

## CHAPTER - IV

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CROP LANDUSE PATTERN

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Section I : Cropping pattern and changes therein

Section II : Crop regions and changes therein

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SECTION - I

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CROPPING PATTERN AND CHANGES THEREIN

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CROPPING PATTERN

Food crops - Foodgrains - Cereals - Jowar - Bajara  
Wheat - Pulses - Gram - Tur - Sugarcane - Non Food  
crop - Oilseeds - Groundnut - Miscellaneous crops

The previous chapter dwelt with the extent of broad categories of land use viz. forest land, area not available for cultivation, other uncultivated land, fallow land and agricultural land. Now it would be pertinent to examine how intensively the net sown area (agri.land) being cropped. In this chapter the focus is on patterns of cropping and crop regions. The overall cropping pattern of the region is outlined in the first section, with a discussion of the individual crops. Each crop has two maps, the first shows the distribution and second the changes therein. The second section of the chapter is dealt with the crop regions.

#### CROPPING PATTERN :

Generally, the crops are classified into four important groups as below :-

#### Food crops :

- i) Foodgrains - cereals and pulses
- ii) Non foodgrains - sugarcane, fruits and vegetables, condiment and spices

#### Non food crops :

- iii) Oilseeds - groundnut
- iv) Miscellaneous crops - tobacco, cotton, minor oilseeds, fodder etc.

The overall cropping pattern and the trends therein is shown in Table 4.1. According to some agricultural economists a cropping pattern means the proportion of area under various crops at a point of time (Kanwar, 1972). In the region's overall

cropping pattern food crops occupy the largest area (10,67,533 hectares) which is about 89.52 percent of the total gross cropped area. Jawar is the leading crop followed by Bajara. But oilseeds has now attained significant proportion i.e.94,995 hectares of cultivated area (7.97%). Other nonfood crops are insignificant in the cropping pattern of the study area. There are remarkable changes in the cropping pattern of the district during the period under investigation. The total area involved in change is 4 percent which is more significant in case of food crops (54.64%),while the area involved in change under the nonfood crops is only 7.79 percent.

Besides these generalities, there are spatial variations depending upon rainfall and soil conditions. Therefore a detailed analysis of each tillage crop based on the three year averages (for 1951-53 and 1976-78) and the respective changes therein now follows :-

#### FOOD CROPS :

By the census department the crops are grouped under the two broad heads i.e. food crops and non-food crops. Among the food crops cereals, pulses, condiment and spices, sugarcane, fruits and vegetables are included. In the region's overall cropping pattern, food crops occupy the largest area (10,98,537 hectares) which is about 89.52 percent of the total cropped area (Table 4.1). Since long, the region is known for jawar production which is the leading crop of the district (57.46 percent). It is followed by bajara.

**Table 4.1 : Trends in cropping pattern in Solapur District.**

Crop	1951-53 %	1976-78 %	Change %
<u>Foodcrops</u>	34.87	89.52	+54.64
Foodgrains	33.95	86.72	+52.77
Cereals	31.04	70.26	+39.22
Rice	0.28	0.58	+ 0.30
Jawar	26.78	57.46	+30.68
Wheat	0.79	4.34	+ 3.55
Bajara	2.87	6.10	+ 3.23
Other cereals	0.13	1.79	+ 1.66
Pulses	2.91	16.46	+13.55
Tur	0.98	5.68	+ 4.70
Gram	1.04	3.02	+ 1.98
Other pulses	0.88	7.32	+ 6.44
Sugarcane	0.25	1.69	+ 1.44
Condiments & Spices	0.23	0.06	- 0.17
Fruits & Vegetables	0.17	0.70	+ 0.53
<u>Non-food crops</u>	2.69	10.48	+ 7.79
Oilseeds	3.15	7.97	+ 4.82
Groundnut	1.98	2.66	+ 0.68
Other oilseeds	1.06	0.75	- 0.31
Cotton	0.31	0.81	+ 0.50
Tobacco	0.02	0.02	0.00
Misc. food crops	0.49	-	- 0.49
Gross cropped area	100.00	100.00	-

**SOURCE :** Compiled by Author.

FOODGRAINS :

Foodgrains play a major role in the cropping pattern of the region. This is mainly due to their importance both as grains for human beings and straw for livestock. But individual foodgrains differ much in their requirements and can be grown under wide range of conditions. For example, rice is well suited to monsoon rains and jawar is grown where rainfall conditions are moderate.

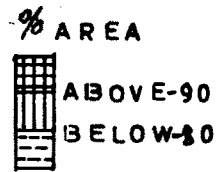
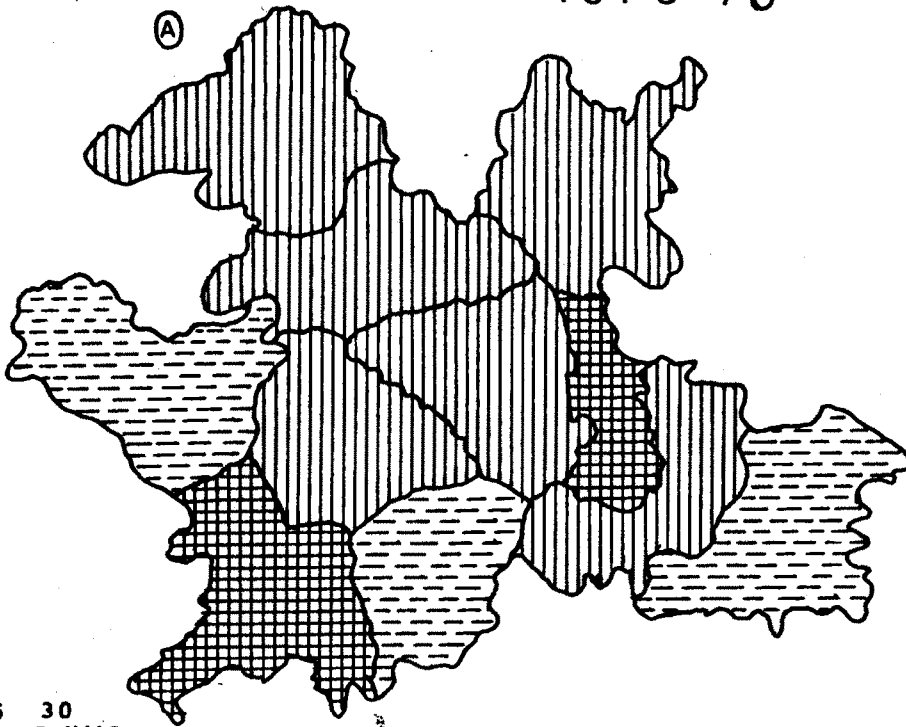
About 86.72% of the cropped area is under foodgrains (cereals and pulses) in the region under study which is higher than that of state average of about 68.96 percent. Fig.4.1A depicts the regional variations in distribution of foodgrains ranging from under 80 to over 90 percent of the total gross cropped area. High percentage under foodgrains (above 90%) are noted in the south western part (Sangola 90.63%) and eastern part (South Solapur 93.64%). The talukas of Pandharpur, Mohol, North Solapur, Madha, Barshi, Karmala record 80 to 90 percent area under foodgrains. Elsewhere its proportion is below the district average and this is mainly due to the growing importance of jawar crop in the region. On the whole, the cereals and pulses dominate the agricultural landscape of the region.

The change that has occurred in foodgrains distribution during the period under investigation is shown in the map in Fig.4.1B. The most noticeable change is the overall increase of area under foodgrains in the region. Eleven talukas under study, have shown positive change from under 50 to over 55 percent.

# FOODGRAINS CROPPING

1976-78

(A)

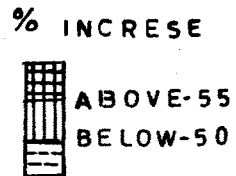
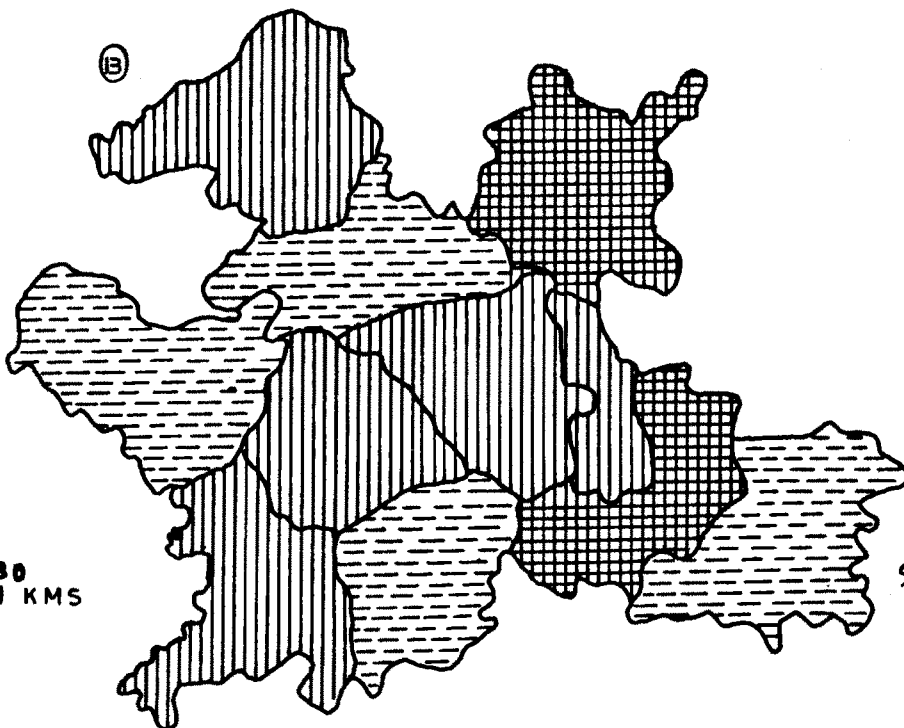


REGION AVERAGE 85.76%

# CHANGES IN FOODGRAINS CROPPING

1951-53 TO 1976-78

(B)



REGION AVERAGE = 51.81%

FIG. 41

CEREALS :

Cereals, such as rice, jawar, barley, maize, bajara, wheat etc. are of much importance among the foodgrain crops. They are both of superior and inferior quality. The inferior cereals survive well in areas having poor soils. Jawar, bajara, maize, wheat are the major cereals of the region, whereas rice, ragi, barley, vari, are the minor crops, in the overall cropping pattern of the region. These minor crops gain some local significance but for the most part they remain unimportant.

