

**AGRICULTURAL DEVELOPMENT OF
MAHARASHTRA
(1960-61 TO 1971-72)**

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1. INTRODUCTION

1.1 Maharashtra is often referred to as a 'progressive' State but its performance in agriculture over the period under consideration would justify its classification as an agriculturally backward State. Like other states, the population is predominantly rural, deriving the sustenance from agriculture and yet, the net State domestic product originating from agriculture has been declining or at best is stationary over the period. The consequences of such a phenomenon are serious in that income inequalities sharpen and poverty problem deepens under these conditions. But if one takes into account the rising disparities within agriculture itself, then the consequences for the bulk of the rural, and hence the State, population are bound to be disastrous.

This gives rise to several questions. It is apparent that in the State large investments are made in irrigation over the period. Fertilizer consumption too is increasing. At the all-India level, the new technology in form of increasing irrigation, fertilizer use and equally important, use of hybrid and high-yielding varieties is rapidly transforming agriculture. What happened to the increased irrigation and increased fertilizer use in the State? Further, since Maharashtra has large areas exposed to frequent scarcity conditions, is the decline-stagnancy due to this factor? In other words, is the underlying secular trend satisfactory? In the following pages we will try to answer these questions or failing that, we will locate the problem areas or problem crops in the State.

Acknowledgement

Grateful acknowledgement is made of the work done by research colleagues Sarvashri C.S. Gajjarajan, M.V. Joglekar, M.B. Padki and G.R. Mulla who were associated with this project at various stages.

1.2 But let us be more specific about the declining net product from Agriculture. In Table 1.1 figures for net State domestic product originating from agriculture and those for total net State domestic product at constant prices are presented for the twelve years under consideration. Here we see that the former is fluctuating but distinctly declining while the latter is consistently rising. In the initial period net product from agriculture is about 35 to 40 per cent of the total while in the end period it is 25 to 30 per cent, so the share of agriculture is definitely declining.¹

The compound growth rate² for the total net domestic product is 3.10 per cent per annum. This is well above the population growth rate of 2.40 per cent per annum between the two Censuses of 1961 and 1971. But the growth rate for net product from agriculture, the part we are concerned with and the bulk of the State population is concerned with, comes to -0.63 per cent per annum.

Now the last two years, 1970-71 and 1971-72 were years affected by scarcity conditions (the extent of which is described in later chapters) and if we exclude these two years, the rate is -0.67 per cent per annum.³ If the worst year of 1965-66 is also deleted, the rate comes to -0.74 per cent. Then again if the usually good year

1 The declining share of agricultural in the State's net product would be taken as a sign of progress in happier circumstances. But when the net product from agriculture even in absolute terms is declining, the situation is indeed serious.

2 Using the regression method.

3 This rate is slightly lower perhaps because the worst year 1965-66 appears exactly in the middle of the time series and has no effect on the rate whereas before exclusion of last two years it appears in the first half of the period and the relative fall is lower. But in most of the series like area, production, etc., the rate improves.

Table 1.1 : Agricultural Component of Net State Domestic Product (NSDP) at Constant (1960-61) Prices

(Rs. Lakhs)

	NSDP originating from Agriculture (1)	Total NSDP (2)	(1) as Percent- age of (2)
1960-61	64111 (100.00)	159742 (100.00)	40.13
1961-62	57112 (89.08)	159569 (99.89)	35.79
1962-63	58345 (91.00)	164322 (102.87)	35.51
1963-64	59901 (93.43)	171224 (107.19)	34.89
1964-65	59315 (92.52)	176708 (110.62)	33.57
1965-66	47203 (73.63)	170406 (106.67)	27.70
1966-67	51701 (80.64)	179371 (112.29)	28.82
1967-68	56603 (88.29)	188810 (118.20)	29.98
1968-69	59692 (93.11)	200658 (125.61)	29.75
1969-70	57926 (90.35)	206434 (129.23)	28.06
1970-71	55215 (86.12)	212712 (133.15)	25.96
1971-72	53669* (83.71)	220179* (137.83)	24.38

* Provisional Indices are shown in parenthesis

Source : Statistical Abstracts of Maharashtra State (1973-74), Directorate of Economics and Statistics, Government of Maharashtra

(in fact the best in the series) of 1960-61 is further dropped then the growth rate improves to -0.21 per cent per annum. Thus even if we delete the years that are likely to affect the growth rate adversely, the situation of stagnancy or decline persists. This is a situation which should cause concern because one does not have to discuss the adequacy of growth in agriculture but has actually to explain the decline. It is also clear that the net product from non-agricultural sector is increasing at a faster pace and income disparities are widening. The bulk of the population appears to have little share in the growth.

1.3 We are covering the period 1960-61 to 1971-72. By 1960-61 the reorganization of the State was completed and we have really consistent data from this year onwards. We end with the year 1971-72 because the important official source of agricultural data, viz. the Season and Crop Report (1971-72) became available during 1975-76 at which time some preliminary work on this problem was initiated.

It was decided to adopt district as the unit of analysis. It was felt that the State-level performance could be more meaningfully interpreted when districtwise data are analysed. Often the State-level behaviour cannot easily be explained but when we go to the districts, the analysis suggests possible reasons. There is ample evidence in the analysis presented, to show that this has been useful. There are 26 districts in the State and for our comments we resolve these districts into five regions so that the basic differences in growth are properly brought out and one is not lost in the details. Complete districtwise analytical tables are, however, incorporated in this volume for the interested reader.

1.4 As indicated above, our main source of data is the Season and Crop Reports compiled by the Directorate of Agriculture, Maharashtra State. Districtwise data on various aspects of agriculture like land use, cropping pattern, irrigated cropping pattern, production, etc., are available in these reports. It may be pointed out that for the first eight years, that is upto 1967-68 the data are in acres, long tons, pounds, etc., while from 1968-69 onwards the data are in metric units in hectares, tonnes, kilograms, etc. We have converted the pre-1968-69 data into metric units and hence the time series districtwise data are in metric units which forms the basis for our analysis. This involved considerable work and it was felt that these data in consistent units should be put in a volume form for the benefit of interested researchers. Along with index numbers and appropriate percentages, these districtwise data on various aspects was put out as a volume of 'Data Tables' consisting of about 700 foolscap pages in a typed form.

In fact this work involved considerable labour. It may be mentioned here that for the first eight year period figures in the Season and Crop Reports are very difficult to read. Often row and column totals checks had to be resorted to, to arrive at a correct figure. There are also a number of errors and the errata appended does not do justice to them. We have done our best in arriving at the consistent figures and have convinced ourselves that the remaining discrepancies are not large to affect our conclusions. One must concede that the task of compilation of Season and Crop Reports is unenviable and also note that from 1969-70 onwards the size of Reports is more spacious and printing is much

better with fewer errors. We base our chapters on land utilization, cropping pattern, irrigated cropping pattern and production on these data. For the fertiliser use, the data are taken from the Fertilisers Statistics published by the Fertiliser Association of India. For the districtwise fertiliser consumption data for the first eight years we are indebted to Dr. Gunwant M. Desai of Indian Institute of Management, Ahmedabad. For the chapter on finance, various sources like the Land Development Bank, Government budgets, etc., were used. We also contacted major commercial banks and collected relevant loan data. Although we cannot say that we have a complete picture of finance, we have some useful analysis on this aspect. As to the analysis of productivity, we have used the data on area and production (from Season and Crop Reports) to arrive at productivity. It may be mentioned that no separate data on productivity of irrigated crops are available. Whatever data on productivity of irrigated crops that are contained in the Season and Crop Reports are based on annewari estimates for most of the years. These estimates are of little use as these are not consistent with area and production data. The production data are based on yield estimates from crop estimation surveys which are 'composite', for the total (irrigated + unirrigated) area.

In addition we have also used Bureau's Indices of area, production and productivity (which are State-level only) to comment on the 'overall' performance in agriculture. For the next chapter on scarcity areas in Maharashtra we have used the data from the Report of the Fact Finding Committee for the Survey of Scarcity Areas in Maharashtra (1972). This chapter was thought to be

necessary because large areas are exposed to frequent scarcity conditions in the State and no analysis of growth of agriculture over a period could be complete without a reference to the scarcity conditions. In fertilizer use, we have also used NSS data collected in the twenty-sixth round.

1.5 Now let us turn to the methodology adopted for analysis. It is already mentioned that unit of analysis is the district. The focus of the present work is on the change and this change is depicted in two ways : compound growth rate and absolute change. The absolute changes are relevant because growth rates by themselves are not enough. When the magnitude of a given series is rather low, growth rate tends to be exaggerated. With simultaneous estimate of absolute changes the 'impact' of a particular growth rate is immediately clear. As a first step in analysis, the compound growth rates were calculated for the entire period 1960-61 to 1971-72 by the regression method. The absolute changes were arrived at by fitting a linear regression to the data. These linear changes are in absolute terms and expressed per year. These rates (unlike growth rates) are additive and this facilitates correct interpretation of growth rates.

But as the time series is affected by some unusual years, it became clear that in our quest for the underlying trend these unusual years should be deleted. So a slightly different approach was preferred. After the deletion of unusual years, average of the first three years is taken to represent the initial position (or the base period position) and average of the last three years is taken as the 'end position'. Compound growth rates (in per cent per annum) based on these two-point data

are calculated. The absolute changes are simply the differences between these points. These are not reduced to per annum basis because relative importance of absolute change is adequately represented by the absolute changes over the entire period. Apart from saving on calculations, this method of depicting absolute changes has the advantage that with the availability of 'initial position' we know on what level of magnitude this (two-point) compound growth rate is operating and a given growth rate can be interpreted in proper perspective. In fact wherever we have retained the regression based growth rates based on entire twelve year period, such calculation of initial position and end position was also found to be necessary. These entire period regression based rates are retained for examination of two aspects : growth of irrigated cropping (including growth of sources of irrigation) and fertilizer use because these were the sort of series which go on increasing consistently and deletion of unusual years have little effect on them. Further, since production-productivity of irrigated crops are not separately available and cropwise fertilizer consumption simply not available, growth in irrigated area and fertilizer consumption cannot be directly linked with the total (irrigated + unirrigated) production-productivity analysis and trends in irrigated cropping and fertilizer use, by this slightly different (regression) method, are adequate. Wherever such regression-based growth rates are retained, the corresponding absolute changes are by linear regression and are in per year terms. For the bulk of the analysis, however, two-point method is used. To avoid confusion, whenever regression method is used to obtain the growth rate, the fact is clearly stated.

1.6 In such a study of change, the limitations should be noted. As mentioned earlier, Maharashtra has large areas exposed to frequent scarcity conditions. This uncertainty introduces a large random element in the performance. As pointed out in the first two sections, the agricultural performance is clearly unsatisfactory. To get the underlying trend, we have tried to delete the scarcity years which appear in the middle and the terminal parts of the series. We have also deleted (for analysis of production) unusually good first year (there was nothing exceptional about area in that year) because obviously the weather conditions have been extremely in favour in that year. Such a good year occurring at the beginning of the series would have a depressing effect on the rates of growth and may not depict the correct underlying trend and hence its deletion. But there are degrees of scarcities and if later years have a higher degree of scarcity, a downward trend may still persist. We have, however, focused our attention on the resources which are likely to lead stability and induce growth, like irrigation, fertilisers, etc. We have tried find out whether these resources are being used in the right direction and whether, over time, stability and growth of agriculture resulting in containing and reducing rural poverty can reasonably be expected.

For the impact of irrigation, productivity (and hence production) data of irrigated crops are necessary but these are not available as mentioned above and we have to evaluate the irrigation impact in a round-about way. Regarding fertiliser use, districtwise consumption figures are available but in absence of cropwise consumption data, it is not easy to judge whether a given good

performance of a particular crop is due to increased use of fertilisers (or irrigation) or whether the unirrigated component (generally the major component) has done well due to fair weather conditions. We have used some NSS data on cropwise fertilizer consumption for 1970-71 as mentioned earlier, but such one-point data providing a static picture are woefully inadequate for a study of change. Similar is the case with adoption of hybrid-improved varieties. Area estimates are far too unreliable to judge their impact on production.

But these are limitations inherent in the data and we have tried to make a fair assessment of the performance in agriculture. We come to rather depressing conclusions and one hopes that these are due to the random elements and data limitations and with average weather conditions, underlying positive trends would assert themselves over time.

2. SCARCITY AREAS IN MAHARASHTRA

2.1 Maharashtra has large areas which are scarcity affected and one must take into account the scarcity conditions over the period in any analysis of the State's agricultural performance. Scarcity has been described in the Scarcity Manual of Government of Maharashtra as "marked deterioration of agricultural season due to failure of rains or floods or damage to crops from insects resulting in severe unemployment and consequent distress among agricultural labourers and cultivators." Drought is obviously the most important cause of scarcity but one may distinguish between drought and scarcity by pointing out that a drought year may not give rise to 'scarcity conditions' if preceded by an abnormally good year. But we are not interested in these finer points here. Without doubt, lack of adequate and timely rainfall has been the cause of drought and scarcity conditions in the State although some parts may suffer due to excessive rainfall. In the present chapter we will identify drought-prone areas and consider some of the annewari data in these drought-prone regions as well as data on declaration of scarcity conditions in villages in the entire State to obtain some idea about the intensity of drought conditions over the twelve years under consideration.

2.2 Depiction of the variability of rainfall in the broad drought zone is not as easy task but we have the 'Report of the Committee Survey of Scarcity Areas in Maharashtra (1973)'¹ and we will use some of the data

¹ Report of the Fact Finding Committee for Survey of Scarcity Areas Maharashtra State, Government of Maharashtra (1973). Shri Sukhathankar was the Chairman of this Committee.

in that Report which fortunately covers the same period under consideration as for the present study. Considering rainfall in a period of 22 weeks between June and October² in a year, the abovementioned Report (henceforward mentioned simply as the 'Committee Report') gives data on the number of years in which rainfall is 'deficient' over a period of about 15 years (1958 to 1972 depending upon the availability of data) for talukas falling in the broad drought zone.³ A deficient year is defined as one in which rainfall is less than normal in more than 11 weeks out of these 22 weeks of rainfall.⁴ In Table 2.1 we abridge the talukawise data and present it for the districts in the drought zone. We have added a column of 'frequency-ratio of deficient years' and this needs some clarification. The original table in the 'Committee Report' gives (number of deficient years out of about 15 years for each taluka in the drought zone.) Taking a ratio of deficient years/number of years considered for each taluka, we have weighted it by the talukawise net sown rainfed area to arrive at the 'frequency-ratio of deficient years' for the district. (The net sown area and net irrigated area appear to be for the year 1969-70 although no clear mention is made in the Committee Report.) Thus one interprets the ratio of 0.72 for Nasik district (No. 1) as 'deficient years occurring with a frequency of more than 7 years out of 10',

2 'Some 85 to 98 per cent of rainfall is received between June and October over most parts of Maharashtra' - Committee Report (1973) Vol. I.

3 Ibid., pp. 72-79.

4 The broad drought zone has an average annual rainfall of 600 mm, barely sufficient for successful growth of a crop. Any reduction in this affects crops adversely.

Table 2.1 : Districts under the Broad Brought zone in Maharashtra
(Area in hectares for 1969-70, Dz=Brought Zone, NSA = Net Sown Area)

District	Total No. of talukas	No. of talukas in brought zone (%)	Rainfed net sown area in the Dz.	Total net sown area of the district**	Percentage of rainfed to total net sown area	Weighted frequency ratio of deficient years*	Interpretation : deficient years occurring with frequency of	Comment on basis of divisions
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Drought Region I</u>								
1. Nasik	13	9	631134	877100	71.96	.7245	More than 7 years in 10	<u>Pune Division: 7 Districts, 3 in Dz.</u> NSA for Division = 3258200 i) NSA of districts in Dz/NSA of Division=72.57% ii) Rainfed area in Dz/NSA of Division = 48.07% iii) Rainfed area in Dz/NSA of State=2.48
2. Dhule	10	6	40252	574900	72.84	.6427	About 4 years in 3	
3. Jalgaon	13	8	444031	811200	54.74	.6538	About 2 years in 3	
Total	36	23	1565417	2365200	66.24	.6732	2 years in 3	
<u>Drought Region II</u>								
4. Ahmednagar	13	13	1114895	1261900	88.35	.7066	About 7 years in 10	<u>Poona Division: 6 districts, all in Dz.</u> NSA for Division = 5248700 i) NSA of districts in Dz/NSA of Division = 1.00% ii) Rainfed area in Dz/NSA of Division = 71.84% iii) Rainfed area in Dz/NSA of State = 20.42%
5. Poona	13	9	702075	1010000	69.51	.5790	About 6 years in 10	
6. Satara	11	6	428896	700500	61.23	.5875	About 6 years in 10	
7. Sangli	6	6	478597	632800	75.63	.5191	More than 1 year in 2	
8. Solapur	11	11	971701	1235900	78.56	.6991	About 7 years in 10	
9. Kolhapur	12	2	74525	406800	18.53	.5525	About 5 years in 9	
Total	66	47	3770892	5248700	71.84	.6405	About 2 years in 3	
<u>Drought Region III</u>								
10. Aurangabad	12	7	771107	1332500	57.87	.5268	About 5 years in 9	<u>Aurangabad Division: 5 districts, 3 in Dz.</u> NSA for Division = 4905600 i) NSA of districts in Dz/NSA of Division = 65.53% ii) Rainfed area in Dz/NSA of Division = 36.78% iii) Rainfed area in Dz/NSA of State=9.42%
11. Dhule	7	6	647628	814000	79.56	.5983	About 6 years in 10	
12. Osmanabad	11	5	385435	1095100	35.20	.5355	About 5 years in 9	
Total	30	18	1804170	3214600	55.86	.5543	About 5 years in 9	
<u>Drought Region IV</u>								
13. Huldana	5	2	250002	698500	35.79	.4592	About 1 year in 2	<u>Nagpur Division: 6 districts, 4 in Dz.</u> NSA for Division = 5051900 i) NSA of districts in Dz/NSA of Division = 13.83% ii) Rainfed area in Dz/NSA of Division = 4.95% iii) Rainfed area in Dz/NSA of State=1.12%
Total for Brought Divisions (I to IV) 137	90	90	7390281	11525000	64.12	.6216	More than 6 year in 10	
<u>Maharashtra: 26 districts, 13 in Dz.</u> NSA for State = 18162100 i) NSA of district in Dz/NSA of State = 62.72% ii) Rainfed area in Dz/NSA of State=40.42%								

* Data based on taluka figures in the Committee Report. ** Data from Season & Crop reports in hundred hectares converted to actuals.
* 'deficient year' is one in which in more than 11 weeks out of 22 (total rainfall period from June to October), rainfall is deficient.
source : Compiled from Report of the Fact Finding Committee for Survey of scarcity Areas, Maharashtra State (1975) Vol. I, Table 2, pp. 72-79.

etc. From the last row one finds that the broad drought zone covers parts of 13 districts out of 26 (or 25 if we leave out Bombay district which is unimportant agriculturally) in the State. Out of 137 talukas of these districts 90 talukas fall in the actual drought zone. From the Bombay Division⁵ of 7 districts, 3 fall in the drought zone. These are Nasik, Dhulia and Jalgaon districts denoted as Drought Region I. The frequency ratio for these three districts lies between .63 and .72 and the combined area has the ratio of .67 or a frequency of deficient years of 2 years out of 3 which is very high indeed. The rainfed area of this region (which is certainly exposed to drought) forms 46 per cent of the net sown area (NSA) of Bombay Division and over 8 per cent of the NSA of the State (see the last column of 'comments'). The drought zone covers parts of all the 6 districts of the Poona Division and as many as 47 out of 66 talukas fall in the actual drought zone with a combined frequency ratio of .64 only slightly smaller than first region. The rainfed area in this drought zone of Drought Region II forms 72 per cent of area of the Poona Division or 20 per cent of the NSA of the State. From Aurangabad Division 3 out of 5 districts have parts in the drought zone with a combined ratio of .55 indicating relatively less exposure to drought. The rainfed area in this Drought Region III forms 37 per cent of NSA of Aurangabad Division or 10 per cent of NSA of the State. In the Nagpur Division out of eight districts, only one district has 2 out of 5 talukas in the drought zone, the rainfed area being 5 per cent of the Division NSA or

⁵ The State is divided into four administrative divisions. These are : Bombay Division, Poona Division, Aurangabad Division and Nagpur Division.

1.35 per cent of the State NSA and the frequency-ratio is .49. For the entire drought zone of 90 talukas (see the last row), the rainfed area forms 40 per cent of the State NSA and the frequency ratio is .62 i.e. more than 6 deficient years in 10. To summarise, we have

Drought Region	Rainfed Area/ Division NSA (%)	Rainfed Area State NSA (%)	Frequency Ratio of de- ficient rain- fall years
I	48.07	8.48	.67
II	71.84	20.42	.64
III	36.78	9.77	.55
IV	4.95	1.35	.49
All Drought Regions		40.02	.62

Thus on the basis of taluka as a unit and considering only the rainfed area in drought regions, 40 per cent of the State NSA is exposed to deficient rains with deficient years (rainfall less than normal in 11 out of 22 weeks in the year) occurring in more than 6 years in 10. Poona Division, Drought Region II, appears particularly susceptible with nearly three-fourth of the NSA being exposed to deficient rains (Drought Region I is not far behind). Since the 22 weeks cover all the important stages of growth of crops, it is obvious that frequent occurrence of deficient years would affect agricultural production substantially. The extent of the impact in a particular year would depend upon how many weeks in excess of the 11 prescribed are deficient as well as whether there are successive deficient weeks or not. Thus a very strong random element would be introduced in the agricultural performance of the drought zone and hence of the State. This fact has to be kept in mind in assessing the agricultural performance of the State.

2.3 On the basis of extent of the rainfall, dependability of rainfall and available irrigation facility, the Committee has identified Drought-Prone talukas and the details are presented in Table 2.2 for reference as we will consider annewari data in these drought-prone (DP for short) regions. The DP regions actually identified by the Committee cover 83 instead of 90 talukas considered to be in the drought zone earlier but this is a minor difference. In Volume II of the Committee Report we have talukawise data of number of villages with annewari less than 6 annas (with break-up of villages having annewari less than 4 annas and those with 4 to 6 annas being shown separately) from 1958-59 to 1972-73. We have compiled Table 2.3 from these data for the four DP regions for the period under consideration. (Year 1972-73 is included here for information only, as it is an indicator of how severe the conditions could be in some years.) From the last three columns for the State we see that out of 38867 villages (1961 census) in the State, 9586 villages fall in the DP (drought-prone) region. Looking at the number of villages below annewari of 6 annas one notes that the year 1965-66, 1970-71 and 1971-72 are particularly bad with 5162 (54 per cent of DP villages), 6207 (65 per cent) and 6323 (66 per cent) villages having annewari less than 6 annas. (Not to mention a figure of 7876 - 82 per cent - villages in 1972-73, a year not in the period under consideration.)

This indicates that the DP areas can have very bad years and when they occur in succession, as for the period 1970-71 to 1971-72, the effect could indeed be disastrous for agriculture in the State. Except for

Table 2.2 : Drought Prone Areas of Maharashtra
(DP = Drought Prone, NDP = Not Drought Prone)

District	Wholly drought prone (DP) talukas	Partly DP talukas	Total DP talukas	No. of talukas in the district	Comment on partly DP talukas
Nasik	3	6	9	13	6 talukas: Areas not served by irrigation canal system DP
Dhulia	0	1	4	10	1 taluka: 1 revenue circle NDP
Jalgaon	1	6	7	13	4 talukas: Areas not served by irrigation canal system DP 2 talukas: 3 revenue circles DP
Ahmednagar	5	8	13	13	7 talukas: Areas not served by large canal irrigation system DP 1 taluka: 2 revenue circles DP
Poona	-	8	8	13	5 talukas: Areas not served by irrigation canal system DP 3 talukas: 4 revenue circles DP
Satara	3	2	5	11	2 talukas: Areas not served by canal system DP
Sangli	3	3	6	6	3 talukas: 5 revenue circles DP
Sholapur	8	3	11	11	3 talukas: Area not served by irrigation canal system DP
Aurangabad	0	1	7	12	1 taluka: 2 revenue circles DP
Bhir	4	2	6	7	1 taluka: 2 revenue circles DP 1 taluka: One circle NDP
Qamranabad	3	2	5	11	1 taluka: 2 revenue circles DP 1 taluka: 1 revenue circle NDP
Buldhane	-	2	2	5	2 talukas: 2 revenue circles DP
Bombay Division (6 districts ex. Bombay)					
Region I	7	13	20	27	
Poona Division (6 districts)					
Region II	19	24	43	60	
Aurangabad Division (5 districts)					
Region III	13	5	18	46	
Nasik Division (8 districts)					
Region IV	-	2	2	39	
TOTAL	39	54	83	228	

Compiled from Fact Finding Committee for Survey of Scarcity Areas, Maharashtra State (1973), Vol. 1, pp. 80-82. All areas are identified by the Committee on the basis of extent of rainfall, dependability of rainfall and existing irrigation facilities.

Table 2.3 : Number of Villages with Annewari Less Than 6 Annas in the Drought Prone Regions of Maharashtra (1960-61 to 1971-72)
(Taluka unit of identification of DP region)

	DP regions of Bombay Division Nasik-Dhule-Jalgaon districts (No. of DP villages 2403)			DP regions of Poona Division districts (No. of DP villages 3734)			DP regions of Aurangabad Division (No. of DP villages 2921)			DP regions of Nagpur Division (No. of DP villages 508)			DP regions of Maharashtra (No. of DP villages 9366 out of 38867 villages in State)		
	Annawari less than 4 As.	Annawari 4-6 As.	Total	Annawari less than 4 As.	Annawari 4-6 As.	Total	Annawari less than 4 As.	Annawari 4-6 As.	Total	Annawari less than 4 As.	Annawari 4-6 As.	Total	Annawari less than 4 As.	Annawari 4-6 As.	Total
1960-61	36	83	121	19	1	20	27	57	84	-	-	-	84	141	225
1961-62	86	153	239	346	191	537	-	123	123	28	189	217	460	656	1116
1962-63	4	10	14	28	38	66	-	35	35	-	-	-	32	83	115
1963-64	60	35	95	113	330	443	-	22	22	-	10	10	173	397	570
1964-65	7	35	42	66	188	254	-	49	49	-	60	60	73	332	405
1965-66	979	690	1669	774	1380	2154	450	409	859	390	110	500	2593	2569	5162
1966-67	490	414	904	114	142	256	73	84	157	-	98	98	677	738	1415
1967-68	137	92	229	108	283	391	87	41	128	13	181	194	345	597	942
1968-69	54	68	122	238	488	726	56	38	94	-	-	-	348	594	942
1969-70	64	247	311	21	263	284	1	3	4	-	151	151	86	664	750
1970-71	623	597	1220	1581	516	2097	1977	385	2362	508	-	508	4709	1498	6207
1971-72	1285	291	1576	1221	779	2000	2001	238	2239	502	6	508	5009	1314	6323
(1972-73)	(1744)	-	(1744)	(3535)	-	(3535)	(2260)	-	(2260)	(335)	-	(335)	(7874)	-	(7874)
Average number of first three years			125 (5.20)			208 (5.57)			81 (2.75)			72 (14.17)			486 (5.07)
Average number of last three years			104.2 (43.36)			1460 (39.10)			1535 (52.19)			389 (76.57)			4426 (46.17)
Average number of 1967-70			221 (9.20)			467 (12.51)			75 (2.55)			115 (22.64)			878 (9.16)

(Compiled from various talukawise tables in Report of the Fact Finding Committee for the Survey of Scarcity Areas, 1973, Volume II).

Note: Year 1972-73 included only for information. Figures in parentheses in the last three lines are percentages to DP villages in the respective regions.

the Kaggur Division which has negligible area in the DP region, one would expect serious repercussions on agricultural production.

What is the relevance of these bad years when one examines the agricultural performance for the twelve years under consideration? Other things remaining equal, the appearance of last two bad years in the DP areas would introduce a definite downward trend in the agricultural production, area sown (to the extent adverse weather conditions affect sowing itself) and productivity of different crops. From the last three rows of the present table we see that during the initial period (we take average of 1960-61 to 1962-63) 5 per cent of villages in DP areas of the State had annewari less than 6 annas while at the end period (average of 1969-70 to 1971-72) this percentage is as high as 46 per cent. This would certainly introduce a downward trend in agricultural performance. In particular, the first three drought regions would show a deteriorating situation with their large DP regions.

Since our aim is not merely to present facts but to seek underlying secular trends free from nature's influence one would probe further by deleting bad years. If we drop the last two years and take the end period as average of three years from 1967-68 to 1969-70, the percentage of State DP villages with annewari less than 6 annas drops to 9 per cent (instead of 46 per cent) at the end period and mildly deteriorating weather conditions are obtained. (Note that in considering the initial and end period three year averages, another bad year viz. 1965-66, is automatically deleted.) It is difficult to say to what extent this trend will be reflected in

area-production-productivity analysis but this is the best one could do to eliminate the influence of drought in the assessment of change.

2.4 So far we considered the drought-prone regions only. How to depict the weather conditions over the period for the State as a whole? For DP regions we considered manifestation of weather conditions in the form of annewari data. For the State as a whole, we use the districtwise data in the Committee Report on the number of villages declared as scarcity affected over the period 1960-61 to 1971-72.⁶ We divide the State into five regions to analyse these data.

- Region I : Bombay, Thana and Kolaba districts of Bombay Division. No part of this region is in the drought zone.
- Region II : Nasik, Dhulia and Jalgaon districts of Bombay Division. Drought Region I covers these three districts.
- Region III : All six districts of Poona Division. All six districts have parts in the Drought Region II (five districts in the DP region identified by the Committee).
- Region IV : All five districts of Aurangabad Division. Three out of these five districts have parts in the Drought Region III.
- Region V : All eight districts of Nagpur Division. One district in Drought Region IV.

These regions are formed on the basis of their drought-proneness, availability and quality of irrigation and

⁶ Committee Report (1973) Vol. I, pp. 112-113.

increases in irrigated area in the period under consideration. We will assess the agricultural performance in subsequent chapters by these regions.

In Table 2.4 abovementioned data on number of villages declared as scarcity affected are presented by these five regions.

From this table we see that for the State as a whole on an average, 6357 out of 38867 villages in the State were declared as scarcity affected every year i.e. over 16 per cent (see row (i)). Similar percentage for Konkan (Region I) is understandably low, at just over 1 per cent, with its assured rainfall. For Regions II, III and IV the percentages are 18, 15 and 19 respectively as these regions have large parts drought affected. What is surprising, however, is the fact that Nagpur Division (Region V) has this percentage highest at about 20 although this is an assured rainfall zone with just one district in the DP area. The worst year for the Division is 1970-71, when there were excessive rains and over 11 thousand (out of 15 thousand) villages were declared as scarcity affected. Years 1960-61, 1965-66, 1966-67 and 1971-72 have also been relatively bad. Thus this assured rainfall area has also suffered over the period under consideration. What are the implications of the behaviour of scarcity conditions in the analysis of agricultural performance? From rows (iii) and (iv) of the Table we see that for the State in the initial period (average 1960-61 to 1962-63) 3 per cent of villages were declared as scarcity affected while at the end of the period as many as 34 per cent (average 1969-70 to 1971-72) were declared as scarcity affected and barring the first region, all other regions including Nagpur Division show substantial

Table 2.4 : Villages Declared as Scarcity Affected Over the 12 Year Period 1960-61 to 1971-72

Year	Region I Thana, Kolaba, Ratanagiri districts of Bombay Divi- sion (Villages 5106)	Region II Nasik, Dhulia, Jalgaon dis- tricts of Bombay Divi- sion (Villages 4518)	Region III Poona Divi- sion districts (Villages 6568)	Region IV Aurangabad Division districts (Villages 7393)	Region V Nagpur Divi- sion districts (Villages 15262)	Maharashtra (Villages 38857)
1960-61	18	105	-	84	1	208
1961-62	9	239	840	123	3749	4960
1962-63	12	47	216	-	509	784
1963-64	10	102	429	72	662	1275
1964-65	13	52	63	129	867	1144
1965-66	45	2916	3940	1907	7363	16151
1966-67	4	1393	313	469	4861	7040
1967-68	102	401	414	477	2689	4083
1968-69	39	110	707	105	1	962
1969-70	184	341	435	-	1066	2026
1970-71	38	2066	2465	7336	11085	22992
1971-72	222	2120	2106	6602	3605	14655
1) Average number affected per year	58	824.5	994	1642	3038.17	6356.67
ii) Average/total (%) villages	(1.14)	(18.25)	(15.09)	(19.50)	(19.91)	(16.35)
iii) Average number first 3 year	13 (0.25)	130 (2.86)	352 (5.34)	69 (0.93)	1420 (9.30)	1984 (5.10)
iv) Average last 3 yrs	148 (2.90)	1510 (33.42)	1669 (25.33)	4646 (62.84)	5252 (34.41)	13224 (34.02)
v) Average 1967-70	108 (2.12)	284 (6.29)	519 (7.88)	194 (2.62)	1252 (8.20)	2357 (6.06)

Percentage of villages affected in each region shown in parentheses.

Source: Maharashtra on Economic Review 1972-73 quoted in Report of the Fact Finding Committee for Survey of Scarcity Areas, 1973, Vol. I, pp. 112-13.

increases in the percentage of villages affected at the end of the period. For Aurangabad Division the contrast is quite striking. Although in the initial period slightly less than 1 per cent of villages were scarcity affected, nearly 63 per cent were affected at the end of the period. On the whole, one should expect a downward trend, other things remaining equal, in the agricultural performance of the State over the period.

If we redefine the end period by deleting the last two years and take average of years 1967-68 to 1969-70 as the 'end period' the situation improves considerably (with the deletion of worst two years of 1970-71 and 1971-72) and for the State as a whole percentage of affected villages rises from 5 per cent in the initial period to just over 6 per cent (compared with the earlier 34 per cent) at the end of the period. Thus if we delete the last two years, the initial and end period situation shows that the influence of external factor is more or less eliminated but we note that for the first four regions the percentage of villages affected at the end period is slightly higher while for Nagpur Division the percentage of affected villages reduces slightly from 9.30 to 8.20 per cent between the two periods.

Another point to be noted is that in the first year of analysis the number of villages affected is the least - just 208 out of 38867 villages. It was already noted that agricultural production attained at the first year is not surpassed in any of the subsequent eleven years. With this situation of the best year occurring at the start of the period, other things remaining equal, one would expect a downward trend in the various aspects of agricultural performance.

This discussion prepares the background for the analysis to follow in the following chapters with one important factor affecting the agricultural performance in Indian conditions - the hand of nature - put in a proper perspective.

3. LAND UTILIZATION

3.1 Our enquiry into the agricultural performance of Maharashtra starts with the most basic of inputs, viz. land. In the present chapter land utilisation aspect is examined, based on the land use data available in the Season and Crop Reports. While the basic data for the State along with relevant percentages and indices are presented in Table III-1 at the end of this chapter, similar districtwise data are incorporated in the separate volume of 'Data Tables'.

We will focus our attention on the change in land use over the period and not on the static aspects like which area or districts have greater proportion of land under cultivation, etc. Land use statistics gives data under various categories - geographical area, area under forests, area not available for cultivation, other uncultivated land, fallow land, net area sown, area sown more than once, total cropped area, etc., and this statistics for the State for the twelve year period is presented in Table III-1 as mentioned above. Looking at these data, we find some changes in the geographical area itself, a result of changes in reporting area. A detailed analysis of these changes reveals that these affect mostly area under forest and not the area relevant for cultivation.

We will concentrate on the categories of land use which are relevant for cultivation in the first instance and the double cropping will be examined later in this chapter. We single out four categories from these data, viz., culturable waste, fallow other than current fallow,

current fallow and net sown area which could be taken to form 'land available for cultivation'. It would not be out of place to recount the definitions of these four categories given in the Indian Agricultural Statistics. These are as follows :

Culturable Waste : These include all lands available for cultivation whether or not taken up for cultivation or taken up for cultivation once, but not cultivated during the last five years or more in succession. Such lands may be either fallow or covered with shrubs or jungle which are not put to any use. (They may be assessed or unassessed and may be in isolated blocks or within cultivated holdings.) Land once cultivated but not cultivated for five years in succession shall also be included in this category at the end of five years.

Fallows other than Current Fallows : This implies all lands taken up for cultivation but are temporarily out of cultivation for not less than one year and not more than five years. The reasons for having such lands may be (i) poverty of cultivators, (ii) inadequate supply of water, (iii) malarial climate, (iv) silting of canals and rivers, and (v) unremunerative nature of farming.

Current Fallows : This class comprises of cropped areas which are kept fallow during the current year. For example, if any seedling areas is not cropped again in the same year it may be treated as current fallow.

Net Sown Area : This represents the area sown with crops and orchards counting area sown more than once in the same year only once.

We note two things in these definitions. Firstly, there is a definite direction in movement from net sown area to current fallows and to fallows other than current fallows. Secondly, culturable waste consists of two categories : area available for cultivation but not taken up for cultivation and 'fallows other than current fallows' joining the category of culturable waste after the completion of five years of fallow. The relevance of this discussion will be apparent subsequently.

3.2 What is the behaviour of these four categories over the entire twelve-year period? From Table III-1 we see that for the State as a whole, the net sown area fluctuates between 55.38 per cent (1971-72) and 60 per cent (1969-70) of the geographical area. In fact one notices somewhat steady upward movement in NSA (net sown area) from 58 to 60 per cent over the first ten years. Obviously the bad terminal year (1971-72) has affected this category heavily : the index of NSA is 95 (with 1960-61 NSA = 100) compared with 103 for 1969-70. If we consider current fallows and fallows other than current fallow together as 'total fallows' (Col. 13) we see that total fallows form 7 to 8 per cent of geographical area except for the year 1970-71 (another bad year) where surprisingly it is lowest at 5.34 per cent. We will discuss this peculiar behaviour in detail later on. Culturable waste category appears to decrease somewhat continuously from 8.32 per cent (1960-61) of geographical area to 7.33 per cent (1969-70) whereas for last two years it exceeds 10 per cent level.

The compound growth rates for these four categories for the State calculated by the regression method are as follows.

Entire period 1960-61 to 1971-72		
	Compound Growth Rate (per cent per annum)	Linear Rates of Increase (hundred hecta- res per annum)
i) Culturable Waste	1.80	247.37
ii) Other Fallows	-2.10	-216.91
iii) Current Fallows	-0.32	-4.45
iv) Net Sown Area (NSA)	-0.16	-292.31
Land available for cultivation (Addition of Categories (i) to (iv))	-0.14	-266.30

The linear rates of increase (or change) are also calculated by regression method and one can see that these are in absolute terms and are additive. One sees here that cultivable waste shows an increase over time while the fallows (both categories) and NSA show decline with negative growth rates. These rates summarise a behaviour rather opposite to the one observed for the first ten years (upto 1969-70). It was seen that over the first ten years NSA showed slight increase, total fallows fluctuated between 7 to 8 per cent of geographical area and cultivable waste declined. Apparently the last two bad years affected the NSA (some measure of the 'bad' nature of these two years was examined in the previous chapter) adversely and have pulled the growth rate of NSA down to a negative level. But it is rather odd that with the decline in NSA, total fallows which should increase, actually decline. This is the result of the behaviour of cultivable waste and fallows in the last two years only. Let us look at the figures of the four categories over the last three years :

	(Area in hundred hectares)		
	1969-70	1970-71	1971-72
	-----	-----	-----
Culturable waste	7084	14897	13551
Fallow other than current fallows	11050	8196	9302
Current fallows	21868	16423	24134
Net sown area (NSA)	184624	176682	170364

With the scarcity years of 1970-71 and 1971-72 it is understandable that the NSA reduces. But in the year 1970-71, the first of the scarcity years, the current fallows instead of increasing (a natural consequence of scarcity year) actually fall substantially by 5445 Hha (hundred hectares) and so do fallows other than current fallows. This behaviour cannot be explained. Further, the sudden jump in culturable waste by 7813 Hha (culturable waste more than doubling itself) in 1970-71 is totally perplexing as its behaviour is inconsistent with that of current fallows and 'other fallows'. In 1971-72 current fallows show a substantial increase, consistent with the reducing NSA from 1969-70 level but culturable waste also reduces. It is difficult to visualise massive reclamation of land which was not previously culturable, into culturable land (but not actually cultivated) in the year 1970-71.¹ Further, if we rely on the figure of culturable waste in 1970-71, why should it reduce in 1971-72 when NSA has further declined? All this goes to show that for the last two years data on culturable waste and both type of fallows are rather

1 At the time of writing present Report, data upto 1974-75 on land use are available and culturable waste shows a continuous decline till 1974-75, standing at 10087 Hha in that year. For 1972-73, the worst scarcity year, the culturable waste surprisingly declines even with lower NSA compared to 1971-72 and reclamation hypothesis appears untenable.

arbitrary. As mentioned above, for the first ten years the movement of these categories of land use is somewhat smooth and consistent with definitions of these categories mentioned at the beginning of the present section. Last two years data on culturable waste and fallows appear unreliable.

