultural mechanisation together form a developed kind of agricultural landscape and provide a frame of parameter to measure the level of agricultural development of a region (Rajapati Ram, 1979). An attempt is made to investigate the levels of agricultural development in Kolhapur district which is regarded as one of the most developed parts of the State of Maharashtra.

To analyse the spatial disparities in levels of agricultural development the ratios of selected indicators (Technological Factors) to net sown area have been calculated according to Dutt and Robin (1969), the computation procedure is as follows:

a) **Index of Irrigated area to net sown area** :

From the statistical information we take the proportion of irrigated area to net sown area corresponding to each taluka. Let this value be represented by

\[ p_{\text{tm}} = \frac{a_{\text{tr}}}{a_{\text{tn}}} \]
where atr = irrigated area of the taluka and atn = net sown area of the taluka. Similarly we build up the proportion for the whole district of Kolhapur which we may represent by Pkrn. Then the index of irrigated area to net sown area for the taluka will be

\[ I(1)t = \frac{ptrn}{pkrn} \times 100 \]

Similarly as in (a) we may build up the index for the taluka by taking the proportion of other indicators to the net sown area for the taluka and Kolhapur district respectively and the index values may be represented by \( I(2)t, I(3)t, I(4)t, I(5)t, I(6)t, I(7)t \) and \( I(8)t \).

**Composite Index of Agricultural Development**:

Thus, deriving the indices as shown above, we may take the simple average so as to get the composite index for the taluka. That is

\[ It = \frac{I(1)t + I(2)t + I(3)t + I(4)t + I(5)t + I(6)t + I(7)t + I(8)t}{8} \]

The composite index numbers derived from the method stated above were plotted for each taluka and three categories have been identified, indicating (i) high, (ii) medium and (iii) low level of development.
i) High Development:

Eastern talukas (Shiroi, Hatkanangale and Karveer) record high level of development which obviously enjoy more advantageous environmental conditions in the district (Chapter I). They possess more of level land as compared to western talukas. The soil in this part of the district (See Fig. 1.10) is medium to deep black and the rainfall is also fairly adequate for crops.

These three talukas rank first in irrigation as they are drained by the rivers of Panchaganga and Varna in their lower reaches which provide water for growing the commercial crops. In this area all the irrigated land is devoted to the cultivation of sugarcane, a crop taken only once during the year. The spatial pattern of the use of machinery shown in Fig. 7.3.B also brings out distinctly the leading position of Karveer, Hatkanangale and Shiroi talukas.

In the use of inputs like chemical fertilizers and pesticides which enable the farmers to get high crop yields, Karveer and Shiroi talukas rank first and Hatkanangale ranks third. But Hatkanangale taluka holds leading position with regards to use of improved seeds (Fig. 7.3.B).

These three talukas also enjoy relatively more favourable position in respect of agricultural credits, soil conservation and kilometerage of surface roads (Fig. 7.4).
Fig. 7.3
As such Shirol, Hatkanangale and Karveer talukas may be regarded as the core area of agricultural development in the region under study.

ii) **Medium Development** :

Seven talukas namely Shahuwadi, Panhala, Radhanagari, Kagal, Bhudargad, Gadhinglaj and Chandgad are included in medium category of development. This is the central transitional belt bordered by the areas of high and low development index values. So these talukas have better position in some indices and poor in others but measured by the composite index of agricultural development they belong to medium category.

It is evident from Fig. 7.3.C that out of seven talukas three talukas namely, Gadhinglaj, Radhanagari and Ajra have high index value in respect of improved seeds, whereas Fig. 7.4.H shows that all these seven talukas hold moderate rank in the index value of surface road lengths. Again these seven talukas except Kagal are moderate ranking in the use of chemical pesticides and Fig. 7.3.A reveals that the irrigation facilities are inadequate in these talukas. The position of these talukas with regard to soil conservation is also rather unsatisfactory.
Chemical Pesticides Index

Agri. Credit Index

Kilometrage of Road Index

Soil Conservation Index

Fig. 7.4
All these talukas may attain their level of development in near future, if efforts are made to extend area under irrigation along with other agricultural inputs.

iii) **Low Development**

The areas of low development comprise only the western two talukas namely Bawada and Ajra (Fig. 7.5). Here rugged topography, heavy soil erosion and predominance of forest lands seem to have restrained agricultural development.

Bawada taluka has very poor position in case of all inputs in general and of pesticides and fertilizers in particular. So it records the lowest development in the region where the composite index value is just 73.24.

Ajra taluka has relatively better position in improved seed index and road index but falls down in most of the indices. Thus, the poor position in the use of agricultural inputs along with environmental handicaps brought this taluka in the low level development category.

C) **CHANGES IN AGRICULTURAL LANDUSE**

The changes in various components of agricultural landuse pattern related with the technological factors are assessed in this part. The radical changes which took place
COMPOSITE INDEX OF AGRICULTURAL DEVELOPMENT

Fig. 7.5
in agricultural landuse of the region during the period under review had a marked impact of technological factors and brought about many changes in agricultural landuse and productivity of crops also.