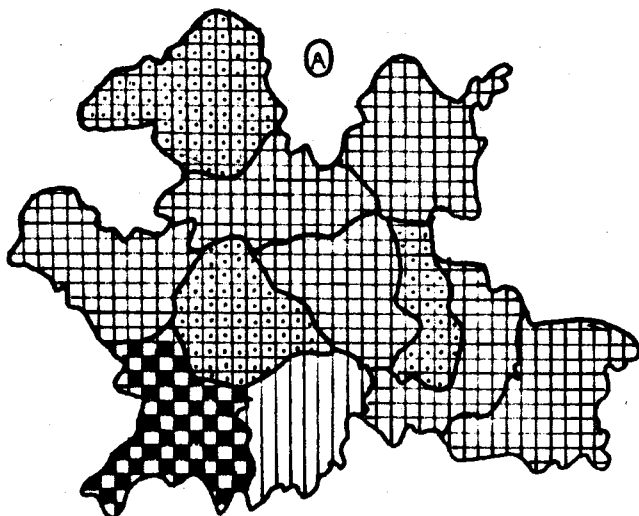
The cereals occupy 8,37,900 hectares (amounting to 70.26%) of the total cultivated area as against 100,91,200 hectares of Maharashtra State (55.85%). Fig.4.2A and B portrays the spatial distribution and changes in the area of total cereals in the region. The great dominance of cereals is obviously due to the favourable physical conditions. The regional variation in the major cereals distribution and changes therein will be evident while going through the different sets of maps.

JOWAR (Jvari) :

Jowar is the most extensively grown cereal crop in the district and occupying an area 6,85,214 hectares and with an average yield of 321 kg. It is grown in all talukas of the district mostly as Rabi crop. It is the most economic crop as it yields good quality grains and palatable and superior fodder. Jawar is grown best in deep and heavy black soil.

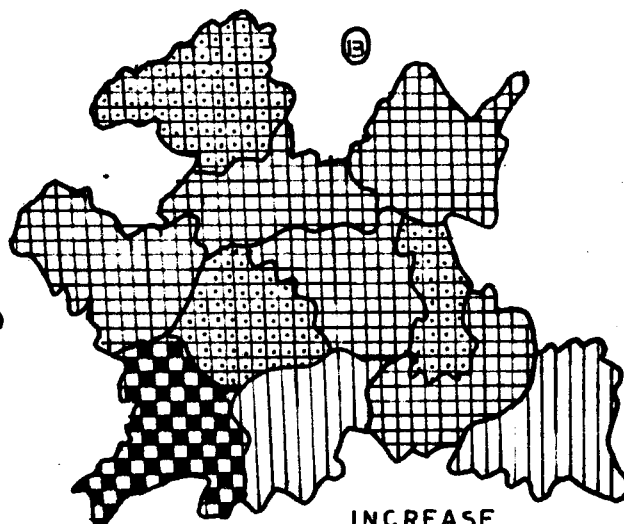


CEREALS CROPPING  
(1976-78 AVERAGE)



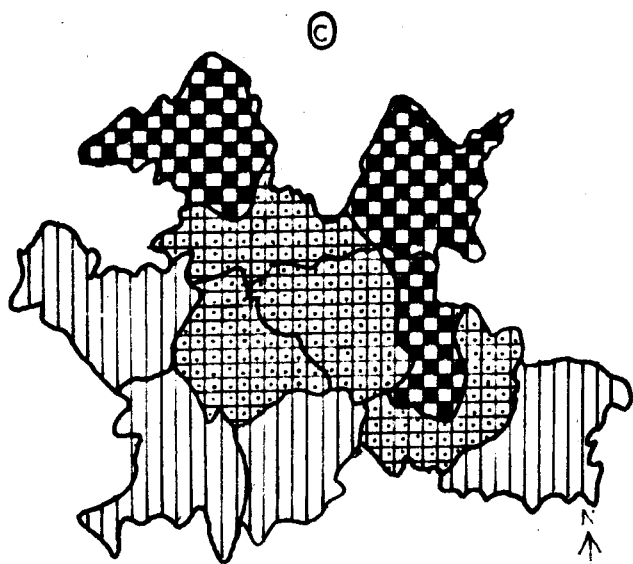
% AREA  
REGION AVERAGE = 68.90%  
ABOVE-80  
70  
BELOW-60

CHANGES IN CEREALS CROPPING  
(1951-53 TO 1976-78)



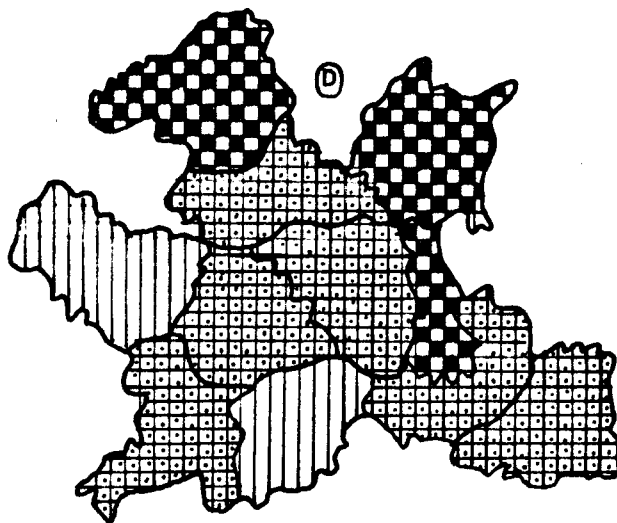
INCREASE  
% AREA  
REGION AVERAGE = 37.91%  
ABOVE-45  
40  
BELOW-35

JAWAR CROPPING  
(1976 TO 78 AVERAGE)



% AREA  
REGION AVERAGE 58.54%  
ABOVE-65  
BELOW-55

CHANGES IN JAWAR CROPPING  
(1951-53 TO 76-78)



INCREASE  
% AREA  
REGION AVERAGE = 37.79%  
ABOVE-35  
BELOW-25

0 15 30 KMS

FIG. 4.2

It is taken in the areas receiving moderate amount of rainfall from 50 mm. to 1,000 mm. The prominent Rabi varieties of jowar grown in the district are Maladandi 35-1 and Shalu.

Jowar is both Kharif and Rabi crop but the proportion of area under Kharif jowar is relatively less. Kharif jowar is sown in June-July and harvested in October to December. Rabi jowar is generally sown in September and October and harvested in February/March. On an average there is 56.09 percent of area under jowar, as against 32.16 percent in Maharashtra as a whole. However, within the district its proportion varies from under 55 percent to over 65 percent of the total gross cropped area. Greater concentration is observed in Barshi, Karmala and North Solapur talukas (above 65%) and in Madha, Pandharpur, Mohol and South Solapur talukas 55% to 65%. Elsewhere the percentage is below 55 percent (Fig.4.2C).

Fig.4.2D exhibits the changes in jowar area. The positive change is observed in all talukas. In the district the positive change is ranging from under 25 to over 35 percent. The prominent increase is noted in Barshi taluka with 44.10 percent.

BAJARA :

It stands second to jowar in importance as a foodcrop in the district. It is occupying an area of 72,749 hectares and yield per hectare is 171 kg. It requires moderately dry climate and light showers of rainfall varying between 254 and 1,016 mm.

with plenty of sunshine between the showers. It is grown in light medium black soil. Bajara is usually grown as a Kharif crop in the district. This crop is sown in June to mid July and harvested at the end of October. Bajara is sown mixed with moog, matki, chavali etc.

About 6.10 percent of the total gross cropped area in the district is under bajara. The main improved varieties grown in the region are Akola 28.15, Hyb 35 etc. The spatial distribution of bajara in the region is shown in Fig.4.3A. It is grown in all talukas ranging from below 2 to over 6 percent. Akkalkot and South Solapur talukas recorded medium proportion of area (4 to 6 percent) and low area is noted in Barshi and North Solapur talukas (under 2 percent) because of rainfall conditions.