3.3 In this section we will try to see whether the frontiers of cultivation have been reached or whether there is scope for extension of cultivation. In Table 3.1 data on land available for cultivation and net sown area are presented at the State level for the twelve year period under consideration. From the last column of the table we see that, the proportion of net sown area to land available for cultivation fluctuates within a narrow range of 84 to 86 per cent barring the last year. In fact leaving out the last two years this percentage increases somewhat steadily from 84 to over 86 per cent over the ten year period. The last two years show decline in this percentage to 85 and 82 per cent respectively. So on the whole these State level data suggest that frontiers of cultivation have more or less been reached. The net area sown may increase over time but it is unlikely to be substantial.

For the entire period, compound growth rate (by the regression method) is -0.14 per cent per annum for land available for cultivation and -0.16 per cent for NSA. If we drop the last two years being scarcity years (and land use data for which, is also unreliable), the growth rate for land available for cultivation comes to 0.10 per cent per annum and for NSA 0.32 per cent per annum (see last row in the table, item iii) suggesting growth in 'land available for cultivation' and even faster

Table 3.1 : Land Available for Cultivation (LAC) and Net Sown Area (NSA) of Maharashtra 1960-61 to 1971-72

(Area in hundred hectares -Hha)

	Land available for cultivation	Net Sown Area	NSA/LAC (%)
1960-61	212257 (100.00)	178786 (100.00)	84.23
1961-62	212544 (100.14)	180535 (100.98)	84.94
1962-63	212310 (100.02)	180125 (100.75)	84.84
1963-64	212749 (100.23)	181787 (101.68)	85.45
1964-65	213075 (100.39)	182542 (102.10)	85.67
1965-66	213124 (100.41)	181335 (101.43)	85.08
1966-67	213005 (100.35)	182138 (101.87)	85.51
1967-68	213327 (100.50)	183206 (102.47)	85.88
1968-69	213050 (100.37)	183673 (102.73)	86.21
1969-70	213576 (100.62)	184624 (103.27)	86.44
1970-71	208002 (98.00)	176682 (98.82)	84.94
1971-72	208049 (98.02)	170364 (95.29)	81.89
CR by Regression			
(Entire Period)	-0.14	-0.16	
i) Average 1960-61 to 1962-63	212370 Hha	179815 Hha	84.67
ii) Average 1969-70 to 1971-72	209876 Hha	177223 Hha	84.44
CR (i) to (ii)	-0.14	-0.16	
iii) Average 1967-68 to 1969-70	213318 Hha	183834 Hha	86.18
CR (i) to (iii)	0.10	0.32	

(CR = Compound growth rate per cent per annum.
Figures in parentheses are indices of area, 1960-61=100)

growth in NSI. In our quest for the underlying secular trends it would be proper to accept these rates as they do not take into account the bad terminal years. A word about the method of calculation of these rates based on 10 years only : As a first step in analysis, compound growth rates by regression method were calculated for the entire period of twelve years but for the further exercise of deletion of last two years, to save on calculations, two point method is used. These two points being three year averages at the beginning (1960-61 to 1962-63) and at the end (1967-68 to 1969-70). With this averaging peculiarities of an individual year are avoided and one gets a close approximation of growth rate that would be obtained if we were to use regression method. In fact, in the present instance, if we were to obtain growth rates² by the two point method for the twelve period also, we get exactly the same growth rates as were obtained by the regression method, viz., -0.14 per cent and -0.16 per cent respectively (see item (ii) in Table 3.1, the table under discussion).

Thus we are inclined to accept the growth rates in land available for cultivation and the NSI, of 0.10 per cent per annum and 0.32 per cent per annum respectively as the underlying secular trends. These are also consistent with the increasing pressure on land, increasing population of the State and the increasing prices of agricultural commodities. By consistency we mean the similarity in the direction of change and not necessarily commensurability - an aspect which could be commented upon more appropriately when we deal with agricultural production.

² The term 'growth rate' is used to mean compound growth rate per cent per annum throughout the present study.

3.4 It was pointed out in Introduction that the behaviour at the State level is better understood when we consider the individual districts and regions within the State. Now we turn to the districtwise analysis of land utilisation. We will concentrate on land available for cultivation and net sown area only, without going deeper into the categories of culturable waste and two types of fallows.

The districtwise data on geographical area, culturable waste, total fallows (current fallows and fallows other than current fallows together), net sown area, land available for cultivation, etc., are presented in Table III-2 at the end of the present chapter. In that table, average for first three years (the initial period), average for the years 1967-68 to 1969-70 (the end position for the curtailed period of ten years, the period we think appropriate to find the underlying trend, dropping the scarcity years 1970-71, 1971-72 and the average net sown area only, for 1969-70 to 1971-72 are presented along with the changes in net sown area, land available for cultivation and growth rate for net sown area. In Table 3.2 similar regionwise information is presented which summarizes districtwise data. Five regions are considered. These regions, as mentioned earlier, are based on geographical contiguity, drought-proneness, availability of irrigation and cropping pattern. Region I is the Konkan region with heavy reliable rainfall and has rice as the main crop. Region II is in the drought zone with similarity in cropping pattern and has considerable increase in irrigated area over the period under consideration. Region III of Poona Division although in the drought

Table 3.2 : Land Use in different regions 1960-61 to 1971-72

(Area in hundred hectares)

	Region I Districts 1 to 4	Region II Districts 5 to 7	Region III Poona Division Districts 8 to 13	Region IV Aurangabad Division Districts 14 to 18	Region V Nagpur Division Districts 19 to 26	State
(A) Average first three years						
1. Geographical Area	29335 (9.53)	41599 (13.51)	75081 (24.41)	64304 (20.90)	97313 (31.63)	307632 (100.00)
2. Culturable waste	3235 (35.05)	915 (9.92)	1506 (16.32)	885 (9.59)	2689 (29.13)	9229 (100.00)
3. Total Fallows	4588 (19.69)	944 (4.06)	4990 (21.41)	9230 (39.60)	3553 (15.25)	23326 (100.00)
4. Net Sown Area (NSA)	8760 (4.88)	23905 (13.29)	52199 (29.03)	46778 (26.01)	48174 (26.79)	179815 (100.00)
5. Land Available for Cultivation (LAC) (2+3+4)	16583	25764	58695	56893	54416	212370
6. NSA/LAC (%)	52.85	92.78	88.93	82.22	88.53	64.07
(B) Average 1967-68 to 1969-70						
7. Geographical Area	29372	41653	75020	64304	97333	307684
8. Culturable waste	2332	364	1307	812	2458	7473
9. Total Fallows	5378	1440	5264	7373	2753	22211
10. Net Sown Area (NSA)	8874	23873	52415	48377	50295	183834
11. Land Available for Cultivation (LAC) (8+9+10)	16584	25877	58986	56562	55506	213318
12. NSA/LAC (%)	53.51	92.97	88.86	85.53	90.61	86.18
Change						
13. Change in NSA from initial period (NSA)	114	-32	216	1599	2121	4019
14. Growth rate (%) NSA	0.18	-0.02	0.06	0.28	0.62	0.32
15. Change in LAC from initial period (LAC)	1	-87	291	-331	1090	948
(C) Average last 3 years (1969-72)						
16. Net Sown Area (NSA)	8036	22720	48999	47188	50279	177223
Change						
17. Change in NSA (NSA)	-724	-1185	-3200	410	2105	-2592
18. Growth rate NSA (%)	-0.95	-0.56	-0.70	0.10	0.48	-0.16

(Regionwise figures may not add upto the State figure due rounding up and other errors. Figures in parentheses show percentage shares of each region in State.)

zone, is the traditionally irrigated area with a network of canals and sugarcane cultivation is concentrated in this region. Region IV of Aurangabad Division has 3 out of its 5 districts in drought zone with not much of irrigation (but considerable increase in net irrigated area over the period) while Region V of Nagpur Division is in the assured rainfall zone and is in the cotton tract except for the last two districts, viz., Bhandara and Chandrapur which have predominantly rice cultivation and have large tank irrigated areas. From the present table (Table 3.2) we see that the first two regions have smaller NSA of 5 and 13 per cent (initial period, item 4) while the remaining three regions have NSA each between 26 to 29 per cent of the State NSA.

Region I of Konkan area is essentially a hilly tract with land available for cultivation being just 57 per cent of geographical area. Of this, 'land available for cultivation' again, only 53 per cent (item 6) is net sown area. Thus it appears that although NSA is just over half of the land available for cultivation, the culturable waste and parts of fallows are such that although technically culturable, these either require reclamation effort to bring it under plough or the quality of land is such that it is not economical to cultivate. If extension of cultivation is to be achieved, detailed study of this area is needed.

The Net Sown Area/Land Available for Cultivation (NSA/LAC) percentages for other regions vary between 82 and 93 per cent and suggest that perhaps the limits of cultivation have been reached in these four regions. However, the land available for cultivation itself can increase, as is the case with Region V of Nagpur Division

where 1090 Hha (hundred hectares)³ have been added over the curtailed period ending 1969-70 (although there is no change in geographical area). On the other hand, even if land available for cultivation reduces, the HSA can register increase, which is the case for Region IV of Aurangabad Division where land available for cultivation shows a decline of 331 Hha (see item 15) but HSA shows a massive increase of 1599 Hha (item 13). For Region I even though land available for cultivation is stationary (increase of only 1 Hha) over the curtailed period HSA has increased by 114 Hha. Thus our earlier observation that limits of cultivation appear to have been reached has to be accepted with some reservations.

As we mentioned earlier, based on the curtailed period (deleting last two years, 1970-71 and 1971-72) which is more acceptable, we will first deal with data in Block B in Table 3.2. The growth rates for HSA can be charted out as follows.

Net Sown Area Changes

	Percentage share in State HSA in the initial period	Growth rate % p.a. (Two-point method)	Absolute change over the period (Hha)
	-----	-----	-----
Region I	4.88	0.18	114
Region II	13.29	-0.02	-32
Region III	29.03	0.06	216
Region IV	26.01	0.48	1599
Region V	26.79	0.62	2121
State	100.00	0.32	4019

³ Hha = hundred hectares. This short-form will be used continuously in the present study.

It is clear that not much change is taking place in the NSA of Regions II and III. Thus over 42 per cent of NSA is stationary at the end of the period. It was seen earlier that these two regions fall in the drought zone and 66 per cent of area in Region II and 72 per cent of area in Region III are drought-prone with deficient rainfall years occurring with a frequency of 2 out of every 3 years (see the previous chapter). But since we are leaving out the bad terminal years 1970-71 and 1971-72 one may wonder why NSA shows stagnancy in this area. Further, as we shall see later, this area has had a considerable increase in irrigation resource and one would expect increasing NSA over the years. In absence of firm data one can only suggest possible reasons for this phenomenon. Firstly, with the high exposure to drought conditions in terms of intensity and frequency, perhaps the position of average farmer gets weakened over the years - particularly when irrigation is not available - and farmers in the region are not keen on extending cultivated area to marginal lands. Secondly, even with increasing irrigation facility, net irrigated area particularly in Region III has not been increasing commensurately due to preference for high irrigation requirement crops and we are on a firmer ground here as we shall find out in the chapter on irrigation. Then again, we must take into account the fact that with large irrigated areas in this region, the economically weak dry land cultivators may be finding it profitable to hire themselves out on irrigated farms rather than cultivate marginal lands. Alternatively, with substantial industrial growth and nearness to Bombay, they may be finding opportunities for supplementary

employment. The incentive to extend cultivation is further lacking because in addition to weakening of his economic position due to frequent rainfall deficient years, prices of inputs, on the other hand must be rising because of increasing demand for them in the irrigated tracts in this area.

In the Region IV of Aurangabad Division, on the other hand, NSA has a growth rate of 0.43 per cent. This covers as much as 40 per cent of added NSA in the State over the period. Although this region has 3 districts in the drought zone, with somewhat lower frequency of deficient rainfall years (and limited opportunities in industrial-urban areas) NSA shows growth. In the last region of Nagpur Division with assured rainfall, NSA has grown at the rate of 0.62 per cent per annum and more than half the increased State NSA has come from this region. Substantial increase in the land available for cultivation in this region is also noted.

3.5 Another point to be noted from this table is that while Regions I and III show addition to NSA of 114 Eha and 216 Eha respectively (item 13), total fallows show some increase while culturable waste has declined. This is rather peculiar as one would expect fallows (especially fallows other than current fallow) to decline with increase in NSA as these fallows have been cultivated in the near past. In Regions IV and V with relatively sizable increases in NSA, both culturable waste and fallows show decline and appropriately enough, fallows show greater decline than culturable waste. We do not probe further into the peculiar behaviour of culturable waste and fallows in Regions I and III as there is evidence to suggest that the official data on these is

somewhat arbitrary. A survey conducted in eight districts by the Department of Agriculture shows that relative proportions of culturable waste and fallows obtained in these districts in the Survey differ widely from the official estimates in the Season and Crop Reports. A brief note on this aspect is incorporated in Appendix A:K1

3.6 Let us note briefly the behaviour of NSA in different districts within the regions. As mentioned earlier, districtwise analysis is presented in Table III-2 at the end of this chapter. From that table one sees that in Regions IV and V all the districts show increased NSA at the end of the (curtailed) period. Similarly in the Konkan (Region I) all the districts have positive growth rates for NSA. (We leave out Bombay district which is of no consequence agriculturally with its share of just 0.05 per cent of State NSA.)

The stationary NSA for Region II (growth rate -0.02 per cent) has resulted with two of the three districts (Nasik and Jalgaon) registering a growth rate of -0.05 per cent each and the remaining district of Dhulia registering a positive growth rate of 0.06 per cent. In Region III, the small growth rate of 0.06 per cent for the region results with four out of six districts having growth rates between 0.07 and 0.29 per cent while remaining two districts (Sangli and Kolhapur) registering growth rates of -0.53 and -0.30 per cent respectively, swamping out the gains in NSA in other districts.

3.7 We have thought it appropriate to delete the last two years as these are scarcity years and analysis

in terms of growth rates is susceptible to occurrence of extreme values especially in the terminal years of any series. In Block C of Table 3.2 regionwise growth in KSA is presented including the last two years for information. From item 17 in that table it is apparent that for the State as a whole KSA shows a reduction of 2592 Hha in absolute terms⁴, Region II and especially Region III making a substantial contribution to the decline. Relative to its share in KSA, Region I too, shows a large decline with a growth rate of -0.95 per cent. Region IV of Aurangabad Division registers modest increase in KSA of 410 Hha (growth rate 0.10 per cent) while Region V of Nagpur Division is the only area where any appreciable growth occurs. Further, all the districts in first three regions show decline in KSA while in Region IV and V all districts except Aurangabad District show gains in KSA.

Double Cropping

3.8 It is obvious from the above discussion that other things remaining equal, KSA growth rate of 0.32 per cent per annum is inadequate to cope with the population growth rate of 2.40 per cent per annum. The dependence on other states for agricultural commodities is bound to increase in such a situation and this dependence can be limited only if intensive cultivation is adopted. For the present we concentrate on extent of double cropping, leaving the productivity aspect which will be examined separately.

⁴ The reduction should be interpreted as being over the period 1961-62 to 1970-71 as the three year averages centre the values in years 1961-62 and 1970-71. Similarly for the curtailed period ending 1969-70, the period covered would be 1961-62 to 1968-69. To compare the change in absolute terms it is better to consider change in per year terms. For the entire period KSA reduces by 288 Hha per year (2592÷9) and for curtailed period KSA increases by 574.14 Hha per year (4019÷7).

Going back to Table III-1 at the end of present chapter where the State level data on double cropping are presented from columns 15 to 19, we find that area sown more than once or 'double cropped area' (DCA) is between 5 to 6 per cent of net sown area (NSA) for years 1960-61 to 1969-70. In fact it does not cross 5.50 per cent mark except for 1961-62 where it is 5.77 per cent. Over these ten years we see that the percentage fluctuates. For the last two years however this percentage is rather high at 6.05 and 6.33 per cent. Obviously, after the unsatisfactory performance of the first crop another crop was attempted and we cannot treat this as the 'general' tendency over the years to increase double cropping. We also note that on the whole, the intensity of double cropping between 5 and 6.50 per cent is obviously low⁵, a static aspect we will not go much into.

Net irrigated area as percentage of net sown area increases continuously from 6 to 8 per cent over the entire period and this too is small by any standard⁶ (another static aspect). This means that even if intensity of irrigated cropping were to be high, its impact on total cropping (i.e. the gross cropped area) is bound to be small since percentage net irrigated area to NSA itself is small.

The intensity of irrigated cropping (col. 18) fluctuates between 13 to 16 per cent over the first ten years. (Intensity is defined as the ratio of area irrigated more than once (DIA) to net irrigated area(EIA).)

⁵ At the All-India level, this percentage is as high as 18.60 per cent for the year 1970-71.

⁶ This percentage is as high as 22.17 (1970-71) at the All-India level.

For the last two years this intensity is rather disproportionately high at 16.59 and 18.61 per cent respectively and it may be more proper to base our analysis on the first ten years only as obviously irrigation was given to crops which in normal year would not receive irrigation.

Here again we note that intensity of irrigated cropping, too, is on the low side.⁷ It is legitimately argued that this method of arriving at the intensity of irrigated cropping does not take into account perennial crops which occupy the land throughout the year (and receive irrigation) but get counted only once and do not form part of double cropping. This is particularly true of Maharashtra where perennial crops like sugarcane and banana do receive considerable irrigation (as we shall see later in the chapter on irrigation) extending over the entire year but get counted only once. But looking at the dismal agricultural performance of the State especially in respect of foodgrains, we refrain from making any 'adjustments' which would take into account this lacuna in the definition of intensity of cropping especially irrigated cropping. Foodgrains, after all form the major part of agricultural production, constitute a basic need of the population and with the majority of the farmers cultivating foodgrains, the 'underestimated' intensity of cropping is more relevant in the present study.

3.9 Now let us look at the growth of double cropping at the State level. In Table 3.3 State level data on double cropping are presented for NSA with break-up of

⁷ At All-India level intensity of irrigated cropping works out to 23.20 per cent in 1970-71.

**Table 3.3 : Double cropping in Maharashtra State,
1960-61 to 1971-72.**

(Area in hundred hectares)

	Average first 3 years	Average 1967-70	Average last 3 years (1969- 72)	Growth rate (%) for period ending 1969-70	Growth rate (%) entire 12 years
1. Double Cropped Area (DCA)	9790	9683	10401	-0.16	0.70
2. Net Sown Area (NSA)	179815 (100.00)	183834	177223	0.32	-0.16
3. Intensity : DCA/NSA (%)	5.44	5.27	5.87		
4. Double Rainfed Area (DRA)	8282	7764	8167	-0.92	-0.16
5. Net Rainfed Cropped Area (NRA)	168889 (93.92)	170233	163406	0.10	-0.37
6. Intensity : DRA/NRA (%)	4.90	4.56	5.00		
7. Double Irriga- ted Cropped Area (DIA)	1508	1919	2234	3.50	4.50
8. Net Irrigated Area (NIA)	10926 (6.08)	13601	13817	3.10	2.70
9. Intensity : DIA/NIA (%)	13.80	14.11	16.17		

(Percentage shares of NRA and NIA in NSA based on
average of first 3 years shown in parentheses.)

rained area and irrigated area with areas under each in the initial period (1960-61 to 1962-63) and 'curtailed end period' (average 1967-68 to 1969-70) and the 'end period' (average 1969-70 to 1971-72) without deletion of last two years being presented along with the relevant growth rates.

Here we see that area sown more than once or 'double cropped area' (DCA) is 5.44 per cent of NSA in the initial period and at the end of the curtailed period it reduces to 5.27 per cent and the intensity of cropping on the whole, appears to have slightly declined. This is because DCA has a growth rate of -0.16 per cent while NSA has a growth rate of 0.32 per cent, thus pulling down the intensity of cropping both ways - due to reducing DCA and increasing NSA. The double cropping in rained area appears to be the main cause for this reduction in intensity as it reduces from 4.90 per cent to 4.56 per cent for rained area (see item 6 in the table) which covers nearly 94 per cent of NSA in the initial period. Here too, double cropped rained area (DRA) registers a negative growth rate of 0.92 per cent while the net rained area (NRA, item 5 in the table) has a positive growth rate of 0.10 per cent) affecting the intensity both ways. Intensity of irrigated cropping, on the other hand, has increased over the (curtailed) period from 13.80 per cent of net irrigated area (NIA) to 14.11 per cent. Net irrigated area itself has a growth rate of 3.10 per cent per annum while double irrigated area (DIA) has a growth rate of 3.50 per cent. Thus on the whole, even with higher intensity of cropping on irrigated area the intensity for total net sown area has in fact declined due to lower intensity of cropping on rained area.

Over the curtailed period of ten years double rainfed area has reduced by as much as 518 Eha. What could be the possible reasons for reduced double cropping on rainfed area even when abnormal years are deleted? Firstly with increasing irrigation, some of the rainfed double cropped area would be taken away because such earlier double rainfed area could be relatively of better quality (capable of double cropping) which is preferred for irrigation. But there is another side to this aspect. Logically introduction of irrigation (especially seasonal) could add to double rainfed area. This may sound curious but if a previously rainfed area cropped only in one season comes to be cropped also in another season with the introduction of irrigation such would be the effect. For, although the second cropping is now possible under irrigated conditions, the land is not certainly 'double irrigated' and the double cropped land would get included in the rainfed double cropped. Further, since the land is now irrigated (in one season) it would be classified under not irrigated area. Thus although irrigation may not add to irrigated double cropping, it can make some contribution to 'rainfed' double cropping. Although this is a logical possibility, with substantial parts of the State being exposed to drought conditions, with the introduction of irrigation a farmer, besides growing another irrigated (rabi) crop may also give his kharif crop protective irrigation. In such a situation, double irrigated area will increase.

Second reason for reduced double rainfed area could be the deteriorating position of cultivators with rather frequent occurrence of scarcity years in the drought zone of the State and the related set of factors mentioned in Section 3.6 regarding reduction of NSA.

3.10 If we were to include all the twelve years and take the end period as represented by the average of three years 1969-70 to 1971-72, a slightly different picture emerges. It is already noted that in the last two years of scarcity the behaviour of double cropping is out of tune with the earlier ten years. From the present table we see that double cropping shows a slight increase (instead of decline as observed for the curtailed period) with the intensity of cropping increasing from 5.44 per cent to 5.87 per cent. Double cropped area (DCA) has a growth rate of 0.70 per cent per annum while NSA shows a negative growth rate of -0.16 per cent. Thus the ratio of intensity is pushed up with increase in the numerator and decrease in the denominator. In case of rainfed cropping both DEA and NEA show growth rates of -0.16 and -0.37 per cent per annum respectively but with NEA declining faster, intensity of cropping actually increases from 4.90 to 5.00 per cent. Intensity of irrigated cropping shows a substantial increase from 13.80 per cent to 16.17 per cent, with growth rates of DIA and EIA being 4.50 and 2.70 per cent. But as pointed out above, with the abnormal behaviour of both rainfed and irrigated double cropping in the last two scarcity years, we are inclined to accept the analysis based on the curtailed period of 10 years only where intensity of cropping declines, with intensity on rainfed area declining and that on irrigated area only slightly increasing.

Thus the state-level analysis shows that EIA has a meagre growth of 0.32 per cent per annum and with intensity of cropping actually declining, other things remaining equal, only substantial growth in productivity would positively prevent a worsening of the situation

with population increasing at the rate of 2.40 per cent per annum.

3.11 Now let us have a look at the regionwise behaviour of double cropping. Here we will consider only the curtailed period ending 1969-70. The basic districtwise initial and end positions along with intensity of cropping for total area, rainfed area and irrigated area are incorporated in Table III-3 at the end of present chapter. For brevity, we will limit this analysis to regions only.

It was seen above that the intensity of cropping has reduced over the (curtailed) period from 5.44 per cent to 5.27 per cent with double cropped area (DCA) registering a growth rate of -0.16 per cent per annum and NSA registering a growth rate of 0.32 per cent per annum. In Table 3.4 we firstly observe the different intensities of the regions. Region II forming Nasik, Dhulia, Jalgaon covering 13 per cent of state NSA generates (i.e. has intensity of) 8.33 per cent double cropped area in the initial period followed by Region III of Poona Division covering 29 per cent of NSA generating 5.88 per cent double cropped area. Remaining three regions covering 58 per cent have intensities between 3.66 per cent to 4.81 per cent, all below the State average of 5.44. Poona Division (Region III) with its network of canals is a traditionally irrigated area and its intensity of 5.88 per cent is rather on the lower side but more about this later.

We observe here that double cropped area (DCA) has gone down in Regions II, III and V while in Region I it has only marginally increased. It is in Region IV of Aurangabad Division that double cropping has increased with a growth rate of 3.50 per cent per annum. The

Table 3.4 : Double Cropping in Different Regions 1960-61 to 1969-70

(Area in hundred hectares)

	Region I Dist. 1 to 4	Region II Dist. 5 to 7	Region III Poona Divi- sion Dist. 8 to 14	Region IV Auran- gabad Divi- sion Dist 14 to 18	Region V Nagpur Divi- sion Dist. 19 to 26	State
A. Average first 3 years						
1 Area sown more than once (DCA)	321 (3.28)	1991 (20.35)	3068 (31.33)	2094 (21.39)	2317 (23.66)	9790 (100.00)
2 Net sown area (NSA)	8760 (4.88)	23905 (13.29)	52199 (29.03)	46778 (26.01)	48174 (26.79)	179815 (100.00)
3 Intensity DCA/NSA (%)	3.66	8.33	5.88	4.48	4.81	5.44
B. Average 1967-68 to 1969-70						
4 Area sown more than once (DCA)	323	1581	2736	2668	2277	9683
5 Net sown area (NSA)	8874	23873	52415	48377	50295	183834
6 Intensity DCA/NSA (%)	3.64	7.04	5.22	5.52	4.53	5.27
<u>Change</u>						
7 Change in DCA	2	-310	-332	574	-40	-107
8 Change in NSA	114	-32	216	1599	2121	4019
9 Growth rate % p.a. DCA	0.10*	-2.39	-1.63	3.50	-0.28	-0.16
10 Growth rate % p.a. NSA	0.18	-2.02	0.06	0.48	0.62	0.32

(* Approximate as based on four figure logarithmic tables without interpolation. Figures in parentheses are percentages to State figure.)

intensity increases in this region from 4.48 per cent to 5.52 per cent with NSA increasing with a growth rate of 0.48 per cent. In the other regions NSA has either increased or remained stationary with decreasing DCA with the effect that intensities have reduced over the period. For Regions II and III high frequency of rainfall-deficient years could be a possible reason. In Region V of Nagpur Division with assured rainfall, NSA has increased significantly but with slight reduction in DCA, the intensity reduces from 4.81 to 4.53 per cent.

A further insight into behaviour of double cropping can be obtained when we consider regionwise rainfed and irrigated break-up. In Table 3.5 these regionwise details are presented. When we consider rainfed area, since reduction in rainfed area as well as double cropped area can occur because of land transfers to irrigation, we do not pay much attention to growth in area but concentrate on intensity. First, we note that in Region II which has a relatively high level of intensity of cropping as noted above, intensity on rainfed area has gone down substantially from 7.27 per cent to 4.96 per cent over the period but with increased irrigation, intensity on irrigated area has increased from 29.53 per cent (higher than any other region) to 30.90 per cent and both DIA and KIA have increased with growth rates of 8.40 and 7.70 per cent respectively (items 19 and 20). Thus what is lost in rainfed category, is to some extent made up in irrigation. This region being in the drought zone, overall intensity reduced as witnessed earlier; from 8 to 7 per cent. In Region III of Poona Division, intensity on rainfed area reduced while that on irrigated cropping remained more or less the same at 17 per cent. Aurangabad

Table 3.5 : Regionwise Double Cropping on Rainfed and Irrigated Area, 1960-61 to 1969-70

(Area in hundred hectares)

	Region I Districts 1 to 4	Region II Districts 5 to 7	Region III Poona Division Districts 8 to 13	Region IV Aurangabad Division Districts 14 to 18	Region V Nagpur Division Districts 19 to 25	State
<u>Rainfed Cropping</u>						
<u>(A) Average first 3 years</u>						
1. Area sown more than once (DRA)	315 (3.80)	1655 (19.97)	2170 (26.19)	1851 (22.34)	2294 (27.69)	8282 (100.00)
2. Net Rainfed Area (NRA)	8555 (5.04)	22787 (13.40)	47025 (27.68)	45188 (26.60)	45356 (26.70)	159859 (100.00)
3. Intensity DRA/NRA (%)	3.68	7.27	4.61	4.10	5.06	5.90
<u>(B) Average 1967-68 to 1969-70</u>						
4. Area sown more than once (DRA)	293	1089	1775	2377	2232	7764
5. Net rainfed area (NRA)	8635	21957	46892	45762	46980	170233
6. Intensity DRA/NRA (%)	3.39	4.96	3.79	5.19	4.75	4.56
<u>Change</u>						
7. Change in DRA	-22	-566	-395	526	-62	-518
8. Change in NRA	80	-810	-133	574	1632	344
9. Growth rate % p.a. for DRA	-1.03	-5.81	-2.84	3.60	-0.39	-0.92
10. Growth rate % p.a. for NRA	0.10	-0.57	-0.05	0.20	0.50	0.10
<u>Irrigated Cropping</u>						
<u>(C) Average first 3 years</u>						
11. Area sown more than once (DIA)	6 (0.40)	336 (22.26)	898 (59.55)	243 (16.11)	23 (1.52)	1508 (100.00)
12. Net Irrigated Area (NIA)	205 (1.88)	1136 (10.22)	5174 (47.36)	1590 (14.55)	2818 (25.79)	10926 (100.00)
13. Intensity DIA/NIA (%)	2.93	29.53	17.36	15.28	0.82	13.80
<u>(D) Average 1967-68 to 1969-70</u>						
14. Area sown more than once (DIA)	30	592	961	291	45	1919
15. Net irrigated Area (NIA)	239	1916	5523	2575	3307	13601
16. Intensity DIA/NIA (%)	12.55	30.90	17.40	11.13	1.36	14.11
<u>Change</u>						
17. Change in DIA	24	256	63	48	22	411
18. Change in NIA	34	770	349	1025	489	2575
19. Growth rate % p.a. DIA	25.80	8.40	0.90	2.80	10.10	3.50
20. Growth rate % p.a. NIA	2.20	7.70	0.90	7.40	2.20	3.10

(Addition of area over regions may not add upto State area because of rounding up errors. Figures in parentheses are percentages to State total.)

Division presents an interesting situation. Here intensity of rainfed cropping has actually registered an increase (along with the increase in intensity for 'total' double cropping) from 4.10 per cent to 5.19 per cent. The DMA has a growth rate of 3.60 per cent while NIA has a rate of 0.20 per cent. On the other hand intensity on irrigated area has gone down from 15.28 per cent to 11.13, a phenomenon not witnessed in other regions.

We see here that in absolute terms although net irrigated area has increased substantially (by 1025 Hha), it is the rainfed double cropped area that has increased (526 Hha) while double irrigated area has increased only marginally (48 Hha). Prima facie, the reasoning for such phenomenon appears to be the one suggested in Section 3.9 viz., if previously rainfed land cropped only in one season is now cropped for a second time in another season under irrigated conditions after introduction of irrigation, such double cropping gets included under rainfed double cropping because the land is irrigated only once. With this region having facilities for seasonal irrigation only (there was ~~ixx~~ no major irrigation project capable of providing perennial irrigation during the period under consideration) this appears plausible.

But if we go deeper, we see that it is not so. Let us look at the districtwise changes in this Region IV of Aurangabad Division for changes in double cropped area (DCA), double rainfed area (DRA), net irrigated area (NIA) and net sown area (NSA).

Here we see that increase in DCA is almost wholly in double rainfed area (DRA) but there appears to be no relationship between increased DRA and increased net irrigated area (NIA). In fact Aurangabad district has 338 Hha of increased NIA (One-third of the Region) but

(Area in hundred hectares
= change over the
curtailed period.)

<u>District</u>	<u>△ DCA</u>	<u>△ DRA</u>	<u>△ NIA</u>	<u>△ NSA</u>
Aurangabad	126	112	338	447
Parbhani	316	314	90	8
Bhir	36	22	128	438
Manded	85	98	174	310
Osmanabad	11	-20	295	396
Region IV	574	526	1025	1599

double rainfed area has increased by 112 Hha (22 per cent of the Region) while Parbhani district has a 90 Hha of increased NIA (17 per cent of Region) but increase in double rainfed area is as high as 314 Hha (60 per cent of the region). It may also be noted that in Osmanabad district, while NIA increased by 295 Hha, DRA actually reduced by 20 Hha (double irrigated increased by 31 Hha). Thus on the whole there is no obvious relationship between increased net irrigated area and the double rainfed area. From the changes in Parbhani district, it appears obvious that bulk of the increased double rainfed area is a 'genuine' increase in double rainfed area (that is it is not irrigated in one season and rainfed in another).

Although in this Region IV both NSA and DCA have shown relatively high increases, these increases do not occur in all the five districts. In Parbhani district although NSA has remained more or less stationary (increase of 8 Hha only) DCA has increased considerably, while substantial increases in NSA are recorded in other districts (between 300 and 450 Hha) relatively smaller increases are recorded by DCA (10 to 125 Hha).

In Region V of Nagpur Division, we have a slightly

different situation. The intensity of double cropping under rainfed conditions is in fact much higher than under irrigated conditions, the cropping intensities in the initial period being 5.06 and 0.82 per cent respectively. Most of the irrigated area is in the two districts of Ebandara and Chandrapur where major source of water is tanks for irrigation, capable of irrigating late varieties of rice only. The cropping intensity for NSA of 4.81 per cent itself is achieved by very high intensities in these two very districts (see Table III-3 giving district-wise data) of 35.47 and 8.49 per cent respectively. The remaining 6 districts in the region have much lower intensities between 0.55 to 2.64 per cent only. The tank irrigated area is capable of producing a rabi crop on the left-over moisture without actually irrigating the crop. Over the period, double cropped area reduced marginally in this region. Region I of Konkan has little irrigation but the small growth in irrigated area and double cropped irrigated area offsets the decline in rainfed double cropped area.

The low level of intensity of irrigated area in Region III (17 per cent) with its network of canals capable of perennial irrigation is a puzzling phenomenon but it is related to the irrigated cropping pattern and we will discuss it in the chapter on irrigation.

3.12 Thus on the whole we find that double cropping has declined over the period and the land is not being used intensively. Because of unreliability of rainfall, districts in the drought zone have poor performance. In Region II increased double irrigated area partially makes up for the reduced double rainfed area while in Region III this does not happen in spite of good irrigation

facilities (and increase in these facilities over the period as we shall see later) because of the particular irrigated cropping pattern adopted. Region IV has made substantial contributions to double cropping (under rain-fed conditions) which are not related to substantially increased net irrigated area. Region V has limited double cropped area which appears to be related to irrigation indirectly. This region too, has a decline in double cropping but it is relatively modest.

Table III.1 : Land Utilization in the Maharashtra State (1960-61 to 1971-72)

Year	Total Geog. area by village papers	Forests	Not available for cultivation		Other Uncultivated Land				Fallow Land			Net area sown	Area sown more than once	(in hundred hectares)				
					Total				Fallow other than current fallow	Current fallow	Total			Total cropped area	Area Irrigated			
					Land put to use as barren & unculturable land	total	Permanent pastures & other	Misc. tree-crops and groves							Culturable waste	Net irrigated	More than once in the same year	Gross cropped area irrigated
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
1960-61	307562 100.00 100.00	5110 17.59 100.00	7003	17945	24948 8.11 100.00	14214	1853	9330	25997 8.42 100.00	12180	11961 3.89 100.00	24111 7.85 100.00	178766 58.13 100.00	9486 5.26 100.00	188232 100.00	10707 5.99 100.00	1475 13.78 100.00	12182 100.00
1961-62	307003 100.00 100.01	54185 17.61 100.74	7042	17676	24918 8.10 99.86	14206	1748	9380	25336 8.24 98.98	11483	11168 3.63 93.35	22629 7.36 93.74	180535 58.69 100.98	10409 5.77 110.19	190944 100.44	10812 5.99 100.98	1524 14.10 103.32	12336 101.26
1962-63	307712 100.00 100.04	52275 17.34 100.30	7099	18105	25204 8.19 101.03	14049	1875	8978	24900 8.09 97.28	11493	11714 3.81 97.93	23247 7.54 95.13	180145 58.54 100.75	9514 5.39 102.84	189039 100.35	11258 6.25 105.15	1524 13.54 103.32	12762 104.92
1963-64	307733 100.00 100.05	52163 17.30 100.10	7102	17943	25045 8.14 100.39	13951	1825	8995	24671 8.02 98.36	11256	10811 3.51 90.39	22067 7.17 91.11	181787 59.07 101.68	9959 5.18 105.43	191746 100.87	11502 6.33 107.62	1828 14.15 110.37	13130 107.78
1964-65	307693 100.00 100.04	52363 17.37 100.47	7006	17714	24720 8.03 99.09	13728	1807	8374	23907 7.77 93.10	11134	11027 3.58 92.19	22161 7.20 91.80	182542 59.33 102.10	9627 5.27 101.92	192159 100.09	11906 6.52 111.20	1732 14.56 117.69	13039 111.36
1965-66	307694 100.00 100.04	52172 17.61 100.11	6944	17072	24016 8.00 98.67	14061	1721	8491	24273 7.89 96.83	11341	11957 3.89 99.97	23298 7.57 96.51	181335 58.93 101.43	8394 4.63 88.86	187729 100.00	12063 6.65 112.66	1817 15.06 123.19	13000 113.94
1966-67	307698 100.00 100.04	52075 17.57 99.94	6859	17793	24052 8.01 98.81	14127	1839	7702	23728 7.71 98.81 92.70	11715	11390 3.70 95.43	23105 7.51 95.71	182136 59.20 101.87	9774 5.37 103.47	191912 100.96	12172 6.68 113.68	1962 16.12 133.02	14134 110.02
1967-68	307688 100.00 100.03	52180 17.60 100.03	6957	17447	24404 7.93 97.82	13972	1825	7571	23306 7.59 91.29	11729	10821 3.52 90.47	22550 7.33 93.11	183205 59.55 102.47	9326 5.09 98.73	192532 100.28	12752 6.96 119.10	2010 15.76 136.27	14762 121.18
1968-69	307981 100.00 100.03	52188 17.61 100.14	6911	17800	24711 8.03 99.05	13799	1933	7153	22695 7.44 89.44	11192	11022 3.58 92.15	22214 7.22 92.62	183675 59.76 102.73	9975 5.44 105.81	193668 100.89	13742 7.48 128.35	1823 13.27 123.59	15565 127.77
1969-70	307882 100.00 100.03	52086 17.58 99.99	6820	17737	24557 7.98 98.43	13513	1950	7084	22547 7.33 88.68	11050	10818 3.52 90.44	21658 7.11 90.58	184024 60.00 103.27	9728 5.27 102.98	194352 100.25	14309 7.75 133.64	1923 13.44 130.37	16232 133.25
1970-71	307565 100.00 100.00	52158 17.61 100.11	6558	18020	26678 8.67 106.93	16660	2075	14997	35632 10.93 131.39	8198	8227 2.67 68.78	16423 5.34 66.03	176882 57.55 98.82	10587 6.05 113.14	187369 99.54	1309 7.62 125.80	2234 16.59 151.66	15703 128.90
1971-72	307583 100.00 100.00	52088 17.58 99.92	8773	17989	26762 8.70 107.27	15564	2070	13551	32255 10.49 125.01	9302	14832 4.82 124.00	21134 7.65 95.97	170361 59.58 95.29	10789 6.33 114.22	181153 95.24	13672 8.63 127.69	2544 18.81 172.47	18216 133.11

Note : Line 1 - Area in hundred hectares

Line 2 - (a) Figures under items 3 to 14 are percentages to total geographical area (item 2)

(b) Figures under items 15 to 17 are percentages to net sown area (item 14)

(c) Figures under item 18 are percentages to net irrigated area (item 17)

Line 3 - Index of area with 1960-61 = 100.

Table III.2 : (Contd.)