A change in the agricultural landuse implies a change in the proportion of area under different crops at two different times. Agricultural changes in the region have involved certain modifications in the cropping pattern. These modifications represent the combined effect of these technological developments (Fig. 7.5). With the new innovations the farmers have continually altered the proportion of land under different crops. The aggregate results of these individual actions are reflected in the changes in the proportion of area under various crops. The method used for measurement of overall change and the direction of change of individual crops is as follows:

The amount of area involved in change for every areal unit (taluka) is calculated for individual crops and the crops of leading increase and decrease are marked and the same have been mapped in each taluka providing a comparative view of the direction of change. For the quantitative measurement of the overall change in agricultural landuse during the period 1951-75, Weaver's index (1954) is used.
Index of change in agricultural landuse = \frac{A}{B},

where 'A' is the difference of percentage of crops of increase and 'B' the difference of percentage of crops of decrease for the period under review. The summation of the numerator and the denominator should be the same and this can only be achieved if landuse statistics are accurate and carefully computed. It is the percentage of land which is actually involved in the transfer of area from one crop to the other. Having thus achieved the percentage of land involved in change for every taluka, can be mapped, giving a comparative view of the areas where agricultural landuse patterns have been highly dynamic and by contrast other areas where they have been highly stable. The higher the index, the more radical are the changes in the landuse pattern and lower the index, the more is the stability. The technique of determining the index of change is given in Appendix I.

Crops of leading Increase and Decrease:

The important crops of leading increase are sugarcane, groundnut and fodder and the crops of leading decrease are rice, jowar, ragi and tobacco with considerable areal percentage strength. The two maps in Fig. 7.6.A and B exhibit the spatial pattern of crops of leading increase and decrease in the region.
The shift from cereals, tobacco and fodder growing area to sugarcane is remarkable and is registered in Panhala, Radhanagari, Karveer, Hatkanangale and Shirol. In Kagal and Gadhinglaj it is from fodder and tobacco to groundnut, in Shahuwadi, Bawada, and Bhudargad from rice to fodder, in Ajra from ragi to sugarcane and in Chandgad it is from rice to ragi.

The foodgrains (cereals and pulses) give relatively less money to farmers so they have shifted to cash crops particularly sugarcane in irrigated areas. Thus, the notable shift is from foodgrains to sugarcane or from less remunerative to more remunerative crops which are high input based. All these changes are gradual in relation to changed technological factors.

**Cropping Pattern Change Regions**:

The overall area involved in change in agricultural land is studied in collaboration with the technological determinations and individual crop pattern changes. It provides the overall comparative picture of the areas where the cropping pattern has been relatively dynamic and whereby contrast has been relatively stable. Four areas of change which occurred during the period under investigation in the study area were obtained. The spatial pattern of these is shown in Fig. 7.6.C.
Crops of Leading Crops of Leading Changes in Crop Pattern
(INCiREASE) (DECREASE) 1951-55 / 1971-75 1951-55 / 1971-75

228

-7.0

Region average = 11.63

% Of area involved in change

Sugarcane
Groundnut
Fodder
Ragi

Rice
Jowar
Tobacco
Ragi
Fodder

20
15
10

Fig 7.6
The very outstanding areas of change with high dynamic swing (over 20%) are observed in Shahuwadi and Shirol talukas. Here the level of technological development is from high to moderate. These are the leading talukas in total crop shift and the crops of leading increase are fodder and sugarcane and crops of leading decrease are rice and tobacco.

The proportion of 15 to 20 percent change region is largely confined to Hatkanangale, Kagal, Bhudargad, Gadhinglaj and Bawada talukas. In all these talukas except Bawada the level of technological development is also from high to moderate and only in Bawada it is relatively low. Here the significant expansion is in sugarcane, groundnut and fodder and reduction in tobacco, rice, ragi and fodder. Thus, it has a diversified change pattern which involves most of the crops.

The moderate change (10 - 15%) is noted in four talukas namely Karveer, Panhala, Radhanagari and Chandgad. Here the level of technological development is high only in Karveer and in others it is moderate. Hence the significant increase is in sugarcane and ragi and decrease in jowar, fodder and rice.

The low change occurred only in Ajra taluka. Here the important increasing crop is sugarcane and declining
crop is ragi. Most of the other crops have remained virtually stable and this relative stability has prevailed due to low level of technological development in this taluka (Fig. 7.6.C).

D) PRODUCTIVITY OF PRINCIPAL CROPS:

The taluka-level data of yield and production of crops are not available to show the spatial pattern of agricultural productivity. So the district-level data are used and the temporal changes in productivity of principal crops in the region are investigated.

Changes in crop productivity have occurred in response to many technological developments in the period (1951-75). The rapid adoption of seed - fertilizer - irrigation technology by the farmers resulted in substantial increases in farm production and in diversifying the production pattern. The soil conservation has been an additional impetus in increasing the productivity. The other factors responsible for increase in production are co-operative and other institutions, favourable prices improved rural accessibility and expanded market facilities. Thus, all these factors in combination or singly brought about the changes in farm production during the period under review.
Figs. 7.7 and 7.8 show the yield and production trends of principal crops viz., rice, jowar, ragi, tur, sugar-cane, groundnut and tobacco in the region.