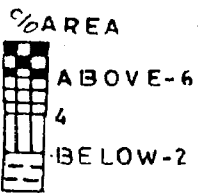
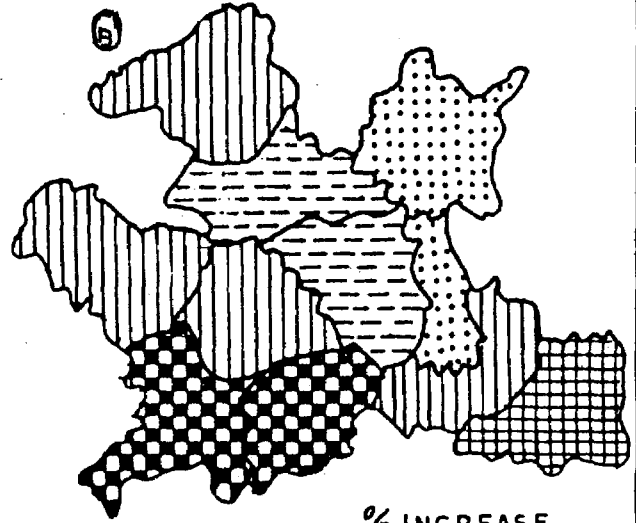
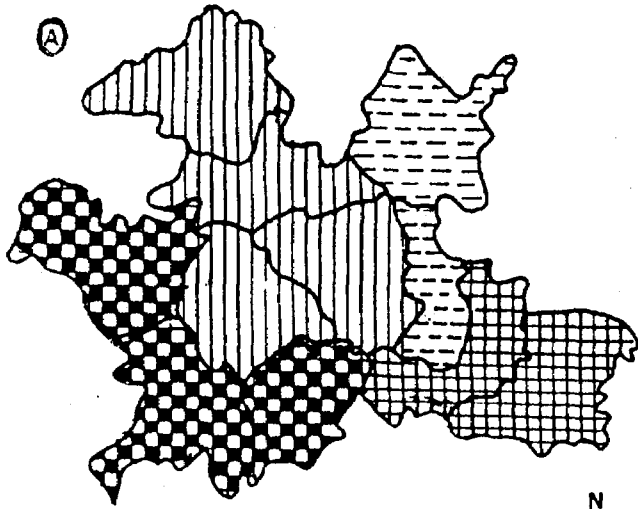
Map showing changes in bajara area, records increase from below 1 to over 4 percent. But decrease is only in Barshi taluka (under 0.1 percent) and high increase is in Sangola (14.33 percent) and Mangalwedha taluka (6.27 percent). In Akkalkot taluka increase is 2.72% of the cropped area. Remaining all talukas records increase under 2.50 percent of the cropped area (Fig.4.3B).

#### WHEAT (Gahu) :

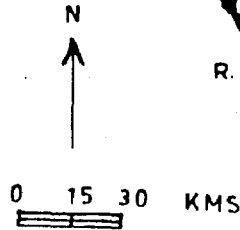
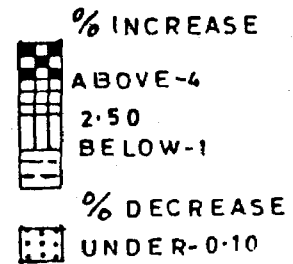
Wheat stands third among the cereals in the district. It is occupying an area of 51,747 hectares and yield per hectare is 840 kg. It is mainly a rabi crop. It thrives well in black soils and requires dry and cold weather during its growing period. Wheat sowing is done from the first week of October to the middle

**BAJARA CROPPING**  
(1976 TO 1978 AVERAGE)

**CHANGES IN BAJARA CROPPING**  
(1951-53 TO 1976-78)



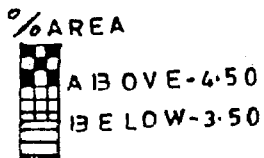
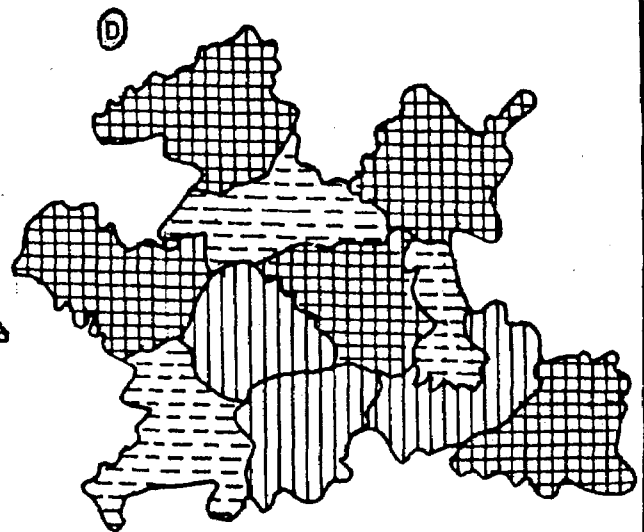
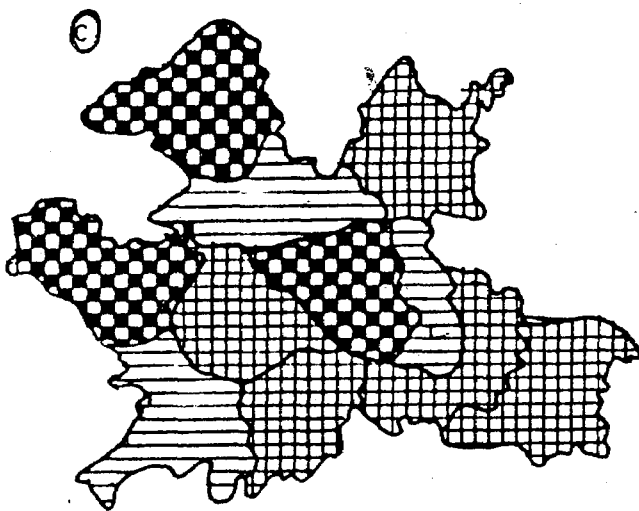
R.A.=2.86%



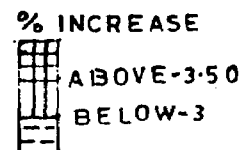
REGION AVERAGE=6.15%

**WHEAT CROPPING**  
(1976 TO 1978 AVERAGE)

**CHANGES IN WHEAT CROPPING**  
(1951-53 TO 1976-78)



REGION AVERAGE=3.64%



REGION AVERAGE=4.32%

FIG. 43

of November. Irrigation is given for 21 to 30 days after sowing. This crop is harvested from the middle of February to the middle of March.

About 4.34% of the cropped area is under wheat in the region under study. Fig.4.3C depicts the regional variations in distribution of wheat ranging from under 3.50 to over 4.50 percent of the total gross cropped area. High percentage under wheat (above 4.5%) is recorded in the Karmala, Mohol and Malshiras talukas. The talukas of Barshi, Pandharpur, South Solapur and Akkalkot notes 3.50 to 4.50 percent area under wheat. Elsewhere its proportion is below the district average.

The change that has occurred in wheat distribution is shown in the map in Fig.4.3D. The most noticeable change is the overall increase of area under wheats in the region. All the talukas of Solapur district have shown positive change from under 3 to over 3.50 percent.

#### PULSES :

Pulses occupy an important position in the agrarian economy of the district. Next to cereals, they are important as foodgrain crops. The variety of pulses grown in the region are tur, gram, udid, mug, masur, watana, val, kulith etc. These pulses are very useful in many ways. They serve as a excellent nutrition food and also increase the fertility of soil. They are grown both as kharif and rabi crops. The soil and moisture

requirements vary from pulse to pulse. But generally they need less moisture and most of them are rainfed.

The proportion of area under all the pulses (tur and other pulses) in the region is 1,96,328 hectares (16.46%) of the total gross cropped area as against 22,82,200 hectares (13.10%) of the state. Fig.4.4A shows the regional variations in the share of pulses cropped area ranging from below 15 to over 20 percent. The principal pulses growing areas are Barshi, Mohol and South Solapur talukas. Elsewhere, the proportions are moderate because of low rainfall conditions.

Map (Fig.4.4B) shows the changes in pulses area. High increase is in Barshi (18.96%), South Solapur (24.45%), Mohol (13.92%) and Mangalwedha (17.36%). Medium increase i.e. 12 to 17% is in Madha, Pandharpur and Akkalkot talukas. Remaining talukas record under 12 percent increase in the district.

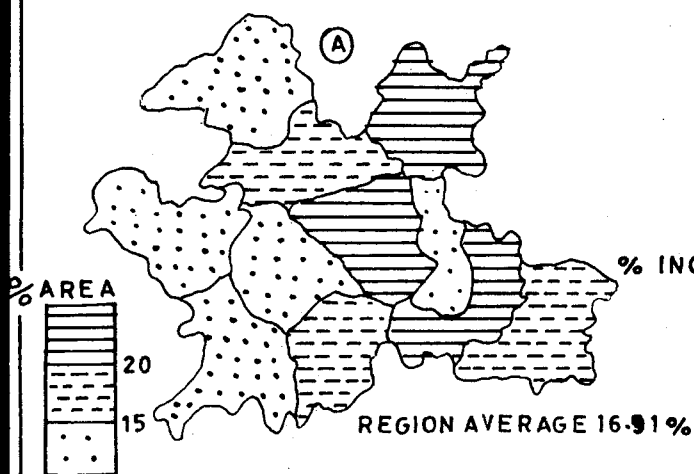
GRAM (Harbara) :

Gram is the important pulse crop taken in the district. It occupied an area of 3,596 hectares and average yield of 225 kg. It is grown as a rabi crop. It is grown on all types of soils from the heaviest clay to the lightest loam. It gives high yield on good black soil where it is grown alone, while on light soils it is taken as a mixed crop. It is sown in October-November and harvested after three months i.e. in February-March.

The distribution of gram in the region is shown in Fig.4.4C.