District/ Region	Average first 3 years					Average 1967-70 to 1969-70					Average last 3 years (1971-70 to 1971-72)							
	Geo-graphical area	Cultur- able waste	Total Pa- llows	Net sown area (NSA)	Land availa- ble for cultiva- tion(LAC) (2+3+4)	NSA/ LAC (%)	Geo,ra- phical area	Cultur- able waste	Total Pa- llows	Net sown area (NSA)	Land availa- ble for cultiva- tion(LAC) (6+9+10)	NSA/LAC (%)	Δ NSA (10-4)	Growth rate of NSA (%) p.a.	Δ LAC (11-5)	Total Δ (16)	NSA (17)	Growth rate (NSA) % p.a. (18)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
14 Aurangabad	15272 (5.29)	171 (1.85)	933 (4.60)	12617 (7.14)	13951	94.53	15272	152	475	13294	13901	95.63	427	0.49	-50	12220	-627	-0.55
15 Fardani	1250 (4.00)	130 (1.41)	2032 (8.72)	9115 (5.07)	11277	80.83	12504	71	1969	9123	11153	81.73	8	0.01	-114	9233	118	0.12
16 Niz	11169 (3.63)	169 (2.05)	2700 (1.59)	7314 (4.07)	10403	71.88	11169	169	2127	7752	10668	76.97	436	0.83	-135	7769	455	0.67
17 Rahand	10332 (3.36)	222 (2.41)	1076 (4.62)	5973 (3.88)	8271	84.31	10332	223	767	7283	8273	88.03	310	0.62	2	7253	280	0.44
18 Osmanabad	14027 (4.56)	173 (1.87)	2489 (10.88)	10524 (5.86)	13191	79.82	14027	197	2035	10925	13157	83.04	346	0.53	-34	10713	184	0.19
Region IV	64304 (20.90)	885 (9.59)	9230 (39.30)	46778 (26.01)	56893	82.22	64304	812	7373	46377	56562	85.53	1599	0.48	-331	47188	410	0.10
19 Buldhana	9772 (3.18)	170 (1.84)	414 (1.78)	6810 (3.79)	7394	92.10	9771	166	479	6399	7544	91.65	6	0.19	150	6935	125	0.20
20 Akola	10560 (3.43)	74 (0.80)	524 (2.25)	7664 (4.27)	8262	92.76	10560	83	351	7944	8376	94.82	260	0.68	96	7972	286	0.41
21 Amraoti	12197 (3.96)	170 (1.84)	559 (2.40)	6859 (3.81)	7500	90.39	12217	165	284	7172	7601	94.36	313	0.64	13	7072	213	0.34
22 Yedmal	13519 (4.39)	322 (3.49)	869 (3.81)	7452 (4.14)	8663	86.02	13519	371	711	8035	9117	86.13	583	1.08	454	8138	686	0.98
23 Wardha	6284 (2.04)	278 (3.01)	223 (0.96)	4071 (2.26)	4572	89.04	6289	200	99	4290	4589	93.48	219	0.75	17	4263	192	0.51
24 Nappur	9904 (3.22)	474 (5.13)	322 (1.38)	5309 (2.95)	6105	86.96	9891	407	233	5165	6105	89.52	156	0.41	0	5458	149	0.31
25 Chandara	9239 (3.00)	270 (2.92)	216 (0.93)	3828 (2.13)	4314	88.73	9252	276	233	3803	4392	88.41	55	0.20	78	3898	70	0.20
26 Chandrapur	25834 (8.40)	931 (10.09)	400 (1.74)	6161 (3.43)	7198	82.17	25834	810	363	6607	7780	84.92	446	1.00	282	6543	382	0.67
Region V	97513 (31.63)	2669 (29.13)	3553 (15.25)	48174 (26.79)	5816	88.53	97333	2658	2753	50295	55506	90.61	2121	0.62	1090	50279	2105	0.42
Maharashtra	307032 (100.00)	9229 (100.00)	23326 (100.00)	179815 (100.00)	212370	84.07	307084	7273	22211	163834	213318	86.18	4019	0.32	946	177223	-2592	-0.16

Change figures in parentheses are percentage to state total.

Table III.3 : Area sown more than Once in Maharashtra 1960-61 to 1971-72 (Area in hundred hectares)

District/ Region	Sown Area						Rainfed Area						Irrigated Area					
	Average first 3 years			Average 1967-68 to 1969-70			Average first 3 years			Average 1967-68 to 1969-70			Average first 3 years			Average 1967-68 to 1969-70		
	Area sown more than once (DCA) (1)	Net sown area (NSA) (2)	DCA/NSA (%) (3)	Area sown more than once (DCA) (4)	Net sown area (NSA) (5)	DCA/NSA (%) (6)	Double cropped R. area (DCA) (7)	Net Rainfed area (NSA) (8)	DCA/NSA (%) (9)	DCA (10)	NSA (11)	DCA/NSA (%) (12)	Double irrigated area (DIA) (13)	Net irrigated area (NIA) (14)	DIA/NIA (%) (15)	DIA (16)	NIA (17)	DIA/NIA (%) (18)
1 Bombay	4	82	4.88	1	69	1.45	4	80	5.00	0	67	0.00	0	2	0.0	1	2	-
2 Thane	85	2941	2.89	52	2985	1.74	79	2904	2.72	49	2949	1.66	6	37	16.22	3	36	8.33
3 Kolaba	123	2160	5.69	140	2209	6.34	123	2126	5.79	139	2160	6.44	0	34	0.00	1	49	2.04
4 Ratnagiri	109	3577	3.05	130	3611	3.60	109	3445	3.16	105	3459	3.03	0	132	0.0	25	152	16.45
Region I	321	8760 (4.08)	3.66	323	8674	3.64	315	8555	3.68	293	8635	3.39	6	205	2.93	30	239	12.55
5 Nashik	611	9120	6.70	506	9066	5.57	414	8673	4.77	202	8369	2.41	197	447	44.07	304	719	42.28
6 Dhulia	850	6715	12.66	685	6745	10.16	775	6407	12.10	555	6173	8.99	75	308	24.35	130	572	22.73
7 Jalgaon	530	8070	6.57	490	8040	6.09	466	7687	6.06	332	7415	4.48	64	383	16.71	158	625	25.28
Region II	1991	23905 (13.29)	8.33	1681	23673	7.04	1655	22767	7.27	1089	21957	4.96	336	1138	29.52	592	1916	30.90
8 Ahmednagar	750	12595	5.95	635	12661	5.01	559	11166	5.01	391	11191	3.49	191	1429	13.37	244	1470	16.60
9 Poona	928	10034	9.25	775	10128	7.65	780	9009	8.66	639	9053	7.06	148	1025	14.44	136	1075	12.65
10 Satara	665	6034	9.73	494	6974	7.08	427	6048	7.06	278	6146	4.52	238	786	30.28	216	828	26.09
11 Sangli	255	6560	3.88	204	6341	3.22	164	6112	3.01	107	5795	1.85	71	468	15.17	97	546	17.77
12 Solapur	373	12006	3.11	572	12246	4.67	128	10915	1.17	333	11115	3.00	245	1091	22.46	239	1133	21.09
13 Kolhapur	97	4150	2.34	56	4063	1.38	92	3775	2.44	27	3592	0.75	5	375	1.33	29	471	6.16
Region III	3068	52197 (29.03)	5.88	2736	52415	5.22	2170	47025	4.61	1775	46892	3.79	898	5174	17.36	961	5523	17.40
14 Aurangabad	611	12647	4.76	737	13294	5.54	500	12321	4.06	612	12430	4.92	111	526	21.10	125	864	14.47
15 Parbhani	546	9115	5.99	662	9123	7.45	546	8987	6.08	660	8905	9.66	0	128	0.0	2	218	0.92
16 Nair	409	7314	5.59	445	7752	5.74	361	6924	5.21	383	7234	5.29	48	390	12.31	62	516	11.97
17 Nanded	159	6973	2.28	244	7283	3.35	137	6889	1.99	235	7025	3.35	22	84	26.19	9	258	3.49
18 Osmanabad	369	10529	3.50	380	10925	3.48	307	10067	3.05	287	10168	2.82	62	162	13.42	93	757	12.26
Region IV	2094	46776 (26.01)	4.48	2668	48377	5.52	1851	45186	4.10	2377	45762	5.19	243	1590	15.28	291	2615	11.13

(Contd.)

Table III.3 : (Contd.)

District/ Region	Sown Area						Rainfed Area						Irrigated Area					
	Average first 3 years			Average 1967-68 to 1969-70			Average first 3 years			Average 1967-68 to 1969-70			Average first 3 years			Average to		Average 1967-68 to 1969-70
	Area sown more than once (DCA) (1)	Net sown area (NSA) (2)	DCA/NSA (%) (3)	Area sown more than once (DCA) (4)	Net sown area (NSA) (5)	DCA/NSA (%) (6)	Double cropped area (DCA) (7)	Net Rainfed area (NSA) (8)	DRA/NRA (%) (9)	DRA (10)	NRA (11)	DRA/NRA (%) (12)	Double irrigated area (DIA) (13)	Net irrigated area (NIA) (14)	DIA/NIA (%) (15)	DIA (16)	NIA (17)	
19 Buldhana	180	6810	2.64	248	6699	3.59	180	6686	2.69	241	6724	3.58	0	124	0.0	7	175	4.00
20 Akola	42	7684	0.55	101	7944	1.27	42	7650	0.55	101	7843	1.29	0	34	0.0	0	101	0.0
21 Amraoti	41	6059	0.60	35	7172	0.49	41	6783	0.60	35	7032	0.50	0	76	0.0	0	140	0.0
22 Yeotmal	56	7452	0.78	64	8035	0.80	58	7421	0.78	55	7969	0.69	0	31	0.0	9	66	3.64
23 Wardha	36	4071	0.88	73	4290	1.70	32	4015	0.80	65	4207	1.55	4	56	7.14	8	83	9.64
24 Nagpur	79	5309	1.49	104	5465	1.90	74	5027	1.47	94	5142	1.83	5	282	1.77	10	323	3.10
25 Bhandara	1358	3828	35.47	1164	3883	29.98	1350	2575	52.43	1160	2561	45.29	8	1253	0.64	4	1322	0.30
26 Chandrapur	523	6161	8.49	488	6607	7.39	517	5204	9.94	481	5510	8.73	6	962	0.62	7	1097	0.64
Region V	2317	48174	4.81	2277	50295	4.53	2294	45356	5.06	2232	46988	4.75	23	2818	0.82	45	3307	1.36
Maharashtra	9790	179815 (100.00)	5.44	9683	183834	5.27	8282	168869	4.90	7764	170233	4.56	1508	10926	13.80	1919	13601	7.11

4. CROPPING PATTERN

4.1 Having discussed the land utilization we now turn to the changes in the cropping pattern in Maharashtra. The basic data relating to this aspect for individual districts and the State are incorporated in the separate volume of Data Tables. The time series for the cropping pattern of the state as a whole is presented in Table IV-1 at the end of the present chapter. We will first take up the changes in cropping pattern at the State level in Part I of this chapter and then move on to the different regions and districts in Part II.

I

4.2 In Table IV-1 the data on cropping pattern for the State are presented for over 40 important crops and groups of crops for the twelve years under consideration.

Looking at this table, we find that the gross cropped area shows a very gradual increase from 1960-61 to 1969-70 from 188236 Hha (hundred hectares) to 194351 Hha, the index rising from 100 to 103.24. The year 1965-66 shows a slight decline, but the index remains above 100. For the last two years however, the index drops sharply from 103.24 in 1969-70 to 99.53 in 1970-71 and 96.23 in 1971-72, the GCA (gross cropped area) of 181153 Hha in 1971-72 being the lowest in the whole series. This behaviour is similar to the one observed for net sown area (NSA) in the previous chapter. From Table 4.1 where cropwise and crop-groupwise growth rates are presented we see that the growth rate for GCA for the entire period (see the last item) is negative at -0.12 per cent. In this table we have placed the growth rates for the entire

Table A.1 : Cropping Pattern and Growth of Area under different Crops 1960-61 to 1969-70

(Hha = hundred hectares)

	Average first 3 years (Hha)	% of GCA	Average 1967-70 (Hha)	Change (Hha)	Growth Rate % P.a.	Growth Rate Entire Period
Rice	13199	6.96	13306	105	0.11	(0.16)
Wheat	8980	4.74	8347	-633	-1.04	(-0.28)
Kharif Jowar	25140	13.26	25249	109	0.06	(-0.36)
Rabi Jowar	36748	19.38	32745	-4003	-1.63	(-1.08)
Total Jowar	61888	32.64	57994	-3894	-0.92	(-0.78)
Bajra	16677	8.80	20613	3936	3.07	(1.00)
Other Cereals	4678	2.47	4638	-40	-0.12	(-1.05)
<u>Total Cereals</u>	105422	55.60	104895	-527	-0.07	(-0.33)
Gram	3926	2.07	3487	-439	-1.69	(-0.85)
Green Gram (Mung)	4075	2.15	5183	1108	3.50	(2.00)
Tur	5453	2.88	6157	704	1.70	(0.80)
Black Gram (Udid)	4350	2.29	5199	849	2.60	(1.30)
Other Pulses	5954	3.14	6392	438	1.00	(0.50)
<u>Total Pulses</u>	23758	12.53	26419	2661	1.53	(0.77)
<u>Foodgrains (Cereals+Pulses)</u>	129180	68.13	131314	2134	0.23	(-0.12)
Sugarcane	1484	0.78	1938	454	3.90	(3.70)
Chillies	1602	0.84	1609	7	0.07	(-0.85)
Other Condiments	424	0.22	427	3	0.10	(0.10)
Total Condiments	2025	1.07	2037	12	0.09	(-0.64)
Fruits	708	0.37	907	199	3.60	(3.38)
Vegetables	801	0.42	1040	239	3.80	(3.69)
Other Food Crops	39	0.02	24	-15	-6.70	(-10.07)
<u>Non-Foodgrain Food</u>	5057	2.67	5945	888	2.34	(2.02)
<u>Total Food Crops</u>	134237	70.80	137259	3022	0.32	(-0.03)

(continued)

Table 4.1 : (continued)

	Average first 3 years (Hha)	% of GCA	Average 1967-70 (Hha)	Change (Hha)	Growth Rate P.a.	Growth Rate Entire Period
Cotton	26171	13.80	27428	1257	0.67	(0.32)
Other Fibres	837	0.44	945	108	1.70	(-0.72)
Total Fibres	27008	14.24	28373	1365	0.70	(0.30)
Groundnut	11150	5.88	9152	-1998	-2.78	(-2.60)
Sesamum	1267	0.67	1621	354	3.60	(0.30)
Safflower	3295	1.74	3129	434	1.78	(3.15)
Other Edible Oilseeds	248	0.13	212	-36	-2.23	(-3.19)
Total Edible Oilseeds	15960	8.42	14714	-1246	-1.15	(-0.94)
Total Non-Edible Oilseeds	3200	1.69	2704	-496	-2.38	(-0.98)
Drugs and Narcotics	259	0.14	140	-119	-8.42	(-6.31)
Fodder	8902	4.69	10296	1394	2.10	(-0.76)
Other Non-Food	41	0.02	32	-9	-3.49	(-1.74)
<u>Total Non-Food Crops</u>	55371	29.20	56259	888	0.23	(-0.32)
<u>Kharif Crops</u>	129229	68.16	138023	8795	0.94	(0.12)
<u>Rabi Crops</u>	60379	31.84	55495	-4864	-1.19	(-0.64)
<u>Gross Cropped Area</u>	189608	100.00	193518	3910	0.29	(-0.12)

(Figures in parentheses are the growth rates for the entire period, 1960-61 to 1971-72, i.e., without deleting the scarcity years of 1970-71 and 1971-72.)

period in parentheses for information as we will be considering the curtailed period ending 1969-70 deleting the last two scarcity years in our quest for the underlying trend. Thus while the mild rising trend upto 1969-70 is offset entirely by the last two years if we consider the entire period, for the curtailed period we get a growth rate of 0.29 per cent per annum indicating a small rising trend. In absolute terms, we have an addition of 3910 Hha. We may mention here that these growth rates are based on the 'two-points' method.

The growth rate for the GCA of 0.29 per cent per annum for the (curtailed) period is thus slightly lower than the rate of the ESA (net sown area) of 0.32 per cent. This is not surprising as the double cropped area has shown a decline (growth rate -0.16 per cent), as we saw in the previous chapter.

4.3 Kharif and Rabi

The Season and Crop Reports give details of area under kharif crops and rabi crops and the addition of the two equals the gross cropped area. This means that perennial crops like sugarcane, fruits, etc. have been included under either of these two headings and this is rather inappropriate. However since the share of these crops in GCA is small (together between 1 to 1.5 per cent) one could ignore this shortcoming. From Table IV-1 (at the end of the chapter) we see that nearly 70 per cent of GCA is under kharif crops and 30 per cent under rabi crops. Over the years, kharif area shows increase while rabi area shows a decline. Last two years are again out of tune with the earlier ten years. Index of kharif crops rises steadily from 100 in 1960-61 to 109.62 in 1969-70

and the index of rabi crops falls from 100 to 90 over the same period. In the last two years kharif index drops to 105.61 and 92.57 per cent respectively, showing that the last year was particularly bad for kharif crops. The falling rabi index continues to fall for 1970-71, standing at 86.63 (lowest in the series) while for the last year 1971-72 it rises substantially to 103.90 (highest in the series) which probably shows an attempt on the part of cultivators to compensate for the large reduction in kharif area in 1971-72.

From Table 4.1 (lower part of the table) we see that the growth rate for the curtailed period is 0.94 per cent for per annum for kharif crops and -1.19 per cent for the rabi crops (for the entire period these being 0.12 per cent and -0.64 per cent per annum respectively, showing a similarity in direction with lesser intensity) and one concludes that by and large there is an increasing tendency for kharif area and a declining one for the rabi area. In absolute terms, kharif area has increased by 8795 Hha over the curtailed period while rabi area has declined by 4664 Hha. The reduction in rabi area is contrary to the trend for the country as a whole where rabi cultivation is not only growing, but growing at a faster rate than kharif cultivated area. Looking at the initial part of Table 4.1 we see that increase in kharif area is caused by bajra (3936 Hha), pulses other than gram which are mostly kharif (3099 Hha) and cotton (1257 Hha) but on the other hand groundnut, another kharif crop, has declined (-1998 Hha). The decline in rabi area is caused by a massive reduction in the most predominant crop of rabi jowar (-4003 Hha) and other crops like wheat (-633 Hha) and gram (-439 Hha) while a

rabi crop like safflower has increased (434 Kha). On the whole, kharif crops seem to be preferred for cultivation. It is difficult to pinpoint a reason for this phenomenon. Perhaps the fact that most of the rainfall in the State is between June and October, cultivators prefer kharif crops rather than risk a rabi cultivation. Irrigation, which should play a significant role in extending rabi cultivation, appears to have failed or is of the magnitude which is unable to offset an overwhelming declining tendency.

Food Crops and Non-food Crops

4.4 The official data breaks up the GCA into food crops and non-food crops. Food crops include foodgrains and other crops like sugarcane, chillies, fruits and vegetables, etc. Non-food crops include cotton, oilseeds, fodder, etc. Food crops cover 71 per cent of GCA and from Table IV-1 we see that in the first six years the index is below hundred (but above 99) in three years but does not exceed 100.11 in the remaining three. In the next four years, it is consistently above 101 (101.78 to be exact) but not exceeding 102.28 while in the last year (1971-72) a steep drop to 94.24 is noted. Thus by and large we discern a rising tendency and especially over the curtailed period ending 1969-70.

Food crops have an area growth rate of 0.32 per cent per annum and in absolute terms, an addition of 3022 Kha. The non-food crops show a growth rate of 0.23 per cent or an addition of 888 Kha. Thus non-food crops have a growth rate lower than the overall growth rate for GCA of 0.29 per cent per annum.

Food Crops

Looking at the feedcrops themselves, we find that foodgrains, which dominate the feedcrops, also have a lower than the overall growth rate of 0.23 per cent per annum while the remaining food crops which we denote by the category 'non-foodgrains food' (not in the original official statistics) show a much higher growth rate of 2.34 per cent per annum and raise the growth rate of food crops to 0.32 per cent, slightly higher than the overall growth rate. Let us chart out these changes in the categories of foodgrains and 'non-foodgrains food' :

(Area in hundred hectares (Hha).)

	Area average first three years (Hha)	% of GCA	Change in area (Hha)	Total change in GCA of 3910 Hha (Marginal share) %	GR % p.a.
	1	2	3	4	5
Foodgrains	129180	68.13	2134	54.58	0.23
Non-food- grains food	5057	2.67	688	22.71	2.34
Total food	134237	70.80	3222 3022	77.29	0.32

Here we see that the 'marginal share' of foodgrains is 54.58 per cent only, compared with the initial share of 68.13 per cent. Thus the marginal share of foodgrains has gone down as compared with their initial share. On the other hand marginal share of non-foodgrains food is 22.71 per cent which is much higher than the initial share of 2.67 per cent. We particularly highlight the decline in share of area under foodgrains in view of the stagnant foodgrains production.

We will discuss non-foodgrains feed category first and then move on to foodgrains which we would consider in great detail.

In the 'non-foodgrains feed' category sugarcane, fruits and vegetables cover about 60 per cent of area (1.57 per cent out of the 2.67 per cent share of the non-foodgrains feed in GCA). These three crops have shown a considerable increase in area relative to their initial acreage. The growth rates for these three crops are 3.90 per cent, 3.60 per cent and 3.80 per cent per annum respectively, much higher than the overall growth rate of mere 0.29 per cent p.a. for GCA. Sugarcane is a hundred percent irrigated crop in Maharashtra and proportion of irrigated area in fruits and vegetables is also high. Since area under these crops has increased we have an inkling about the direction of the use of increased irrigation. This aspect of utilization of irrigation will be discussed in detail under irrigation.

Foodgrains

Cereals

4.5 Foodgrains cover 68 per cent of the GCA and is obviously the most important group of crops. Nearly 56 per cent (of GCA) is composed of cereals and 12 per cent by all pulses. The growth rate of 0.23 per cent for area under foodgrains is the result of a slightly negative growth rate of -0.07 per cent for cereals and a positive and relatively high growth rate for pulses of 1.53 per cent per annum. As we shall see later productivity has not made any gains and hence the stagnancy of area under cereals has to be viewed with concern when we remember

$$\begin{array}{r} X_9 (J) . 2315 \cdot N7 \\ \underline{L_9} \\ 182454 \end{array}$$

that population has been increasing at a much faster rate (2.40 per cent p.a.). We also underline in the fact that one arrives at this state of affairs even after deleting the last two unfavourable years.

In cereals rice, kharif jowar and bajra show gains while wheat, rabi jowar and 'other cereals' register a decline in area. Bajra, a kharif crop, has shown a considerable gain with its growth rate of 3.07 per cent p.a. or in absolute terms, an addition of 3936 Hha over the period. This gain in bajra area is neatly offset by rabi jowar with its growth rate of -1.63 per cent or a decline of 4003 Hha. We note that rabi jowar the main item of food in rural areas occupies the largest area of 19.38 per cent of GCA. It is not easy to say why bajra is being preferred to jowar. As mentioned earlier, on the whole kharif cropping is being preferred to rabi over the period which itself may be due to unreliability of rabi rainfall. We also note that during this period jowar was under monopoly procurement but it is not possible to relate this fact with the decline in rabi jowar for lack of relevant data on procurement. But we note that kharif jowar which is second in importance areawise (13 per cent of GCA) has made only a modest addition of 109 Hha with a growth rate of 0.06 per cent per annum; so, jowar as a crop was definitely less preferred over the period.

On the whole, apart from substantially increased bajra area, other crops have lesser area, or slightly increased area at the end of the period. As we shall see later, under irrigated conditions, the response of farmers is different. Total irrigated cereals increased by 1743 Hha and more than half of it is in wheat (993 Hha)

which is a rabi crop. This is followed by rice (340 Hha). Rabi jowar which has the highest share of gross irrigated area (22 per cent) has an addition of just 51 Hha. Thus rabi jowar even under irrigated conditions is not attracting additional area. On the other hand we note that total wheat declines by 633 Hha but irrigated wheat area shows considerable gains.

Pulses

Pulses on the other hand show considerable area gains compared to the stagnant area under cereals. Pulses cover 12.53 per cent of GCA which is composed of gram, greengram (mung), tur, black gram (udid) with a share of between 2 to 3 per cent each (of GCA) while other pulses have the share of 3.14 per cent. Of these, gram, an essentially rabi pulse, has a growth rate of -1.69 per cent per annum or a decline of 439 Hha in absolute terms. Other pulses which are mostly kharif have growth rates between 1 and 3.50 per cent. The highest growth rate of 3.50 per cent is recorded by green gram (mung) which has an addition of 1108 Hha in absolute terms. For pulses as a whole, one has a growth rate of 1.53 per cent or an addition of 2661 Hha.

Non-food crops

4.6 From Table 4.1 we see that non-food crops which have an area share of 29.20 per cent (based on average first three years) have three important crops. Cotton (13.80 per cent), groundnut (5.88 per cent) and fodder crops (4.69 per cent). Cotton has an area growth rate of 0.67 per cent, better than the overall growth rate of 0.29 per cent (of GCA) or an addition of 1257 Hha.

Fodder crops too show a growth rate of 2.10 per cent or an addition of 1394 Hha. Groundnut, on the other hand, has a negative growth rate of 2.78 per cent or a decline of 1998 Hha, offsetting large additions in cotton and fodder. Groundnut is an important cooking medium and although safflower, sesamum have positive growth rates, edible oilseeds on the whole have an absolute change in area of -1246 Hha over the (curtailed) period. (Over the entire period the decline is even greater with a growth rate of -3.19 per cent p.a. compared with the growth rate of -2.23 per cent for the curtailed period.) Thus one sees that over the period essentials like cereals and edible oilseeds have a stagnant or declining area.

4.7 Let us summarize the changes in cropping pattern at the State level. Growth rate of 0.29 per cent per annum for GCA (gross cropped area) which is slightly smaller than the growth rate for NSA (net sown area) appears incapable of preventing the worsening of conditions compared to the population growth rate between censuses of 1961 and 1971 of 2.40 per cent per annum. This is particularly true because as we shall see later, there is little to show in the sphere of productivity also. We note that the modest growth rate for GCA is based on the curtailed period which ignores the last two scarcity years. Area under cereals covering more than half the GCA is stagnant. Pulses show a growth rate of 1.53 per cent which enables foodgrains as a whole covering 68 per cent of GCA to have a growth rate of 0.23 per cent per annum which is lower than the overall GCA growth rate. Non-foodgrains food crops which are really commercial food crops like sugarcane, fruits and vegetables have a much higher growth rate of 2.34 per cent. While

cotton and fodder among non-food crops show increases, edible oilseeds have declined significantly. The major oilseeds crop of groundnut has particularly declined. Rabi cropping which shares nearly one-third of GCA has declined considerably with a growth rate of -1.13 per cent while kharif cropping consisting of over two-thirds of GCA has increased with a growth rate of 0.94 per cent.

Above all, we note the decline in rabi jowar occupying largest area under a single crop (over 19 per cent of GCA) with its growth rate of -1.63 per cent per annum.

II

4.8 Now we move on to the behaviour of area under various crops for various regions and districts. District and regionwise data for curtailed and entire period along with growth rates and absolute changes are incorporated in Table IV-2 at the end of the present chapter. While growth rates are per cent per annum, the absolute changes are for the period covered as a whole and we mention again that since the initial position is arrived at by averaging the first three years 1960-61 to 1962-63, the average is centred on 1961-62 and thus for the entire period we have a span of 10 years, the end position being the three year average centred on 1970-71. For the curtailed period the span is of 8 years, the end position being the three-year average centred on 1968-69. The absolute changes between the two periods should be compared with these different spans in mind. Although data for both the periods are incorporated in Table IV-2, in the present discussion we will restrict our comments to the curtailed period only. Further, Bombay district with its negligible share of State GCA (0.04 per cent)

and essentially urban characteristics is deleted from Region I (without adjusting the state total).

Gross Cropped Area, Kharif and Rabi Cropping

In Table 4.2 we set out regionwise changes in GCA, kharif and rabi cropping. Regions II and III show some decline in GCA while region IV and V of Aurangabad Division and Nagpur Division show relatively substantial increases, which really enable the GCA at state level to reach a small but positive growth rate of 0.29 per cent, or a net addition of 3910 Hha over the period. This is more or less as expected, with the behaviour of NSA and double cropping examined in the previous chapter.

In case of kharif and rabi cropping we see that although GCA reduced in Regions II and III by 343 Hha and 114 Hha over the period (growth rates -0.19 per cent and -0.03 per cent per annum respectively), area under kharif crops increased by 682 Hha and 1715 Hha respectively. But in other regions where GCA has increased, the increase has again occurred only in the kharif area. The kharif:rabi proportions of different regions are as follows : (based on average first 3 years).

Region	Kharif:rabi proportion	Growth-rate (%) p.a. for rabi	Change in rabi (Hha)
I	98:2	5.30	91
II	83:17	-3.62	-1025
III	54:46	-1.06	-1827
IV	61:39	-0.93	-1205
V	78:22	-1.21	-915

Thus the reduction in rabi area has occurred irrespective of the share of rabi in gross cropped area. What is more surprising is the fact that Region IV, in spite of its increased double cropped area (growth rate

**Table 4.2 : Regionwise Changes in Gross Cropped Area,
Kharif and Rabi Area (1960-61 to 1969-70)**

(Hha = hundred hectares)

	Region I* Dist. 2-4	Region II Dist. 5-7	Region III Dist. 8-13	Region IV Dist. 14-18	Region V Dist. 19-26	State
A. <u>Gross Cropped Area (GCA)</u>						
Average first 3 years (Hha)	8995	25895	55265	48871	50492	189608
% of State **	4.75	13.66	29.15	25.77	26.63	100.00
Average 1967-70 (Hha)	9128	25552	55151	51046	52571	193518
Change (Hha)	133	-343	-114	2175	2079	3910
Growth Rate % p.a.	0.20	-0.19	-0.03	0.62	0.58	0.29
B. <u>Kharif Crops</u>						
Average first 3 years (Hha)	8786	21385	29781	29897	39293	129229
% of State	6.80	16.55	23.04	23.13	30.41	100.00
Average 1967-70 (Hha)	8828	22067	31496	33278	42284	138024
Change (Hha)	42	682	1715	3381	2991	8795
Growth rate (%)	0.06	0.45	0.80	1.54	1.05	0.94
C. <u>Rabi Crops</u>						
Average first 3 years (Hha)	209	4510	25483	18973	11201	60379
% of State	0.35	7.47	42.21	31.42	18.55	100.00
Average 1967-70 (Hha)	300	3485	23656	17768	10286	55495
Change (Hha)	91	-1025	-1827	-1205	-915	-4884
Growth rate (%)	5.30	-3.62	-1.06	-0.93	-1.21	-1.19

** Based on average first three years.

(* Bombay district excluded. The regionwise addition may not add to State total due to rounding up and exclusion of Bombay district.)

3.50 per cent per annum absolute increase of 574 Hha over the period) also records a reduction in rabi area to the tune of 1205 Hha. It may be recalled that HSA has increased substantially (1599 Hha) in this region. It appears that the extension of kharif cultivation is responsible for not only the net cultivated area but also the increased double cropped area. This in turn implies that areas that were previously cultivated only in rabi are now being also cultivated in the kharif period. This means that kharif cropping is decidedly preferred.

Foodgrains

4.9 We now move straight away to foodgrains, an important category, occupying 68 per cent of GCA. It was pointed out in Introduction that agricultural production has shown a decline over the entire period of 12 years from 1960-61 to 1971-72 and appears to have stagnated if we delete the last two scarcity years. The major component of foodgrains (with a weightage of 65.81 out of 100 in Bureau's index of agricultural production) has not done well and appears to be mainly responsible for this overall decline or stagnancy. In view of this fact we will look at the changes in area under foodgrains in depth.

In Table 4.3 we set out the changing cropping pattern of foodgrains by considering its two major constituents : cereals and pulses. Of the total area under foodgrains at the State level nearly 82 per cent is shared by cereals and remaining 18 per cent by pulses. It was already seen that area under cereals has slightly declined for the state with a growth rate of -0.07 per cent per annum over the (curtailed) period or an absolute decrease of 527 Hha. Of the five different regions, the first three

**Table 4.3 : Regionwise Changes in Area under Foodgrains
1960-61 to 1969-70**

(Hha = hundred hectares)

	Region I	Region II	Region III	Region IV	Region V	State
A. Cereals						
Average first 3 years (Hha)	5818	13414	37004	24809	24350	105422
% of State *	5.54	12.72	35.10	23.53	23.10	100.00
Average 1967-70 (Hha)	5669	13413	35664	24970	25163	104895
Change (Hha)	-149	-1	-1340	161	813	-527
Growth rate % p.a.	-0.38	0.00	-0.53	0.09	0.47	-0.07
B. Pulses						
Average first 3 years (Hha)	402	3904	4439	8462	6552	23758
% of State	1.69	16.43	18.68	35.62	27.58	100.00
Average 1967-70 (Hha)	396	4342	4744	10076	6858	26419
Change (Hha)	-6	438	305	1614	306	2661
Growth rate % p.a.	-0.21	1.53	0.95	2.53	0.65	1.53

* Percentage shares based on average first three years.

(contd.)

Table 4.3 : (Contd.)

	Region I	Region II	Region III	Region IV	Region V	State
C. Foodgrains						
<u>(A+B)</u>						
Average first 3 years (Hha)	6220	17318	41443	33271	30902	129180
% of State	4.84	13.41	32.08	25.75	23.93	100.00
Average 1967-70 (Hha)	6065	17755	40408	35046	32021	131314
Change (Hha)	-155	437	-1035	1775	1119	2134
Growth rate % p.a.	-0.37	0.36	-0.36	0.74	0.50	0.23

(Addition over the regions may not add to the state figure due to exclusion of Bombay district and rounding up errors)

regions covering 52 per cent of area under cereals show decline or stagnation. Region III of Poona Division shows a decline of 1340 Hha with a growth rate of -0.53 per cent per annum. The remaining 48 per cent of area under cereals in Regions IV and V shows increase but we note that Region IV of Aurangabad Division which showed the highest increase in GCA of 2175 Hha has only 161 Hha to contribute to increased cereals area. It is Region V of Nagpur Division which makes any worthwhile contribution to increase in cereals area of 813 Hha with a growth rate of 0.47 per cent per annum. District Chandrapur makes a contribution of 320 Hha to this increase of 813 Hha and the remaining 7 districts in this region show increase in area under cereals ranging from 19 to 150 Hha. In Region IV, Aurangabad and Bhir districts show increases of 296 and 392 Hha respectively but this increase is reduced greatly by the decline in other districts. Thus we have a somewhat mixed performance within a given region.

Pulses, on the other hand show increases in area in all the regions except the first where it declines slightly by 6 Hha. Thus while area under cereals shows decline or modest increases, pulses show increases. As pointed out earlier, gram, an essentially rabi pulse shows decline at the State level and hence we can attribute increased kharif cropping to this substantial increase in kharif pulses. Thus by and large increased area under foodgrains is the result of increased area in pulses only.

It is difficult to explain this preference for pulses over cereals. Apart from the factors related to agronomy, farm harvest prices is also a determinant of area allocation. In Appendix B farm harvest prices¹ of

1 Source : Season and Crop Reports.

some of the important crops are presented along with the indices and growth rates. Here we see that prices of tur dal and gram, have growth rates of slightly over to 10 per cent per annum while major cereals of rice, wheat, jowar and bajra have growth rates of price ranging between 6 and 8 per cent only. Although these growth rates relate to the entire twelve year period, the growth rates for cereals would be even lower if we delete the last two years. Between tur and gram, with the evident preference for kharif season, kharif pulses like tur seem to be preferred.

Cereals

4.10 We now turn to individual cereals and study whether some are preferred to the others in different regions. At the state level it was already noted that rabi jowar a crop occupying largest area has a considerable decline while wheat too, shows a substantial decline. Is this true of all regions?

In Table 4.4 absolute changes and growth rates of area under major cereals are presented. The percentage shares of each region in state area under a given crop are also incorporated. (Area under each crop in initial period and end period is not included in this table for brevity. These could be found in Table IV-2 at the end of the chapter.) Region III of Poona Division has a share (initial period) of 58 per cent of state area under rabi jowar and records a large decline of 2183 Hha and so do Regions II and IV with smaller shares in state rabi jowar area. Region V of Nagpur is an exception where we see an increase of 138 Hha. It may be mentioned here that under irrigated conditions, while rabi jowar declines

Table 4.4 : Regionwise Changes in Area under different Cereals, 1960-61 to 1969-70

(Hha = hundred hectares)

	Region I	Region II	Region III	Region IV	Region V	State
1. Rice						
% share of State*	31.46	5.59	16.25	6.37	40.13	100.00
Change (Hha)	-22	-134	-162	17	422	105
Growth rate % p.a.	-0.07	-2.82	-1.12	0.29	1.10	0.11
2. Wheat						
% share of State	-	17.27	13.10	29.80	39.83	100.00
Change (Hha)	-	87	32	-234	-516	-633
Growth rate % p.a.	-	0.78	0.38	-1.30	-2.20	-1.04
3. Kh. Jowar						
% share of State	0.02	8.76	11.68	30.14	49.40	100.00
Change (Hha)	2	-166	-511	-117	662	109
Growth rate % p.a.	-	-1.11	-2.69	0.22	0.74	0.06
4. Rabi Jowar						
% share of State	-	6.24	57.99	28.73	7.03	100.00
Change (Hha)	-	-962	-2183	-995	138	-4603
Growth rate % p.a.	-	-7.47	-1.53	-1.40	0.74	-1.63
5. Bajra						
% share of State	-	33.26	48.89	16.12	1.72	100.00
Change (Hha)	-	1075	1542	1257	64	3936
Growth rate % p.a.	-	2.56	2.50	5.63	2.92	3.07

* Percentage shares based on average first three years.

(Regionwise addition may not tally with State total due to exclusion of Bombay district and rounding up errors.)

in Region III it increases in Region IV. (Other regions have negligible changes). Thus in Region III rabi jowar is not preferred both under irrigated and rainfed conditions while in Region IV it is preferred under irrigated conditions but not under rainfed conditions. Kharif jowar also declines in Regions II and III by 166 and 511 Hha respectively (growth rates -1.11 and -2.69 per cent per annum respectively) while Regions IV and V which are major kharif jowar areas show increases of 117 Hha and 662 Hha respectively. Thus trends in area under kharif jowar are contrasting between western Maharashtra (generally referring to Regions I, II and III) and eastern Maharashtra (Regions IV and V).

Increase in area under bajra is a common feature of all the regions. Region II and III with substantial bajra area (33 and 49 per cent of State bajra) have increases of 1075 Hha and 1542 Hha respectively while Region IV with 16 per cent share in State bajra area has an increase of 1257 Hha with a highest growth rate of 5.63 per cent per annum. Kharif jowar, rabi jowar and bajra cover three-fourth of the area under cereals and we see that large increases and decreases really cancel each other and the stagnation in area under cereals results.

Regarding area under wheat, one sees that while it has increased in Regions II and III (Western Maharashtra) larger declines are recorded in Region IV and V (Eastern Maharashtra). Increase in Regions II and III is contrary to the general trend of decline in rabi cropping. It may be added here that in these two regions (especially in Region II) irrigated wheat also increased substantially. In Region IV and V although area under irrigated wheat increased, the larger part of unirrigated wheat recorded substantial area decreases.

In the case of rice, Region I which is mostly rice area occupying nearly one-third of State rice area has a small decline. In fact, Region I, II and III or western Maharashtra covering 53 per cent of state rice area show decreases while eastern Maharashtra and especially Region V show gains in area. Miscellaneous cereals have declined by and large in western Maharashtra and increased in eastern Maharashtra but changes are not very substantial and hence they are excluded from Table 4.4.

We will not go into regionwise changes in different pulses and the relevant time series data may be referred to in volume of Data Tables for examination of regionwise changes. We mention again that for the state as a whole, rabi pulse of gram has declined while other pulses mostly kharif, have recorded substantial increases with the result that addition to foodgrains area as a whole is on account of pulses and not cereals as pointed out earlier.

Non-foodgrains Food

4.11 We now move on to non-foodgrains food. It was already noted that this category consisting of sugarcane, chillies and other condiments, fruits and vegetables have performed much better than foodgrains with their growth rates ranging between 3.60 and 3.90 per cent per annum.