1) **Rice**:

Rice is grown practically all over the district with an average yield of 981.72 kg. per hectare which is higher than the State average (970.51 kg. per hectare).

The yield per hectare and production of rice in the region increased from 1950-51 to 1960-61 and they are the highest during 1960-61 (yield 1385 kg. and production 139900 M. tonnes). But they have decreased in 1965-66 which was the famine year having received scanty rainfall. The yield and production increased steadily from 1965-66 onwards and the highest yield and production are recorded in 1974-75. This is mainly due to the adoption of new seeds, fertilizers and irrigation in the region.

2) **Jowar**:

Jowar is grown both as kharif and rabi crop but kharif jowar is first ranking in this district of Maharashtra. The district's average yield of jowar is 994.05 kg. per hectare and that of State is 485.25 kg. per hectare.
KOLHAPUR DISTRICT
YIELD PER HECTARE AND OUT-TURN OF PRINCIPAL CROPS

RICE

JOWAR

RAGI

TUR

Yield per hect in kg
Production in 00 M. tonnes

Yield per hect in kg
Production in 00 M. tonnes

Yield per hect in kg
Production in 00 M. tonnes

Yield per hect in kg
Production in 00 M. tonnes

---

Yield per hect:
Production:
NA = Not Available

Fig. 7.7
The yield and production of jowar are the highest in 1960-61 but decreased during 1950-51 and 1970-71 (Fig. 7.7). From 1970-71 onwards it has increased and during 1974-75 the yield per hectare is 1622 kg. and production 86600 M. tonnes.

iii) Ragi:

The trend of yield and production of ragi becomes clear from Fig. 7.7. It increased steadily from 1950-51 to 1960-61. The highest yield and production are recorded in the year 1974-75 yield per hectare 916 kg. and production 32600 M. tonnes.

Thus, the yield and production of cereal crops in the region increased with the adoption of new high yielding variety of seeds, application of chemical fertilizers and pesticides.

iv) Tur:

Tur is the important pulse crop of the region. The highest yield and production are recorded in 1974-75 (yield 1036 kg. per hectare and production 5700 M. tonnes). The next value of high yield and production is in 1955-56, whereas the yield per hectare and production are relatively low in 1950-51, 1965-66 and 1970-71 (Fig. 7.7).
v) **Sugarcane (Gur):**

Sugarcane is grown extensively in this district of western Maharashtra. The region's average yield of sugarcane works out to 7611.72 kg. per hectare which is higher than that of the State average 7318.10 kg. The yield and production have been increasing from 1950-51 onwards and yield has decreased only in 1965-66 but there is not much change in the total production as the area under sugarcane has increased. The highest yield i.e. 9180 kg. and the production 39200 M. tonnes are recorded in 1974-75 (Fig. 7.8).

These high yields are obtained with the application of fertilizers, careful selection of seeds and fairly large irrigated area in the region.

vi) **Groundnut:**

Groundnut is one of the most important oilseeds of the district and the average yield is 785.67 kg. per hectare and that of State average is 634.31 kg. The maximum yield and production are noted in 1950-51 (yield 1116 kg. per hectare and production 66000 M. tonnes) but from this year both are decreasing and the next high values of yield and production are observed in 1974-75. Comparatively lower yields and production are recorded in 1955-56 (Fig. 7.8).
KOLHAPUR DISTRICT
YIELD PER HECTARE AND OUT-TURN OF PRINCIPAL CROPS

GROUNDNUT

Yield per hect. in kg

Production in 00 M tonnes

--- Yield per hect
--- Production

SUGARCANE (Gur)

Yield per hect. in kg

Production in 00 M tonnes

Tobacco

Yield per hect. in kg

Production in 00 M tonnes

Fig. 7.8
vii) **Tobacco**:  

It is one of the important crops of this part of the State but the average yield is 475.17 kg. per hectare and it is lower than that of the State average 504.31 kg. The yield and production rates of this crop in the region have been decreasing. The highest yield and production are recorded only in 1950-51 (529 kg. and 5400 M. tonnes) and 1960-61 (490 kg. and 6000 M. tonnes) (Fig. 7.8).

**Conclusion**:  

The application of chemical fertilizers has increased substantially, though the quantity used has been much smaller than those recommended. The use of pesticides has also increased but the mechanisation of farm operations is slow. Co-operative agricultural credit societies, improved rural roads, market facilities, other inputs and services have forced to change the agricultural landscape of the region.

There are marked regional disparities in levels of agricultural development in the district, wherein the composite index value of technological factors ranges widely. Changes in agricultural landuse have occurred in response to many technological developments in the post-independence period and the rapid adoption of seed-
fertilizer-irrigation technology by the farmers has resulted in substantial increases in farm production.
REFERENCES