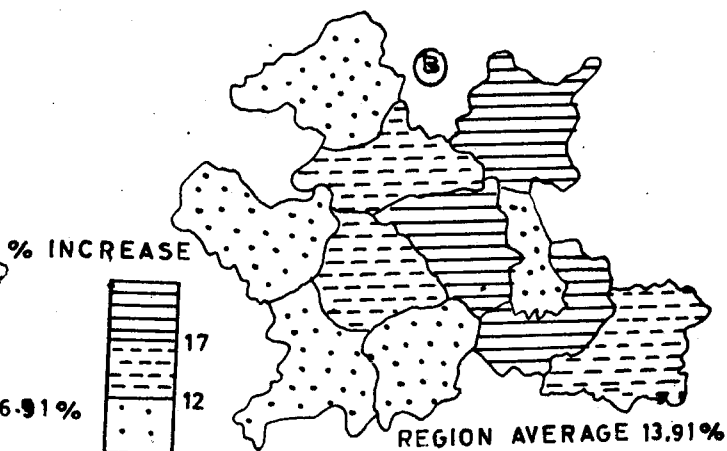
PULSES CROPPING

1976-78



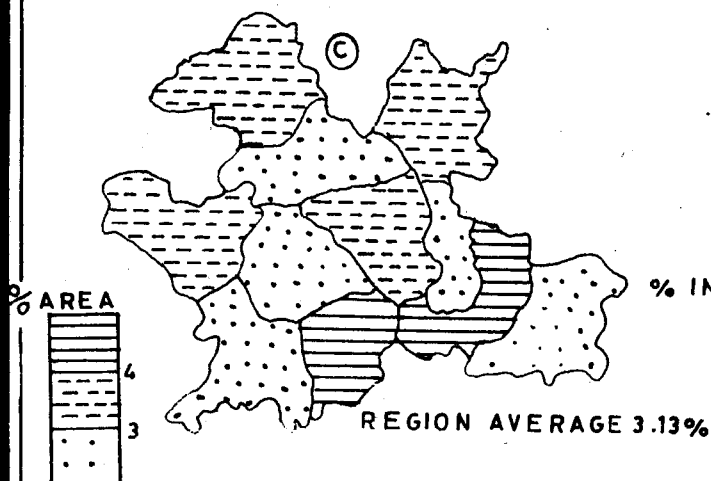
CHANGES IN PULSES

1951-53 TO 1976-78



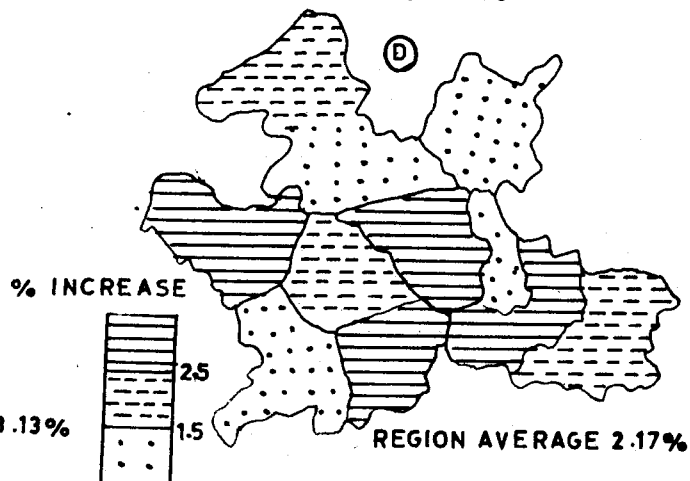
GRAM CROPPING

1976-78



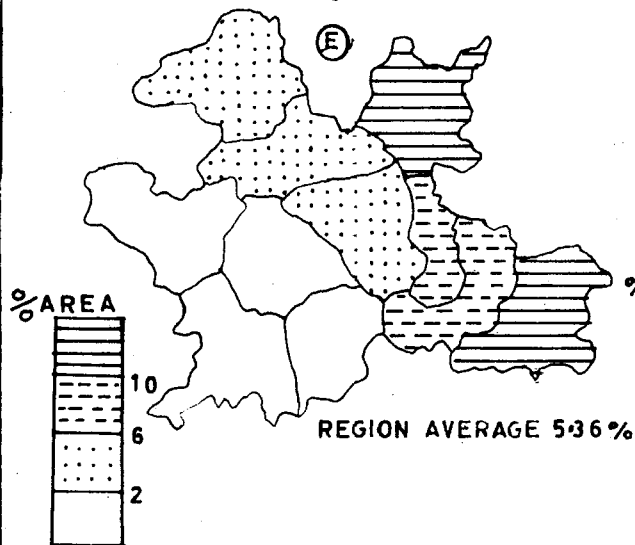
CHANGES IN GRAM

1951-53 TO 1976-78



TUR CROPPING

1976-78



CHANGES IN TUR

1951-53 TO 1976-78

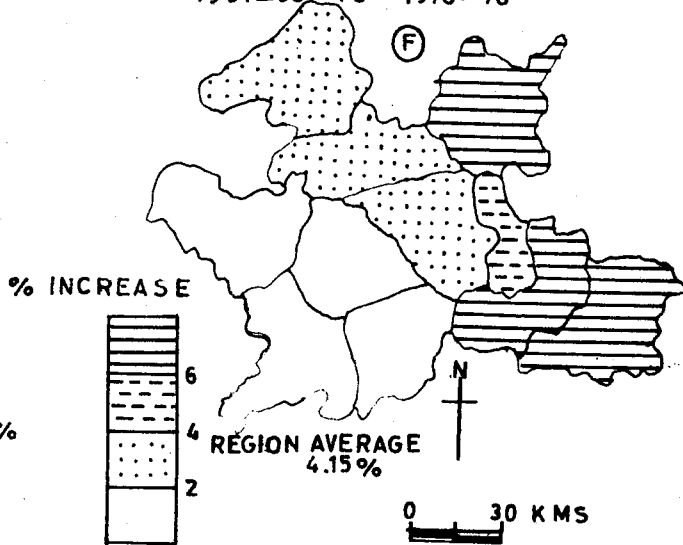


FIG. 4.4

It is grown in all talukas of the district. It's distribution ranges from below 3 to over 4 percent. The moderate proportions 3 to 4 percent are recorded in Barshi, Karmala and Mohol talukas. The remaining talukas have under 3% area under gram.

Changes in gram cultivation in the region are exhibited in Fig.4.4D. Out of the eleven talukas, four talukas have over 2.5% increase in the area of gram. Karmala, Barshi, Madha, Pandharpur, Sangola, North Solapur and Akkalkot talukas record moderate increase i.e. 1.5 to 2.5 percent. Rest of the talukas have noted less increase under gram i.e. 1.5 percent.

TUR (Pigeon pea) :

Tur is grown all over the district. It is an important pulse crop of the region with an average yield 289 kg.per hectare. It is sown in June-July and harvested in February/March. Usually it is sown as a mixed crop with cotton, bajra in every fourth or eighth row. It requires moderate amount of rainfall and black to brown soil.

Variations in the distribution and changes of area under tur are much and range from under 2 to over 10 percent and 2 to 6 percent respectively in the region under study (Fig.4.4 E & F). On an average 5.36 percent of area is under the tur as against 2.94 percent of the state. The eastern part (comprising, Barshi, Akkalkot and North and South Solapur talukas) has some concentration. The proportion of 2 to 6 percent is recorded in Karmala, Madha and



Mohol talukas. Remaining talukas have under 2 percent area. The red and light brown seeds are generally sown in the district. N-84, improved strain evolved by the department of agriculture, is also used in the district. It's yield is 12 percent more than that of local variety.

SUGARCANE :

Sugarcane locally called 'oos' is the cash crop in the district. The cultivation of sugarcane has been steadily increasing because of the opening of sugar factories in this district and also due to the increasing irrigation facilities. Sugarcane is mainly an irrigated crop and is grown all over the district in deep black soils. Malshiras taluka occupied the largest area under sugarcane. In this district, some people make 'Jaggery' from sugarcane. Bulk of the cane and crushers are used for making white sugar. There are 8 sugar factories in the region. It is twelve month crop and is planted in the month of January.

It is a water-loving tropical crop and therefore requires high temperature, maximum moisture and irrigation facilities. Sugarcane cultivation has considerably increased in the canal areas since the opening of Nira Canals and Ujani Canals. About 1.69% (20,151 hectares) of the total gross cropped area of district is under sugarcane which accounts for 22.18 percent of the total sugarcane cropped area of the state. The local variety of sugarcane is known as Pundya and is grown throughout the district. The improved varieties grown in the region are CO-740, CO-775 and cover less area of sugarcane in the district.

Sugarcane cropping area is shown in Fig.4.5A which ranges from below 0.5 percent to above 2 percent of the total gross cropped area. The taluka of Malshiras record over 2 percent , followed by Pandharpur & North Solapur talukas with 1.5 to 2 percent area under sugarcane. The lowest area is recorded in Karmala and Sangola talukas. Rest of the talukas have a moderate proportion ( 1% to 1.5% ) of area under sugarcane.

The map in Fig.4.5B exhibits the pattern of change in sugarcane cropping in the region. The area under sugarcane has less increase during the period under investigation with an average of 1.54 percent and this is mainly due to irrigation facilities, developed in North Solapur, Malshiras and Pandharpur talukas of the district. Two talukas (Malshiras and North Solapur) record above 2 percent, while Pandharpur has recorded an increase of 1.50 to 2 percent. In the remaining talukas the proportion of area increased under sugarcane is 0.50 to 1.50 percent and below 0.50 percent.