In Table 4.5 regionwise changes in sugarcane, fruits and vegetables - the three major categories - are presented. Although non-foodgrains food category shares just 2.67 per cent of GCA (share based on initial period) its 'marginal share' i.e. share of the increased total gross cropped area (of 3910 Hha) is as high as 23 per cent. This category draws substantial irrigation - a crucial resource. In fact sugarcane and banana (both wholly irrigated) have

Table 4.5 : Regionwise Changes in Area under Major Non-foodgrains Food crops 1960-61 to 1969-70

(Hha = hundred hectares)

	Region I	Region II	Region III	Region IV	Region V	State
1. Sugarcane						
% share of State*	0.14	9.86	72.92	15.26	1.82	100.00
Change (Hha)	3	18	350	77	12	454
Growth Rate % p.a.	-	1.67	4.09	4.28	5.39	3.90
2. Fruits						
% share of State	15.34	24.71	16.19	18.45	25.29	100.00
Change (Hha)	78	98	-5	10	23	199
Growth Rate % p.a.	8.30	6.59	-0.64	1.06	1.75	3.60
3. Vegetables						
% share of State	4.63	23.78	44.68	10.89	15.52	100.00
Change (Hha)	13	78	55	34	66	239
Growth Rate % p.a.	3.45	5.04	2.07	4.83	6.29	3.80
Total Non-Food- grains Food						
% share of State	4.11	16.71	38.96	22.30	17.86	100.00
Change (Hha)	96	67 ⁺	386	191	151	888
Growth Rate % p.a.	5.28	1.10	2.59	2.26	2.23	2.34

* Percentage shares based on average first 3 years.

+ Condiments (mostly chillies) recorded a decline of 124 Hha in this region.

(Additions over the regions may not tally with the State total due to exclusion of Bombay district and rounding up errors)

an annual requirement of more than 100 acre-inches - easily 5 to 6 times the requirement of any cereal - and changes in area under this category should be viewed with this aspect in mind.

From Table 4.5 we see that in all the regions the three crop-heads considered show increases. Regions II and III which had otherwise shown mostly declines for foodgrains, now show increases. Region III of Poona Division with considerable irrigation facility shows substantial gain in area under sugarcane (growth rate 4.09 per cent, absolute increase 350 Hha) while Region II of Nasik Dhulia and Jalgaon districts show gains in fruits. The addition of 98 Hha in fruits in this region is due to an increase of 92 Hha for district Jalgaon and most of this is in area under banana. It may be recalled that these two regions (Regions II and III) come under the drought zone and we see here that these are leading producers of banana and sugarcane-crops with very high water requirements.

Vegetable area has also good growth rates (between 2 to over 6 per cent p.a.) in all the regions. Thus one sees that area under cereals stagnated or in fact has a slight set-back, pulses area increased but a clear preference for the non-foodgrains feed crop is patent in all the regions and most of these crops require concentration of inputs like fertilizers, water and labour. With increased population, more cereals should be produced which means more area should be devoted to them. But what farmers prefer to cultivate are crops like pulses, sugarcane, fruits and vegetables. We do not have time series for composite prices of fruits, vegetables, etc. but the farm harvest prices presented in Appendix B show

that raw sugar (gur) has a price growth rate of 13.20 per cent per annum which is way above the growth rates for rice, wheat, jowar and bajra (Even higher rates for pulses are noted earlier).

Non-food Crops

4.12 Absolute increase in area under non-food crops is same as for the 'non-foodgrains food' category, viz., 888 Hha for the State as a whole (see Table 4.1). Non-food crops occupy 29 per cent of GCA and the 'marginal share' comes to 23 per cent which is less than the initial share. Thus this category continued to increase but the increases are relatively smaller. Cotton, edible oilseeds (especially groundnut) and fodder appear to be the important crops. We will examine regionwise changes in these crops and in addition, we also include non-edible oilseeds group also as this group has recorded a sizable fall of nearly 500 Hha.

In Table 4.6 changes in areas under these crops are incorporated. Here we see that cotton, the most important of non-food crops (14 per cent of state GCA) has recorded an area increase of 1088 Hha in Region V of Nagpur Division, the major cotton producing tract. In Region II and III also area under cotton has increased while in Region III of Poona Division it has gone down by 134 Hha. The growth rate of 0.63 per cent per annum at the State level which is better than the state GCA growth rate of 0.29 per cent is a direct result of increases in Region V (growth rate 1.02 per cent) and Region IV (growth rate 0.43 per cent) which together cover 85 per cent of cotton area.

Groundnut, an important cooking medium has shown a decline of 1998 Hha at the State level and this is mainly

Table 4.6 : Regionwise Changes in Area under Major Non-food Crops 1960-61 to 1969-70

(Hha = hundred hectares)

	Region I	Region II	Region III	Region IV	Region V	State
1. Cotton						
% share of State*	-	12.50	2.64	28.23	56.63	100.00
Change (Hha)	-	76	-134	225	1088	1257
Growth Rate % p.a.	-	0.33	-3.03	0.43	1.02	0.67
2. Groundnut						
% share of State	0.01	28.26	30.54	30.14	11.05	100.00
Change (Hha)	4	-1159	-9	-776	-44	-1998
Growth Rate % p.a.	-	-6.35	-0.03	-3.68	-0.53	-2.79
3. Total Edible Oilseeds including Groundnut						
% share of State	1.05	20.90	31.44	33.20	13.40	100.00
Change (Hha)	4	-1199	-28	-277	256	-1246
Growth Rate % p.a.	0.25	-6.16	-0.08	-0.76	1.63	-1.15
4. Total Non-Edible Oilseeds						
% share of State	0.53	10.26	5.03	36.02	48.16	100.00
Change (Hha)	12	-65	-29	103	-515	-496
Growth Rate % p.a.	7.93	-3.11	-2.80	1.23	-5.65	-2.38

(contd.)

Table 4.6 : (Contd.)

	Region I	Region II	Region III	Region IV	Region V	State
5. <u>Fodder</u>						
% share of State	26.67	8.42	63.78	0.61	0.18	100.00
Change (Hha)	186	359	823	29	-1	1394
Growth Rate % p.a.	1.08	5.75	1.95	6.33	-0.92	2.10
<u>Total Non-food Crops</u>						
% share of State	4.64	13.96	21.42	26.14	33.75	100.00
Change (Hha)	190	-845	531	207	808	888
Growth Rate % p.a.	1.01	-1.64	0.63	0.20	0.60	0.23

* Percentage changes based on average first 3 years.

(Additions over regions may not tally with State total because of exclusion of Bombay district and rounding up errors)

due to Region II and IV having recorded declines of 1159 Hha and 776 Hha respectively. Region III of Poona Division has a share in State groundnut area of 30 per cent - nearly same as Regions II and IV - and the area under groundnut has decreased only marginally (9 Hha) in this region. It is significant that no region has shown an increase in area under this crop. Other edible oilseeds, on the other hand have gained in area and thus for total edible oilseeds the reduction in area is somewhat contained. Safflower and sesamum are the other major 'other edible oilseeds' of which safflower is rabi while sesamum is kharif rainfed and is also grown in rabi under irrigated conditions. On the whole, the decline in edible oilseeds area should be viewed with concern.

Although non-edible oilseeds cover just 1.69 per cent of state GCA, this group has recorded a fall of 496 Hha and most of this is due to the decline in Region V of Nagpur Division which has half the State area under non-edible oilseeds.

Fodder crops, on the other hand, have performed very well. For the state as a whole, an addition of as much as 1394 Hha is quite large. To put it in a different way, the 'marginal share' of fodder in increased state GCA of nearly 36 per cent (1394 divided by increase state GCA of 3910 Hha) is way above the 'initial' share of 4.69 per cent witnessed in Table 4.1. Regions II and III which showed relatively poor performance in general, have increased area under fodder of 359 Hha and 823 Hha respectively. But we note that area under gram and babul is the main component of this increase in Region III (449 Hha) while jowar is the main component in Region II (197 Hha). Lucern, an irrigated fodder crop (per acre irrigation requirement of

over 30 acre inches) has increased only in Region II (33 Kha increase) while in Region III it is stationary. It may be mentioned that lucern is cultivated mostly in these two regions.

For the non-food crops as a whole, Region III (due to increase in fodder) and Region V (due to increase in cotton) stand out with their growth rates of over 0.60 per cent per annum and high absolute increase. Region II of Masik-Dhulia-Jalgaon districts show a large decline of 845 Kha (growth rate - 1.64 per cent) mainly due to decline in groundnut. The remaining two regions (Region I and II) have fared tolerably well.

Regionwise Review

4.13 Now let us take a quick regionwise review of changes in cropping pattern. Region I is the coastal Konkan area, which shared nearly 5 per cent of state GCA in the initial period. Being a coastal area, it receives high (and reliable) rainfall and nearly half of its GCA is under rice. Over the period, following are the major changes :

<u>Crop</u>	<u>Change (Kha)</u>	<u>Crop-group</u>	<u>Change (Kha)</u>
Rice	-22	Foodgrains	-155
Other cereals	-128	Non-foodgrains feed	96
Fruits	78	Non-food crops	190
Fodder	186	GCA	133

While GCA has increased by 133 Kha, rice, the major crop (covering one-third of State's rice area) and other cereals (ragi, kodra) have declined and the foodgrains show a decline of 155 Kha. Non-foodgrains feed increased

due to increase in area under fruits and non-feed category shows an increase 190 Hha due mainly to increase in fodder area. Thus this rice tract has not contributed anything to area under foodgrains while area under fruits and fodder show gains.

Region II of Nask-Dhulia-Jalgaon districts covering 14 per cent of state CCA and this region falls in the drought zone. Bajra, pulses, cotton, groundnut, kharif jowar and rabi jowar are the important crops and important changes are as follows :

<u>Crop</u>	<u>Change (Hha)</u>	<u>Crop-group</u>	<u>Change (Hha)</u>
Rabi jowar	-962	Cereals	-1
Bajra	1075	Pulses	438
Fruits	98	Foodgrains	437
Vegetables	78	Non-foodgrains feed	67
Groundnut	-1159	Non-food crops	-845
		CCA	-343

The gross cropped area in this region has declined. The main decrease appears to be in the group of non-feed crops, groundnut being the main contributor. The region has 28 per cent of State area under groundnut and thus this region is responsible for the decline in groundnut area. Area under cereals remains unchanged and yet bajra has made considerable gains while rabi jowar has declined.

Region III of Poona Division also in the drought zone covers 29 per cent of State CCA. Rabi jowar, bajra, groundnut and fodder are important crops in this area. This region contributes 58 per cent of State rabi jowar area and 49 per cent of bajra area and 30 per cent of state groundnut area. Although sugarcane covers

barley 2 per cent of its gross cropped area, the region contributes 73 per cent of the State sugarcane area.

The changes in these crops are as follows :

<u>Crop</u>	<u>Change (Hha)</u>	<u>Crop-group</u>	<u>Change (Hha)</u>
Rabi jowar	-2183	Cereals	-1340
Bajra	1542	Pulses	305
Sugarcane	350	Foodgrains	-1035
Groundnut	-9	Non-foodgrain feed	386
Fodder	823	Non-food	531
		GCA	-114

Thus, this region which contributes 32 per cent of State foodgrains area, has a decline of 1035 Hha in foodgrains, mainly due to the decline in rabi jowar area. Non-foodgrains feed category shows an increase which is the highest of all the regions because of increase in area and sugarcane. Area under groundnut has not declined significantly but area under fodder has increased and hence non-food crops show an increase, unlike the earlier two regions. Thus on the whole, this major foodgrains area has shown decline in foodgrains while increases in non-foodgrains feed and non-food due to increases in sugarcane and fodder respectively.

Region IV of Aurangabad Division which has 3 out of its 5 districts in drought zone shows a markedly different performance. Its main crops are rabi jowar, kharif jowar, pulses and cotton. It also makes sizable contribution to wheat, sugarcane and groundnut. The important area changes are :

<u>Crop</u>	<u>Change (Hha)</u>	<u>Crop-group</u>	<u>Change (Hha)</u>
Wheat	-234	Cereals	161
Kh. jowar	117	Pulses	1614
Rabi jowar	-995	Foodgrains	1775
Bajra	1257	Non-foodgrain food	191
Sugarcane	77	Non-food crops	207
Cotton	225	GCA	2175
Groundnut	-776		

Increase in area under bajra is to be noted. Bajra is not a major crop in this region as it covers only 5 to 6 per cent of the region's GCA or 16 per cent of State area under bajra. Thus the relatively large increase in bajra is a change in new direction. Pulses, on the other hand, cover 17 per cent of regions GCA and makes the highest contribution of 36 per cent to State area under pulses and these too, have a notable increase of 1614 Hha. These increases have offset the declines in rabi jowar, the region's major crop (21 per cent of region's GCA, 29 per cent of State rabi jowar) and wheat (5 per cent of region's GCA but 30 per cent of State wheat area) and foodgrains as a whole make a sizable contribution of 1775 Hha. Kharif jowar, another important crop (15 per cent of region's GCA, 30 per cent of State kharif jowar area) has also increased although not very substantially, by 117 Hha.

Among non-food crops, cotton and groundnut are important. Cotton, in fact covers as much as 15 per cent of region's GCA (28 per cent of State cotton area) and the increase of 225 Hha is rather modest as the growth rate is 0.43 per cent per annum compared to the region's GCA growth rate of 0.62 per cent.

The decline in groundnut (776 Hha) is made up to some extent by increase in other edible oilseeds (safflower and sesamum) of nearly 500 Hha. Thus non-food crops have also shown increase. With this, the region achieves a net addition to GCA of 2175 Hha highest among the regions with a growth rate of 0.62 per cent. Thus on the whole, this region covering 26 per cent of GCA, is mainly responsible for the State GCA increase of 3910 Hha.

Region V of Nagpur Division is in the assured rainfall zone. Its major crops are : cotton (29 per cent of region's GCA, 57 per cent of State cotton area), kharif jowar (25 per cent region's GCA, 49 per cent of State kharif jowar) pulses (13 per cent region's GCA, 28 per cent of State wheat). The important changes are :

<u>Crop</u>	<u>Change (Hha)</u>	<u>Crop-group</u>	<u>Change (Hha)</u>
Rice	422	Cereals	813
Wheat	-516	Pulses	306
Kharif jowar	662	Foodgrains	1119
Cotton	1088	Non-food	808
Groundnut	-44	GCA	2079

In fact, apart from decreases in wheat and groundnut, nearly all the crops show gains in area and thus the region appears to have an all-round growth. Increase in cereals is nearly 3 times the increase in pulses, unlike other regions where cereals increased only marginally or even declined in area whereas pulses showed sizable area increases. Increase in the GCA of 2079 is also sizable, nearly the same as Region IV. Rabi jowar, not a very important crop in the region (5 per cent of

Table IV.2 : Districtwise Changes in Cropping Pattern in Maharashtra (1950-61 to 1971-72)

(Area in hundred hectares)

	1. Rice				2. wheat				3. Kharif Jowar												
	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ1	Δ2	GR1	GR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ1	Δ2	GR1	GR2							
1. Thane	1498 (11.35)	1405	1432	-73	-66	-0.71	-.64	-	-	-	4 (.02)	4	6	0	2	-	-				
3. Kolaba	1365 (10.19)	1360	1361	15	16	.12	.17	-	-	-	-	-	-	-	-	-	-				
4. Raunapuri	1307 (9.90)	1410	1335	103	28	.84	.30	-	-	-	-	-	-	-	-	-	-				
<u>REGION I</u>	4150 (31.45)	4175	4128	25	-22	.06	-.07	-	-	-	4 (.02)	4	6	0	2	-	-				
5. Nasik	391 (2.96)	345	345	-46	-46	-1.36	-1.77	921 (10.26)	839	848	-82	-73	-1.03	-1.17	182 (0.73)	115	91	-67	-91	-4.97	-9.43
6. Dhule	294 (2.23)	197	194	-97	-100	-4.35	-5.76	343 (3.82)	464	451	141	106	3.90	3.99	567 (2.25)	443	487	-124	-80	-2.70	-2.15
7. Jalgaon	53 (0.40)	76	65	23	12	4.05	2.96	287 (3.20)	450	339	153	52	5.12	2.41	1454 (5.78)	1273	1459	-181	5	-1.47	.05
<u>REGION II</u>	738 (5.59)	616	604	-120	-134	-1.95	-2.62	1551 (17.27)	1773	1638	222	87	1.50	0.78	2203 (8.76)	1831	2037	-372	-166	-2.03	-1.11
8. Ahmednagar	103 (0.78)	72	80	-31	-23	-3.90	-3.54	442 (4.92)	494	441	52	-1	1.24	-.03	7 (0.03)	27	13	20	6	-	-
9. Poona	526 (3.99)	450	468	-76	-58	-1.72	-1.65	206 (2.29)	239	215	33	9	1.66	.61	2491 (0.99)	140	194	-109	-55	-6.20	-3.50
10. Satara	261 (1.98)	285	272	25	11	1.02	.59	151 (1.57)	161	148	20	7	1.48	.69	608 (2.42)	696	607	88	-1	1.51	-.02
11. Solani	136 (1.03)	162	155	26	19	1.96	1.86	144 (1.60)	137	129	-7	-15	-0.55	-1.56	1559 (6.20)	1154	1182	-405	-397	-3.29	-3.86
12. Sholapur	102 (0.77)	60	72	-42	-30	-5.72	-4.85	222 (2.48)	325	254	103	32	4.33	1.94	20 (0.08)	31	23	11	3	4.99	2.02
13. Kolhapur	1016 (7.70)	903	935	-113	-81	-1.62	-1.18	21 (0.24)	18	21	-3	0	-1.70	0.00	495 (1.97)	442	408	-53	-87	-1.25	-2.72
<u>REGION III</u>	2144 (16.25)	1933	1982	-211	-162	-1.14	-1.12	1176 (13.10)	1374	1208	198	32	1.74	0.38	2938 (11.58)	2490	2427	-448	-511	-1.82	-2.69

Table IV.2 : (Contd.)

	1. Rice			2. Wheat						3. Sharif Jowar											
	Average first 3 years	Average last 3 years	Average 3 years 1967-70	GR1	GR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	GR1	GR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	GR1	GR2						
14. Adilabad	82 (0.27)	68	53	-14	-9	-2.60	-2.22	640 (9.36)	775	322	-65	-18	-.89	-.31	1016 (4.04)	661	790	-355	-226	-4.55	-3.53
15. Adilmani	151 (1.14)	116	122	-33	-29	-2.76	-3.00	578 (6.66)	555	464	-43	-134	-.82	-3.56	1585 (6.14)	1643	1596	-102	53	-.76	.48
16. Aijir	85 (0.64)	59	80	-26	-5	-3.96	-.86	369 (4.33)	510	106	121	15	3.05	.54	726 (2.89)	806	786	74	60	1.08	1.16
17. Andhra	247 (1.87)	256	260	9	13	0.46	.73	255 (2.84)	233	233	-22	-22	-1.0	-1.28	2256 (8.97)	2388	2324	130	68	.62	.47
18. Anantapur	295 (2.24)	324	342	29	47	1.04 1.04	2.13	594 (6.62)	557	519	3	-75	.05	-1.91	2036 (8.10)	2111	2198	75	162	0.80	1.10
<u>REGION IV</u>	840 (6.37)	605	657	-35	17	-.27	.29	2676 (29.66)	2670	2442	-6	-234	-.02	-1.30	7579 (30.14)	7401	7695	-178	117	-.26	.22
19. Anaparthi	30 (0.23)	29	24	-1	-1	-.37	-.46	430 (4.79)	337	320	-93	-110	-2.87	-2.13	2402 (9.55)	2502	2616	100	214	0.45	1.23
20. Anala	78 (0.59)	77	79	-1	1	-.14	.18	544 (6.06)	404	489	-80	-56	-1.75	-1.51	2370 (9.42)	2502	2565	132	195	0.60	1.16
21. Aravati	74 (0.56)	100	118	26	44	3.40	6.89	397 (4.42)	333	358	-64	-39	-1.93	-1.47	1803 (7.17)	1883	1788	-120	-15	-.76	-.12
22. Yeotmal	111 (0.84)	127	125	16	14	1.51	1.71	216 (2.41)	147	146	-69	-70	-4.18	-5.44	2677 (10.41)	2681	2617	64	200	.27	1.05
23. Ardna	34 (0.26)	76	63	42	29	9.35	9.21	443 (4.93)	347	365	-36	-78	-2.06	-2.73	1233 (4.90)	1278	1328	45	95	.40	1.07
24. Arjapur	230 (1.74)	346	313	116	83	4.64	4.50	826 (9.20)	634	673	-192	-153	-2.90	-2.66	1620 (6.47)	1544	1603	-84	-25	-.59	-.22
25. Chandara	2642 (20.02)	2787	2716	145	74	0.60	.39	328 (3.05)	335 318	40 335	-10	7	-.34	.30	41 (0.16)	21	22	-20	-19	-7.41	-6.51
26. Channarayana	2097 (15.89)	2300	2275	203	178	1.03	1.17	392 (4.37)	358	374	-34	-18	-1.00	-.87	327 (1.30)	407	344	60	17	2.26	.73
<u>REGION V</u>	5276 (40.73)	5112	5718	546	422	1.10	1.10	3576 (39.83)	2938	3060	-638	-516	-2.16	-2.20	12421 (49.40)	12618	13003	177	662	.17	.74
<u>REGION VI</u>	1319 (100.00)	1330	13504	109	105	.16	.11	6980 (100.00)	8756	8347 8347	-224	-833	-.26	-1.04	25140 (100.00)	24345	25249	-795	109	-.36	.08

region's GCA, 7 per cent of state rabi jowar area) actually increased, unlike other regions, by 138 kha.

To sum up, the area increases over the period for the State as a whole, especially for area increases in foodgrains, are due to the Region IV and V comprising Eastern Maharashtra. Western Maharashtra, on the other hand, had a disappointing performance over the period. We emphasise again the fact that this is the state of affairs even after deleting the bad years of 1970-71 and 1971-72. Thus the analysis of cropping pattern reveals one of the reasons for the poor agricultural performance of Maharashtra.

Table IV.1 : Cropping Pattern for Maharashtra State for the years 1960-61 to 1971-72

		Line (1) : Area in Hectares						Line (2) : Percentage to Gross Cropped Area			Line (3) : Index of Area			
		Rice	Wheat	Kharif Jowar	Rabi Jowar	Bajri	Other cereals	Total Cereals	Gram	Green Gram (Mu.)	Tur	Black Gram (Uda)	Other Pulses	Total Pulses
		1	2	3	4	5	6	7	8	9	10	11	12	13
1960-61	(1)	12997	9067	25427	37357	16352	4726	100046	4019	3824	5300	4488	5223	23514
	(2)	6.90	4.82	13.54	19.85	8.59	2.54	56.34	2.13	2.06	2.82	2.38	3.10	12.49
	(3)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1961-62	(1)	13186	9075	24261	37220	16876	4613	105291	4036	4234	5615	4300	6085	24271
	(2)	6.91	4.75	12.72	19.53	8.83	2.41	55.15	2.11	2.22	2.95	2.25	3.19	12.72
	(3)	101.45	100.10	95.17	99.75	103.20	96.36	99.28	100.46	108.98	110.97	95.80	104.47	103.20
1962-63	(1)	13414	8799	25672	35606	16002	4635	104930	3722	4107	5442	4263	5954	23488
	(2)	7.07	4.64	13.54	18.78	8.05	2.44	55.33	1.96	2.17	2.87	2.25	3.14	12.39
	(3)	103.21	97.05	100.71	95.29	102.74	96.82	98.94	92.64	105.71	102.69	94.31	102.23	99.87
1963-64	(1)	13508	8886	25096	36435	17050	4509	105504	3756	4207	5657	4278	5948	23806
	(2)	7.04	4.63	13.09	19.02	8.89	2.39	55.6	1.96	2.19	2.95	2.23	3.09	12.42
	(3)	103.93	98.01	94.45	97.50	100.26	95.06	99.54	93.48	108.29	100.75	95.31	101.44	101.22
1964-65	(1)	13700	8262	25501	35204	17390	4582	105247	3591	4153	5245	4481	5970	24060
	(2)	7.13	4.61	13.27	18.32	9.05	2.38	54.76	1.87	2.16	3.04	2.33	3.11	12.51
	(3)	105.41	97.77	100.04	94.21	106.38	95.72	99.24	89.38	106.90	110.29	99.84	102.50	102.22
1965-66	(1)	13213	8329	26036	34533	18177	4817	105107	3123	4320	5610	4608	5627	23318
	(2)	6.96	4.39	13.72	18.20	9.56	2.54	55.39	1.65	2.28	2.97	2.42	2.96	12.28
	(3)	101.66	97.87	102.15	92.41	111.15	100.63	99.11	77.73	111.19	106.43	102.64	98.61	99.14
1966-67	(1)	13543	8395	26250	34440	20181	4766	107590	3373	4546	6018	4811	5782	24530
	(2)	7.06	4.37	13.66	17.95	10.51	2.48	56.05	1.76	2.37	3.13	2.51	3.01	12.76
	(3)	104.20	92.66	103.00	92.18	123.42	99.58	101.45	83.95	117.01	113.55	107.19	99.27	102.30
1967-68	(1)	13377	8222	25592	34243	20206	4820	106396	3445	4668	6043	4975	5922	25053
	(2)	6.95	4.30	13.30	17.78	10.53	2.40	55.26	1.79	2.42	3.14	2.58	3.08	13.01
	(3)	103.00	97.36	100.39	91.63	123.92	99.64	100.12	85.75	120.15	114.03	110.84	101.68	100.52
1968-69	(1)	13281	8394	25316	33537	29347	4601	105473	3549	4974	6142	5316	6344	26325
	(2)	6.86	4.33	13.07	17.52	10.50	2.36	54.45	1.83	2.57	3.17	2.74	3.26	13.59
	(3)	102.18	92.56	99.51	89.75	124.26	98.11	99.45	86.33	120.03	115.90	118.14	105.93	111.93
1969-70	(1)	13214	8365	24638	30455	21240	4687	102817	3107	5908	6267	5307	5909	27878
	(2)	6.81	4.30	12.78	15.60	10.91	2.40	52.85	1.78	3.04	3.23	2.73	3.55	14.33
	(3)	101.90	92.26	97.04	81.49	129.21	99.79	96.95	86.29	152.07	118.63	118.23	118.63	118.54
1970-71	(1)	13524	8120	25370	31000	20307	4139	103200	3103	5075	6271	4957	6257	25663
	(2)	7.22	4.33	13.54	10.90	10.86	2.21	55.08	1.80	2.71	3.35	2.65	3.33	13.70
	(3)	104.05	89.51	99.53	83.72	124.57	86.46	97.31	77.23	130.63	118.33	114.04	107.43	109.12
1971-72	(1)	13395	9783	22820	37855	13123	3730	100912	4335	5030	5042	4314	5501	22222
	(2)	7.39	5.40	12.60	20.90	7.24	2.17	55.70	2.39	2.60	2.76	2.39	3.04	12.60
	(3)	103.00	107.91	89.55	101.30	88.25	82.10	95.14	107.90	93.43	95.14	95.11	94.45	97.04

Table 11.1 : (Contd.)

Line (1) : Area in hundred hectares, Line (2) : Percentage to Gross Cropped Area, Line (3) : Index of Area

		Food grains (7 + 13) 14	Sugarcane 15	Oilseeds 16	Other Condiments 17	Total Condiments 18	Total fruit 19	Total Vegetables 20	Other Food Crops 21	Total Food Crops 22
1960-61	(1)	129580	1556	1583	440	2023	689	779	23	132630
	(2)	68.83	0.83	0.84	0.23	1.07	0.37	0.41	0.01	71.52
	(3)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1961-62	(1)	129562	1545	1606	431	2037	730	801	32	134707
	(2)	67.85	0.81	0.84	0.22	1.09	0.38	0.41	0.01	70.54
	(3)	100.00	99.30	101.43	91.14	100.77	106.14	102.85	139.13	100.04
1962-63	(1)	128418	1352	1616	400	2016	704	824	61	133375
	(2)	67.72	0.72	0.85	0.21	1.06	0.37	0.43	0.03	70.33
	(3)	99.12	86.89	102.07	90.92	99.73	102.36	105.80	265.22	99.06
1963-64	(1)	129370	1371	1682	384	2056	735	888	28	134458
	(2)	67.47	0.71	0.88	0.20	1.08	0.37	0.41	0.01	70.12
	(3)	99.85	88.01	106.23	87.28	102.20	106.87	114.02	121.74	99.86
1964-65	(1)	129287	1588	1735	427	2162	790	946	20	134793
	(2)	67.28	0.83	0.90	0.22	1.12	0.41	0.49	0.01	70.13
	(3)	99.85	102.06	109.58	97.06	106.95	114.87	121.47	86.96	100.11
1965-66	(1)	128425	1713	1602	364	1965	837	934	19	133694
	(2)	67.69	0.91	0.85	0.19	1.04	0.44	0.49	0.01	70.56
	(3)	99.79	109.09	101.18	82.74	97.26	121.70	119.92	86.52	99.44
1966-67	(1)	132120	1501	1631	412	2065	858	963	41	137606
	(2)	68.84	0.82	0.86	0.21	1.07	0.45	0.50	0.02	71.69
	(3)	101.98	100.32	104.28	93.65	102.06	124.75	123.65	178.27	102.20
1967-68	(1)	131449	1583	1753	429	2182	852	1025	15	137106
	(2)	68.27	0.83	0.91	0.22	1.13	0.44	0.54	-	71.21
	(3)	101.46	101.74	110.72	97.51	107.95	123.88	131.61	65.22	101.83
1968-69	(1)	131798	2013	1545	422	1967	895	1014	34	137721
	(2)	68.05	1.04	0.79	0.22	1.01	0.47	0.52	0.01	71.10
	(3)	101.73	129.37	97.28	95.92	97.31	130.13	130.20	147.83	102.28
1969-70	(1)	130695	2219	1530	431	1961	973	1081	22	136951
	(2)	67.25	1.14	0.78	0.22	1.00	0.50	0.56	0.01	70.40
	(3)	100.88	142.61	96.63	97.97	97.01	141.47	138.80	95.66	101.71
1970-71	(1)	128863	2039	1475	419	1894	959	1160	9	134924
	(2)	68.77	1.08	0.79	0.22	1.01	0.51	0.62	-	72.00
	(3)	99.46	131.04	93.16	95.24	93.70	139.44	148.94	39.13	100.21
1971-72	(1)	123734	1935	1444	433	1877	932	1088	14	129580
	(2)	68.30	1.07	0.80	0.24	1.04	0.51	0.60	-	71.52
	(3)	95.50	124.36	91.20	98.42	92.86	135.51	137.70	80.87	94.24

Table IV.1 : (Contd.)

Line (1) : Area in Hectares, Line (2) : Percentage to Gross Cropped Area, Line (3) : Index of Area

		Cotton	Other Fibres	Total fibres	Groundnut	Peanut	Safflower	Other edible Oil-seeds	Total edible Oil-seeds	Total Non- edible Oil-seeds	Total Drugs & Narcotic	Total Cereal	Other Non-food Crops
		23	24	25	26	27	28	29	30	31	32	33	34
1960-61	(1)	24996	795	25791	10829	1282	3305	273	15889	3218	287	8581	40
	(2)	13.28	0.42	13.70	5.75	0.68	1.76	0.15	8.34	1.71	0.15	4.56	0.02
	(3)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1961-62	(1)	20916	873	21789	11175	1186	3391	241	15993	3274	268	8890	27
	(2)	14.41	0.14	14.55	5.86	0.62	1.79	0.12	8.38	1.71	0.14	4.66	0.01
	(3)	107.66	109.82	107.71	103.19	92.51	102.61	88.28	101.92	101.98	93.37	103.88	67.50
1962-63	(1)	26001	844	27445	11446	1334	3189	229	16198	3109	223	9234	56
	(2)	14.02	0.45	14.47	6.04	0.70	1.68	0.12	8.54	1.63	0.12	4.87	0.03
	(3)	106.40	105.17	106.38	105.69	104.05	96.50	83.88	103.23	98.84	77.69	107.87	140.00
1963-64	(1)	24022	868	24890	11359	1263	3074	236	15932	2948	208	9257	51
	(2)	14.62	0.45	15.07	5.93	0.66	1.60	0.12	8.31	1.54	0.11	4.52	0.02
	(3)	112.08	109.19	111.98	104.89	98.51	93.01	86.45	101.53	91.83	72.47	107.94	127.50
1964-65	(1)	28235	850	29085	11220	1268	3099	287	15814	2813	188	9417	53
	(2)	14.69	0.44	15.13	5.84	0.63	1.61	0.15	8.23	1.46	0.10	4.90	0.03
	(3)	112.94	106.93	112.73	103.60	94.22	93.77	105.13	100.78	87.62	67.50	109.80	132.50
1965-66	(1)	27157	871	28028	11173	1262	2995	283	15713	2630	157	9303	0
	(2)	14.32	0.46	14.78	5.89	0.67	1.57	0.15	8.28	1.39	0.08	4.90	-
	(3)	106.63	109.59	108.64	103.17	98.43	90.62	103.66	100.14	81.92	54.70	108.47	20.00
1966-67	(1)	26151	866	27017	9761	1472	3315	222	14770	2653	154	9705	12
	(2)	13.63	0.45	14.08	5.09	0.77	1.73	0.11	7.70	1.38	0.08	5.06	-
	(3)	104.60	108.94	104.72	90.13	114.82	100.51	81.32	94.13	82.64	53.65	113.16	30.00
1967-68	(1)	27077	921	27998	9190	1793	3508	213	14784	2716	150	9759	23
	(2)	14.06	0.48	14.54	4.78	0.93	1.86	0.11	7.68	1.41	0.08	5.07	0.01
	(3)	108.31	115.86	108.52	84.86	139.85	106.57	78.02	94.22	84.60	52.26	113.79	57.50
1968-69	(1)	27162	950	28112	9277	1547	3662	229	14915	2667	129	10114	11
	(2)	14.02	0.49	14.51	4.79	0.80	1.99	0.12	7.70	1.38	0.07	5.22	-
	(3)	108.65	119.51	108.96	85.06	120.67	110.86	83.88	95.07	83.08	44.94	117.93	27.50
1969-70	(1)	28045	964	29009	8986	1522	3738	195	14443	2730	142	11015	61
	(2)	14.42	0.49	14.91	4.62	0.78	1.93	0.10	7.43	1.40	0.07	5.50	0.03
	(3)	112.18	121.27	112.44	80.99	118.72	113.11	71.23	92.04	85.04	49.47	128.43	152.50
1970-71	(1)	27496	704	28202	9040	1237	3053	175	14505	2827	144	6737	30
	(2)	14.67	0.38	15.05	4.83	0.86	2.16	0.09	7.74	1.51	0.07	3.60	0.01
	(3)	109.99	88.56	109.31	83.47	90.49	122.64	64.10	92.44	88.06	50.17	78.55	75.00
1971-72	(1)	25200	667	25867	8348	1175	5314	164	15021	3225	147	7192	13
	(2)	13.97	0.38	14.35	4.61	0.65	2.93	0.10	8.29	1.78	0.18	3.97	-
	(3)	101.45	86.02	100.68	77.08	91.65	160.00	57.40	95.73	100.16	51.21	83.86	32.50

Table IV.1 : (Contd.)

Line (1) : Area in Hundred hectares, Line (2) : Percentage to Gross Cropped Area, Line (3) : Index of area

		Total Non- food crops 35	Kharif food crops 36	Kharif non- food crops 37	Total Kharif 38	Rabi food crops 39	Rabi Non- food crops 40	Total Rabi 41	Gross cropped area 42
1960-61	(1)	53606	60905	46457	127362	53727	7147	60874	186236
	(2)	28.48	42.96	24.66	67.66	28.54	3.80	32.34	100.00
	(3)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1961-62	(1)	56241	60069	48256	126925	54638	7385	62023	150948
	(2)	29.45	41.93	25.59	67.52	28.61	3.86	32.48	100.00
	(3)	104.89	98.96	105.14	101.23	101.68	103.32	101.89	101.43
1962-63	(1)	56765	82009	49390	131399	51360	6675	58035	189620
	(2)	29.60	43.24	28.04	69.29	27.09	3.62	30.71	100.00
	(3)	104.93	101.36	108.29	103.17	95.59	96.18	95.67	100.74
1963-64	(1)	57266	62627	50841	133470	51829	6445	58274	191744
	(2)	29.67	43.09	28.51	69.61	27.03	3.36	30.39	100.00
	(3)	106.83	102.13	109.41	104.60	96.65	90.17	95.73	101.85
1964-65	(1)	57371	83235	51249	134864	51556	6122	57678	192164
	(2)	29.85	43.31	28.66	69.98	26.82	3.19	30.02	100.00
	(3)	106.99	102.88	110.29	105.59	95.94	85.65	94.75	102.08
1965-66	(1)	58639	85566	49781	135377	48308	6058	54366	189733
	(2)	29.43	45.10	28.43	71.35	25.46	3.20	28.65	100.00
	(3)	104.14	100.58	107.13	106.28	89.90	87.75	89.31	101.79
1966-67	(1)	54311	69958	46160	136136	47648	8131	55779	191917
	(2)	28.30	46.16	24.66	70.94	23.53	4.24	29.16	100.00
	(3)	101.29	111.19	99.38	106.93	88.34	113.75	91.63	101.95
1967-68	(1)	55430	67665	49128	133993	49241	6302	55543	192536
	(2)	28.79	46.64	25.52	71.15	24.37	3.27	28.85	100.00
	(3)	103.37	103.60	105.72	107.56	91.64	88.16	91.24	102.27
1968-69	(1)	55947	69361	48062	137463	48340	7865	56205	193628
	(2)	28.82	46.14	24.82	70.98	24.96	4.06	29.02	100.00
	(3)	104.34	110.47	103.47	107.93	89.96	111.03	92.33	102.88
1969-70	(1)	57400	91275	48380	135675	45676	9060	54736	194351
	(2)	29.50	46.92	24.83	71.64	23.48	4.65	28.16	100.00
	(3)	107.05	112.82	104.03	109.62	85.00	126.75	89.92	103.24
1970-71	(1)	58145	89310	45213	134513	45614	7242	52856	187369
	(2)	27.98	47.66	24.12	71.79	24.34	3.88	28.21	100.00
	(3)	97.60	110.39	97.28	105.61	84.09	101.32	85.83	99.53
1971-72	(1)	51573	74877	43029	117605	34703	8544	63247	181153
	(2)	28.47	41.33	23.75	65.09	28.19	4.72	34.91	100.00
	(3)	96.18	92.55	92.00	92.57	101.60	117.53	103.90	96.23

Explanatory Note to Table IV-2 : Districtwise changes in Cropping Pattern in Maharashtra State(1960-61 to 1971-72)

In this table, important crops and crop-groups are considered. The absolute changes in area as well as compound growth rates for each crop-head are presented for individual districts and regions. The description of various columns is as follows :

1. Average first three years : Average to area in hundred hectares for three years 1960-61 to 1962-63. This defines the initial position.
2. Average last three years : Average of three years 1969-70 to 1971-72. This defines the end-position including the scarcity years of 1970-71 and 1971-72. This is end position of the 'entire period'.
3. Average three years 1967-70 : Average of three years 1967-68 to 1969-70. This is end position excluding the scarcity years of 1970-71 and 1971-72. This is the end of the 'curtailed period' which is mainly considered in the text.
4. 1 : Absolute change in area in hundred hectares over the entire period, i.e. between items 1 and 2 above. This covers a span of 10 years as the respective averages are centred on 1961-62 and 1970-71.
5. 2 : Absolute change in area in hundred hectares over the 'curtailed period'. This is the difference between items 1 and 3 above. This covers a span of 8 years as respective averages are centred on 1961-62 and 1968-69. 1 and 2 are not directly comparable but the two could be compared in 'per year' terms after dividing by 9 and 7 respectively.

6. GR 1 : Compound growth rates (per cent per annum) based on two-points method for the 'entire' period.
7. GR 2 : Compound growth rates for the 'curtailed' period generally referred to in the text and tables in the text.
8. District No. 1, the Bombay district is deleted as it is essentially urban in character. Its share of State GCA is just 0.04 per cent. The state figure however is including the Bombay district.
9. Figures in parentheses are percentage shares of each district in the State acreage under a given crop-head.

Table IV.2 : (contd.)