#### NON FOOD CROPS :

In the foregoing analysis the foodgrain crops and non-foodgrain crops are considered. Now in this category of landuse only the oilseeds is discussed, On an average 10.48 percent of the gross cropped area is occupied by non-food crops and the major share is being contributed by oilseeds (Table 4.1).

OILSEEDS :

The oilseeds are very useful in many ways as they are used both for edible and industrial purposes and the edible oilseeds occupy most of the cultivated areas. Almost all the oilseeds are grown in kharif season on lighter type of soils and constitute an important group of cash crops. Among the oilseeds grown in the region groundnut is important one. The principal oilseed growing talukas are Barshi, Madha and Sangola (over 10%) (Fig.4.5C). The area of medium proportion (8 to 10 percent) is only in Karmala taluka and 6 to 8 percent area is found in Pandharpur and Mangalwedha talukas. In the remaining talukas the proportions are below 6 percent.

In all total, increase in area under oilseeds is observed during the period under investigation because of its commercial value. Significant increase is occurred in Barshi and Madha taluka followed by Akkalkot, Karmala and Pandharpur (4 to 6 percent). In other talukas increase is 2 to 4 percent and below 2 percent (Fig.4.5D).

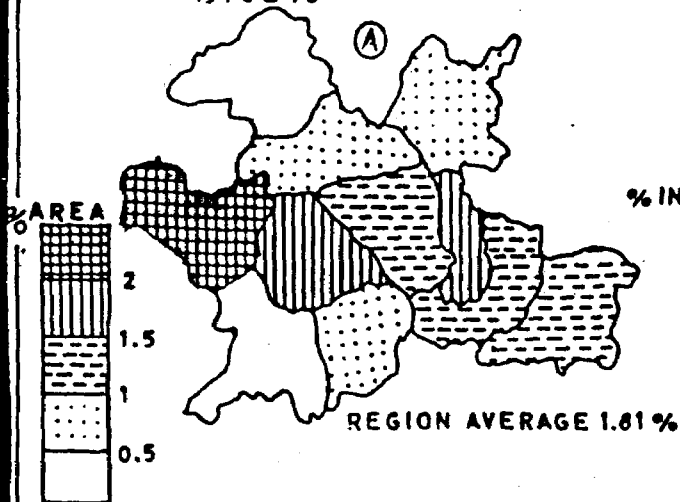
GROUNDNUT (Bhuimug) :

Groundnut locally known as 'bhuimug' is a kharif crop, sown in June-July and harvested in November-December. By census department it is included in non-food crop category. It is chiefly grown in areas receiving rainfall between 500 mm. to 1,000 mm.

It can be grown on light sandy soil, red loam, alluvial

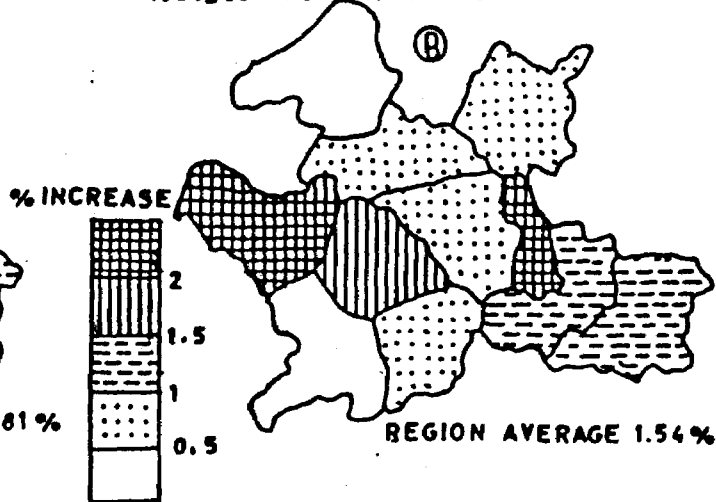
SUGARCANE CROPPING

1976-78



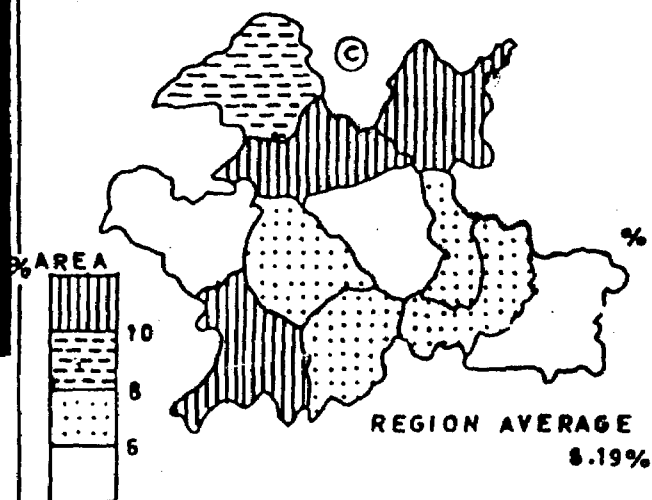
CHANGES IN SUGARCANE

1951-53 TO 1976-78



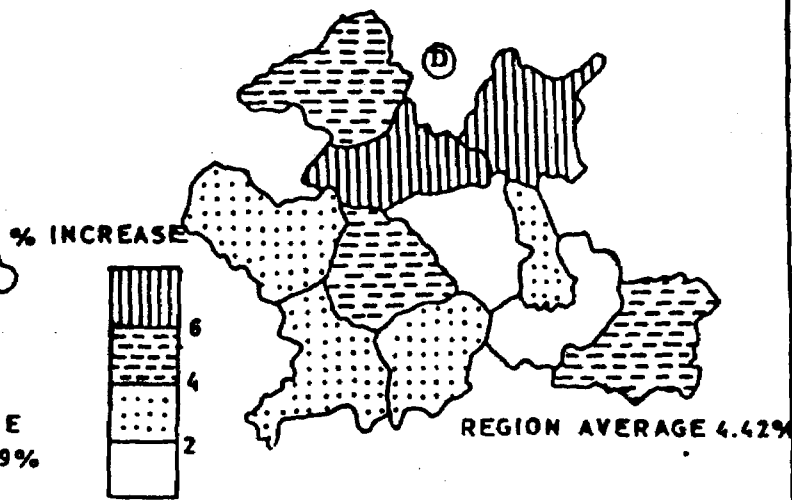
OIL SEEDS CROPPING

1976-1978



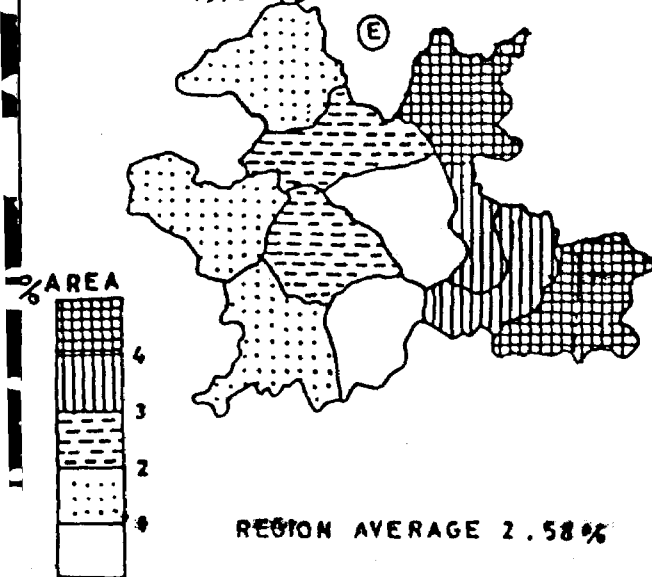
CHANGES IN OIL SEEDS

1951-1953 TO 1976-1978



GROUNDNUT CROPPING

1976-78



CHANGES IN GROUNDNUT

1951-53 TO 1976-78

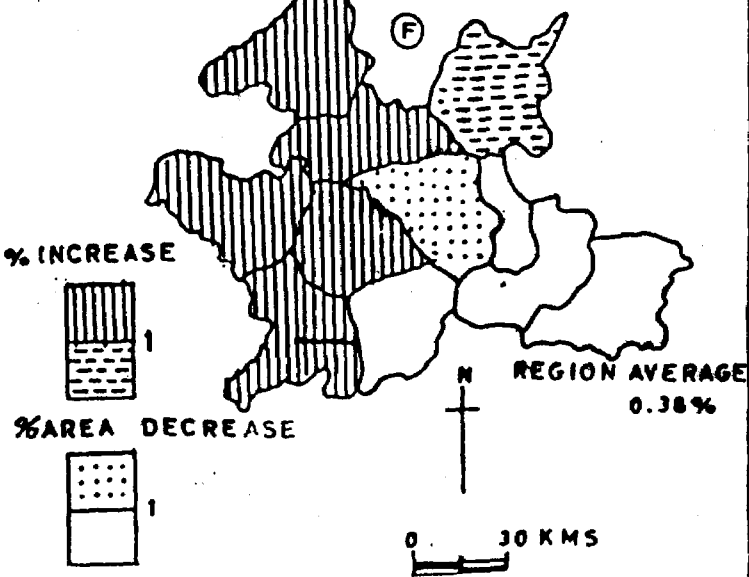


FIG 4-5

loam and also on black soil of good depth. The average area (2.58%) of groundnut in the region is lower than that of state average 4.26 percent. Fig.4.5E, shows the regional variation in the extent of groundnut cultivation in the region. The greater concentration (above 4 percent) of groundnut area is in the eastern talukas namely Barshi and Akkalkot. Whereas in North and South Solapur talukas the proportion of groundnut area is from 3 to 4 percent. Madha and Pandharpur taluka recorded 2 to 3 percent and elsewhere below 1 percent area under groundnut is registered.