	1. Rice				2. Wheat						3. Other Cereals										
	Average first 3 years	Average last 3 years	Average 3 years 1967-70		CR1	CR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70		CR1	CR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70		CR1	CR2			
12. Karnal road	62 (0.47)	48	53	-14	-9	-2.60	-2.22	640 (9.36)	775	622	-65	-18	-.89	-.31	1016 (4.04)	661	790	-355	-226	-4.55	-3.53
15. Meerut	151 (1.14)	110	122	-33	-29	-2.70	-3.00	598 (6.60)	555	464	-43	-134	-.82	-3.56	1545 (6.14)	1443	1596	-102	53	-.76	.48
16. Mirzapur	85 (0.64)	59	80	-26	-5	-3.30	-.86	389 (4.33)	510	104	121	15	3.05	.54	726 (2.89)	800	786	7	60	1.08	1.14
17. Muzaffarnagar	247 (1.87)	250	260	9	13	0.40	.73	255 (2.84)	233	233	-22	-22	-1.0	-1.28	2256 (8.97)	2300	2324	13	68	.62	.47
18. Gopalanagar	295 (2.24)	324	342	29	47	1.04 1.04	2.13	594 (6.62)	577	519	3	-75	.05	-1.91	2036 (8.10)	2111	2198	75	162	0.40	1.10
<u>U.P. IV</u>	840 (6.37)	605	657	-35	17	-.37	.29	2676 (29.80)	2670	2442	-6	-234	-.02	-1.30	7579 (30.14)	7401	7695	-178	117	-.26	.22
19. Lucknow	50 (0.23)	29	25	-1	-1	-.37	-.46	430 (4.79)	337	320	-93	-110	-.87	-1.13	2402 (9.55)	2502	2616	100	214	0.45	1.23
20. Allahabad	78 (0.59)	77	79	-1	1	-.14	.18	544 (6.06)	404	409	-80	-55	-1.75	-1.51	2370 (9.42)	2502	2565	132	195	0.60	1.14
21. Gorakhpur	74 (0.56)	100	113	26	44	3.40	6.89	397 (1.42)	333	358	-54	-39	-1.93	-1.47	1803 (7.17)	1623	1788	-120	-15	-.76	-.12
22. Jaunpur	111 (0.84)	127	125	16	14	1.51	1.71	216 (2.21)	147	140	-69	-70	-4.18	-5.44	2617 (10.41)	2681	2617	64	200	.27	1.06
23. Azamgarh	34 (0.26)	76	63	42	29	9.35	9.21	443 (4.93)	347	365	-96	-78	-2.66	-2.73	1233 (4.90)	1270	1328	45	95	.40	1.07
24. Faizabad	230 (1.74)	345	313	116	83	4.64	4.50	826 (9.20)	634	673	-192	-153	-2.90	-2.60	1620 (6.47)	1544	1603	-84	-25	-.59	-.22
25. Ghazipur	2642 (20.02)	2787	2716	145	74	0.60	.39	328 (3.05)	335 318	10 335	-10	7	-.34	.30	41 (0.16)	21	22	-20	-19	-7.41	-6.51
26. Bahraich	2097 (15.89)	2300	2275	203	178	1.03	1.17	392 (4.37)	358	374	-34	-18	-1.60	-.87	327 (1.30)	407	344	80	17	2.16	.73
<u>U.P. V</u>	526 (4.13)	512	5718	546	422	1.10	1.10	3576 (39.83)	2938	3060	-638	-516	-2.16	-2.20	12421 (49.40)	12018	13003	177	662	.17	.74
<u>U.P. VI</u>	1319 (100.00)	1330	13504	109	105	.16	.11	1980 (100.00)	2756	8347 8375	-224	-655	-.28	-1.04	25140 (100.00)	24345	25049	-795	109	-.36	.06

Table 13.2 : (Contd.)

	4. Bahi Jowar					5. Total Jowar					6. Bajra										
	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	GR1	GR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	GR1	GR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	GR1	GR2
2. Bahra	-	-	-					4	4	6	-	2			-	-	-				
3. Solaha	-	-	-					(0.01)													
4. Patnagiri	-	-	-																		
<u>Region I</u>	-	-	-					4	4	6	-	2			(0.0)						
5. Basik	173 (2.10)	294	330	-479	-443	-10.18	-11.40	995 (1.54)	409	421	-540	-534	-2.99	-11.04	3268 (20.86)	3344	2000	.124	532	- .40	2.06
6. Buhia	1194 (3.25)	694	796	-500	-398	- 5.85	- 5.63	1761 (2.05)	1137	1283	-624	-478	-4.74	- 4.39	1351 (8.10)	1618	1719	267	378	2.02	3.50
7. Jalpaon	3282 (0.89)	219	207	-109	-121	- 4.39	- 5.36	1782 (2.88)	1492	1666	-290	-115	-1.96	- 0.86	727 (4.36)	890	902	163	175	2.27	3.13
<u>Region II</u>	2295 (6.24)	1207	1333	-1088	-962	- 6.89	- 7.47	4498 (7.27)	3038	3370	-1460	-1128	-4.26	- 4.04	5546 (33.26)	5852	6921	306	1075	0.60	2.56
8. Ahmednagar	6446 (17.68)	5720	5398	-778	-1098	-1.40	- 2.61	6503 (10.51)	5747	5411	-756	-1092	-1.37	- 2.00	2592 (15.55)	2875	3640	283	1048	1.16	4.97
9. Poona	4164 (11.33)	3769	3790	-395	-374	-1.10	- 1.33	4413 (7.13)	3909	3984	-504	-429	-1.32	- 1.44	4006 (10.84)	1718	1880	-90	72	- .56	.56
10. Satara	1560 (4.26)	1455	1253	-111	-313	- .81	- 3.13	2174 (5.51)	2151	1800	-23	-314	-0.12	- 2.21	1513 (9.07)	1222	1514	-291	1	-2.34	.01
11. Sangli	1044 (2.84)	963	891	-81	-153	- .89	- 2.24	2603 (4.21)	2117	2073	-486	-530	-2.28	- 3.19	1312 (7.87)	1283	1424	- 29	112	- .25	1.16
12. Solapur	8007 (21.79)	7355	7747	-652	-260	- .94	- .47	8027 (12.97)	7386	7770	-641	-257	-0.92	- 0.46	906 (2.43)	1080	1223	154	317	1.76	4.38
13. Kolhapur	32 (.09)	15	47	-17	15	- 8.07	5.64	527 (0.55)	457	455	-70	-72	-1.58	- 2.08	21 (0.13)	12	13	-9	-8	-6.03	-6.62
<u>Region III</u>	21309 (57.99)	19277	19126	-2032	-2183	-1.10	-1.53	24247 (39.18)	21767	21553	-2480	-2894	-1.19	- 1.67	8152 (48.89)	8170	9894	18	1542	.02	2.50

Table 11.2 : (Contd.)

	4. Kharif Jowar					5. Total Jowar					6. Bajra										
	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	CR1	CR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	CR1	CR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	CR1	CR2
14. Aurangabad	3162 (6.56)	3210	3020	28	-162	.10	-.74	4198 (6.78)	3871	3810	-327	-308	-0.90	-1.37	1673 (10.03)	2168	2335	495	662	2.92	4.88
15. Borhari	2105 (5.73)	2141	1917	36	-188	.19	-1.33	3050 (5.90)	3584	3515	-66	-135	-0.21	-0.33	40 (0.24)	151	67	111	27	15.90	7.65
16. Chir	2257 (6.74)	2477	2220	220	-37	1.04	-.24	2983 (4.82)	3277	3006	294	23	1.00	0.10	764 (4.58)	1203	1226	439	402	5.17	6.99
17. Handed	600 (1.85)	427	431	-253	-249	-5.04	-0.31	2936 (4.74)	2813	2755	-123	-161	-0.49	-0.92	16 (0.11)	16	25	-2	7	-1.30	4.80
18. Kalanabad	2333 (6.35)	1925	1774	-408	-359	-2.11	-2.36	4369 (7.66)	4036	4172	-333	-197	-0.87	-0.67	193 (1.16)	303	292	110	99	5.14	6.09
<u>Grand Total</u>	10557 (26.73)	10120	9562	-377	-995	-1.40	-1.40	18136 (29.30)	17501	17250	-555	-878	-0.35	-0.72	2880 (15.12)	3841	3945	1153	1257	4.05	5.63
19. Kuzhans	11 (0.03)	16	8	5	-3	-	-	2413 (3.90)	2516	2624	105	211	0.50	1.20	50 (0.30)	95	60	45	38	7.39	8.11
20. Kolia	0 (0.0)	1	0	1	0	-	-	2370 (3.83)	2503	2565	133	195	0.60	1.10	52 (0.31)	65	62	13	10	2.51	2.54
21. Karavati	0 (0.0)	1	0	1	0	-	-	1803 (2.91)	1664	1780	-119	-15	-0.76	-0.12	56 (0.34)	69	72	13	16	2.35	3.65
22. Yeetal	7 (0.02)	3	0	-4	-7	-	-	2624 (4.24)	2664	2817	60	193	0.20	1.00	104 (0.62)	132	114	28	10	2.68	1.32
23. Saraha	26 (0.07)	14	12	-12	-14	-6.65	-1.48 -10.46	1259 (2.03)	1292	1340	33	81	0.30	0.90	16 (0.10)	15	12	-1	-4	-	-
24. Chappur	541 (1.47)	514	554	-27	13	-.56	.34	2109 (3.50)	2058	2157	-111	-12	-0.58	-0.07	2 (0.01)	2	3	0	1	-	-
25. Handra	367 (0.94)	357	365	10	10	.32	.72	388 (0.63)	378	387	-10	-1	-0.30	-0.05	0 (0.0)	0	-	-	-	-	-
26. Chandrapur	1655 (4.50)	1754	1786	99	131	.65	1.09	1902 (3.20)	2161	2130	179	148	0.90	1.00	7 (0.04)	1	0	-6	-7	-	-
<u>Grand Total</u>	2507 (7.03)	2660	2725	73	136	.31	.74	15000 (24.25)	15278	15000	270	800	0.20	0.74	207 (1.72)	379	351	92	64	3.14	2.92
<u>Grand Total</u>	30748 (100.00)	33323	32745	-3425	-4003	-1.08	-1.63	61008 (100.00)	57060	57994	-4220	-3094	-.78	-0.92	16077 (100.00)	16240	20613	1569	3936	1.00	3.07

Table IV.2: (in c.)

	7. Other Cereals				8. Total Cereals								9. Total Pulses								
	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	GR1	GR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	GR1	GR2	Average first 3 years	Average last 3 years	Average 3 years 1967-70	Δ_1	Δ_2	GR1	GR2
2. Bhatnagar	399 (8.54)	362	377	-37	-22	-1.07	-.81	1901 (1.80)	1771	1815	-130	-86	-.78	-.66	143 (0.60)	125	140	-18	-3	-1.48	-.30
3. Bolnisi	292 (8.25)	212	293	-80	1	-3.49	.05	1630 (1.55)	1573	1554	-65	16	-.45	.14	113 (0.46)	75	108	-38	-5	-4.45	-.64
4. Bhatnagar Iri	972 (20.80)	693	665	-279	-107	-3.69	-1.65	2279 (2.16)	2104	2200	-175	-79	-.68	-.50	140 (0.61)	109	148	-37	2	-3.19	.19
<u>Subtotal I</u>	1663 (35.54)	1267	1535	-396	-128	-2.88	-1.14	5018 (3.54)	5448	5059	-370	-149	-.73	-.38	402 (1.09)	309	396	-93	-6	-2.90	-.21
5. Bhatnagar	689 (14.68)	629	677	-57	-9	-.96	-.19	6422 (6.09)	5505	6251	-857	-131	-1.56	-.29	1095 (4.44)	977	1026	-78	-29	-.85	-.40
6. Bhatnagar	304 (8.22)	487	409	103	105	2.67	3.51	4132 (3.92)	3923	4137	-209	5	-.57	.02	967 (4.07)	1191	1213	224	246	2.34	3.29
7. Bhatnagar	10 (0.21)	10	12	0	2	-	-	2860 (2.71)	2918	2985	58	125	.22	.01	1882 (7.92)	1925	2103	63	221	.37	1.80
<u>Subtotal II</u>	1020 (23.11)	1126	1178	46	98	.45	1.25	13414 (12.72)	12406	13413	-1008	-1	-.06	0.0	3904 (10.43)	4113	4342	209	438	.58	1.53
8. Bhatnagar	137 (2.93)	128	124	-11	-13	-.92	-1.11	9777 (9.27)	9314	9096	-463	-81	-.54	-.12	1095 (4.61)	905	1153	-190	58	-2.09	.72
9. Bhatnagar	253 (5.51)	211	220	-42	-13	-2.0	-.75	7206 (6.83)	6527	6706	-679	-420	-1.09	-.85	716 (2.61)	594	640	-122	-76	-2.05	-1.59
10. Bhatnagar	195 (4.17)	155	165	-40	-30	-2.52	-2.36	4283 (4.04)	3976	3959	-307	-324	-.82	-1.14	685 (2.82)	551	651	-124	-34	-2.19	-.72
11. Bhatnagar	63 (1.35)	53	54	-10	-9	-1.90	-2.18	4258 (4.04)	3752	3835	-506	-423	-1.93	-1.48	729 (3.07)	707	727	-22	-2	-.34	-.01
12. Bhatnagar	64 (1.37)	116	98	52	34	5.83	6.28	9322 (8.84)	8947	9017	-375	95	-.45	-.14	1011 (4.26)	1236	1223	425	412	3.60	5.00
13. Bhatnagar	573 (12.26)	530	546	-35	-27	-7.0	-.89	2156 (2.05)	1928	1971	-230	-187	-1.24	-1.29	203 (0.85)	143	150	-60	-53	-3.22	-4.23
<u>Subtotal III</u>	1285 (21.47)	1199	1227	-86	-58	-.77	-.66	37004 (35.10)	34444	35004	-2560	-1340	-.79	-.53	4439 (13.60)	4346	4744	-93	305	-.23	.95

5. IRRIGATION

5.1 In this chapter we will examine area irrigated by different sources of irrigation, growth in the 'means' of irrigation, i.e. growth of canals, wells, oil engines with pump sets, electrical pump sets, etc. Then we will examine changes in irrigated cropping pattern over the years and find out which crops are being preferred for irrigation.

At the outset, let us note one difficulty in assessing the impact of irrigation. While changes in irrigated area and irrigated cropping pattern can be ascertained from the official data, it is not possible to link up irrigation directly with production and productivity because production and productivity are not separately available for irrigated crops and production data for a given crop is for irrigated and unirrigated area put together. Thus impact of the increase in this very important resource is to be judged indirectly. As we shall see later, a large part of investment in agriculture is linked up with irrigation and finding out crop preferences for irrigation would help us in assessing the impact of irrigation to some extent.

It was already mentioned that foodgrains production has unsatisfactory performance over the period. In the present chapter we show that a substantial part of the increased irrigation has in fact been utilized for crops like sugarcane and fruits-vegetables and foodgrain crops are neglected. This is one of the reasons of the poor performance in production of foodgrains.

5.2 It was mentioned earlier that as a first step in analysis of data, compound growth rates and linear rates

of increase were calculated for the entire 12 year period 1960-61 to 1971-72 by the regression method. Later on, to find out the underlying secular trend, the last two years were deleted because these were the scarcity years in which cropped area as well as production suffered heavily. For the curtailed period ending 1969-70 of ten years, we calculated the compound growth rates by the two-point method, the two points themselves being the triennial average of first three years (1960-61 to 1962-63) and similar average for last three years (1967-68 to 1969-70). This saved much time and it was found that this method gives compound growth rates which were close to the rates obtained by the regression method for the curtailed period. The absolute change was obtained by taking simply the difference between the two points. Of course this absolute change covers a period of 8 years (initial triennial average being centred on 1961-62 and end triennial average being centred on 1968-69) and to obtain per annum rate of change comparable to the linear rate of change per annum obtained by regression method one would have to divide the absolute change by 7.

Irrigated cropped area, on the other hand, has not adversely affected by the last two scarcity years. Gross irrigated area remained fairly stable and double cropped irrigated area in fact increased relatively more in the last two years. Obviously, some of the crops received irrigation which in normal course would not have received it and these crops are likely to be the feedgrains crops. This is because irrigation requirement of feedgrains is comparatively much lower than that for sugarcane and fruits-vegetables and sharp area increases in the double

cropped irrigated area can occur when foodgrains are receiving irrigation. With this behaviour of gross irrigated area and double irrigated area, there is no reason to 'curtail' the period and we consider the entire twelve year period 1960-61 to 1971-72 to analyse the irrigation data. As we shall find out in this chapter with the twelve year period data that foodgrains received a relatively small share of increased irrigation, for the curtailed period even smaller share would be received by foodgrains and this conclusion would be in fact sharper.

Since we consider data for all the twelve years, we retain the compound growth rates and linear rates of increase per annum (the latter in absolute terms) obtained by the regression method.

5.3 Another point of departure from the earlier chapters is that we will consider only three major irrigation regions covering more than three-fourth of the State irrigated area rather than divide the State into five regions as in the previous chapter, since the irrigation resource is divided rather unevenly in the State. Since we aim at finding out only the direction of use of irrigation and since in any case no direct linking up of irrigation with production and productivity is possible as mentioned in Section 5.1, consideration of three major regions adequately serves our purpose. Further, Regions II and III of the earlier chapter are identical with Irrigation Regions 3 and 2 respectively and some comparison is possible.

Broad Indicators of Irrigation

5.4 To begin with we will look at the behaviour of

gross irrigated area (GIA) net irrigated area (NIA) and area irrigated more than once (DIA). In Table 5.1 these data are presented at the State level along with gross cropped area, net cropped (or woen) area and double cropped area for reference. As mentioned above, index of gross irrigated area (GIA) in the scarcity years remains above the level in 1968-69 while index of double irrigated area (DIA) of 151 and 172 points in the scarcity years is much higher than earlier years. Net irrigated area (NIA) is also more or less maintained in the scarcity years and supports the observation in Section 5.2 that irrigated area has not been adversely affected in the scarcity years.

Compound growth rate by the regression method for the twelve year period is 2.60 per cent per annum for NIA, 4.30 per cent for DIA and 2.90 per cent for GIA. It may be recalled that compound growth rates for NIA and DIA calculated by the two-points method for the same period in Chapter 3 (see Table 3.3) were 2.70 and 4.50 per cent per annum which are quite close to those obtained by the regression method. As mentioned in that chapter, we see from the present table that NIA/NSA percentage increases steadily between 5.99 to 8.03 per cent while GIA/GCA percentage increases from 6.47 to 8.95 per cent indicating the rather low level of irrigation in Maharashtra. The rather low level of intensity of 'total' cropping (DCA/NSA) between 5 and 6 per cent and of intensity of irrigated cropping (DIA/NIA) between 13 to 16 per cent was also noted in the chapter on land utilisation.

Table 5.1 : Gross Cropped Area, Gross Irrigated Area and their break-up into Net and More than once Cropped Areas for Maharashtra (1960-61 to 1971-72)

Line (1) : Area in hundred hectares (ha)

Line (2) : Index of area

Year	(1)	Gross Cropped Area (GCA)	Net Cropped Area (NCA)	Cropped more than once (MCA)	Gross Irrigated Area (GIA)	Net Irrigated Area (NIA)	Cropped more than once Irrigated (OIA)	NIA/ GCA (%)	GIA/ GCA (%)
1960-61	(1)	182236	176786	9446	12182	10707	1475	5.97	6.47
	(2)	100.00	100.00	100.00	100.00	100.00	100.00		
1961-62	(1)	180946	180535	10409	12336	10812	1524	5.99	6.46
	(2)	101.53	100.94	110.13	101.31	101.03	103.31		
1962-63	(1)	189046	180125	9514	12762	11258	1524	6.25	6.74
	(2)	103.74	100.71	100.60	104.92	105.24	103.31		
1963-64	(1)	191744	181787	9959	13130	11502	1628	6.33	6.85
	(2)	101.85	101.66	105.36	107.60	107.68	110.36		
1964-65	(1)	192164	182542	9627	13639	11906	1733	6.52	7.10
	(2)	102.08	102.05	101.85	111.56	111.31	117.68		
1965-66	(1)	189733	181335	8394	13000	12063	1617	6.65	7.32
	(2)	100.79	101.38	88.81	113.95	112.71	123.17		
1966-67	(1)	191917	182138	9774	14134	12172	1962	6.68	7.36
	(2)	101.95	101.83	103.81	116.01	113.74	133.00		
1967-68	(1)	192536	183206	9326	14762	12752	2010	6.96	7.67
	(2)	102.27	102.15	98.67	121.18	119.16	136.26		
1968-69	(1)	193658	183673	9995	15565	13742	1823	7.48	8.04
	(2)	102.66	102.73	105.75	127.83	126.41	123.58		
1969-70	(1)	195351	184624	9728	16232	14309	1923	7.75	8.35
	(2)	103.24	103.38	102.92	133.25	133.74	130.36		
1970-71	(1)	187389	176682	10687	15703	13469	2234	7.62	8.38
	(2)	99.53	98.81	113.10	128.90	125.89	151.64		
1971-72	(1)	181153	170364	10789	16216	13672	2544	8.03	8.95
	(2)	96.23	95.29	114.15	133.17	127.76	172.46		
Compound Growth rate percent per annum		-0.12	-0.16	0.70	2.90	2.60	4.30		
Linear Rate of Increase Hha per annum		-224.57	-292.31	67.94	400.79	320.74	80.05		

Distribution of Net and Gross
Irrigated Areas; Irrigation Regions

5.5 Although percentage of area irrigated is small in the State, let us examine the distribution of this important resource over various districts. In Table 5.2 percentage shares of different districts are presented for the first three years together and the last three years together in State NIA and GIA.¹ Along with these, district shares in GCA are also presented in the first column based on the twelve year average GCA of each district. The GCA shares are not presented for the 'initial' and the 'end' periods because a rough idea about the GCA share suffices for our purpose and we are not interested in changes in GCA shares here. The 'irrigation proportion' for individual districts is also presented for the initial and end periods in the same table, proportion being based on district GIA/district GCA ratios. Similar district NIA/district GCA ratios are not presented because the ratios do not differ greatly from the gross level ratios and in any case, the ranking of top districts does not change.

It is already seen that the irrigated area forms a small proportion of the State cropped area but from the present table we further see that it is distributed rather unevenly over the different districts. Looking at this table, one can form three important irrigated regions. Considering the initial period shares we find that the two districts of Bhandara and Chandrapur in Nagpur Division share over 6 per cent of State GCA and

¹ The abbreviations used are : GCA = Gross cropped area, GIA = Gross irrigated area, NIA = Net irrigated area, DIA = Area irrigated more than once or 'double' irrigated area.

Table 5.2 : Percentage Shares of Different Districts in the State Net Irrigated Area (NIA) and State Gross Irrigated Area (GIA) 1960-61 to 1971-72

District	12 year average % share in State Gross Cropped Area (District GCA/State GCA)	Percentage Irrigated Area in each district (Dist.GIA/Dist. GCA)		Percentage share in State Net Irrigated Area (Dist. NIA/State NIA)		Percentage share in State Gross Irrigated Area (Dist. GIA/State GIA)	
		Average first 3 years	Average last 3 years	Average first 3 years	Average last 3 years	Average first 3 years	Average last 3 years
2. Thana*	1.55	1.42	1.72	0.36	0.28	0.35	0.28
3. Kulaba	1.18	1.49	2.46	0.31	0.35	0.28	0.31
4. Ratnagiri	1.93	3.58	4.14	1.21	0.89	1.06	0.92
5. Nasik	4.96	6.62	13.08	4.09	6.12	5.18	7.04
6. Dhulia	3.93	5.06	10.73	2.81	4.41	3.08	4.85
7. Jalgaon	4.48	5.20	11.99	3.50	5.70	3.59	6.34
(Bombay Division)	(18.07)			(12.28)	(17.75)	(13.56)	(19.76)
8. Ahmednagar	6.90	12.14	14.12	13.07	11.14	13.03	11.06
9. Poona	5.71	10.64	12.19	9.38	7.56	9.43	7.98
10. Satara	3.79	15.49	14.02	7.19	5.73	8.24	6.23
11. Sangli	3.48	7.89	10.65	4.29	4.06	4.34	4.11
12. Sholapur	6.52	10.79	11.40	9.98	8.11	10.74	8.70
13. Kolhapur	2.20	8.95	12.71	3.43	3.58	3.06	3.26
(Poona Division)	(28.59)			(47.34)	(40.18)	(48.84)	(41.32)

(Continued)

Table 5.2 : (Continued)

District	12 year average % share in State Gross Cropped Area (District GCA/State GCA)	Percentage Irrigated Area in each district (Dist. GIA/Dist. GCA)		Percentage share in State Net Irrigated Area (Dist. NIA/State NIA)		Percentage share in State Gross Irrigated Area (Dist. GIA/State GIA)	
		Average first 3 years	Average last 3 years	Average first 3 years	Average last 3 years	Average first 3 years	Average last 3 years
14. Aurangabad	7.11	4.73	7.25	4.81	5.59	5.12	5.86
15. Parbhani	5.16	1.32	2.12	1.17	1.52	1.03	1.33
16. Dhule	4.16	5.67	7.03	3.57	3.66	3.52	3.62
17. Handed	3.89	1.49	3.07	0.77	1.55	0.86	1.44
18. Osmanabad	5.87	4.81	7.23	4.22	5.24	4.22	5.04
(Aurangabad Division)	(26.18)			(14.54)	(17.56)	(14.75)	(17.29)
19. Buldhana	3.72	1.79	2.43	1.14	1.04	1.00	1.10
20. Akola	4.77	0.44	1.02	0.31	0.59	0.27	0.52
21. Amravati	3.71	1.10	2.03	0.70	1.03	0.61	0.90
22. Yeshwantnagar	4.14	0.41	0.95	0.28	0.50	0.25	0.48
23. Wardha	2.23	1.46	2.30	0.50	0.67	0.49	0.62
24. Nagpur	2.88	5.33	7.33	2.58	2.84	2.30	2.56
25. Bhandara	2.65	24.31	26.76	11.47	9.85	10.14	8.51
26. Chandrapur	3.65	14.47	15.67	8.80	7.95	7.78	6.92
(Nagpur Division)	(27.15)			(25.78)	(24.47)	(22.84)	(21.61)
Maharashtra	100.00	6.53	8.55			100.00	100.00

(* Bombay District (District No. 1) is deleted as it is of no consequence agriculturally).

have 20 per cent share in State NIA. These two districts have as much as 24 and 14 per cent of their gross cropped area (GCA) under irrigation and are easily the two top districts considering the irrigation proportion (compared to the 6.5 per cent irrigation proportion at the State level). This we denote as Irrigation Region 1. Further, the six districts comprising the Poona Division (serial Nos. 8 to 13) while sharing about 29 per cent of State GCA have as much as 47 per cent share in State net irrigated area (NIA) and have irrigation proportions between 8 and 15 per cent (considering the 'initial' shares). This is Irrigation Region 2. Next in importance are three districts of Nasik, Dhulia and Jalgaon from Bombay Division with 13 per cent share in State GCA and over 10 per cent share in State NIA. The irrigation proportions (district CIA/district GCA) of this region (5 to 6.60 per cent) are understandably close the State irrigation proportion of 6.53 per cent. It would appear that these are 'average' districts but these are included here because this region has had substantial increases in irrigated area over the period. The 'end period' share in State NIA has risen to over 16 per cent for this region. These districts together form Irrigation Region 3.

The initial and end period (average first three years 1960-61 to 1962-63 and last three years 1969-70 to 1971-72 respectively) shares of these three regions are as follows :

	12 year average GCA share (%)	Net irrigated area		Gross irrigated area	
		Initial period share (%)	End period share (%)	Initial period share (%)	End period share (%)
I. Region 1	6.30	20.27	17.80	17.92	15.43
I. Region 2	28.59	47.34	40.18	48.84	41.32
I. Region 3	13.37	10.40	16.23	11.85	18.23
Three Regions together	48.26	78.01	74.21	78.61	74.98

(State = 100)

Thus these three irrigation regions with about 48 per cent of State GCA cover about 78.79 per cent of irrigated area in the initial period and 74.75 per cent in the end period and if we concentrate on these three regions we could be in a position to explain the behaviour of various aspects of irrigation. (We note that Region II in the last chapter is equivalent to the Irrigation Region 2 and Region III of last chapter is equivalent to Irrigation Region 3 here.) The importance of these three regions would be further clear as we go into other aspects of irrigation like irrigated area, sourcewise irrigation, irrigation by canals, wells, etc., and the irrigated cropping pattern.

Districtwise Growth of Irrigated Area

5.6 That the share of net irrigated area (NIA) of Irrigation Region 2 of Peona Division has declined considerably, from 47 per cent in the initial period to 40 per cent at the end period while share of Irrigation Region 3 has increased from 13 to 16 per cent can be seen from the above table. We now present districtwise

compound growth rates and linear rates of increase in irrigated area for individual districts in Table 5.3 to get a clear picture of growth rates and the distribution of increase for the State in different districts. For the consideration of the distribution of increase, linear rates of increase are useful. Growth in net irrigated area (NIA) and gross irrigated area (GIA) is presented in this table. At the State level, the growth rates for NIA and GIA are 2.60 and 2.90 per cent per annum respectively while the linear rates of increase are 321.04 hundred hectares (Hha) and 400.84 Hha respectively. Between the districts, Akola (Serial No. 21) has highest growth rates for both NIA and GIA but in linear terms, it ranks much lower (17th for NIA) and thus in terms of 'impact' on the State it is not significant. Same is the case with Amraoti and Yestmal districts (Nos.21 and 22). High compound as well as linear rates are noticeable for the three districts of Nasik, Dhulia and Jalgaon (all from I. Region 3 as mentioned earlier) with compound growth rates for NIA between 7 and 8 per cent and linear rates between 33 and 43 Hha per annum. In fact in terms of linear increase, these are easily the top three districts for both NIA and GIA.

Conspicuously lower are the growth rates and linear rates for the Poona Division districts which cover 47 per cent of NIA in the initial period. In fact four of these six districts with 9 to 13 per cent share each in State NIA in the initial period (see Table 5.2) have growth rates between 0.03 and 0.73 per cent. These NIA growth rates are much lower than the overall State rate of 2.63 per cent. In terms of linear increase, the

Table 5.1 : Compound Growth Rates and Linear Rates of Increase per annum of the Irrigated Area in Different Districts of Maharashtra (1960-61 to 1971-72)

(1ha = Hundred hectares)

	Net Irrigated Area		Gross Irrigated Area	
	Compound growth rate (% per annum) (1)	Linear Rate of increase (1ha per annum) (2)	Compound growth rate (% per annum) (3)	Linear Rate of increase (1ha per annum) (4)
2. Thane*	0.68	0.28	0.70	0.25
3. Kolaba	4.26	1.74	4.60	1.87
4. Ratnagiri	-0.21	-0.24	0.70	1.48
5. Nasik	7.20	43.05	6.40	53.37
6. Mulshi	7.71	33.09	6.20	44.15
7. Jalgaon	7.65	41.59	9.50	62.67
(Bombay Division)		(119.51)		(163.79)
8. Ahmednagar	0.71	10.45	0.90	15.08
9. Poona	0.73	7.36	1.10	13.47
10. Satara	0.03	0.22	-0.18	-1.89
11. Sangli	2.06	10.37	2.30	13.33
12. Sholapur	0.14	1.55	0.20	3.78
13. Kolhapur	2.99	12.65	3.40	14.98
(Poona Division)		(42.62)		(58.75)
14. Aurangabad	4.25	27.22	4.30	34.07
15. Parbhani	6.57	10.24	6.80	10.57
16. Dhir	2.01	11.62	2.90	14.44
17. Handed	10.41	14.58	8.01	14.25
18. Lomenabad	5.31	30.98	5.10	33.73
(Aurangabad Division)		(94.64)		(107.06)
19. Bulchana	2.47	3.71	4.50	6.81
20. Akola	11.24	6.16	11.40	6.31
21. Amraoti	7.83	8.03	8.10	8.41
22. Yestmal	9.70	4.46	10.70	5.29
23. Wardha	5.84	4.05	6.20	4.73
24. Nagpur	3.44	11.41	4.00	13.38
25. Washera	0.07	11.21	0.80	10.68
26. Chandrapur	1.49	15.24	1.50	15.78
(Nagpur Division)		(64.27)		(71.31)
Maharashtra	2.60	321.04	2.90	400.84

(* Table excluding Bombay district No. 1 which is of no consequence agriculturally. Growth Rates and Linear Rates calculated by the regression method).

highest in this division of 12.65 Hha is by Kolhapur district (No. 13) which ranks eighth in the State when one considers linear increase. Thus the linear increases, too, are small in this region. Now let us chart out the linear increases in Table 5.4 for the three regions created earlier. These are as follows :

Table 5.4 : Linear increases per annum in hundred hectares (Hha) for the three regions (1960-61 to 1971-72).

	Initial (first 3 years average NIA(Hha)	Linear increases in		
		Net irri- gated area(NIA)	Gross irri- gated area (GIA)	Double irrigated area(DIA)
I. Region 1 (Ehandara and Chandrapur)	2214 (20.27)	26.45 (8.24)	26.46 (6.60)	0.01 (0.01)
I. Region 2 (All six dist- ricts of Poona Division)	5173 (47.34)	42.62 (13.28)	58.75 (14.66)	16.13 (20.21)
I. Region 3 (Nasik, Dhulia and Jalgaon Districts)	1136 (10.40)	117.73 (36.67)	160.19 (39.96)	42.46 (53.21)
Maharashtra	10925 (100.00)	321.04 (100.00)	400.84 (100.00)	79.80 (100.00)

(Percentage shares in State shown in parentheses.
I.Region - Irrigation Region)

Thus shares in increase in State irrigated area for Irrigation Region 2 of Poona Division are indeed small for all the three categories of irrigated areas. Although its initial share in State NIA is over 47 per cent (and that in State GIA of the similar order), its share in increased State NIA is just over 13 per cent. Its share in increased State DIA is again small at 20 per cent. It is not surprising then, that the share of

this region in State NIA has gone down to 40 per cent at the end of the period (see the unnumbered table in Section 5.5). One wonders whether the growth of irrigation facility is towards its more equitable distribution in Maharashtra and is of the order suggested by this reduced share for Irrigation Region 2. But we will come to this aspect later. Here we note that the third region with its small initial share in State NIA of over 10 per cent has a very high share in increased State NIA of 37 per cent while its share in increased State GIA is over 53 per cent, which is relatively very high.

Sourcewise Irrigation

5.7 We now consider various sources of irrigation in Maharashtra and the growth of these sources. The Season and Crop Reports give yearwise net area irrigated by four sources viz. canal, tank, wells and 'other sources'. Along with these, length of canals, number of tube wells and number of wells for irrigation purpose are also given. In addition, number of oil engines and electric pump sets (the latter for last four years only) are also available. All these data for individual districts and the State are not presented here for want of space. (These data are available in the separate volume of 'Data Tables'.) The compound and linear growth rates are presented in Table V-1 and V-2 at the end of this chapter. In the present section we concentrate on 'net area irrigated by sources of irrigation' while the remaining data which may roughly be labelled 'means of irrigation' are examined in the next section.

In Table 5.5 we present net irrigated area (NIA) by different sources of irrigation for the initial and the end periods for the three important irrigated regions already mentioned along with the similar data for the

Table 5.5: Net Area Irrigated by Different Sources of Irrigation in Maharashtra 1960-61 to 1971-72

(Area in hundred hectares)

	Canals		Tanks		Wells		Other Sources		Total Net Irrigated Area	
	Initial period	End period	Initial Period	End period	Initial period	End period	Initial period	End period	Initial period	End period
I. Region 1 (Districts Shandara and Chandrapur)	379 (18.02)	468 (19.00)	1738 (78.50)	1859 (75.51)	36 (1.54)	62 (2.52)	43 (1.94)	73 (2.97)	2214 (100.00)	2460 (100.00)
I. Region 2 (All districts of Poona Division)	1616 (31.23)	1535 (27.65)	54 (1.04)	29 (0.52)	3201 (61.87)	3384 (60.96)	303 (5.86)	603 (10.86)	5173 (100.00)	5551 (100.00)
I. Region 3 (Nasik, Dhulia and Jalgaon districts)	282 (24.82)	556 (24.80)	9 (0.79)	1 (0.04)	844 (74.30)	1675 (74.71)	2 (0.18)	10 (0.45)	1136 (100.00)	2242 (100.00)
Three Regions together	2277 (20.94)	2559 (24.95)	1801 (21.13)	1889 (18.42)	4079 (47.85)	5121 (49.94)	348 (4.08)	686 (6.69)	8523 (100.00)	10253 (100.00)
Maharashtra	2465 (22.56)	3021 (21.87)	1929 (17.66)	2143 (15.51)	6120 (56.02)	7865 (56.93)	410 (3.75)	787 (5.70)	10925 (100.00)	13817 (100.00)

Note : Initial Period : Average first 3 years (1960-61 to 1962-63)
End period : Average last 3 years (1969-70 to 1971-72)

(Percentage shares of different sources in each region are indicated in parentheses).

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State. For the State as a whole, it can be seen that over 22 per cent of NIA is covered by canal irrigation (in the initial period) 18 per cent by tank irrigation, 56 per cent by well irrigation, and about 4 per cent by other sources. Irrigation Region 1 has mainly tank irrigation as mentioned earlier with tank irrigation covering as much as 78 per cent of NIA of that region in the initial period. Irrigation Region 2 consisting of entire Poona Division has canal-well irrigation, the respective share being 31 and 62 per cent respectively (in the initial period) of NIA of the region. 'Other sources' in this region cover 6 per cent of NIA which is high, relatively to the other two regions. Irrigation Region 3 also has canal and well irrigation, the respective shares being 25 and 74 per cent in the initial period. Over the period, for the State as a whole the shares of different sources do not appear to have changed, except for the 'other sources' the share for which has increased from 3.75 to 5.70 per cent with some decline in the share of tank irrigation. For the first and the third regions also the shares have not changed appreciably over the period but for the second region the share of canal irrigation has declined from 31.23 to 27.65 per cent while the share of 'other sources' has nearly doubled itself from 5.86 to 10.86 per cent. This increase is mainly due to the 'lift irrigation'. Although the third region does not show much change in percentage sourcewise shares, we note that both canal and well irrigated area has doubled over the period.

Now let us look at the shares of these regions for net area irrigated by different sources in the sourcewise State NIA. Along with this we examine the

linear rates of increase for each Region and the State as a whole. These data are presented in Table 5.6. The shares of Irrigation Region 2 in the State linear increase merit special attention here. It was already seen that although this region has 47 per cent share in the initial period in State NIA, its share is as small as 13 per cent in the State linear increase in NIA (Table 5.4). Here we further see that area under canal irrigation (the most assured of all irrigations) has not only failed to increase in absolute terms but has actually gone down. The linear rate is -5.21 Kha (hundred hectares) per annum for canal irrigated area in this region. The well irrigation has increased in absolute terms (linear rate 18.11 Kha) but compared to the region's share in well irrigated area of 52.30 per cent the share in the linear increase (which may be referred to as 'marginal share') is as small as 9.40 per cent. Thus in the region characterized by canal and well irrigation, the area irrigated by these sources has shown small marginal increases or even a decline. Only in the case of 'other sources' has this region shown higher marginal share than the initial share. Irrigation Region 3, on the other hand, has 11.44 per cent share in State canal irrigated area in the initial period, but the marginal share (share in State linear increase) is as high as 46 per cent. Similarly wells have a share of 14 per cent in the initial period but the marginal share is much higher at 47 per cent in State well NIA. (The negative 'shares' in this table appear rather odd, but we have presented negative percentages because of their small magnitudes and the essential conclusions remain unaffected.)