The changes in groundnut cropping is exhibited in Fig.4.5F. Six out of eleven talukas have shown some increase in the area under groundnut but overall increase during the period is only 0.38 percent. The areas of increase are Karmala, Madha, Malshiras, Pandharpur and Sangola (above 1%), elsewhere, area involved in positive change is just below 1 percent. Decrease in area is mostly confined to the talukas of south eastern part of the district viz., Mangalwedha, Akkalkot, South and North Solapur (under 1%) and Mohol (over 1%).

#### MISCELLANEOUS CROPS :

In the region, the miscellaneous crops are fruits and vegetables, minor cereals, minor pulses, cotton, minor oilseeds, fodder, tobacco, condiments and spices and they serve local needs. Fruits and vegetables records low proportion of area in the region, it accounts only 0.7 percent of the total gross cropped area and minor cereals occupy 1.79 percent. Rice is locally known as 'Bhat'.

It is grown in all talukas of the district occupying an area of 6,896 hectares (0.58 percent). Minor pulses (udid, masur, watana, val, mataki, kulith etc.) register 7.32 percent of the total gross cropped area.

Cotton and minor oil seeds record 0.81 percent and 0.75 percent area respectively. The area under condiments and spices, (chilly, turmeric, garlic etc.) is only 0.06 percent of the total gross cropped area and it is less than the state average of 1.43 percent. The area under tobacco is very small i.e. 0.02 percent and the fodder is negligible in the region. Thus there is difficulty in mapping them individually as the actual area under each crop is very insignificant. So they are simply ignored.

SECTION - II

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CROP REGIONS AND CHANGES THEREIN

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- A. Ranking of crops and changes therein
    - i) First ranking
    - ii) Second ranking
    - iii) Third ranking
  - B. Crop combination regions and changes therein
  - C. Crop concentration and changes therein
  - D. Pattern of diversification and changes therein
- Conclusion
- References

The study of the cropping pattern of the region is made in the first section of this chapter. Now it remains to integrate these patterns for formulating broad crop regions. The same is attempted in this section through the ranking of crops, the crop combination regions, crop concentration and diversification of crops.

A. RANKING OF CROPS AND CHANGES THEREIN :

On the basis of the percentage value under individual crops a ranking of crops in the region for 1951-53 and 1976-78 are shown in Fig.4.6. Such ranking provides the best measure of the areal significance of individual crops. Similarly, the crop and its strength in the total cropping area is useful to find out the geographical characteristics of the area as the crop is the product of them. Fig.4.6 A,B,C,D,E,F, show the crops upto third rank in which 8 crops are involved.

i) First ranking :

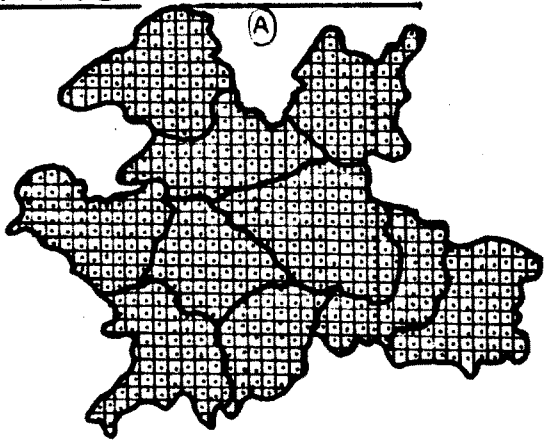
Jowar, ranks first in all eleven talukas (Fig.4.6A & B). Jowar is prominent in this region. Particularly the Mangalwedha taluka is the famous for Jowar production. The areal significance of first ranking jowar crop is associated with different environmental conditions as described earlier.

Fig.4.6B shows the changes occurred in first ranking crops during the period under investigation. There are no changes at all. In 1978 also the jowar cropping is first ranking in all the talukas.



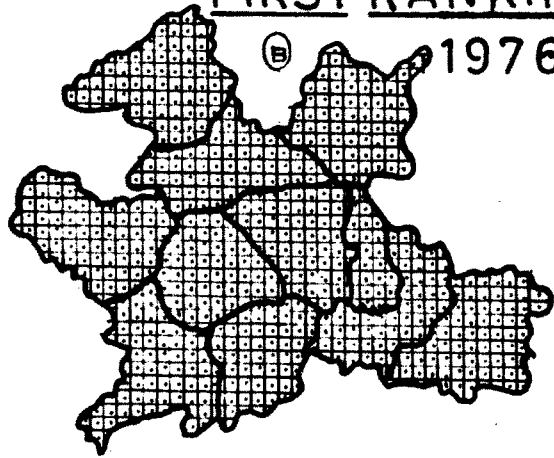
CROP RANKING

FIRST RANKING-1951-53

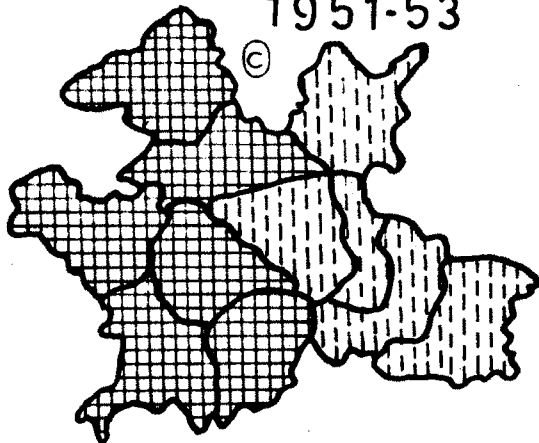


FIRST RANKING

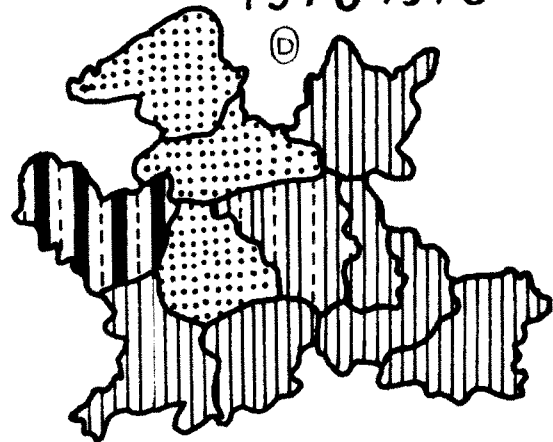
1976-78



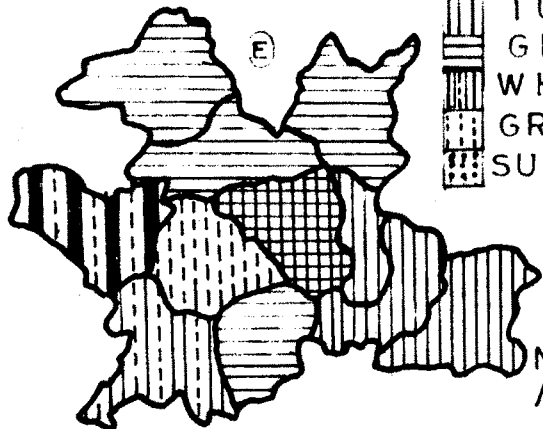
SECOND RANKING  
1951-53



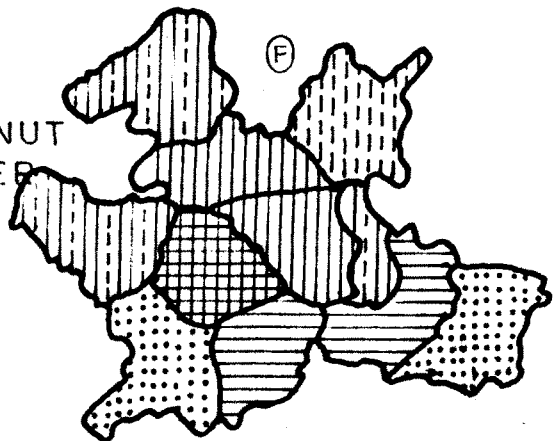
SECOND RANKING  
1976-1978



THIRD RANKING  
1951-53



THIRD RANKING  
1976-78



- JAWAR
- BAJARA
- SUGARCANE
- TUR
- GRAM
- WHEAT
- GROUNDNUT
- SUNFLOWER



0 15 30 KMS

FIG. 4-6

ii) Second ranking :

The Figure 4.6C shows the spatial distribution of second ranking crops. There are two second ranking crops i.e. bajara and groundnut. Bajara ranks second after jowar in Karmala, Madha, Malshiras, Pandharpur, Sangola and Mangalwedha. Groundnut after jowar ranks second in Barshi, Mohol, North Solapur, South Solapur and Akkalkot.

Some changes have occurred in the second ranking crops as they have changed in nine talukas. In Mangalwedha and Sangola, there is no change in the second ranking crops (Fig.4.6C & D). In Mohol the change is from groundnut to wheat and Barshi, North Solapur, South Solapur and Akkalkot from groundnut to tur, in Malshiras from bajara to sugarcane, in Madha, Karmala & Pandharpur from bajara to sunflower.

iii) Third ranking :

The Fig.4.6E shows that many crops are included in the third rank. Out of eleven talukas gram ranks third in four talukas (Karmala, Madha, Barshi and Mangalwedha). Bajara ranks third only in Mohol. Tur ranks in North Solapur, South Solapur and Akkalkot. Sugarcane is third ranking in Malshiras, groundnut in Pandharpur and wheat in Sangola. All over the district, considerable changes have taken place in the third ranking crops as shown in Fig.4.6F. Mangalwedha and South Solapur talukas have observed the change from sugarcane to wheat, in Sangola from wheat to sunflower in



Pandharpur from groundnut to bajara, in Madha from gram to tur, in Karmala from gram to wheat, in Barshi from gram to groundnut and in Mohol from bajara to tur, in Akkalkot from tur to sunflower.

**B. CROP COMBINATION REGIONS AND CHANGES THEREIN :**

Some crops are seldom grown in absolute isolation but appear in combination. Various environmental factors tend to combine them in associations to rather restricted areas where they receive their requisite ecological conditions. Crop combination as it provides areal significance and strenght of individual crops, to advocate suitable device for planning improvements in the underdeveloped regions and helpful in the introduction of innovations in agriculture (Grigg, 1971).

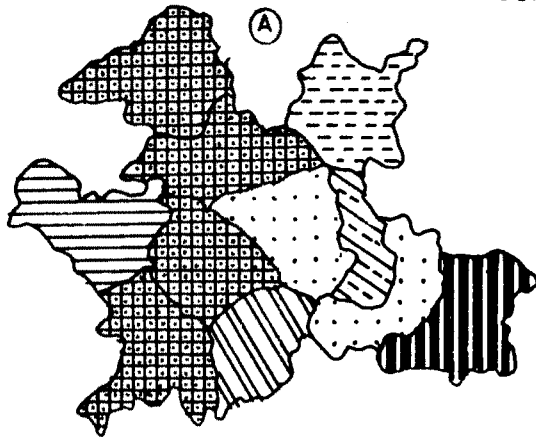
In the present study an attempt is made by using minimum standard deviation method as introduced by Weaver (1954) and maximum positive deviation introduced by Rafiullah (1965).

**Crop combination regions :**

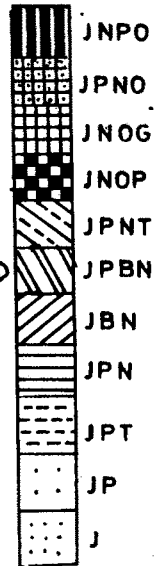
The Fig.4.7 A & B exposed eleven crop combination regions based on Weaver's minimum standard deviation method. They are derived from ten crops (jowar, bajara, wheat, groundnut, pulses, oilseeds, sunflower, sugarcane, non food crops and tur) occupying at least 1% or more of the total cropped area. In this region, monoculture, two crops, three crops and four crops regions are

(WEAVER'S METHOD)

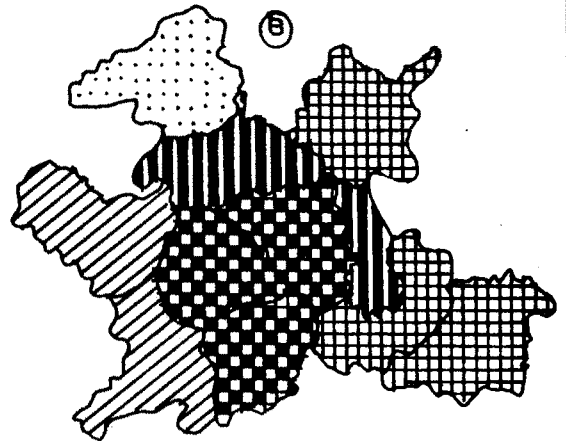
1951\_53 AVERAGE



COMBINATIONS

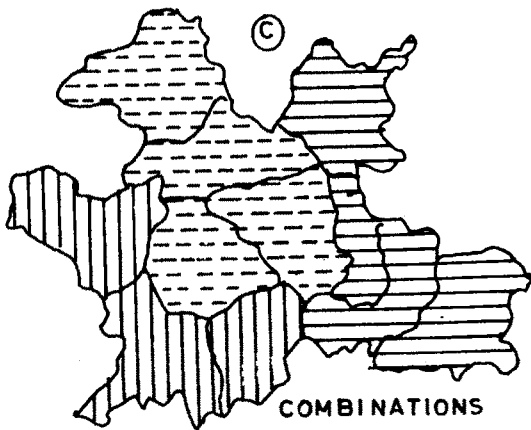


1976\_78 AVERAGE

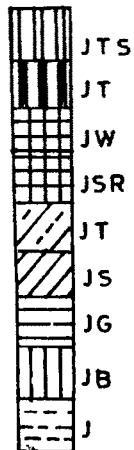


RAFFULLAH'S METHOD

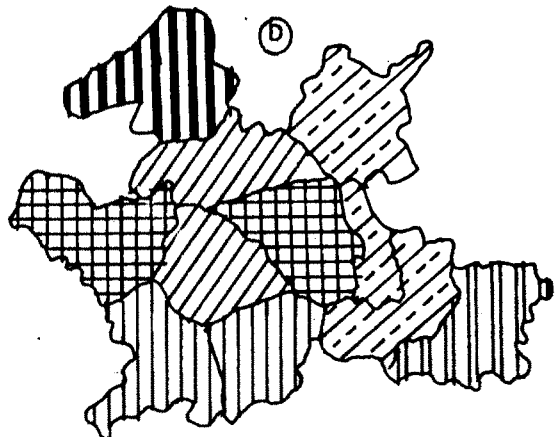
1951\_53 AVERAGE



COMBINATIONS



1976\_78 AVERAGE



ABBREVIATIONS

- J JAWAR
- B BAJARA
- G GROUNDNUT
- W WHEAT
- T TUR
- S SUNFLOWER
- SR SUGARCANE
- P PULSES
- N NON FOOD-CROP
- O OIL SEED

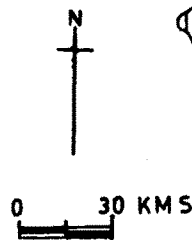


FIG. 4-7

present. Monoculture is confined in Karmala taluka with jowar crop. Two crop combination covers Mohol and South Solapur and the crops are jowar and pulses. Three crop combination association is observed in Barshi i.e. jowar, pulses and tur. Four crop combination is observed in Madha, Pandharpur and Sangola. Fig.4.7B shows the change in the crop associations all over the district.

Before the analysis of the crop combination regions by Raffullah's method, some discussion regarding Weaver's method and crop combination regions of Solapur is necessary. The crop combination regions demarcated by Weaver's method have included all the crops in the combinations, hence the combinations become over generalised. Therefore, the method fails to give precise crop combinations of the region under study. Another method i.e. maximum positive deviation method by Raffullah is applied for the crop combination regions of Solapur district and the resultant crop combination regions are shown in Fig.4.7 C & D.

There are three crop combinations. Out of eleven talukas, seven talukas record two crop combinations and they are Barshi, Malshiras, North Solapur, South Solapur, Sangola, Mangalwedha, and Akkalkot. In the remaining tahsils monoculture is observed namely Karmala, Madha, Pandharpur and Mohol.

Changes in the crop combinations regions resultant from Raffullah's method during the period under study show

some significant change as shown in Table 4.2. Change is occurred in Karmala, Madha, Pandharpur and Mohol from monoculture to two crop, elsewhere except Akkalkot the number of crops in combinations do not show any change. But Akkalkot has changed from two to three crop combination.

Table 4.2 : Changes in number of crops in the combination in Solapur district.

Sr. No.	District/ Taluka	Weaver's Method Number of crops		Raffullah's Method Number of crops	
		1951-53	1976-78	1951-53	1976-78
1.	Karmala	4	1	1	2
2.	Barshi	3	4	2	2
3.	Madha	4	4	1	2
4.	Malsniras	3	3	2	2
5.	Pandharpur	4	4	1	2
6.	Mohol	2	4	1	2
7.	North Solapur	4	4	2	2
8.	South Solapur	2	4	2	2
9.	Sangola	4	3	2	2
10.	Mangalwedha	4	4	2	2
11.	Akkalkot	4	4	2	3

SOURCE : Compiled by Author.

Lesser number of crops are included in the combinations than Weaver's method. However, these combinations are true representatives of the primary crops.

C. CROP CONCENTRATION AND CHANGES THEREIN :

The present study also focus on the changing scene in respect of crop concentration for the two points of time i.e. 1951-53 and 1976-78. Index values of concentration of crops have been computed with 'location quotient method' (Bhatia, 1965). The following is the method used for computing crop concentration index values.

$$\text{Computing index of crop concentration} = \frac{\text{Area of X crop in a component areal unit}}{\text{Area of all crops in a component areal unit}} \div \frac{\text{Area of X crop in a entire country}}{\text{Area of all crops in the entire country}}$$

The areal concentration of individual crops have been determined and mapped. For the discussion only four crops namely, jowar, bajara, tur, gram have been taken into account. The predominance of jowar is continued right from the beginning.

Fig.4.8C shows the position of crop concentration in 1951-53. It reveals that the crop concentration is high in North Solapur and Mangalwedha taluka above (1.5%). Medium concentration is found in Malshiras, Sangola, Barshi, Mohol, South Solapur and Akkalkot taluka. Here rainfall is more compared to other talukas. Remaining talukas particularly Karmala, Madha, Pandharpur record low concentration due to low rainfall and shallow unfertile soil.