Table 2.2 : Growth of Net Area Irrigated by Different Sources of Irrigation (1960-61 to 1971-72)

	(Area in hundred hectares)								
	Canals			Tanks			Wells		
	Initial period	End period	Linear rate	Initial period	End period	Linear rate	Initial period	End period	Linear rate
I. Region 1 (Districts Bhandara and Chandrapur)	399 (16.19)	468 (15.47)	5.98 (9.89)	1738 (17.16) (90.10)	1859 (86.75)	13.09 (54.00)	34 (0.55)	62 (0.79)	3.13 (1.62)
I. Region 2 (All 6 districts of Poona Division)	1616 (65.56)	1535 (50.81)	-5.21 (-8.62)	54 (2.80)	29 (1.35)	-3.31 (-13.66)	3201 (52.30)	3384 (43.02)	18.11 (9.40)
I. Region 3 (Nasik, Dhulia and Jalgaon districts)	282 (11.44)	556 (18.40)	27.81 (40.02)	9 (0.47)	1 (0.05)	-1.10 (-4.54)	844 (13.79)	1673 (21.29)	90.22 (40.60)
Three regions together	2277 (93.18)	2559 (84.71)	28.58 (47.29)	1801 (93.36)	1889 (88.15)	8.68 (35.81)	4079 (66.65)	5121 (65.11)	111.46 (57.82)
Maharashtra	2465 (100.00)	3021 (100.00)	60.43 (100.00)	1929 (100.00)	2143 (100.00)	24.24 (100.00)	6120 (100.00)	7865 (100.00)	192.75 (100.00)

Notes: Initial Period: Average first 3 years. End Period: Average last 3 years. Linear rate: Hundred hectares p.a.
(Percentage share of each region to State area irrigated by a given source shown in parentheses)

(Continued)

Table 5.6 : (Continued)

	(Area in hundred hectares)					
	Other Sources			Total Net Irrigated Area		
	Initial period	End period	Linear rate	Initial period	End period	Linear rate
I. Region 1 (Districts Bhandara and Chandrapur)	43 (10.49)	73 (9.27)	3.58 (8.23)	2214 (20.27)	2460 (17.60)	26.45 (8.25)
I. Region 2 (All 6 districts of Poona Division)	303 (73.21)	603 (76.02)	33.14 (76.02)	5173 (47.34)	5551 (40.18)	42.63 (13.29)
I. Region 3 (Nasik, Dhulia and Jalgaon Districts)	2 (0.48)	10 (1.27)	0.84 (1.27)	1136 (10.40)	2242 (16.23)	117.72 (36.71)
Three Regions together	348 (84.08)	686 (87.16)	37.56 (86.84)	8523 (78.01)	10253 (74.21)	186.80 (58.25)
Maharashtra	410 (100.00)	787 (100.00)	43.25 (100.00)	10925 (100.00)	13017 (100.00)	320.67 (100.00)

Once again one wonders whether the small increase in irrigated area in I. Region 2 indicate a movement towards more equitable distribution of irrigation facility in the State. This region is politically the most vocal and such a deliberate movement towards equity is rather unlikely. That this region in fact had a fair share in the increased irrigation facility, will be established in the next section. Further why should area irrigated by canals decline however marginally? The possible answers can be found in the pattern of irrigated cropping. But before we go into the irrigated cropping pattern, let us examine growth in 'means of irrigation' mentioned at the beginning of the present section.

Mean of Irrigation

5.8 In the 'means of irrigation' are included data available in the Season and Crop Reports on canal length, number of wells for irrigation purpose and number of oil engines and electrical pump sets. The growth rates and linear rates, etc., are presented in Table V-2 at the end of present chapter. The data on number of electrical pump sets are available in Season and Crop Reports for last four years only and are not of much use. However we have three Livestock Censuses over the twelve year period, of 1961, 1966 and 1972, giving data on oil engines with pumps for irrigation purposes as well as electrical pump sets for irrigation purpose and we use these data here. Since the reference date for these censuses is 15th April of these years, we assign data from these censuses to years 1960-61, 1965-66 and 1971-72 respectively. These fit nicely into the 12-year period of our analysis

as these three years constitute the beginning, the middle and the end of this period. The growth rates and the linear rates based on these just three observations should not cause concern because 'number of oil engines and electrical pump sets for irrigation' are sort of series where there are no significant year to year fluctuations and the series in fact have a steady trend. The rates based on these three points should be quite close to the actual trend.

These data relating to the irrigation facility we broadly label as 'means of irrigation' and although these are by no means exhaustive nor sufficient to relate with growth in irrigated area these data are not insufficient to draw broad conclusions.

In Table 5.7 are presented data on six categories: canal length (in kms.), number of tube wells, number of irrigation purpose wells, number of oil engines (all four from Season and Crop Reports) and number of oil engines and number of electric motors with pump sets for irrigation purpose (from the three Livestock Censuses). The differences between data on number of oil engines from Season and Crop Reports and number of oil engines for irrigation purpose from Livestock Censuses are notable but we are not much concerned about these as our interest lies in the growth and relative shares of these 'means of irrigation'.

From this Table we see that for all the three irrigation regions together the shares in State for different categories have slightly gone down over the period except for tube wells and electrical pump sets and there is some movement towards equity. The contrast between marginal shares of I. Region 2 in the different categories and the shares in net area irrigated (NAI)

Table 5.7 : Growth of Canals, Irrigation Purpose Wells, Oil Engines, Electric Pump Sets etc. (1960-61 to 1971-72).

	Canal Length (Kms.)			Tube Wells (No.)			Irrigation Wells (No.)		
	Initial period	End period	Linear rate P.a.	Initial period	End period	Linear rate P.a.	Initial period	End period	Linear rate P.a.
I. Region 1 (Districts Bhandara and Chandrapur)	665 (5.44)	574 (4.03)	-14.26 (-6.63)	57 (51.35)	343 (64.60)	32 (65.27)	15220 (2.73)	18173 (2.61)	325 (2.12)
I. Region 2 (All 6 districts of Poona Division)	9463 (77.38)	10461 (73.48)	105.28 (48.93)	-	-	-	232534 (41.74)	271333 (39.01)	4412 (28.73)
I. Region 3 (Nasik, Dhulia and Jalgaon Districts)	1139 (9.31)	1227 (8.62)	7.23 (3.36)	-	4 (0.75)	-	108301 (19.44)	128697 (18.50)	2301 (14.98)
Three Regions together	11267 (92.13)	12262 (86.13)	98.25 (45.66)	57 (51.35)	347 (65.35)	32 (65.27)	356055 (63.91)	418203 (60.12)	7038 (45.83)
Maharashtra	12230 (100.00)	14236 (100.00)	215.16 (100.00)	111 (100.00)	531 (100.00)	50 (100.00)	557143 (100.00)	695516 (100.00)	15355 (100.00)

contd.

Table 5.7 : (contd.)

	Oil Engines (No.)			Oil Engines with Pumps for Irrigation Purpose * (No.)			Electric Pumps for irrigation purpose * (No.)		
	Initial period	End period	Linear rate p.a.	Initial period L.Census 61	End period L.Census 72	Linear rate p.a.	Initial period L.Census 61	End period L.Census 72	Linear rate p.a.
I. Region 1 (Districts Bhandara and Chandrapur)	304 (0.56)	1483 (1.03)	134 (1.31)	310 (0.48)	2135 (1.24)	166 (1.72)	66 (0.93)	1600 (0.94)	142 (0.95)
I. Region 2 (All 6 districts of Poona Division)	23348 (43.34)	56143 (39.06)	3710 (36.47)	32502 (50.98)	82775 (48.12)	4487 (46.47)	565 (7.96)	63673 (37.51)	5830 (38.80)
I. Region 3 (Nasik, Dhulia and Jalgaon Districts)	16236 (30.13)	37890 (26.35)	2505 (24.62)	16591 (26.02)	37139 (21.60)	1790 (18.54)	480 (6.76)	36255 (21.35)	3314 (22.05)
Three Regions together	39888 (74.03)	95516 (66.44)	6349 (62.40)	49403 (77.48)	122049 (70.96)	6443 (66.73)	1111 (15.65)	101528 (59.80)	9286 (61.80)
Maharashtra	53880 (100.00)	143758 (100.00)	10174 (100.00)	63747 (100.00)	172003 (100.00)	9656 (100.00)	7100 (100.00)	169778 (100.00)	15026 (100.00)

* Based on Livestock Census 1961, 1966 and 1972. 'Oil Engines' in Column based on Season and Crop Reports.
 Initial Period : Average first 3 years. Eng Period : Average last 3 years.
 Percentage shares in state for a given category shown in parentheses.

is worth noting. The share in canal length for this region is as high as 49 per cent of the State linear increase and although it is smaller than its share in the initial period, the stagnant (in fact 'negative') share in the linear increase in net canal irrigated area (Table 5.7) is not justified. Compare this behaviour with I. Region 3 which has just 3.36 per cent share in the State linear increase in canal length (lower than its initial share) and as much as 46 per cent share in State linear increase in net canal irrigated area. The decline in net canal irrigated area for Region 2 with half the increase in State canal length is certainly a baffling phenomenon for this most assured irrigation facility. This decline cannot be attributed to 'bad' terminal years of 1970-71 and 1971-72 in terms of inadequate rainfall either, because an examination of the series of canal irrigated area reveals that the decline (or stagnancy) is apparent in earlier years too.

The decline in canal length for Region 1 is to be noted. In the Ehandara district of that region the length of canal has decreased by half from 525 kms. in 1965-66 to 254 kms. in 1966-67 and has not gone beyond 313 kms. in the remaining years. This sudden reduction in 1966-67 draws only a brief comment in the Season and Crop Report of 1966-67 (Chapter 3, p. 7), "8. Sources of water supply -- During the year under report, the number of Government canals was 625 as against 612 in the previous year, thus recording an increase of 13 canals or by 2.1 per cent. There was, however, a decrease in the mileage of these canals from 2,588 to 2,372 i.e. by 8.3 per cent", (emphasis not in the original) without any explanation, and we leave it at that.

In the case of number of irrigation wells, I Region 2 shows a share of 29 per cent in State linear increase which is smaller than the initial period share of 42 per cent. But I. Region 3 too has a smaller share of 15 per cent in State linear increase compared to its initial share of 19 per cent and yet, its share in State's linear increase in KIA by wells is as high as 47 per cent while I. Region 2 has a share of just 9 per cent.

In the case of number of oil engines and electric pump sets for irrigation purposes, the situation is not much different. Regarding the linear increase per year in oil engines, the linear rate based on Season and Crop Reports shows a share of I. Region 2 at 36 per cent, smaller than its initial share of 43 per cent. The Livestock Census based estimate of linear rate for oil engines shows 46 per cent share for Region 2 in State linear increase, slightly smaller than initial share of 50 per cent. For electrical pump sets (data based on Livestock Census) the growth is phenomenal for this region. The share in State linear increase is 39 per cent compared to 8 per cent share initially.

Another point to be noted from this Table is the fact that for I. Region 2 and I. Region 3 with every additional well there is an increase of more than two pump sets with either oil engine or electric motor.² This means that along with the creation of additional wells nearly the same amount is spent on these mechanical devices of irrigation. The linear rate of increase in number of wells for I. Region 2 is nearly twice the rate

² Whether we base the linear rate of increase for oil engines on Season and Crop Reports data or on the Livestock Censuses. For Region 2 some of these pump sets would be used on lift irrigation. However that should not affect the argument made here.

for I. Region 3 and yet, the linear increase in the net area irrigated for the region (Table 5.6) is one-fifth of the rate of Region 3. Thus the contribution of I. Region 2 to increased net irrigated area of the State is meagre compared to its share in increased wells and pump sets. Further, if the well irrigated area/number of wells ratio is any indication, while the ratio has declined for I. Region 2, it has increased for I. Region 3 over the period. This is because the irrigation facility is used for high irrigation requirement cash crop in Region 2 as we shall see in the analysis of irrigated cropping pattern. Similar explanation accounts for the stagnant or slightly declining canal irrigated area in I. Region 2.

On the whole a broad conclusion can be drawn that I. Region 2 of Poona Division has had a fair share of growth in the means of irrigation and its very low share in increased net area irrigated for the State of mere 13 per cent (Table 5.6), cannot be attributed to a deliberate movement towards equity (or 'neglect' of this region) in irrigation facility.

Irrigated Cropping Pattern

5.9 In the analysis of cropping pattern of irrigated crops we shall look into the growth of area under various irrigated crops and find out which crops are being preferred for irrigation and examine the implications of such preferences for the foodgrains production. It is of course readily to be conceded that Maharashtra has only 6 (1963-61) to 9 per cent (1971-72) of gross cropped area covered by irrigation. But while inadequate as this facility is in the State it would be worthwhile

to examine to what extent has this potent force been useful in reducing the severity of declining feedgrains production considering the fact that the modern technology in the form of improved and hybrid seed, use of chemical fertilizers, etc., can be effective only with assured irrigation facility. The irrigated cropping pattern data for State is produced in Table V-3 at the end of this chapter. Similar tables for districts are incorporated in the separate volume of 'Data Tables'.

In Table 5.8 relevant data for growth of different crops for the State are presented. Similar data on growth rates and linear rates of increase for the districts are set out in Table V-4 at the end of the present chapter.

From Table 5.8 we see that for the State the gross irrigated area (GIA) shows a growth rate of 2.90 per cent per annum or in linear terms an increase of 400.84 hundred hectares (Hha) per annum. Jowar has its share reduced from 23 per cent in the initial period (highest share in GIA of that period) to 18 per cent in the end period but the area remains more or less the same at the end of the period, the growth rate being zero. Rice, which ranks second in the initial period (with its share in GIA only slightly less than that for jowar) comes out first at the end of the period but with a lower share of 20 per cent, with jowar (17.96 per cent) and wheat (17.38 per cent) with near equal shares following. It is for wheat that a substantial increase in share is observed from 11.29 to 17.38 per cent of GIA. Bajra and 'other cereals' (consisting mostly of maize) also show small increases. However, for cereals as a whole the share in GIA has slightly declined from 59.60

Table 5.8: Compound Growth Rates and Linear Rates of Increase of Area under Different Irrigated Crops for Maharashtra (1960-61 to 1971-72)

(Hha = Hundred hectares)

	First 3 years average		Last 3 years average		For twelve year period		
	Area (Hha)	Share (%)	Area (Hha)	Share (%)	Growth Rate (%)	Linear Rate of Increase (Hha)	Share Linear Increase (%)
1. Rice	2731	21.97	3156	19.66	1.60	47.93	11.96
2. Wheat	1404	11.29	2789	17.38	8.10	156.06	38.93
3. Kharif Jowar	97	0.78	203	1.26	9.70	13.04	3.25
4. Rabi Jowar	2714	21.83	2630	16.39	-0.44	-12.05	-3.01
5. Total Jowar	2811	22.61	2833	17.96	0.00	0.99	0.25
6. Bajra	329	2.65	472	2.94	3.00	16.42	4.10
7. Other Cereals	135	1.09	227	1.41	6.30	10.89	2.72
8. <u>Total Cereals</u>	7410	59.60	9477	59.05	2.80	232.27	57.95
9. Gram	356	2.86	507	3.16	4.30	18.33	4.57
10. Other Pulses	70	0.56	88	0.55	-0.03	0.99	0.25
11. Total Pulses	426	3.42	595	3.71	3.80	19.31	4.82
12. <u>Total Cereals and Pulses (Foodgrains)</u>	7836	63.02	10072	62.75	2.90	251.58	62.76
13. Sugarcane	1481	11.91	2063	12.85	3.60	62.31	15.54
14. Chillies	658	5.29	641	3.99	-0.41	-2.73	-1.32
15. Turmeric and Ginger	82	0.66	107	0.67	2.80	2.64	0.66
16. Fruits, Vegetable and Other Food Crops	1196	9.62	1763	10.98	4.80	68.14	17.00
17. Non-foodgrain Food	3417	27.49	4574	28.50	3.40	130.35	32.52
18. Total Food Crops	11253	90.51	14646	91.25	3.00	381.93	95.28
19. Cotton	474	3.81	712	4.44	4.50	23.08	5.76
20. Santharp and hemp	22	0.18	20	0.12	-	-0.20	-
21. Groundnut	132	1.06	202	1.26	4.60	7.00	1.76
22. Other Oilseeds	69	0.55	85	0.53	1.70	1.26	0.31
23. Fodder Crops	292	2.35	316	1.97	0.70	2.11	0.53
24. Other Non-food Crops	192	1.54	69	0.43	-11.65	-14.40	-3.59
25. Total Non-food Crops	1180	9.49	1404	8.75	1.60	18.91	4.72
26. Gross Irrigated Area	12433	100.00	16050	100.00	2.90	400.84	100.00

to 59.05 per cent with a lower than overall growth rate of 2.80 per cent per annum. The decline (although small) in percentage share for cereals is significant in the context of declining foodgrains production. In fact, if we look at the last column of the Table we find that the 'marginal share' in cereals (linear increase in area under cereals divided by linear increase in GIA) is less than 58 per cent as compared to the initial share of 59.60 per cent. Compared similarly, 'marginal' share for jowar is almost zero against the initial share of 23 per cent. For wheat, the marginal share is substantially high at 38.93 per cent against the initial share of 23 per cent. In fact, this crop has the highest growth rate of 8.10 per cent per annum excluding kharif jowar the irrigated area under which is negligible. The marginal share for rice is again well below the initial share. What could be the possible reason for this preference between cereals for cultivation under irrigated conditions? The decline of jowar in the order of preference (reaching the bottom of the preference table in fact) cannot be attributed to changes in consumer tastes. One reason could be the fact that improved varieties of wheat are preferred for cultivation with their better pay-offs. The same cannot be said of hybrid jowar and improved rice varieties which have yet to take a firm 'root' in Maharashtra to be able to compete with other crops or even with its own local, low-yielding varieties. The other reason for relatively high growth of irrigated wheat could be the influence of urban demand. But logically, this should have resulted in increased area under 'total' (irrigated + unirrigated) wheat, which has not happened, with a small negative growth rate for

total wheat. The reason could be found in the fact that in 'total' cropping we have a multitude of farmers near subsistence level, producing more for their own needs rather than for marketing. Farmers with irrigated holdings are likely to be relatively better off and are perhaps in a better position to respond to the urban demand. But on the whole, cereals sharing slightly less in the increasing GIA is an unsatisfactory phenomenon, considering the fact that the stagnancy or the decline in foodgrains production (and the resultant shortages) must have been patent half-way through this period. This perhaps shows an absence of a mechanism which would try to remove shortages in vital areas of ineffectiveness of such a mechanism if it existed.

Pulses, on the other hand, have a slightly higher growth rate of irrigated area of 3.50 per cent than that for the GIA. Thus for foodgrains as a whole, the area growth rate is the same as that for the GIA, viz. 2.90 per cent per annum, with marginal share being nearly same as the initial share. It would appear that there is nothing to complain about here, with foodgrains as a whole continuing to have the same share in the increased GIA as in the initial period, viz. 63 per cent. But we disagree with such a view and the explanation will be provided when we go into the crop preferences in the three important regions in the next section.

'Non-foodgrains food' category, however, shows a remarkable increase. Major crops in this category are sugarcane and fruits and vegetables. We have created this special category for these crops not in the original official data because of their importance in irrigated cropping pattern with their high irrigation requirements.

This category has the irrigated area growth rate of 3.80 per cent per annum with a linear increase of 130.35 Hha per annum. The marginal share thus comes to nearly 33 per cent compared to its initial share of 27.49 per cent in GIA. Sugarcane, the major crop in this category, shows a growth rate of 3.60 per cent. The marginal share for sugarcane is again higher than the initial share of 11.91 per cent. Fruits, vegetables and other food crops (of which 'other food crops' have a negligible share) considered as a single category have 9.62 per cent share in GIA in the initial period, but with a growth rate of 4.80 per cent per annum, this category accounts for slightly more than sugarcane in linear terms. Only chillies show a decline in this group.

The non-food group has an area growth rate of 1.60 per cent (and linear rate of 19 Hha) which is well below the growth rate for the State GIA. Cotton, an important component, shows a growth rate of 4.50 per cent and groundnut, another important crop, has also a high growth rate of 4.60 per cent. 'Other non-food crops' which include some of the fibres, drugs and narcotics, etc., however, show a large decline with a negative growth rate of 3.59 per cent.

Crop Preferences in the Three Irrigation Regions

5.10 When we look into the crop preferences in irrigated cropping by different irrigation regions, we would realise the contrasts in growth of different crops in different regions and we are likely to form a better understanding of the growth of irrigated cropping at the State level, where these contrasts are not in such a sharp focus.

In Table 5.9 are presented area changes in important categories of irrigated crops for the three irrigation regions already mentioned, covering major part of the gross irrigated area (GIA). Here again we present areas in the initial and end periods along with the linear rates of increase, but the percentages (or the 'marginal shares') refer to the GIA of each irrigation region because our emphasis here is on crop preferences within a region.

For the first region, it was seen that the GIA/Gross cropped area (GCA) ratios are highest in the State and the region itself covers 18 per cent of State GIA in the initial period. As mentioned earlier, irrigation here consists mainly of tank irrigation which is supplemental in nature, going to late varieties of rice in the kharif period. From the present Table we see that irrigated foodgrains cover about 97 per cent of GIA in both the periods, with the 'marginal' share (ratio of linear increase in foodgrains for the region to linear increase in GIA of the region) being equally high at 95 per cent. So whatever increase in GIA that has occurred, has gone to foodgrains (mainly rice as pointed out earlier). For the second region of entire Poona Division which covers 49 per cent of State GIA (or 47 per cent of State NIA) in the initial period the foodgrains' share in GIA has reduced from 58.58 per cent in the initial period to 56.02 per cent in the final period, the marginal share is indeed low - mere 21 per cent of the area additions to GIA of the region. On the other hand, sugarcane share in GIA of the region has gone up from 17.79 per cent to 23.59 per cent over the period. The marginal share is over 65 per cent,

Table 5.9 : Change in Area of Important Categories of Irrigated Crops in Major Irrigated Regions of Maharashtra (1960-61 to 1971-72)

(Area and Linear Rates in Hundred Hectares)

	I. Region 1			I. Region 2		
	Bhandara and Chandrapur Districts of Nagpur Division			All Six Districts of Poona Division		
	Average Area for First 3 Years	Average Area for Last 3 Years	Linear Rate	Average Area for First 3 Years	Average Area for Last 3 Years	Linear Rate
Foodgrains	2156 (96.81)	2391 (96.65)	25.19 (95.00)	3556 (58.58)	3716 (56.02)	16.82 (21.38)
Sugarcane	8.3 (0.37)	7.6 (0.31)	=	1080 (17.79)	1565 (23.59)	51.56 (65.56)
Non-foodgrains food*	71 (3.19)	82 (3.31)	1.27 (4.80)	1743 (28.71)	2277 (34.33)	61.83 (78.61)
Food	2227 (100.00)	2473 (99.96)	26.46 (100.00)	5299 (87.30)	5993 (90.35)	78.65 (100.00)
Non-food	=	1 (0.04)	=	771 (12.70)	640 (9.65)	-19.90 -
GIA	2227 (100.00)	2474 (100.00)	26.46 (100.00)	6070 (100.00)	6633 (100.00)	58.75

(* Non-foodgrains food includes sugarcane.
Percentage shares in GIA shown in parentheses.)

(continued)

Table 5.2 : (Continued)

I. Region 3						
Districts of Bombay Division			Maharashtra			
	Average Area for First 3 Years	Average Area for Last 3 Years	Linear Rate	Average Area for First 3 Years	Average Area for Last 3 Years	Linear Rate
Foodgrains	570 (38.67)	1572 (53.76)	116.62 (72.80)	7836 (63.02)	10072 (62.75)	251.58 (62.76)
Sugarcane	146 (9.90)	193 (6.60)	4.42 (2.76)	1481 (11.91)	2063 (12.85)	62.31 (15.54)
Non-foodgrains Food ^o	689 (46.74)	984 (33.65)	27.21 (16.98)	3417 (27.49)	4574 (28.50)	130.35 (32.52)
Food	1259 (85.41)	2556 (87.41)	143.83 (89.78)	11253 (90.51)	14646 (91.25)	381.93 (95.28)
Non-food	215 (14.59)	368 (12.58)	16.37 (10.22)	1180 (9.49)	1404 (8.75)	18.91 (4.72)
GIA	1474 (100.00)	2924 (100.00)	160.20 (100.00)	12433 (100.00)	16050 (100.00)	400.84 (100.00)

thus indicating that a very large proportion of increased irrigated area has gone to sugarcane. Rather high negative value for linear rate for non-food crops creates some difficulty in interpretation. The argument would run somewhat as follows : 'Non-food crops' are not preferred for irrigated cultivation and record a reduction in area overtime : about 19.90 kha per annum are taken out of this category. Consequently while the GIA in this region increased at the rate of 58.75 kha per annum, irrigated area under crops other than the non-food category increased at the rate of 78.65 kha per annum. Of this 21 per cent area is shared by foodgrains, 65.56 per cent by sugarcane, etc.'. The conclusion that sugarcane is highly preferred, is unmistakable.

Turning to the third Irrigation Region consisting of Nasik, Dhulia and Jalgaon districts covering 12 per cent of GIA initially, we find that irrigated foodgrains area is 38.67 per cent of regional GIA and rises substantially to 53.76 per cent at the end of the period. The marginal share of 73 per cent is very high - nearly twice - the initial foodgrains share. Large GIA increases occurred in this region and one sees that the linear increase in area under irrigated foodgrains is 116.62 kha per year - nearly half of the linear area increase at the State level of 251.58 kha per annum. The contrast between the second and third regions is very sharp here.

Sugarcane is an annual crop with an irrigation requirement of over 100 acre-inches per acre whereas the requirement of any foodgrain crop is not likely to cross 20 acre-inches. This indicates a 5:1 irrigation requirement ratio. The ratio of marginal shares for area of sugarcane:share for area under foodgrains for I. Region 2,

are 65 per cent: 21 per cent i.e., about 3:1. Using irrigation water requirements ratio of 5:1 one can quickly see that increased water utilized for sugarcane: water utilized for feedgrains has a ratio of about 18:1. With such a high proportion of increased water used for irrigation going to sugarcane, it is no wonder that the net irrigated area itself is increasing slowly in this region. It was already seen in Section 5.8 that this region has had a fairly large share in the increase in the means of irrigation in the form of canals, wells (and lift irrigation), etc., but a paltry share in the increased State NIA of 13 per cent while I. Region 3 with much lower shares in means of irrigation had 37 per cent share of increase in State NIA. This means that the growth of net (and consequently gross) irrigated area in I. Region 2 of Poona Division (and hence of the State) is severely hampered because of the decided preference to high irrigation requirement crop of sugarcane.

It was seen in Chapter 3 that Poona Division Region (Region III in that Chapter) contributed just 63 Hha to the increase in double irrigated area (DIA) of State which is 411 Hha. The preference for sugarcane crop thus reduces DIA because although occupying land throughout the year and consuming enormous irrigation water, area under sugarcane gets counted only once.

It is in this sense that dissatisfaction was expressed in the later part of the previous section regarding the share of foodgrains in increased CIA at the State level although it was same as in the initial period, at about 63 per cent. With Irrigation Region 2 covering half the irrigated area of the State and having a fairly large share of the increased means of irrigation over the period, we maintain that the growth of irrigated area

itself is retarded in the State because of the preference to sugarcane crop in I. Region 2. That is, the growth rate of 2.90 for State CIA (or 2.60 for MIA) itself could have been improved upon significantly if proper conditions were created for the cultivation of foodgrains under irrigated conditions in I. Region 2 (or for that matter in the State).

Sugarcane is obviously a crop par excellence in Maharashtra. It is a robust crop free of major diseases and given adequate doses of fertiliser and irrigation, one is more or less assured of a good harvest. Crop-loans are also easily available because the repayment is made at the factory level from the proceeds of the sugarcane. Regarding the suitability of this crop in Maharashtra, the Report of the Sugar Enquiry Commission, Ministry of Food and Agriculture (1965) - (the 'Sen Committee') - observes "Maharashtra seems to possess a comparative advantage in the cultivation of sugarcane over other sugarcane producing states". The price trend of sugarcane also appears to have been favourable.

An example of the profitability of sugarcane cultivation may be cited here. An Income-Saving-Investment Survey conducted by the Agro-Economic Research Unit at the Institute³ at the instance of Ministry of Food and Agriculture in 'progressive' areas of Maharashtra for three years from 1969-70 to 1971-72 in Ahmednagar district (largest in Poona Division) in the sugarcane tract covering about 100 farmers from 10 villages reveals that for these farmers, while the harvested cane area marginally increased between 1969-70 and 1971-72 from 66 to 68

3 Khare, M.P. Income, Saving and Investment in Agriculturally Progressive Areas in Ahmednagar District, Maharashtra State (1969-70 to 1971-72), Gokhale Institute of Politics and Economics, (1977), pp. 23-25 and 111.

hectares and cane output slightly declined (from 9151 metric tonnes to 8628 metric tonnes), their average (i.e. per farmer) income per household net of cash and out-of-pocket expenses increased by more than 50 per cent, from Rs.5887 in 1969-70 to Rs.9012 in 1971-72. This was due to rise in price of cane from Rs.85 to Rs.130 per tonne. During the period, prices of fertilisers slightly declined and so did wages of farm labour because of the surfeit of labour due to scarcity conditions prevailing in half the villages of the district in 1970-71 and nearly two-thirds of villages in 1971-72.

One may wonder why sugarcane failed to be equally attractive in other irrigated regions. This is perhaps because a large scale growth of sugarcane has to be accompanied by the infrastructure of factories and Poona Division districts have a longer tradition in this respect. But one can pick up straws in the wind. For the Poona Division districts the growth rates and the linear rates for sugarcane are as follows :

<u>District</u>	<u>Growth Rate (%)</u>	<u>Linear Rate (Hha)</u>
Ahmednagar	4.50	17.96
Poona	2.50	3.69
Satara	3.60	4.09
Sangli	8.70	11.74
Shelapur	3.00	3.71
Kolhapur	3.00	10.37

Other districts showing comparable growth rates (with linear rates in parentheses) are : Nasik (From I. Region 3), 3.60 per cent (4.23 Hha), Dhulia (again from I. Region 3) 3.80 per cent (1.06 Hha), Osmanabad 3.40 per cent (2.36 Hha), Ranjed 5.30 per cent (1.69 Hha) and Bhir 3.30 per cent

(0.52 Hha). Thus growth rates for sugarcane in these districts show strength of the movement but with their lower linear rates, the impact has not been substantial. Jalgaon district from I. Region 3, on the other hand has shown considerable increase in banana--another crop with over 100 acre-inches of annual requirement. In fact, for banana Maharashtra has the linear rate of increase of 12.17 Hha per annum (and a growth rate of 4.20 per cent) of which 11.92 Hha are contributed by Jalgaon district alone.

The crucial fact appearing from this discussion is that growing foodgrains under irrigated conditions is not as profitable to the farmer as growing an annual crop like sugarcane. (For such a comparison one considers two or three foodgrain crops which are seasonal.) With relatively 'good' years foodgrains prices come down and this may be acting as a deterrent. Removing price instability of foodgrains may be a step in the right direction. Mere withdrawing State encouragement (and it is considerable) to sugarcane production may not ensure increases in foodgrains production as some other cash crop may come to be preferred. Another important need is to develop and popularize high-yielding varieties of foodgrains that would increase pay-offs of foodgrains cultivation. As pointed out earlier, high-yielding varieties of wheat do seem attractive and area under irrigated wheat has shown high (highest among foodgrains) growth rate. This has not happened in the case of rice and particularly jowar (most important of cereals in Maharashtra) which has lost irrigated area particularly in I. Region 2 (linear rate - 30 Hha per annum) which is a major irrigated jowar producer.⁴

⁴ In the initial period area under irrigated jowar in Maharashtra is 2811 Hha and that for the Region 2 it is 2103 Hha or 75 per cent of Maharashtra irrigated jowar area.

Shares of Crops in Increased Water Consumed

5.11 Lastly, we attempt an exercise to ascertain how much of increased water used for irrigation goes to different crops and in particular, to sugarcane. For want of detailed data, we approach this problem in a round-about way. We use the irrigation water requirements for different crops for the State as a whole and from the linear increases in area under individual crops calculate the increased irrigation water consumed by each of the crops and from their relative shares ascertain the importance of individual crops. Thus from shares of different crops in increased irrigated area in State we go a step further and find out crop shares in increased volume of irrigation water consumed. There are certain pitfalls in this approach with different regions having different rainfalls, soil types, etc., but we are aiming at a broad picture of this distribution. In fact, it is because of the awareness of these shortcomings that we attempt it in this penultimate section of the present chapter. If all the relevant data were available, this exercise would have occupied a pride of place in the present analysis. But here we use it merely as a supporting evidence.

The "Guide to Agricultural Officers" of the Directorate of Agriculture, Government of Maharashtra gives irrigation water requirements of different crops. These are presented in Table 5.10 where number of irrigations, acre-inches per irrigation and total requirement of all irrigation for a given crop are incorporated. For most of the foodgrains, total requirement is available in range rather than in one single figure. We have adopted the upper limit of this range to allow for a maximum share for foodgrains. The

Table 5.10 : Per Acre Annual Irrigation Water Requirements of Different Crops (Assuming a Rainfall of 20 inches during June to September)

				(Water requirement in acre-inches)																																																																																																																																		
Crop	Number of Irrigations		Acres inches per turn	Total requirement in acre inches																																																																																																																																		
<u>Kharif Crops</u>																																																																																																																																						
Rice	2-3		2	4-6																																																																																																																																		
Jowar	1-2		2	2-4																																																																																																																																		
Cotton	3-4		2	6-8																																																																																																																																		
Bajra	0-1		1-1.5	0-1.5																																																																																																																																		
Groundnut	0-1		2	0-2																																																																																																																																		
Tobacco	2-3		1.5-2	4-6																																																																																																																																		
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Jowar	2-3		2	4-6																																																																																																																																		
Wheat	3-4		2	6-8																																																																																																																																		
Gram	2-3		1.5	3-4.5																																																																																																																																		
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<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th colspan="2" style="text-align: center;">Summer Season</th> <th colspan="2" style="text-align: center;">Rainy Season</th> <th colspan="2" style="text-align: center;">Winter Season</th> <th rowspan="2" style="text-align: center;">Total Requirement in acre inches</th> </tr> <tr> <th></th> <th style="text-align: center;">Irrigation turns</th> <th style="text-align: center;">Acres inches per turn</th> <th style="text-align: center;">Irrigation turns</th> <th style="text-align: center;">Acres inches per turn</th> <th style="text-align: center;">Irrigation turns</th> <th style="text-align: center;">Acres inches per turn</th> </tr> </thead> <tbody> <tr> <td><u>Fruits</u></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Banana</td> <td style="text-align: center;">20</td> <td style="text-align: center;">3</td> <td style="text-align: center;">8</td> <td style="text-align: center;">2</td> <td style="text-align: center;">15</td> <td style="text-align: center;">2</td> <td style="text-align: center;">106</td> </tr> <tr> <td>Orange</td> <td style="text-align: center;">15</td> <td style="text-align: center;">2</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">7</td> <td style="text-align: center;">2</td> <td style="text-align: center;">53</td> </tr> <tr> <td>Mango</td> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">6</td> </tr> <tr> <td>Papaya</td> <td style="text-align: center;">20</td> <td style="text-align: center;">1</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1</td> <td style="text-align: center;">12</td> <td style="text-align: center;">1</td> <td style="text-align: center;">38</td> </tr> <tr> <td>Guava</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1</td> <td style="text-align: center;">12</td> <td style="text-align: center;">1</td> <td style="text-align: center;">24</td> </tr> <tr> <td>Grape</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">14</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">42</td> </tr> <tr> <td>Fig</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">8</td> <td style="text-align: center;">1</td> <td style="text-align: center;">15</td> <td style="text-align: center;">1</td> <td style="text-align: center;">27</td> </tr> <tr> <td>Chiku</td> <td style="text-align: center;">10</td> <td style="text-align: center;">3</td> <td style="text-align: center;">6</td> <td style="text-align: center;">2</td> <td style="text-align: center;">10</td> <td style="text-align: center;">2</td> <td style="text-align: center;">62</td> </tr> <tr> <td>Sitaphal-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Amphal</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">8</td> <td style="text-align: center;">1</td> <td style="text-align: center;">21</td> </tr> <tr> <td colspan="8"><u>Other Crops</u></td> </tr> <tr> <td>Sugarcane</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3.5</td> <td style="text-align: center;">4</td> <td style="text-align: center;">3</td> <td style="text-align: center;">105</td> </tr> <tr> <td></td> <td style="text-align: center;">+8</td> <td style="text-align: center;">3.5</td> <td style="text-align: center;">+9</td> <td style="text-align: center;">2.5</td> <td style="text-align: center;">+8</td> <td style="text-align: center;">2.5</td> <td></td> </tr> </tbody> </table>									Summer Season		Rainy Season		Winter Season		Total Requirement in acre inches		Irrigation turns	Acres inches per turn	Irrigation turns	Acres inches per turn	Irrigation turns	Acres inches per turn	<u>Fruits</u>								Banana	20	3	8	2	15	2	106	Orange	15	2	6	1.5	7	2	53	Mango	3	2	-	-	-	-	6	Papaya	20	1	6	1	12	1	38	Guava	4	1.5	6	1	12	1	24	Grape	4	1.5	6	1.5	14	1.5	42	Fig	4	1	8	1	15	1	27	Chiku	10	3	6	2	10	2	62	Sitaphal-								Amphal	6	1.5	4	1	8	1	21	<u>Other Crops</u>								Sugarcane	5	3	2	3.5	4	3	105		+8	3.5	+9	2.5	+8	2.5	
	Summer Season		Rainy Season		Winter Season		Total Requirement in acre inches																																																																																																																															
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Orange	15	2	6	1.5	7	2	53																																																																																																																															
Mango	3	2	-	-	-	-	6																																																																																																																															
Papaya	20	1	6	1	12	1	38																																																																																																																															
Guava	4	1.5	6	1	12	1	24																																																																																																																															
Grape	4	1.5	6	1.5	14	1.5	42																																																																																																																															
Fig	4	1	8	1	15	1	27																																																																																																																															
Chiku	10	3	6	2	10	2	62																																																																																																																															
Sitaphal-																																																																																																																																						
Amphal	6	1.5	4	1	8	1	21																																																																																																																															
<u>Other Crops</u>																																																																																																																																						
Sugarcane	5	3	2	3.5	4	3	105																																																																																																																															
	+8	3.5	+9	2.5	+8	2.5																																																																																																																																

Source : Guide to Agricultural Officers (in Marathi).
Directorate of Agriculture (1965).

requirements given here may appear to be on the lower side but we shall come to that aspect later in this section.

With the help of these irrigation water requirements and the linear rates of increase (per year) of irrigated areas under different crops (Table 5.8), increased water used per year in hundred acre-inches is arrived at for individual crops. These are set out in Table 5.11 where the per year quantum of water used for individual crops are presented for Maharashtra and for Irrigation Region 2 (using State irrigation requirements) of Poona Division. Linear increases in crop areas are taken from the Table V-4.

In this Table water-requirements for 'other cereals' (mainly maize), 'other pulses', chillies, 'other condiments' (turmeric and ginger) and 'other non-food crops' are estimated externally. The group of 'fruits, vegetables and miscellaneous food crops' presents some problems in estimating irrigation water requirements. The combined estimate of per acre 48 acre-inches requirement is arrived as follows.

From the break-up available of irrigated area under fruits, vegetables and miscellaneous food in the last four years, i.e. 1968-69 to 1971-72 (for the earlier eight years one single figure was available for this group except for potato) we find that area under 'fruits' is classified under four heads : banana, mango, citrus fruits and 'others'. That 'others' category consists mostly of guava and papaya (both almost entirely irrigated) is obvious from the 'total' (irrigated + unirrigated) cropping pattern table in the Season and Crop Reports. From area figures under guava and papaya we see that the division is

Table 3.11 : Estimates of Increased Water Consumed by Different Crops in Maharashtra (1960-61 to 1971-72)

(Hha = Hundred hectares)

Crop	For Maharashtra				For I. Region 2 of Poona Division		
	Linear rate of increase (per year) of irrigated area (Hha)	Irrigation requirement per acre (Acre-inches)	Estimate of additional water consumed by crops (Hundred acre inches)	Percentage share	Linear rate of increase of irrigated area (Hha p.a.)	Estimate of additional irrigation water consumed by the crops	Percentage share
Rice	47.93	6	710.64	2.45	10.14	150.34	1.06
Wheat	156.06	8	3085.11	10.63	26.83	530.39	3.76
Kharif Jowar	13.04	4	128.89	0.45	-1.34	-13.25	-0.09
Kabi Jowar	-12.05	6	-178.66	-0.62	-23.91	-354.50	-2.51
Total Jowar	0.99	-	-49.77	-0.17	-25.25	-367.75	-2.60
Bajra	16.42	2	81.15	0.28	1.28	6.33	0.04
Other Cereals	10.89	12*	322.92	1.11	5.35	158.64	1.12
Total Cereals	232.27	-	4150.05	14.34	18.35	477.95	3.38
Gram	18.33	5	226.47	0.78	-1.49	-18.41	-0.13
Other Pulses	0.99	5*	12.23	0.04	-0.04	-0.49	-0.00
Total Pulses	19.31	-	238.70	0.82	-1.53	-18.90	-0.13
Total Cereals and Pulses (Foodgrains)	251.58	-	4388.75	15.16	16.82	459.05	3.25

(Continued)

Table 5.11 : (Continued)

Crop	For Maharashtra				For I. Region 2 of Poona Division		
	Linear rate of increase (per year) of irrigated area (Hha)	Irrigation requirement per acre (Acre-inches)	Estimate of additional water consumed by crops (Hundred acre inches)	Percentage share	Linear rate of increase of irrigated area (Hha p.a.)	Estimate of additional irrigation water consumed by the crops	Percentage share
Sugarcane	62.31	105	16167.23	55.85	51.56	13377.99	94.58
Chillies	-2.73	6*	-40.48	-0.14	2.37	35.14	0.25
Other Condiments	2.64	6*	39.14	0.13	-1.14	-16.90	-0.12
Fruits, Vegetables and Miscellaneous Food	68.14	48	8062.24	27.92	9.04 [Ⓢ]	737.18	5.21
Non-food grain food	130.36	-	24248.13	83.76	61.83	14133.41	99.92
Total Food Crops	381.93	-	28636.88	98.92	78.65	14592.46	103.17
Cotton	23.08	8	456.26	1.58	-5.69	-112.48	-0.80
Other Fibres	-0.20	-	-	-	-	-	-
Groundnut	7.06	2	34.89	0.12	-1.52	-7.51	-0.05
Other Oil Seeds	1.26	2	6.33	0.02	0.08	0.40	0.00
Fodder Crops	2.11	19	99.07	0.34	-2.80	-131.46	-0.93
Other Non-food Crops	-14.40	8*	-284.66	-0.98	-9.97	-197.09	-1.39
Total Non-Food Crops	18.91	-	311.79	1.08	-19.90	-448.16	-3.17
Gross Irrigated Area	400.84	-	28948.67	100.00	58.75	14144.32	100.00

Growth rates and linear rates calculated by the regression method.

* Estimated externally.

Ⓢ Requirement taken as per acre 33 acre-inches instead of 48 acre-inches estimated in case of Maharashtra because of relatively smaller component for banana. For fodder crops, per acre requirement for I. Region 2 is same as for State at 19 acre-inches.

approximately 82.18 per cent. Using these as the weights for the per acre irrigation requirement of these crops of 24 and 38 acre-inches respectively, we arrive at the per acre requirement for 'others' (fruits) at 26.52 acre inches, rounded to 27 acre inches. Now the division of irrigated area for last four years for banana, mango, citrus fruits and 'others' is 48:2:35:15 (per cent) while the per acre irrigation requirement (according to Table 5.10) for these crops are 106, 6, 53 and 27 acre-inches respectively (the last mentioned being an estimate as described above). Applying area shares as weights to these irrigation requirements, one arrives at the per acre requirement for fruits as a whole, at 74 acre-inches.

For vegetables group, last four years give area figures for potato, onion and other vegetables separately. The per acre water requirements externally estimated are at 30 acre-inches for all these crops and hence the area shares do not really matter, but incidentally, they are 9:47:44 per cent respectively. Thus this group of 'vegetables' has a per acre requirement of 30 acre-inches. For 'miscellaneous food' we have put an estimate of 20 acre-inches which is external to the table of rates given earlier.

Now last four years give area shares for fruits, vegetables of miscellaneous food at 42:53:5 per cent respectively while the per acre irrigation requirements as seen above, come to 74, 30 and 20 acre-inches respectively. Applying the area shares as weights, one arrives at the combined per acre water requirement for the group at 48 acre-inches.

Regarding 'fodder crops' as a group, similar procedure is adopted. From the last four years we see that

lucern (with high per acre irrigation requirement of 36 acre-inches) forms 30 per cent of area while other fodder crops mainly consisting of jowar form 70 per cent of area. With the irrigation requirement of 36 acre-inches for lucern, of about 12 acre-inches (externally estimated) for jowar, the per acre water requirement for 'fodder crops' as a group comes to 19 acre-inches per year. In all these calculations we are aware that it is not the absolute area shares that are directly relevant but the shares in linear increases in State irrigated area. However, in the absence of independent series for these crops, area shares for last four years are used. Further, in our estimation by last four year's area, banana and lucern turn out to be the important crops and from the total (irrigated + unirrigated) cropping table in the Season and Crop Reports where area for banana and lucern are available for all the twelve years, we know that both the crops have good growth rates. For banana, growth rate is 4.20 per cent per annum (and linear rate of 12.17 Hha) and for lucern the growth rate is 3.50 per cent per annum (linear rate 4 Hha per annum). Regarding the shares of fruits and vegetables, in 'fruits, vegetables and miscellaneous feed crops' based on last four years, it may be pointed out that total (irrigated + unirrigated) fruits and total vegetables have growth rates of 3.50 per cent per annum (26.66 Hha in linear terms) and 3.50 per cent per annum (32.80 Hha in linear terms). The ratio of rates of fruits to vegetables (both total) in linear terms is 1:1.25. If we assume that irrigated fruits and vegetables also have linear increases with a similar ratio (not an unreasonable assumption by any means) then the ratio based on last four years area for irrigated fruits and vegetables of 42:53 per cent or 1:1.23 is

quite satisfactory. Hence the use of irrigated area for last four years for these crops are not likely to lead us astray in our estimation of increased water consumed by these crops.

From this Table (Table 5.11) one can see that for the State, foodgrains as a whole have a share of just over 15 per cent while sugarcane has a share of 56 per cent, nearly four times the share for foodgrains. Fruits, vegetables and miscellaneous food crops group has a share which is nearly twice the share for foodgrains at 28 per cent. On the whole, 'non-foodgrain food' category has a share in increased consumption of irrigation water five and a half times the share for foodgrains. Thus the share of foodgrains is indeed small. Applying the same per acre water requirements to linear increases of area for I. Region 2, we find that this region covers 49 per cent of increased irrigation water consumed in the State (last row of the Table) and further, as much as 95 per cent of the increased irrigation water consumed in the region has gone to sugarcane. Thus our earlier contention that estimate of share of I. Region 2 in increased irrigation facility based on linear rates of net (or gross) area irrigated area of 13.27 per cent (14.66 per cent for gross) are underestimates is further vindicated here with the region's share of 49 per cent in increased irrigation water consumed. Applying State rates of water requirements to a particular region may appear inappropriate but we note that upward revision may be required for foodgrains only (I. Region 2 is a low rainfall area) and the meagre share of just over 3 per cent for foodgrains in increased irrigation water consumed in I. Region 2 is not likely to improve significantly even with an upward revision of water requirements. We had maintained earlier that use

of increased irrigation facility for high water requirement crops in I. Region 2 has had a retarding effect on the growth of irrigated area in Maharashtra and the present table provides further evidence for the argument.

As for the appropriateness or otherwise of the (official) water requirement rates for the State itself, one may concede that per acre six acre-inches requirement for rice is on the lower side. But on the other hand major area increases in irrigated rice come from Bhandara, Chandrapur districts (Nagpur Division) and Kolhapur (Poona Division) with more than 55 per cent share in State area increase in irrigated rice and these three districts are high rainfall areas with lower irrigation water requirements.

But let us look at this matter from another angle. From the present irrigation rates, Table 5.11 shows that for foodgrains as a whole, the linear rate of increase of area per year is 251.58 hundred hectares (Hha) while the water consumed by this area comes to 4388.75 hundred acre-inches (per year). Thus we arrive at per acre irrigation water requirement for foodgrains of 7.06 acre inches. Let us more than double this per acre requirement to 15 acre inches and look at the shares of foodgrains, sugarcane and 'fruits, vegetables, miscellaneous food' in increased water consumed, leaving water requirements of other crops unchanged. For the State as a whole, foodgrains' share becomes 27.52 per cent, share for sugarcane reduces from 56 to 48 per cent and the share for fruits, vegetables groups reduces from 28 to 24 per cent (these estimates not presented in the Table). Thus the share of foodgrains does not improve significantly and the essential conclusion that increased irrigation

is diverted mainly to 'non-foodgrain food' category with the share of 70 per cent and especially to sugarcane, remains unaffected. Similar application of per acre requirement of 15 acre-inches for foodgrains to I. Region 2 gives us a share for foodgrains at 4.36 per cent, not much of an improvement over 3.24 per cent obtained earlier and share of sugarcane in water used marginally reduces from 94.58 per cent to 93.50 per cent. The share of I. Region 2 in increased irrigation water consumed in the State becomes 42 per cent and the conclusion that I. Region 2 has had a significantly larger share in increased irrigation facility but devoted a meagre share to foodgrains remains unaffected.

Or let us disregard altogether the water requirements adopted in the present exercise based on the above-mentioned guide by the Directorate of Agriculture and use an entirely different table of rates with much higher requirements for foodgrains. In Table V-5 irrigation requirements of different crops available in "Report of the Fact Finding Committee for Survey of Scarcity Areas, Maharashtra State (1973)", Vol. I, p. 168, are presented. Here rice has a much higher requirement of 32 acre-inches, jowar near 18 acre-inches, etc. Using these rates we find that foodgrains share in increased consumption of irrigation water comes to 29 per cent, sugarcane share is further reduced but is still high at 39 per cent and fruits-vegetables share is 28 per cent. 'Non-foodgrain food' category still covers 68 per cent of increased consumption.

Thus on the whole we can say that share of foodgrains share in increased consumption of water is between 15 to 30 per cent, of sugarcane between 40 and 56

per cent and of fruits-vegetables between 24 and 28 per cent. The share of sugarcane is likely to be much higher than the lower estimate of 40 per cent because it is widely accepted that sugarcane is given irrigation by farmers much in excess of its requirement. One must view with seriousness the enormous consumption of increased irrigation by the 'non-feedgrains food' category consisting mainly of sugarcane and fruits-vegetables to the tune of 68 to 84 per cent especially with the negative performance of foodgrains production.

Equity and Economical Use of Irrigation Water

5.12 Apart from the obvious need for diverting irrigation to feedgrains to boost production to cope with increasing population, such a measure is called for on the grounds of equity also. Barely one to two per cent of the State gross cropped area is under sugarcane and it does not need proof that a negligible proportion of farm families are engaged in sugarcane cultivation. On the other hand, a very large part of investment in agriculture is in irrigation (80 to 90 per cent as we shall see later) and with the profitability of sugarcane cultivation mentioned in Section 5.10, it is clear that benefits are derived by a very small segment of rural population. This has resulted in large inequalities of income. Even within a given district the prosperity in the sugarcane tract is contrasted by poverty of multitude of average farmers who have to face the recurring drought conditions, not to mention the regional imbalances created with the concentration of sugarcane in Western Maharashtra.

Instead of the concentrated use of water, it is in the interest of the State (to cope with increasing population) and the farmers as a whole (who have to face adversities year after year) to spread this important resource.

Thus on the important grounds of equity and regionally balanced growth, conditions will have to be created where it is profitable to use irrigation for foodgrains cultivation.

Now let us take up the related aspect of economics of water use. Is large scale use of irrigation water generating higher total income than the income that would be generated if same amount of water is used for cultivation of foodgrains? We give this aspect importance secondary to the equity aspect. Nevertheless, let us examine the economics of water use.

From the Report of the Fact Finding Committee for Survey of Scarcity Areas in Maharashtra State (1973) we find evidence that income generated per unit of water used for sugarcane and banana is in fact smaller than most of foodgrains, contrary to the impression given by the high preference for sugarcane by farmers in irrigated tracts. In Table V-5, the last two columns give figures of net returns per unit of water and per unit of land. The Report points out that in terms of returns per unit of land sugarcane and banana rank very high⁵ and this is the reason why a farmer prefers sugarcane cultivation. Rather than raising a foodgrain crop and assuring economical use of water, a farmer would naturally prefer sugarcane cultivation

⁵ For such a comparison one considers two or three foodgrain crops against one annual crop of sugarcane.

and earn much higher net return per unit of land.

Obviously, by appropriate measures this anomaly between interest of the society and interest of an individual should be removed.

It should be remembered that these returns are worked out at 1972 prices and one can conceive a situation in which prices are so favourable to sugarcane that returns per unit of water also exceed those for foodgrains. Hence apart from the economical use of water, on the grounds of equity alone irrigation should be made widely available rather than in concentrated tracts so that multitude of average cultivators would benefit too. The production of foodgrains would also be much greater and this will help in coping up with the rising population. But for this foodgrains cultivation under irrigated conditions should be made sufficiently attractive vis-a-vis sugarcane and other commercial crops by containing price fluctuations and by a judicious mixture of incentive and disincentives.

5.13 Thus on the whole one can conclude from the present analysis that the resource of irrigation facility available in Maharashtra, although meagre, has not been used in the desired direction over the twelve year period under consideration. As stated earlier the decline or stagnancy of foodgrains must have been patent half-way through this period and yet, foodgrains received neglect in the matter of irrigation.

In Maharashtra, foodgrains production is vulnerable to vagaries of nature and it is through irrigation that stability and growth of foodgrains production can be achieved. With considerable investment taking place in irrigation on government (and private)

account it is imperative that the increasing irrigation facility be utilised in the desired direction. With the modern technology of agriculture in the form of improved and hybrid seeds, use of fertilizers, etc., being dependent on assured irrigation, large increases in foodgrains production can be achieved through increased use of irrigation in the cultivation of foodgrains. But from the example of Region 2 it is apparent that sugarcane is consuming a substantial part of increased irrigation. It should be remembered that along with irrigation, sugarcane takes away best of lands and other scarce resources. Data on fertilizer consumption, for example, show that these very districts of Region 2 figure among the top fertilizer consuming districts in the State and it is easy to see where it is being utilized. We also saw earlier that in this region along with every new well there are more than two new pump-sets for which land development banks advance loans at cheaper rates. Thus a significant part of this public and private investment is also towards cultivation of this crop. Further, sugarcane is coming to be preferred in other regions too, as pointed out earlier, but these districts are beginners and the impact of sugarcane growth is not as visible as in case of Region 2. However, if the present trend continues, foodgrains may start suffering in these regions also over a period of time.

One may argue that if Maharashtra has certain advantage over other States, there is nothing wrong in concentrating on sugarcane production. However, sugarcane is not a crop widely grown in Maharashtra (sugarcane farming barely 1.10 per cent of gross cropped area in the State at the end of the period under study). Sugarcane consumes between 40 and 56 per cent of total

additional water consumed by the crops over the period. Farmers prefer sugarcane for irrigated cultivation because per unit of land it gives very high net returns but net returns per unit of water consumed by sugarcane are low, lower than even cereals. Thus the scarce resource of irrigation is not being economically used. On the other hand with a very small segment of farmers receiving the benefits, large inequalities are being created. On the ground of equity and economical use of water, irrigation needs to be diverted to the widely grown foodgrains.

Table V.1 : Compound Growth Rates (GR) and Linear Rates of Increase (LRI) of Net Irrigated Area according to sources of Irrigation for Maharashtra (1960-61 to 1971-72)
(Growth Rates in per cent per annum and Linear Rates of Increase in hundred hectares per annum calculated by regression method)

District	Canals		Tanks		Wells		Other Sources		Total	
	LRI	GR	LRI	GR	LRI	GR	LRI	GR	LRI	GR
2. Thana*	-	-	-	-	0.45	1.29	-0.17	-6.99	0.28	0.68
3. Kolaba	0.69	4.46	-	-	0.56	2.89	0.49	8.94	1.74	4.26
4. Ratnagiri	-2.24	-5.77	-0.50	-14.33	-0.57	-1.45	3.07	7.32	-0.24	-0.29
5. Nasik	6.77	3.38	-	-	35.78	9.05	0.50	12.43	43.05	7.20
6. Dhulia	5.21	4.14	-1.10	-24.52	28.73	9.68	0.26	8.26	33.09	7.71
7. Jalgaon	15.62	33.91	-	-	25.71	5.55	0.68	4.45	41.59	7.85
8. Ahmednagar	-2.08	-0.44	-1.32	-23.45	14.28	1.40	-0.43	-16.41	10.45	0.71
9. Poona	0.82	0.18	1.15	13.95	-2.90	-0.55	8.30	18.06	7.36	0.73
10. Satara	-7.52	-2.12	-0.74	-19.81	3.53	0.96	4.95	13.48	0.22	0.03
11. Sangli	0.08	-1.44	-	-	1.97	0.49	8.42	20.09	10.39	2.06
12. Sholapur	2.95	1.25	-2.23	-15.86	0.30	0.04	0.54	14.95	1.55	0.14
13. Kolhapur	0.54	2.97	-0.18	-4.84	0.93	0.75	11.36	4.12	12.65	2.99
14. Aurangabad	6.39	38.20	1.23	30.87	19.14	3.15	0.45	15.21	27.22	4.25
15. Parbhani	6.41	60.21	0.72	20.84	2.94	2.09	0.18	5.18	10.24	6.57
16. Bhir	3.05	NC	9.20	12.61	-1.07	-0.34	0.43	11.56	11.62	2.61
17. Nanded	7.82	64.57	2.03	10.50	4.51	4.62	0.21	10.74	14.58	10.41
18. Osmanabad	3.05	7.98	1.56	37.20	25.99	4.83	0.34	8.14	30.98	5.31
19. Buldhana	1.46	33.16	-0.05	-0.72	2.30	1.54	0.60	3.50	3.71	2.47
20. Akola	0.46	14.98	-0.07	0.00	5.41	10.61	0.36	7.01	6.16	11.24
21. Amraoti	-0.11	-2.15	-	-	8.08	7.99	0.07	-0.05	8.03	7.83
22. Yeotmal	0.52	22.77	0.12	1.21	3.49	8.34	0.32	12.46	4.46	9.78
23. Wardha	0.99	26.63	-	-	3.05	4.75	0.01	0.71	4.05	5.84
24. Nagpur	3.43	4.58	0.94	1.45	6.97	4.00	0.06	0.46	11.41	3.44
25. Bhandara	3.82	1.41	3.25	0.32	2.41	8.11	1.72	8.02	11.21	0.87
26. Chandrapur	2.16	1.22	9.83	1.24	0.72	4.66	1.86	5.33	15.24	1.49
MAHARASHTRA	60.43	2.24	24.24	1.18	192.75	2.80	43.25	7.73	320.67	2.63

* Bombay district (No. 1) deleted as agriculturally it is of least importance.
NC = Not calculated because of very low level of values for the series.

Table 9.2 : Compound growth rates and linear rates of increase of sources of irrigation for Maharashtra (1961-61 to 1971-72)
(Compound growth rates (CR) in per cent per annum, linear rates of increase (LRI) in absolute terms p.a. calculated by the regression method)

District	Canal length in kms.		No. of tube wells		No. of wells for irrigation purpose only		No. of oil engines		No. of oil engines with pumps for irrigation purposes (Rates based on Livestock Censuses of 1961, 1966 and 1972)		No. of electric pumps for irrigation purposes (Rates based on Livestock Census of 1961, 1966 and 1972)	
	LRI	CR	LRI	CR	LRI	CR	LRI	CR	LRI	CR	LRI	CR
2. Thana*	-	-	-	-	-65.47	-1.07	20.36	4.77	-5.41	-0.69	70.25	7.60
3. Kolaba	0.23	0.53	-	-	23.88	0.61	34.26	23.59	15.55	2.80	168.21	64.30
4. Ratnagiri	-6.60	-0.83	-	-	-66.08	-0.51	34.52	11.62	32.68	12.00	51.57	41.40
5. Nasik	-8.00	-1.02	-	-	1116.04	1.82	1006.90	10.13	1275.80	11.00	1127.55	53.10
6. Dhulia	3.47	1.41	-	-	789.84	4.78	1095.14	15.08	629.57	9.70	612.50	50.20
7. Jalgaon	11.76	5.22	-	NC	394.81	1.00	402.92	5.47	-1115.04	-1.81	1573.67	44.60
8. Ahmednagar	74.63	4.13	-	-	193.23	0.27	427.50	4.56	1146.03	7.70	2246.30	62.90
9. Poona	9.71	1.35	-	-	1839.17	3.93	573.40	14.75	603.82	6.90	738.66	49.10
10. Satara	10.34	0.16	-	-	686.92	2.05	553.74	13.45	462.94	9.80	419.71	53.00
11. Sangli	2.36	0.47	-	-	944.98	2.57	761.65	15.89	709.75	9.60	1270.57	56.90
12. Sholapur	10.48	1.28	-	-	439.56	0.88	905.00	20.81	1132.37	13.90	588.29	68.50
13. Kolhapur	-2.24	-5.75	-	-	306.11	2.39	488.76	5.82	431.66	4.50	566.98	36.10
14. Aurangabad	19.67	54.97	-	-	2948.12	5.66	1356.56	18.80	1016.56	13.50	763.16	43.10
15. Parbhani	22.66	83.82	-	-	706.22	3.85	293.08	54.16	221.41	16.10	650.83	64.00
16. Bhir	29.58	NC	0.31	NC	-244.43	-0.80	406.70	23.79	291.04	15.40	197.81	50.30
17. Nanded	19.82	86.01	-	-	370.91	4.46	96.30	6.98	81.25	8.20	326.33	54.00
18. Osmanabad	18.74	23.77	-	-	1544.88	5.74	1084.71	16.97	1020.42	15.80	714.85	55.50
19. Buldhana	0.22	24.62	0.40	16.69	773.96	4.80	225.50	12.46	196.24	10.30	620.81	36.10
20. Akola	1.66	31.54	1.12	8.48	422.74	7.31	124.07	14.19	112.57	12.20	310.12	20.10
21. Amravati	0.03	0.24	0.14	9.11	640.85	3.93	17.96	1.80	27.21	2.00	659.00	16.20
22. Yeolaal	6.18	30.27	-	-	401.59	5.92	88.34	11.89	98.55	11.50	289.76	27.30
23. Wardha	2.10	33.60	1.90	20.48	303.66	3.76	26.85	5.24	49.34	7.20	378.29	19.90
24. Nagpur	1.28	2.65	12.96	18.25	573.09	2.50	37.13	2.99	66.45	4.80	538.20	14.60
25. Bhandara	-25.73	-6.20	19.42	58.05	176.19	1.88	63.01	18.40	95.29	21.50	109.97	35.90
26. Chandrapur	11.46	5.22	13.00	14.92	149.14	2.09	70.55	21.27	70.58	16.40	32.52	29.50
Maharashtra	215.16	1.63	49.57	20.53	15354.61	2.49	10173.67	11.71	9655.56	9.20	14025.52	33.20

* Bombay district (No. 1) deleted as agriculturally it is of least importance.

NC = Not calculated because of very low level of or irregularity in values for the series.

Table V.3 : Cropping Pattern of Irrigated Crops in Maharashtra State for the Years 1960-61 to 1971-72

		Rice	Wheat	Kharif Jowar	Rabi Jowar	Total Jowar	Bajri	Other Cereals	Total Cereals	Gram	Other Pulses	Total Pulses	Total Cereals and Pulses (Food grains)	Sugarcane
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1960-61	(1)	2724	1386	77	2581	2659	327	124	7220	378	63	441	7661	1552
	(2)	22.36	11.38	0.64	21.19	21.83	2.68	1.02	59.27	3.10	0.52	3.62	62.89	12.74
	(3)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1961-62	(1)	2660	1413	91	2731	2822	337	134	7366	363	76	439	7805	1511
	(2)	21.55	11.45	0.74	22.14	22.88	2.73	1.09	59.71	2.94	0.62	3.56	63.27	12.49
	(3)	97.65	101.95	118.18	105.81	106.13	103.06	108.05	102.02	96.03	120.63	79.55	101.88	99.29
1962-63	(1)	2809	1414	122	2829	2951	324	147	7645	327	70	397	8042	1351
	(2)	21.98	11.06	0.95	22.14	23.09	2.53	1.15	59.81	2.56	0.55	3.11	62.92	10.57
	(3)	103.12	102.02	158.44	109.61	110.98	99.08	118.55	105.89	88.51	111.11	90.02	104.97	87.05
1963-64	(1)	2842	1444	105	3019	3124	314	142	7866	351	87	438	8304	1369
	(2)	21.65	11.00	0.80	22.99	23.79	2.39	1.08	59.91	2.67	0.66	3.33	63.24	10.43
	(3)	104.33	104.18	136.36	118.97	117.49	96.02	114.52	108.95	92.86	138.10	99.32	108.39	88.21
1964-65	(1)	2872	1586	101	3023	3124	356	142	8082	388	109	497	8579	1587
	(2)	21.67	11.63	0.74	22.16	22.90	2.61	1.04	59.25	2.85	0.80	3.65	62.90	11.64
	(3)	105.51	114.43	131.17	117.13	117.49	108.87	114.52	111.94	102.65	173.02	112.70	111.98	102.26
1965-66	(1)	2429	2050	102	3059	3161	276	193	8169	442	71	513	8682	1709
	(2)	17.93	14.77	0.73	22.04	22.77	1.99	1.39	58.85	3.19	0.51	3.70	62.55	12.31
	(3)	91.37	147.91	132.47	118.52	118.86	84.40	155.65	113.14	116.93	112.70	118.33	113.33	110.12
1966-67	(1)	2897	2110	103	2800	2943	449	204	8603	387	74	461	9064	1560
	(2)	20.50	14.93	0.73	20.09	20.82	3.18	1.44	60.87	2.74	0.52	3.26	64.13	11.05
	(3)	106.35	152.24	133.77	110.03	110.68	137.31	164.52	119.16	102.38	117.46	104.53	118.31	100.52
1967-68	(1)	3000	2214	175	2840	3015	420	191	8840	478	58	536	9376	1582
	(2)	20.32	15.00	1.18	19.24	20.42	2.85	1.29	59.88	3.24	0.39	3.63	63.51	10.72
	(3)	110.13	159.74	227.27	110.03	113.39	128.44	154.03	122.44	126.45	92.06	121.54	122.39	101.93
1968-69	(1)	3075	2349	229	2700	3009	493	250	9176	536	111	647	9823	2013
	(2)	19.75	15.09	1.47	17.86	19.33	3.17	1.50	58.94	3.44	0.72	4.16	63.10	12.93
	(3)	112.89	169.48	297.40	107.71	113.16	150.76	201.61	127.09	141.80	176.19	146.71	128.22	129.70
1969-70	(1)	3137	2629	217	2675	2892	512	272	9442	698	160	658	10100	2218
	(2)	19.33	16.20	1.34	16.48	17.82	3.15	1.67	58.17	3.07	0.98	4.05	62.22	13.67
	(3)	115.16	189.88	281.82	103.64	108.76	156.57	219.35	130.78	131.75	253.97	149.21	131.84	142.91
1970-71	(1)	3138	2753	207	2395	2602	594	194	9281	462	48	510	9791	2039
	(2)	19.98	17.53	1.32	15.25	16.57	3.78	1.24	59.10	2.94	0.31	3.25	62.35	12.97
	(3)	115.20	198.63	268.83	92.79	97.86	181.65	156.45	128.55	122.22	76.19	115.65	127.80	131.38
1971-72	(1)	3193	2986	184	2819	3003	310	215	9707	561	57	618	10325	1935
	(2)	19.69	18.41	1.13	17.39	18.52	1.91	1.33	59.86	3.46	0.35	3.81	63.87	11.94
	(3)	117.22	215.44	238.96	109.22	112.94	94.80	173.39	134.45	140.41	90.48	140.14	134.77	124.68

Note : Line (1) : Area in hundred hectares.
Line (2) : Percentage to Gross irrigated Area.
Line (3) : Index of Area.

Table V.3 : (Contd.)

	(17)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
	Chillies	Turmeric and other	Fruits and other crops	Cotton	Semi-hemp and hemp (A. Baddi)	Groundnut	Other Cereals	Fodder Crops	Other Non-food crops	Total Non-food crops	Gross Irrigated Area	Gross Cropped Area	Area (Irrigated + Unirrigated)
1960-61	(1) 635	(2) 5.21	(3) 100.00	(1) 1208	(2) 9.92	(3) 100.00	(1) 87	(2) 5.36	(3) 100.00	(1) 1208	(2) 9.92	(3) 100.00	188236 (6.47)
1961-62	(1) 659	(2) 5.36	(3) 100.00	(1) 1120	(2) 9.08	(3) 100.00	(1) 76	(2) 5.36	(3) 100.00	(1) 1120	(2) 9.08	(3) 100.00	190948 (6.46)
1962-63	(1) 680	(2) 5.32	(3) 107.09	(1) 1260	(2) 9.86	(3) 102.30	(1) 85	(2) 5.32	(3) 107.09	(1) 1260	(2) 9.86	(3) 102.30	189660 (6.74)
1963-64	(1) 743	(2) 5.66	(3) 117.01	(1) 1127	(2) 8.58	(3) 102.38	(1) 66	(2) 5.66	(3) 107.05	(1) 1127	(2) 8.58	(3) 102.38	191774 (6.85)
1964-65	(1) 752	(2) 5.51	(3) 118.42	(1) 1263	(2) 9.26	(3) 102.55	(1) 69	(2) 5.51	(3) 102.55	(1) 1263	(2) 9.26	(3) 102.55	192164 (7.10)
1965-66	(1) 711	(2) 5.12	(3) 111.97	(1) 1364	(2) 9.83	(3) 112.91	(1) 91	(2) 5.12	(3) 108.33	(1) 1364	(2) 9.83	(3) 112.91	189733 (7.32)
1966-67	(1) 734	(2) 5.19	(3) 115.59	(1) 1306	(2) 9.24	(3) 117.27	(1) 92	(2) 5.19	(3) 109.52	(1) 1306	(2) 9.24	(3) 117.27	191917 (7.36)
1967-68	(1) 756	(2) 5.12	(3) 119.05	(1) 1353	(2) 9.89	(3) 121.88	(1) 93	(2) 5.12	(3) 117.69	(1) 1353	(2) 9.89	(3) 121.88	192536 (7.67)
1968-69	(1) 679	(2) 4.36	(3) 106.93	(1) 1220	(2) 9.23	(3) 127.65	(1) 89	(2) 4.36	(3) 108.33	(1) 1220	(2) 9.23	(3) 127.65	193668 (8.04)
1969-70	(1) 697	(2) 4.29	(3) 109.76	(1) 1266	(2) 9.08	(3) 133.27	(1) 95	(2) 4.29	(3) 110.56	(1) 1266	(2) 9.08	(3) 133.27	194351 (8.35)
1970-71	(1) 593	(2) 3.78	(3) 93.39	(1) 1216	(2) 8.68	(3) 150.33	(1) 106	(2) 3.78	(3) 126.19	(1) 1216	(2) 8.68	(3) 150.33	187360 (8.36)
1971-72	(1) 633	(2) 3.90	(3) 99.69	(1) 1278	(2) 8.71	(3) 174.04	(1) 115	(2) 3.90	(3) 136.91	(1) 1278	(2) 8.71	(3) 174.04	181153 (8.95)

Note : Column (20) : Line 1 : Gross cropped area (irrigated + unirrigated)

Line 2 : Gross irrigated area/gross cropped area (percentage)

Table V.4 : Compound Growth Rates (GR) and Linear Rates of Increase (LRI) of Area under Irrigated Crops for Maharashtra (1960-61 to 1971-72)
(Growth rates in Per cent per Annum and Linear rates in hundred hectares per annum calculated by the regression method)

District	Rice		Wheat		Jowar		Bajra		Other Cereals		Total Cereals		Gram		Other Pulses		Total Pulses		Total Cereals & Pulses (Foodgrains)	
	LRI	GR	LRI	GR	LRI	GR	LRI	GR	LRI	GR	LRI	GR	LRI	GR	LRI	GR	LRI	GR	LRI	GR
2. Thana*	-	-	-	-	-	-	-	-	-0.12	-	-0.12	-	-	-	-	-	-	-	-	-
3. Kolaba	0.69	6.50	-	-	-	-	-	-	-	-	0.73	6.80	-	-	-	-	-	-	0.73	6.80
4. Ratnagiri	-1.14	-2.99	-	-	-	-	-	-	0.22	-	-0.92	-	-	-	1.00	-	1.00	-	0.08	-0.39
5. Nasik	1.43	3.40	20.48	10.30	-	-	6.84	N.C.	-	-	30.25	11.10	4.96	-	-	-	4.96	10.40	35.22	11.00
6. Dhulia	3.03	10.10	31.87	12.10	-	-	-	-	-	-	37.00	12.90	1.87	-	-	-	1.87	-	38.87	13.00
7. Jalgaon	4.77	11.10	31.29	15.10	-	-	-	-	-	-	37.99	14.80	4.54	21.80	-	-	4.54	21.80	42.53	15.30
8. Ahmednagar	0.29	2.10	13.55	7.70	-7.60	-1.21	2.53	3.10	0.30	4.00	9.01	1.00	0.06	N.C.	-0.36	N.C.	-0.30	-0.55	8.71	0.90
9. Pune	0.13	0.30	5.34	4.30	4.24	0.90	-4.13	-4.79	0.74	10.10	6.30	0.90	-0.56	-1.30	-2.28	-13.74	-2.82	-4.06	3.48	0.40
10. Satara	2.88	2.30	1.04	0.00	-5.20	-1.72	0.88	1.40	0.44	0.60	0.06	-0.03	-2.40	-4.70	1.21	11.00	-1.19	-2.08	-1.13	-0.18
11. Sangli	3.90	10.90	1.61	2.00	-1.78	-1.35	0.81	4.70	0.12	0.50	4.69	1.70	-0.56	N.C.	0.70	N.C.	0.14	-0.46	4.83	1.60
12. Sholapur	-1.28	-4.99	5.22	3.80	-15.50	-2.84	1.19	2.20	3.75	7.00	-6.65	-0.78	2.03	7.10	0.66	6.50	2.89	7.40	-3.95	-0.41
13. Solapur	4.22	12.10	0.07	0.20	-	-	-	-	0.07	0.20	4.94	7.10	-0.06	N.C.	-	-	-0.06	N.C.	4.88	6.90
14. Aurangabad	0.73	5.20	8.03	4.80	2.27	0.70	4.59	N.C.	-0.15	-2.75	15.48	3.40	3.76	5.50	-	-	3.19	4.40	18.66	3.50
15. Parbhani	0.90	12.00	3.08	9.37	0.34	0.10	-	-	-0.16	-1.81	4.27	6.80	1.11	N.C.	-	-	1.11	N.C.	5.38	8.10
16. Bhir	-0.01	-1.07	1.91	2.90	7.02	2.60	1.47	6.40	-	-	10.23	2.80	1.22	4.40	0.08	1.00	1.29	3.70	11.52	2.80
17. Nanded	0.01	-1.87	5.02	30.70	-	-	-	-	-	-	6.25	9.10	0.95	N.C.	-	-	0.95	N.C.	7.20	10.20
18. Osmanabad	0.77	-0.67	4.24	3.40	11.31	4.20	-	-	3.92	25.10	20.57	4.70	0.78	2.10	-0.58	N.C.	0.20	0.40	20.76	4.40
19. Buldhana	-	-	0.91	1.40	0.83	6.90	-	-	-	-	2.47	3.20	0.21	N.C.	-	-	0.21	5.30	2.68	3.30
20. Akola	-	-	4.44	39.20	-	-	-	-	-	-	4.72	39.20	0.12	N.C.	-	-	0.12	N.C.	4.84	38.20
21. Amravati	-	-	4.30	36.90	-	-	-	-	-	-	4.54	37.80	0.22	N.C.	-	-	0.22	N.C.	4.86	33.00
22. Yeotmal	-	-	2.77	31.80	-	-	-	-	-	-	3.13	31.80	-	-	-	-	-	-	3.13	28.30
23. Wardha	-	-	2.97	17.30	-	-	-	-	-	-	3.50	17.30	0.18	N.C.	-	-	0.18	N.C.	3.68	19.50
24. Nagpur	3.51	2.80	5.34	9.90	-	-	-	-	-	-	8.99	4.90	0.65	N.C.	-	-	0.65	6.60	9.65	5.00
25. Bhandara	8.07	0.70	1.78	24.30	-	-	-	-	-	-	9.95	0.80	-	-	-	-	-	-	9.95	0.80
26. Chandrapur	14.15	1.40	0.97	17.70	-	-	-	-	-	-	15.24	1.50	-	-	-	-	-	-	15.24	1.50
Maharashtra	47.93	16.60	155.06	8.10	0.99	0.00	16.42	3.90	10.89	6.30	232.27	2.80	18.33	4.30	0.99	0.03	19.31	3.80	251.58	2.90

* Bomba District (No. 1) deleted as agriculturally it is of least importance.
N.C. = Not calculated because of very low level of or irregularity in values for the series.

Table V.5 : Water Requirements and Net Returns Per Unit of Water in Maharashtra

Crop	Life period (days)	Total water require- ment Meters	Per acre require- ment in acre - inches	Net Return (Rs.) (1972 Prices)	
				Per Acft	Per Hectare
A. Cereals					
1. Hybrid Bajri (Kharif)	95	.450	17.72	2832	486
2. Jowar (Rabi)	135	.450	17.72	3313	525
3. Maize (Hybrid)	100	.450	17.72	6261	995
4. Hybrid Jowar (Rabi)	120	.525	20.67	4106	761
5. High Yielding wheat	120	.525	20.67	6003	1112
6. Paddy drilled (Kharif)	135	.825	32.48	2294	670
B. Commercial Crops					
7. Grass-Blue Panic	90	.300	11.81	12743	1350
8. Mung (Kharif)	70	.350	13.78	5785	715
9. Pulses (Kharif)	70	.350	13.78	5533	684
10. Sunflower (Kharif) irrigated	110	.350	13.78	6552	810
11. Grass-irrigated	90	.350	13.78	6255	773
12. Sunflower (Rabi)	110	.525	20.67	5728	1062
13. Groundnut (Kharif)	120	.550	21.65	4859	944
14. Chillies	180	.750	29.53	9336	2473
15. Groundnut (Hot Weather)	115	.900	35.43	5069	1611
16. Potato	100	1.050	41.34	11610	4300
17. Long Staple Cotton (Pre-seasonal)	180	1.050	41.34	5257	1950
18. Vegetables (Rabi)	120	1.125	44.29	4446	1768
19. Onion (Rabi)	135	1.275	44.29	9628	4331
20. Turmeric and Ginger (2 seasonal)	180	1.725	67.91	3172	1925
21. Other Perennials (Orange-Mosambi)	-	1.950	76.77	3596	2477
22. Sugarcane (Plant)	410	3.375	118.29*	2633	3125
23. Grass-Gajraj (Perennial)	-	3.625	142.72	3786	4848
24. Sugarcane (Pre-seasonal)	450	4.050	129.33*	2718	3890
25. Sugarcane (Acsali)	540	4.275	113.77*	3228	4870
26. Banana	525	4.800	131.39*	4134	6992

* Converted to obtain the annual requirement.

Source: Report of the Fact Finding Committee for Survey of Scarcity Areas, Maharashtra State, Vol. I, Appendix No. XIII, p. 168, (1971). No source quoted. Only relevant part of the table reproduced here. Column of per acre requirement in acre-inches added for comparison with Table 5.10.

6. CHEMICAL FERTILIZERS

6.1 In the modern technology of agriculture, chemical fertilizers is an important input and in this chapter, we will examine the growth of fertilizer use in the State. It may be pointed out at the outset, that like irrigation, impact of fertilizer use on production cannot be examined directly. Although fertilizer use is largely dependent upon irrigation, since the production-productivity data on irrigated crops themselves are not available, such direct linking between fertilizer use and growth of output is not possible. The State-level data on consumption of fertilizers are available along-with consumption in individual districts but cropwise break-up of this consumption is not available and we have to resort to indirect methods to relate the fertilizer consumption with irrigation and individual crops. The analysis, thus, is in broad terms only.

Fertilizer Consumption Data

6.2 In Table VI-1 at the end of the present chapter two sets of fertilizer use data are presented for the State as a whole, for the twelve year period from 1960-61 to 1971-72. The data in the first set are taken from Fertilizer Statistics published by the Fertilizer Association of India, where districtwise data are not available for the first eight years. For the last four years (1968-69 to 1971-72) Fertilizer Statistics gives districtwise data also which are incorporated in the Table. For the first eight years i.e. upto the year 1967-68, districtwise data were made available through the courtesy of Mr. Gunavant M. Desai of Centre for

Management in Agriculture, Indian Institute of Management, Ahmedabad. The addition of districtwise data forms the second set of data for the State. One sees a very wide discrepancy between the Fertilizer Statistics State level data (Set I) and the districtwise addition data (Set II) for the first eight years. This is because upto the year 1967-68 Fertilizer Statistics assumes that distribution of fertilizer is the consumption of fertilizer in any given year. We accept data in Set II where there is no change in the definition of fertilizer consumption and where district data are also available.