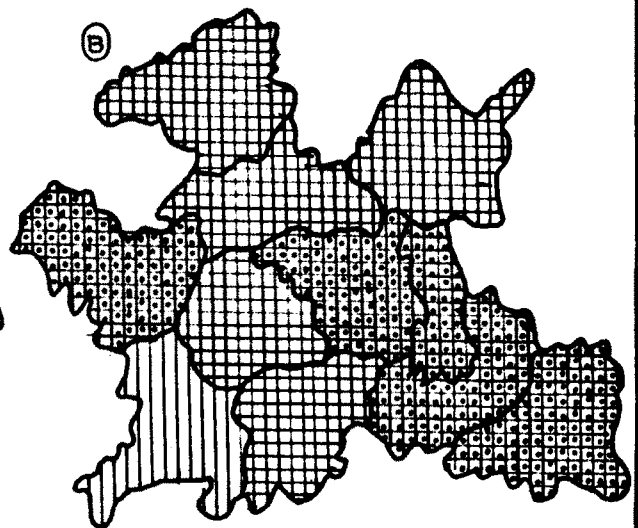
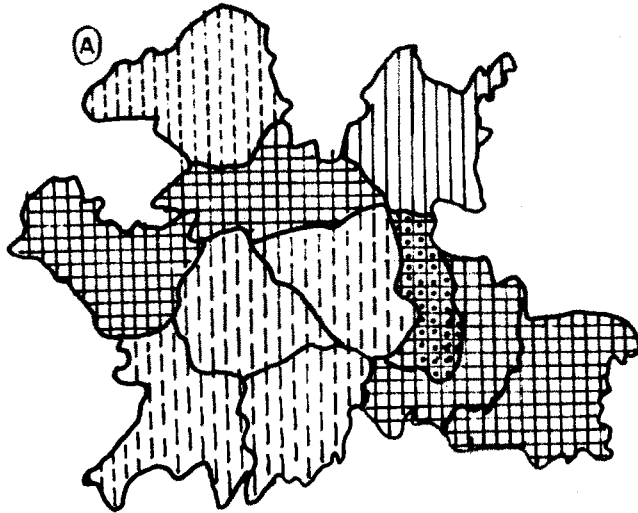
# SOLAPUR DISTRICT

## CROP DIVERSIFICATION

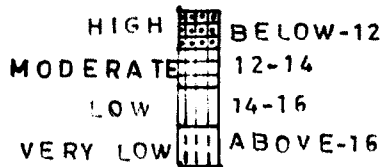
(BHATIA'S METHOD)

1951-53

1976-78



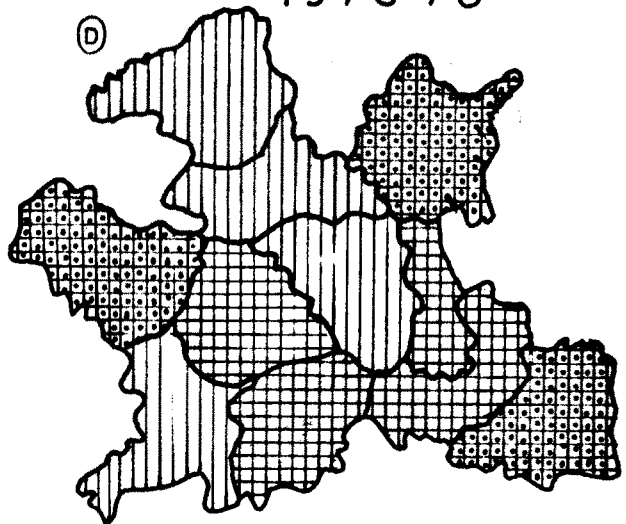
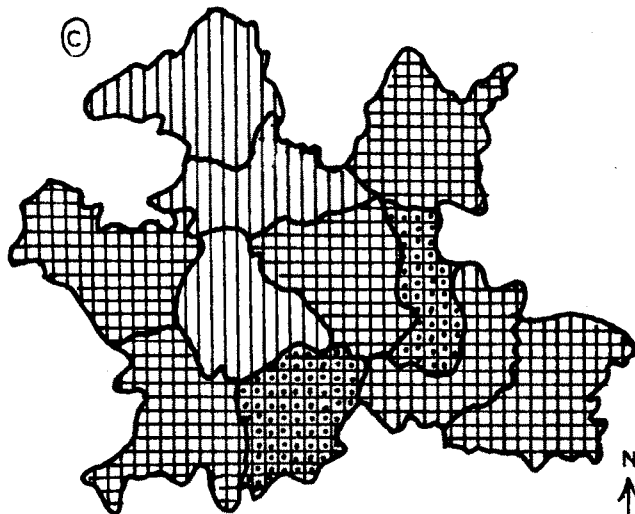
INDEX VALUES



## CROP CONCENTRATION

1951-53

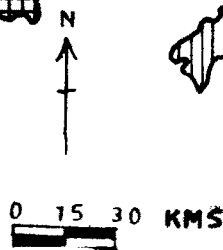
1976-78



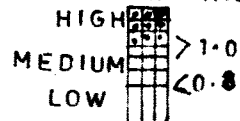
INDEX VALUES



REGION AVERAGE=1.22



INDEX VALUES



REGION AVERAGE=0.98

FIG. 4.8



This crop concentration position is changed in 1976-78 (Fig.4.8D). In Karmala and Madha tahsil there is no change. But in Malshiras, South Solapur, Akkalkot and Barshi taluka it changed from medium to high (0.8 to 1.0).

D. PATTERN OF DIVERSIFICATION AND CHANGES THEREIN :

Diversification in cropping pattern means a variety of crops cultivation on the arable land. The leener the competition higher is the magnitude of diversification (Singh,1976). Though, the pattern of diversification is influenced by physical, socio-economic and techno-organizational factors, physical environment is more strong. The study of crop diversification is of vital importance in judging the competition amongst crops for area, scope for rotation for the maintenance of fertility of soils which affect the productivity.

There is a relationship between crop combination and diversification (Fig.4.8 A & B). Greater the number of crops in the combination, higher is the diversification. To investigate the spatial patterns of crop diversification Bhatia's formula is used as given below.

$$\text{Index of crop Diversification} = \frac{\text{Percentage total of cropped area in 'n' crops}}{\text{Number of 'n' crops}}$$

Where 'n' crops are those which individually have occupied at least 1% or more of the total cropped area in talukas.

The indices of crop diversification are calculated for periods i.e. 1951-53 and 1976-78 (Table 4.3) and shown in Fig.4.8 A & B respectively. It shows the regional distribution of patterns of crop diversification grouped into four categories viz. i) Areas of high diversification ii) Areas of moderate diversification, and iii) Areas of low diversification and iv) Areas of very low diversification.

Table 4.3 : Changes in crop diversification in Solapur district.

Sr. No.	Taluka	1 9 5 1 - 5 3			1 9 7 6 - 7 8		
		No.of crops	Total Area in %	Index	No.of crops	Total Area in %	Index
1.	Karmala	4	82.76	20.69	7	90.44	12.92
2.	Barshi	6	84.35	14.06	7	89.18	12.74
3.	Madha	7	89.60	12.80	6	81.00	13.50
4.	Malshiras	6	77.22	12.87	8	81.28	10.16
5.	Pandharpur	5	88.60	17.72	6	80.88	13.48
6.	Mohol	5	86.50	17.30	7	75.46	10.78
7.	N.Solapur	8	90.00	11.25	8	88.48	11.06
8.	S.Solapur	7	89.53	12.79	7	80.99	11.57
9.	Sangola	4	84.40	21.10	6	86.52	14.42
10.	Mangalwedha	6	90.66	15.11	6	77.82	12.97
11.	Akkalkot	7	87.99	12.57	9	86.04	9.56
Region index		6	86.51	15.29	7	83.46	12.10

SOURCE : Compiled by the Author.

In Malshiras, Mohol, North Solapur, South Solapur and Akkalkot talukas crop diversification is high. In Pandharpur, Karmala, Madha, Barshi, diversification is moderate and elsewhere the diversification is low and very low.

Changes in the crop diversification can be obtained from the comparison of two maps Fig.4.8 A & B. It shows that most of the changes have occurred in the eastern and northern and southern parts of the district. In South Solapur & Akkalkot the change is from moderate to high. In Karmala the change is from very low to moderate. In Barshi the change is from low to moderate. In Pandharpur, Sangola, Mohol and Mangalwedha change is from very low to low and moderate.

#### CONCLUSION :

The foregoing analysis of the cropping pattern clearly indicates that there is a dominance of foodgrains (cereals and pulses). Jowar, bajara, wheat are the leading cereals of the district, whereas rice, maize, ragi, kondra, vari, sava, etc. are not so significant in the cropping pattern of the region. Among the pulses tur and gram are the important pulses. Other pulses are insignificant. Groundnut is the only important non food crop, occupying significant position in the cropping pattern of the region. Fruits and vegetables, cotton and tobacco occupy very small share of the cropped land.

Fluctuations in the crop landuse of the region are notable. There is a overall increase in area under foodgrains (cereals and pulses) corresponding decrease is in condiments and spices, miscellaneous crop and other oilseeds. Other non-foodgrain crops (sugarcane, fruits and vegetable, groundnut, oilseeds) observe very low increase in the region.

Jowar is the first ranking crop of this district. Pulses are grown every where but they are not dominant in the total crop rankings. Raffullah's method has reduced the number of crops in the combination than the Weaver's method. There is a relationship between the combination, concentration and diversification index values of the talukas. As greater the number of crops in the combination, higher is the crop diversification of the taluka.

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