Growth of Fertilizer Use in the State

6.3 In Table 6.1 fertilizer consumption in the State for the twelve year period is presented. These data are from Set II in Table VI-1 mentioned above. The striking feature of this data is the phenomenal growth of fertilizer use in the State. As the index of nutrients N and P shows, the consumption has increased more than ten times over the twelve year period. The compound growth rates (by the regression method) are as high as 24.40 per cent per annum and 27.00 per cent per annum for nutrients N and P respectively. One must concede that fertilizer use has increased enormously. On the other hand, one should remember that initial quantum of consumption has been rather low considering use of nutrients per hectare and this low initial quantum helps in exaggerating the increase. The last two columns of the table indicate that per hectare use of nutrients N and P in the initial three year period is less than one kg. per hectare for N and less than one-half kg. for P respectively. The recommended dose of

**Table 6.1: Fertilizer consumption in Maharashtra
1960-61 to 1971-72 (Nutrients in tonnes)**

	N (tonnes)	P (tonnes)	N(Kg) per hectare of GCA	P(Kg) per hectare of GCA
1960-61	11780 (100)	7573 4873 (100)	0.626	0.259
1961-62	17017 (144)	5822 (119)	0.891	0.305
1962-63	18714 (159)	7664 (157)	0.987	0.404
1963-64	28969 (246)	9273 (190)	1.511	0.484
1964-65	52044 (442)	14159 (290)	2.708	0.737
1965-66	33601 (285)	18356 (377)	1.771	0.967
1966-67	71758 (609)	18305 (376)	3.739	0.954
1967-68	94175 (799)	44059 (904)	4.891	2.288
1968-69	77574 (659)	34978 (718)	4.005	1.806
1969-70	92143 (782)	30370 (623)	4.741	1.563
1970-71	111238 (944)	52053 (1068)	5.937	2.778
1971-72	129748 (1101)	67480 (1385)	7.162	3.725
Compound Growth Rate (% p.a.) by regression	26.40	27.00		

(Figures in parentheses are indices).

N on the other hand (see Table 6.2) is 12 kg. per hectare of unirrigated bajra or groundnut which is the lowest requirement. It is obvious that initial level of fertiliser consumption is indeed low. At the end of the period things have definitely improved with per hectare dose of N rising to over 7 kg. per hectare of GCA in the last year but this is well below the level of 12 kg. for even the low requirement crops like unirrigated bajra or groundnut mentioned above.¹

Another aspect meriting attention is the fact that even in the scarcity years of 1970-71 and 1971-72 consumption of N and P has been increasing by leaps and bounds. For example the index for use of N increases from 782 in 1969-70 to 944 in 1970-71 and 1101 for 1971-72. We saw earlier that in these two scarcity years, gross cropped area declined notably while irrigated area was stable at a relatively high level. This suggests that the fertilizer use is not widespread and is not related with changes in the gross cropped area. With the large increases in the last two scarcity years, we have no reason to 'curtail' the period as we did in Chapter 4 on Cropping Pattern. Further we use the growth rates and linear rates of increase calculated by the regression method based on the entire twelve-year period as in the previous chapter.

Districtwise Distribution and Growth of Fertilizer Use

6.4 In Table VI-2 at the end of the present chapter, districtwise level of consumption of N and P for initial and end periods along with compound growth rates and

¹ Level of use of fertilizers (N) is itself low in Maharashtra. For example in 1969-70 and 1970-71, N(kg.) per hectare is 4.74 and 5.94 respectively, whereas similar All-India figures are 8.97 kg. and 9.34 kg. for the respective years.

Table 6.2: Recommended Fertilizer Doses for Important Crops in Maharashtra

						(Kg. per hectare)
		F.Y.M. or compost (Cartloads)	N	P	K	Comment
1.	Rice	25-37	45	25	25	For irrigated and assured rainfall areas only (For Taichung Native-1, N 178 kg)
2.	Jowar	12-25	49	25	0	For irrigated crop (For hybrid jowar N 74 kg.)
3.	Jowar	12-25	25	25	0	Unirrigated crop (For hybrid rabi crop N 49 kg)
4.	Bajra	12-25	25	25	0	Irrigated crop (For hybrid crop N 49 kg)
5.	Bajra	12-25	12	0	0	Unirrigated crop
6.	Wheat	25-37	49	12	0	Irrigated crop (Improved varieties require 74-99 kg of N with appropriately higher P)
7.	Wheat	25-37	25	0	0	Unirrigated crop
8.	Sugarcane (Adsali)	99	432	185	185	Sugarcane crop is wholly irrigated
9.	" (Pre-seasonal)	74	371	185	185	
10.	" (Suru)	49	272	124	124	
11.	" (Ratoon)	-	292	124	124	
12.	Groundnut	12	25	49	-	Irrigated crop
13.	Groundnut	25	12	12	-	Unirrigated crop
14.	Cotton	12-25	49	49	25	Assured rainfall areas
15.	Cotton	12-25	99	49	25	Irrigated crop
16.	Cotton	12	12	25	-	Unirrigated crop
17.	Vegetables	30-62	49-99	37-99	-	Irrigated/assured rainfall areas only (Potato, Onion, Cabbage, Cauliflower N 99 kg, Methi, Palak & leafy vegetables N 74 kg, Gu, Cowpea, Beans N 49 kg)
18.	Banana	125-148	300	-	-	

Notes: In the 'comments' column N requirements for hybrid and improved varieties are mentioned. Appropriately, P requirement is also higher but not mentioned here. For pulses, mostly FYM is recommended.

Source: Fertilizer statistics (1970-71) published by the Fertilizer Association of India, pp. 280-291.

linear rates of increase per annum are presented. From this table one sees that there has been an all-round increase in fertilizer use. It was seen earlier that growth rate of use of N at the State level is 24.40 per cent per annum and the growth rates for various districts range from 16.70 per cent per annum (Jalgaon district) to 72.70 per cent per annum (Ehir district), leaving out Kolhapur district with a rather low growth rate of 9.80 per cent, but then this district has had a high level of consumption (in fact highest) in the initial period. On the whole, it appears that districts which had rather low shares in the initial period have registered high growth rates and the distribution of fertilizer use is less uneven at the end of the period. This is particularly true of districts in Aurangabad and Nagpur divisions which had rather low shares in the initial period (most of them with less than 2 percent share). Five districts comprising Aurangabad division had in fact shares (in N) in the initial period of between 0.10 percent (Ehir district) to 1.63 per cent (Aurangabad district) and the growth rates registered range from 40 percent per annum (Aurangabad district) to 72.70 per cent (Ehir district). Share in use of N for the Aurangabad division increased from 1.21 per cent of the State to 3.14 per cent at the end period. One must note here that very high growth rates are also the result of rather low initial shares but there is unmistakable pattern of all-round growth.

We will analyse these data further by separating the top ten districts with high share of State fertilizer consumption in the initial period and the end period. Further we will separate top ten districts with high level of per hectare consumption of fertilizers to take

into account the differences in sizes of various districts. The top ten district with high share in consumption at the beginning and at the end of period (triennial averages at both points) are presented in Table 6.3.

(We consider only consumption of nutrient N for brevity.)

We see that in the initial period the top ten districts consuming fertilizers (N) cover over 74 per cent of total consumption of N while they covered about 44 per cent of State GCA, and the distribution of consumption of fertilizers was uneven in the State. In the end period the top ten districts consume 52 per cent of fertilizers (N) covering 42 per cent of State GCA. Thus there is considerable evening out of distribution of consumption of N. We note that while consumption of N increased over 7 times (looking at triennial averages of Table VI-2), it was relatively evened out at the end of the period.

One interesting fact emerges from the above table. In the initial period barring Akola, Amraoti and Kolhapur districts, all other districts come from the drought-prone areas. The drought-prone areas are also the traditionally irrigated areas with a net work of canals and since fertiliser is used with assured rainfall or irrigated conditions only, one may conclude that most of the fertilizers have been consumed by the irrigated crops in these districts. At the end of the period, barring Kolhapur, all the districts come from the drought-prone areas. Of these, four out of six districts from the Poona division were among the top ten in the initial period. The remaining two districts of Satara and Sholapur find ranks seventh and ninth at the end of the period. In addition, Aurangabad district joins in

Table 6.1: Top ten fertiliser consuming districts in the initial and the end periods of 1960-61 to 1971-72

District	Initial Period (1960-61 to 1962-63)	
	% Share in State Consumption of N	% Share in State GCA
1. Kolhapur	17.81	2.24
2. Jalgaon	9.48	4.56
3. Nasik	8.32	5.13
4. Ahmednagar	8.09	7.06
5. Poona	6.06	5.78
6. Dhulia	5.97	3.99
7. Sangli	5.72	3.60
8. Buldhana	4.59	3.69
9. Akola	4.24	4.07
10. Amravati	3.80	3.64
(State = 100)	74.28	43.72

District	End period (1969-70 to 1971-72)	
	% Share in State Consumption of N	% Share in State GCA
1. Poona	8.91	5.60
2. Kolhapur	7.14	2.18
3. Ahmednagar	6.41	6.70
4. Jalgaon	5.39	4.52
5. Nasik	4.85	4.60
6. Dhulia	4.72	3.67
7. Satara	4.36 4.54	3.44
8. Sangli	4.34	3.30
9. Sholapur	4.20	6.53
10. Aurangabad	4.11	6.92
	54.61	47.66

at the end of the period while Buldhana, Akola, Amravati districts from Nagpur division drop out. Thus on the whole, one can conclude that irrigated crops from the drought-prone areas have received a substantial part of fertilizers (N).

But let us look at the fertilizer-use from another angle. In Table 6.4 we have top ten districts according to the level of fertilizer (N) used per hectare of gross cropped area.

Table 6.4 : Top ten districts according to level of fertilizers (N) per hectare

District	Initial period (1960-61 to 1962-63) Kg of N per hectare	District	End period (1969-70 to 1971-72) Kg of N per hectare
1 Kolhapur	6.64	1 Kolhapur	19.34
2 Kolaba	2.41	2 Kolaba	14.13
3 Jalgaon	1.75	3 Thana	11.90
4 Sangli	1.37	4 Poona	9.42
5 Kasik	1.35	5 Ratnagiri	8.85
6 Dhulia	1.25	6 Satara	7.81
7 Thana	1.19	7 Sangli	7.77
8 Ratnagiri	1.06	8 Wardha	7.34
9 Buldhana	1.04	9 Dhulia	7.23
10 Ahmednagar	0.96	10 Jalgaon	7.05

Here we see that the entire Konkan area of Thana-Kolaba and Ratnagiri districts feature in both the lists. With their lower shares of State GCA these districts could not figure in the earlier list of top ten consuming districts. This area is in assured in fact high rainfall area and rice is the main crop. So presumably rice has received significant part in total fertilizer

used. But on the other hand Bhandara and Chanda districts of Nagpur division (another rice growing area) do not feature in the list. It is difficult to explain why in one area rice crop received fertilizer but not in another which has in fact considerable irrigated rice. Kolhapur district which features first in both the periods has considerable area under rice and sugarcane and obviously these two crops received fertilizers.

6.4 Looking at Tables 6.3 and 6.4 we find that somewhat common list of districts which would explain the use of bulk of fertilizer use. These districts are Nasik, Dhulia and Jalgaon districts (Region II in cropping pattern analysis) and more importantly, the Poona division districts of Ahmednagar, Poona, Satara, Sangli, Shelapur and Kolhapur districts (Region III). As noted earlier, these districts come from the drought prone areas. Let us look at the irrigated cropping pattern (and changes in them) of these districts. In this discussion it is relevant to point out that crops like sugarcane, banana and (to some extent other fruits and vegetables) need large doses of fertilizers and one cannot think of these crops without fertilizers. Hence one can assume a direct relationship between area and growth in area of these crops and growth in fertilizer assumption.

District Nasik

Gross irrigated area increased from 644 Hha to 1023 Hha over the period. Thus a substantial increase in irrigated area is noted. Important irrigated crops are :

Crop	% to district CIA in initial and end period	Growth rate % p.a.	Linear rate of increase in Hha per annum
Wheat	21 - 28	10.30	20.48
Fruits and Vegetables	23 - 22	4.60	9.50
Sugarcane	15 - 11	3.60	4.23
Gram	5 - 7	-	4.96
Rice	6 - 5	3.40	1.43

Area under irrigated wheat (largest irrigated crop) has increased considerably and obviously wheat has received a substantial part of increased fertilizers. Sugarcane is another important crop which has received fertilizer. Among fruits and vegetables, vegetables is the major component and over the years area under onion has almost doubled. Hence onion also appears to be a recipient. Regarding rice, the district has total rice area around 350 Hha with a small irrigated component of over 40 Hha. If the fertilizer input in Konkan area is any indication, the rice crop as a whole is also a recipient of fertilizers.

In List 1² (top ten fertilizer consuming districts) this district figures 3rd in the initial period and 5th at the end of the period. In List 2 (top ten districts with high level of N per hectare of CCA) this district figures 5th in the initial period. Growth rate of fertilizer consumption is : 20.80 per cent per annum.

District Dhulia

N consumption 946 tonnes in the initial period increasing to 5246 tonnes at the end of the period.

² For convenience Tables 6.3 and 6.4 are referred to as 'List 1' and 'List 2' respectively in the discussion that follows.

Growth rate 22 per cent. Figures 6th in List 1 in both the periods. Figures 6th and 9th respectively in List 2. Gross irrigated area : 383 Hha in the initial period rising to 702 Hha at the end of the period.

Important irrigated crops

Crop	% of district GIA in initial and end periods	Growth rate % p.a.	Linear Rate Hha p.a.
Wheat	35 - 53	12.10	31.87
Chillies	30 - 12	-5.09	-5.71
Fruits, vegetables	7 - 8	6.40	2.50
Cotton	1 - 5	32.50	7.69
Sugarcane	7 - 5	3.80	1.06
Rice	4 - 6	10.10	3.03

Wheat again appears to be the outstanding beneficiary. Chillies appear to be the loser. The district had total rice area of 294 Hha which decreased to below 200 Hha over the period. Irrigated rice a small component, 20 Hha in the initial period increasing to 45 Hha at the end of the period.

District Jalgaon

W consumption 1501 tonnes in the initial period increasing to 5983 tonnes at the end period. Growth rate 16.70 per cent per annum. Figures 2nd and 4th in List 1, 3rd and 10th in List 2. Gross irrigated area : 447 Hha initial period, rising to 783 Hha at the end period.

Important irrigated crops

Crop	% district GIA in the initial and end period	Growth rate % p.a.	Linear rate kha p.a.
Wheat	25 - 32	15.10	31.29
Fruits, vegetables	35 - 37	7.90	16.68
Sugarcane	21 - 11	-4.77	-0.87
Rice	8 - 7	11.10	4.77
Pulses	2 - 4	21.80	4.96

In this district also, wheat has been a major irrigated crop and is increasing in area significantly from one-fourth of GIA to one-third of GIA. It is obviously a crop that has received fertilizers (N). Among fruits and vegetables, banana is the dominant crop covering 85 per cent of irrigated area under 'fruits and vegetables' group. The area under banana doubled over the period. Since banana is a wholly irrigated crop with high N requirement of about 300 kg. per hectare, (see Table 6.2) banana has been a major recipient of fertilizers. Surprisingly, the area under sugarcane crop has declined somewhat over the period and hence we may conclude that sugarcane's share in fertilizers has gone down.

On the whole, in the three districts of Nasik, Dhulia and Jalgaon (Region II) wheat, banana, onion and to some extent sugarcane appear to be the crops that have received fertilizers.

District Ahmednagar

N consumption : 1281 tonnes in initial period

increasing to 7123 tonnes in the end period. Growth rate 21.10 per cent per annum. Figures 4th and 3rd in List 1 in the initial and end periods and 10th in List 2 in the initial period only. Gross irrigated area : 1620 Hha in the initial period increasing to 1714 Hha at the end of the period.

Important irrigated crops

Crop	% of district GIA in the initial and end period	Growth rate % p.a.	Linear rate Hha p.a.
Rabi Jowar	38 - 35	-1.21	-7.60
Sugarcane	20 - 27	4.50	17.96
Wheat	8 - 11	7.70	13.50
Bajra	4 - 5	3.10	2.53
Cotton	6 - 5	-9.16	-11.42

Sugarcane crop has had enormous growth in this district and is obviously the major fertilizer consuming crop. Next in importance appears to be wheat. Regarding rabi jowar, no firm conclusion is possible because although it is an major irrigated crop, it appears to have declined in area and it is rather difficult to imagine farmers preferring rabi jowar for use of fertilizers but not for extension of area. Hybrid varieties of jowar are not yet very popular unlike wheat the improved varieties of which are greatly preferred.

District Poona

N consumption : 960 tonnes in initial period increasing to 9892 tonnes in the end period. Growth rate 32.40 per cent per annum. Features 5th and 1st in List 1. In List 2 although it does not feature in

the initial period, it features 4th at the end of the period. Gross irrigated area : 1172 Hha in the initial period increasing to 1211 Hha in the end period.

Important irrigated crops

Crop	% of district GIA in initial and end period	Growth rate % p.a.	Linear rate Hha p.a.
Rabi Jowar	34 - 38	0.90	4.24 4.24
Bajra	10 - 5	-4.79	-4.13
Sugarcane	11 - 13	2.50	3.69
Fruits, Vegetables	8 - 14	10.90	13.06
Pulses	7 - 5	-4.06	-2.82
Wheat	9	4.30	5.34

Rabi jowar is the main irrigated crop and it has shown some increase in area. More than one-third of irrigated bajra lies in this district and this crop has suffered over the period and the area has reduced by nearly half from 122 Hha in the initial period. Sugarcane has had a fair increase but the largest increase is in the category of 'fruits and vegetables'. For this category has its area increasing from about 90 to nearly 175 Hha. Among fruits, banana area is small at 9 Hha and appears to have gone down to about 7 Hha while potato area appears stationary around 30 Hha. It is the area under onion which has doubled from 32 to 72 Hha while other vegetables appear to have increased from approximately 20 Hha to about 50 Hha. Thus it is the vegetables group that has increased substantially and may have received fertilizers. Wheat area has also increased with its linear rate being slightly higher than that for rabi jowar. Besides this district has

over 500 Hha of rice not much of it is irrigated. Although area under (total) rice has gone down, part of fertilisers may be going to this crop.

On the whole vegetables (onion and vegetables other than potato), sugarcane, wheat, jowar (not necessarily in that order) and probably rice appear to be the beneficiaries while bajra has lost half the (irrigated) area and probably its share in the fertilizer consumption.

District Satara

N consumption : 485 tonnes in the initial period increasing to 5039 tonnes in the end period. Growth rate 28.40 per cent per annum. Features in Lists 1 and 2, only in the end period with ranks 7 and 6 respectively. Thus this area has assumed importance recently in N consumption. Gross irrigated area : 1024 Hha increasing to 1044 Hha in the end period.

Important irrigated crops

Crop	% district GIA in the initial and end period	Growth rate % p.a.	Linear rate Hha p.a.
Rabi Jowar	31 - 26	-1.72	-5.20
Bajra	29 - 28	1.40	0.88
Rice	9 - 11	2.30	2.88
Sugarcane	9 - 11	3.60	4.09
Fruits, & Vegetables	15 - 12	-6.47	-7.56
Wheat	10	0.00	1.04
Gram	8 - 7	-4.70	-2.40
Cotton	15 - 5	15.80	5.24

The two major crops of rabi jowar and bajra may have received fertilizers. We note that rabi jowar area has declined while bajra area has increased. Sugarcane area has increased and its share in fertilizers (E) has definitely increased because as pointed out earlier, it is difficult to think of sugarcane crop without large fertilizer doses. Cotton area has also increased significantly. Thus sugarcane, cotton and probably bajra are the recipients of fertilizers. Further, the district had total rice area of 260 Hha of which 40 per cent is irrigated and both irrigated and total rice area have increased area over the period. If, like Konkan area, fertilizer use is high for rice, then rice is also an important recipient of fertilizers. Fruits and vegetables appear to be the losers in fertilizer consumption with large declines in irrigated area.

District Sangli

E Consumption : 937 tonnes in the initial period increasing to 4816 tonnes in the end period. Growth rate 19.10 per cent. In List 1 this district features 7th and 8th in the two periods and in List 2 features 4th and 7th in the two periods. Gross irrigated area: 529 Hha in the initial period increasing to 643 Hha in the end period.

Major irrigated crops

Crop	% share in district CIA in the initial and end periods	Growth rate % p.a.	Linear rate Hha p.a.
Sugarcane	17 - 27	8.70	11.74
Rabi Jowar	15 - 12	-1.78	-5.17
Wheat	13 - 12	2.00	1.61
Kharif Jowar	9 - 7	-0.41	-0.03
Chillies	7	0.90	0.40
Fruits, and vegetables	5	0.80	0.19
Rice	4 - 8	10.90	3.90

Sugarcane is a major crop in this area and has registered a very substantial increase of nearly 12 Hha per year and it is obvious that it has consumed large proportion of fertilisers. Rabi & jowar has declined substantially while wheat has registered modest increase. Irrigated rice has increased at the rate of 4 Hha per year. Rainfed rice has also increased in this district. So sugarcane has consumed large amounts fertilizers and to some extent rice and wheat could be the beneficiaries. Rabi jowar continues to occupy 12 per cent of irrigated area but it is difficult to gauge the extent of fertilizer use. If declining area under the crop is any indication, the fertilizer consumption by rabi jowar has probably declined.

District Sholapur

N Consumption : 507 tonnes in the initial period increasing to 4665 tonnes in the end period. Growth rate 28.80 per cent per annum. Features 9th in List 1 at the end of the period only and does not feature at all in List 2. Thus in absolute quantum this district has made substantial gains but in level of N per hectare it ranks lower than top ten. This is the most drought-exposed district in the Poona Division. Gross irrigated area : 1335 Hha in the initial period, increasing to 1372 Hha at the end of the period.

Important irrigated crops

Crop	% of district CIA in initial and end period	Growth rate % p.a.	Linear Hha p.a.
Rabi Jowar	45 - 36	-2.84	-15.50
Wheat	10 - 11	3.80	5.22
Sugarcane	8 - 9	3.00	3.71
Chillies	5 - 6	1.10	0.77
Fruits, vegetables	5 - 6	3.50	2.83
Gram	1.5 - 4	7.10	2.03
Bajra	3 - 4.5	2.20	1.19

While wheat (because of its relatively high linear rate of increase) and sugarcane (because of its high requirement of N) are obvious recipients of fertilizers, major crops of rabi jowar of this district has gone down considerably and if one accepts the proposition that if area under an irrigated crop is declining, it is also less and less preferred for giving fertilizers, then perhaps the share of rabi jowar has declined.

District Kolhapur

It is the only district of Poona division where only a small part is exposed to scarcity conditions. Most of the district is in high and assured rainfall area with considerable rice cultivation - covering nearly 1000 Hha which is one-fifth of the district CIA. The irrigated area consists mostly of sugarcane.

N Consumption : 2820 tonnes increasing to 7925 tonnes at the end of the period. Growth rate : 9.80 per cent per annum. Features 1st and 2nd in List 1 and 1st in both the periods in List 2. Thus in absolute as well as per hectare terms this district ranks very high. Gross irrigated area : 380 Hha increasing to 500 Hha at the end of the period.

Important irrigated crops

<u>Crop</u>	<u>% of district CIA in initial and end period</u>	<u>Growth rate % p.a.</u>	<u>Linear rate Hha p.a.</u>
Sugarcane	78 - 80	3.00	10.37
Wheat	15 - 17	0.20	0.07
Rice	5 - 10	12.10	4.22

Sugarcane is the obvious major recipient of fertilizers. With the high level of fertilizers per hectare of CIA, it is likely that rice (with irrigated and unirrigated) is also an important recipient of fertilizers.

Regarding Poona division on the whole, it appears that sugarcane, wheat and rice could be the recipients of fertilizers. The phenomenal growth in area under sugarcane and the high requirement of fertilizers for this crop clearly indicate that sugarcane is a major recipient. Irrigated wheat has increased in Ahmednagar district substantially while in other districts relatively moderate increases are recorded. As we shall see later, in area-production-productivity analysis, next to Nasik-Dhulia-Jalgaon districts, production-productivity gains in wheat are reported from Poona division. Regarding rice, the position is rather more uncertain. Although irrigated rice has increased in this division it forms a very small proportion of 'total' rice. As we shall see later, production-productivity has declined for rice in all the districts of this division including the major rice district of Kolhapur. The decline in production and especially productivity may be taken to suggest that rice is not being preferred in allocation of fertilizers over the period.

Then again the three districts of Nasik-Dhulia-Jalgaon and the Poona division districts tell only of a part of the story. As can be seen from Table VI-2, these 9 districts covered 68 per cent of N consumption in the initial period but 50 per cent in the end period although in absolute terms N consumption increased from nearly 11 thousand tonnes to 56 thousand tonnes.

If we leave out Konkan area (Districts 2 to 4) with 8 per cent of N consumption in both the periods and with mainly rice crop, Aurangabad and Nagpur divisions have shown a considerable increase from the initial proportion of 25 per cent to 45 per cent of State N

consumption at the end of the period. Of this, most of the Nagpur division is in assured rainfall area and it is difficult to associate crops with fertilizer use with extent of irrigation being negligible barring Bhandara and Chandrapur districts. In Aurangabad division two of the five districts are in assured rainfall area, and crops like sugarcane or banana which always require high fertilizer doses are not predominant.³ Although irrigated wheat has shown modest increases, irrigated proportion of total wheat area being much smaller than in Nasik-Dhulia-Jalgaon districts and with 'total' productivity of wheat having declined, we cannot firmly say whether wheat is a recipient of fertilizers or whether it is consuming higher amount of fertilizers over the period. If production-productivity is any indication, kharif jowar and sugarcane could be the recipients of fertilizer. But then such conclusions are rather vague and we do not go into analysis of these two divisions (or Regions III and IV) similar to the one undertaken for Regions II and III.

We end up this discussion by pointing out that in Region II (Nasik-Dhulia-Jalgaon districts) wheat and banana are major recipients of fertilizers. (Production of productivity gains in wheat are substantial and one-fourth of wheat being irrigated in the initial period and more than one-half at the end of the period, irrigated wheat has caused these gains in production-productivity as the improved varieties have high N

3 But then in this Region IV of Aurangabad Division production of sugarcane has increased substantially mostly due to increases in productivity, the region having much lower productivity levels than the overall State level in the initial period as we shall see in Chapter 8. Some of this productivity increase is surely due to increased fertilizer use.

requirements). In Region III sugarcane and wheat are clear recipients but about rice and rabi jowar (rabi jowar being the major crop) it is difficult to state the extent of fertilizer use with any degree of certainty. Regarding irrigated fruits and vegetables, Poona district has shown significant increase in vegetables but irrigated potato area has gone down. On the other hand in Satara district, fruits and vegetables area has significantly declined. For this region as a whole, fruits and vegetables area (irrigated) has increased at the rate of 9 Hha per annum and this could be another crop which has received fertilizers.

6.5 So far we tried to associate crops with fertilizer use by considering mainly the irrigated area in regions II and III which are drought prone. But as pointed out above, this is only part of the picture and admittedly vague. Firstly, barring sugarcane and banana we cannot say firmly which crops receive fertilizers (apart from the problem of growth in fertilizer use for individual crops). Then again, we are not certain what is the level of application of fertilizers per hectare of crop which may differ from the recommended doses of fertilizers mentioned in Table 6.2. It is clear that an actual survey with a good area coverage would go a long way in indicating which crops receive fertilizers and the actual level of use of fertilizers per hectare. Undoubtedly, there are empirical studies available but often they refer to particular area and are not of much use to estimate even broadly, cropwise consumption of fertilizers for the State as a whole. Fortunately we have data on the fertilizer use collected in the 26th round of NSS which we can make use of, for the purpose.

National Sample Survey Estimates (1970-71)

NSS data refer to the agricultural year 1970-71. We do not go into the sample design etc. but note that 2573 sample households from 310 villages were selected from various districts in Maharashtra State.⁴ Data in respect of area under different crops reporting application of fertilizers like 'ammonium sulphate', 'superphosphate', 'Urea', 'mixed fertilizers' etc. was collected separately for irrigated and unirrigated crops. We will look at the percentage distribution of fertilizers over various crops and confine the discussion of consumption of N only for brevity, although in tables we will present data for P also. (Here it should be underlined that we are considering a one-point data and we can talk of cropwise distribution of fertilizers consumption of 1970-71 only and this will not help us in assessing growth of cropwise fertilizer use over the reference period of our present study).

NSS data do not say much about area under crops. But it gives percentage distribution of fertilizer consumption for irrigated crops and unirrigated crops separately and for straight fertilizers (ammonium sulphate, urea, superphosphate) and mixed fertilizers. From this it is possible to find out shares of different crops (irrigated and rainfed separately) in total consumption of nutrients N and P with certain assumptions about the N and P contents of mixed fertilizers.

In Table 6.5 percentage distribution of fertilizers consumed (quantity and not nutrients) for irrigated crops are presented. Here we see that percentage share of

**Table 6.5: Percentage Distribution of Fertilizers Consumed
(All Irrigated Crops)**

Crop	Ammonium sulphate	Super-phosphate	Urea	Mixed fertilizers	Other chemical fertilizers
1. Rice	34.44	16.72	6.67	10.73	2.91
2. Jowar	2.38	4.37	6.99	20.33	2.22
3. Bajra	4.29	7.46	7.65	1.21	18.99
4. Maize	-	-	0.09	0.10	0.24
5. Wheat	12.43	24.72	19.85	9.29	5.43
6. Other cereals	-	-	-	-	-
7. Gram	-	0.92	0.21	0.26	0.04
8. Tur	-	-	-	-	-
9. Other pulses	0.60	-	0.17	0.02	-
10. Sugarcane	22.39	22.75	33.52	44.69	57.25
11. Cotton	3.81	0.92	6.58	2.85	8.21
12. Other fibres	-	-	-	-	-
13. Groundnut	0.01	1.30	0.30	0.46	-
14. Other oilseeds	-	-	-	-	-
15. Tobacco	-	-	-	-	-
16. Spices and condiments	6.05	1.74	3.24	0.77	0.20
17. Other crop commodities	13.60	19.08	14.73	9.29	4.51
18. All crops	100.00	100.00	100.00	100.00	100.00
19. Estimated quantity consumed (tonnes)	31612	12772	55167	93001	12116
20. Estimated nutrients consumed (tonnes)	6512	2044	25377	-	-

Sources: The National Sample Survey - Twentysixth Round - July 1971-Sept. 1972, Number 265/3 and 4, table (4.3.2) page 22, July 1976.

each crop in quantity consumption is given for five types of fertilizers. In row 19, actual quantities are given. In row 20, nutrient contents for first three straight fertilizers are given while for mixed fertilizers (and also of 'other chemical fertilizers') no N and P estimates are available. While the quantum of straight fertilizers is over 99 thousand tonnes, that of mixed fertilizers is as high as 93 thousand tonnes and of 'other chemical fertilizers' 12 thousand tonnes. Thus mixed and other fertilizers form more than half the fertilizers in quantity terms and thus form a significant proportion. In Table 6.6 similar cropwise percentage distribution for unirrigated crops is presented. Here straight fertilizers (row 24) are over 62 thousand tonnes while mixed and other fertilizers are 50 thousand tonnes, again a significant proportion for which nutrient contents are not available. Thus to make any meaningful use of this NSS data, we have to tackle this problem of nutrients released by these mixed and other fertilizers.

The Fertilizer Statistics gives distribution of mixed fertilizer statewise and we use this data for 1970-71 (year of reference for NSS study) to arrive at estimates of nutrients released by mixed fertilizers. This use of distribution figures assumes composition of mixed fertilizers is same in consumption of fertilizers covered by the NSS sample. The distribution of mixed fertilizers for the State as a whole for 1970-71 is as follows :

**Table 6.6 : Percentage Distribution of Fertilisers Consumed
(All Unirrigated Crops)**

Crop	Ammonium sulphate	Super-phosphate	Urea	Mixed fertilisers	Other chemical fertilisers
1 Rice	50.45	14.67	28.66	55.36	0.66
2 Jowar	18.36	33.37	19.68	12.62	21.44
3 Bajra	5.80	12.57	12.47	6.05	-
4 Maize	-	-	-	-	-
5 Ragi	0.61	1.90	1.40	0.85	-
6 Wheat	2.96	-	2.42	0.25	0.33
7 Other cereals	0.14	4 -	0.37	0.25	-
8 Gram	0.75	-	-	-	-
9 Tur	0.42	0.27	0.68	1.31	3.58
10 Other pulses	0.85	0.36	2.38	0.95	-
11 Sugarcane	0.04	-	-	-	-
12 Cotton	10.12	15.97	17.37	11.88	24.28
13 Jute	-	-	-	-	-
14 Other fibres	-	-	-	-	-
15 Rape and mustard	-	-	-	-	-
16 Groundnut	1.75	11.46	3.43	6.05	16.30
17 Sesamum	-	-	-	-	-
18 Other oilseeds	0.20	-	0.12	0.46	0.64
19 Tobacco	-	-	-	-	-
20 Spices & condiments	4.78	1.03	6.39	2.06	1.28
21 Other crop commodities	2.42	8.40	4.63	0.98	0.08
22 Not recorded	0.35	-	-	0.93	31.41
23 All crops	100.00	100.00	100.00	100.00	100.00
24 Estimated quantity consumed (tonnes)	29925	13155	19408	46552	3643
25 Estimated nutrients consumed (tonnes)	6164	2105	8928	-	-

Source : National Sample Survey - Twentysixth Round - July 1971-Sept. 1972, Number 265/3 and 4, Table (4.4.2) page 25, July 1976.

<u>Complex Fertilizers⁵</u> <u>Fertiliser</u>	<u>N-P-K</u>	<u>Quantity distributed</u>
1. Ammonium Phosphate Sulphate	(16-20-0)	37 tonnes
2. Diammonium Phosphate	(18-46-0)	102 tonnes
3. Nitrophosphates	(20-10-0)	28798 tonnes
4. Nitrophosphates	(18-18-9)	14241 tonnes
5. Nitrophosphates	(15-15-15)	20416 tonnes
<u>Other Chemical Fertilizers⁶</u>		
6. Ammonium Sulphate Nitrate	(26% N)	545 tonnes
7. Calcium Ammonium Nitrate	(25% N)	220 tonnes
8. Ammonium Chloride	(25% N)	5025 tonnes
9. Triple Superphosphate ⁷	(45% P)	2250 tonnes

The composition of mixed fertilizers indicates that on an average, 100 tonnes of mixed fertilizers released 17.94 tonnes of N and 14.46 tonnes of P. Similarly 100 tonnes of 'other chemical fertilizers' on an average released 18.07 tonnes of N and 12.59 tonnes of P. These rates of N and P when applied to the KSS covered quantities of mixed and 'other fertilizers' in Tables 6.5 and 6.6, give us estimates of N and P for the KSS sample. These estimates for irrigated and un-irrigated crops are as follows :

Estimates of N and P for mixed and other chemical fertilizers in KSS (Nutrients in tonnes)

	<u>Irrigated Crops</u> <u>(Table 6.5)</u>		<u>Unirrigated Crops</u> <u>(Table 6.6)</u>	
	<u>N</u>	<u>P</u>	<u>N</u>	<u>P</u>
Mixed fertilizers	16658	12497	8329	6249
Other chemical fertilizers	2189	1519	658	456
Total	18847	14016	9987	6705

5 Fertilizer Statistics (19 70-71), Fertilizer Association of India, pp. 92-93.

6 Ibid, p. 31.

7 Ibid, p. 50.

Thus for irrigated crops, the straight fertilizers released 31289 tonnes of N while estimate of N release from mixed and other chemical fertilizers comes to 18847 tonnes which is more than half the N released by straight fertilizers. Nutrient P released by straight fertilizers is 2044 tonnes while estimate of P for mixed and other chemical fertilizers comes to 14016 tonnes - seven times the P released by straight fertilizers. Thus mixed fertilizers play a very significant role in the fertilizer use in Maharashtra.

With the gaps in last row of Table 6.5 and 6.6 now filled in by the above-mentioned estimates it is now possible to go one step ahead from the NSS analysis and arrive at shares of each crop in total N and P consumption for irrigated and unirrigated categories separately and then arrive at percentage shares for each crop as a whole in NSS covered consumption of N and P respectively.

These percentage shares for each irrigated crop in consumption of N and P by irrigated crops and similar percentages for unirrigated crops in nutrient consumption by unirrigated crops are given in first two columns under N and P respectively in Table 6.7. In the third column under N and P, share of each crop (irrigated and unirrigated together) in total nutrient consumption in the sample are given.

Several things may be noted from this table. Firstly, from the last row, we see that for irrigated crops N consumption is 50736 tonnes while P consumption is 16060 tonnes giving N:P ratio at 3.16:1. For unirrigated crops N:P consumption is 24079 tonnes: 8810

Table 6.7 : Percentage Distribution of Nutrients Consumed by Crops (Irrigated, Unirrigated and Total)

Crop	Nitrogen			Phosphorous		
	Irrigated	Unirrigated	Total	Irrigated	Unirrigated	Total
1 Rice	11.47	42.92	21.67	10.76	42.86	22.13
2 Jowar	10.64	16.93	12.68	16.60	17.75	17.12
3 Bajra	5.49	8.23	6.40	3.69	7.34	4.97
4 Wheat	14.88	1.77	10.67	10.90	0.21	7.12
5 Other Cereals	0.09	1.24	0.46	0.10	1.23	0.06
6 Gram	0.20	0.19	0.20	0.33	-	0.21
7 Tur	-	0.89	0.29	-	1.18	0.42
8 Other Pulses	0.18	1.43	0.58	0.01	0.76	0.27
9 Sugarcane	36.60	0.01	24.66	43.13	-	27.85
10 Cotton	5.05	13.75	7.86	3.01	13.60	6.69
11 Other fibres	-	-	-	-	-	-
12 Groundnut	0.32	4.20	1.57	0.53	7.92	3.13
13 Other oilseeds	-	0.27	0.09	-	0.37	0.12
14 Spices & condiments	2.66	4.36	3.21	0.86	1.73	1.17
15 Other crop Commodities	12.42	2.69	9.29	10.08	2.75	7.49
16 Not recorded	-	1.12	0.37	-	2.30	0.81
17 Total all crops	100.00	100.00	100.00	100.00	100.00	100.00
18 Estimated quantity of nutrients commodities (tonnes)	50736	24079	74815	16060	8810	24870

tonnes or 2.73:1.⁸ For irrigated and unirrigated crops together, N:P ratio is 748.5 tonnes:24870 tonnes or 3:1 which appears a reasonable one⁹ and our method of estimating N and P releases from mixed and other chemical fertilizers has not led us to unlikely ratios. Secondly, of the total N consumption (henceforward we will again restrict the discussion to consumption of nutrient N only) of 74815 tonnes irrigated crops cover 50736 tonnes or nearly 68 per cent. This is not very surprising as fertilizer use is dependent upon assured irrigation or assured rainfall and as noted in the chapter on 'Scarcity Areas in Maharashtra' nearly 40 per cent of gross cropped area is clearly exposed to drought.

We accept the percentage shares of individual crops as adequately representing the shares at the State level. Then we see that irrigated crops covering 8.38 per cent of gross irrigated area (1970-71) consume 68 per cent of nutrient N. What are the irrigated crops accounting for major part of N consumption? These are as follows :

8 Curiously enough, after admitting that quantum of complex fertilizers concerned is significant in Maharashtra, the NSS report bases N:P ratios on straight fertilizers only and mentions 'high' ratios of 16:1 and 7:1 for irrigated crops and unirrigated crops respectively. See The National Sample Survey, Twentieth Round, Number 265/3 and 4, Fertilizer Use in Agricultural Holding (Rural Sector), July 1976, Chapter IV, p. 18.

9 Admittedly, this ratio is higher than the ratio indicated by State consumption figures for 1970-71 in Table 6.1 which is 111238 tonnes: 52053 tonnes or 2.14:1. But a 3:1 ratio is a considerable improvement over the very high ratios in the above footnote.

Crop	% of N consumption by irrigated crops (NSS)	% of State Gross Irrigated Area (1970-71)
Sugarcane	36.60	12.97
Wheat	14.88	17.54
Other crop commodities (fruits and vegetables)	12.42	11.58
Rice	11.47	19.98
Jowar	10.64	16.57
Cotton	5.05	4.62
(All irrigated crops)	(100.00)	(100.00)

Thus among irrigated crops, sugarcane, while covering nearly 13 per cent of gross irrigated area, accounts for 37 per cent of N consumed by irrigated crops. Sugarcane, of course has a very high N requirement (see Table 6.2). Wheat is next in importance. Most of irrigated wheat is in Nasik-Dhulia-Jalgaon districts in Region II and Ahmednagar, Poona, Satara, Sholapur districts in Region III. Region II districts have recorded a considerable increase in irrigated area. Average yield per acre is also relatively higher for 'total' (irrigated + unirrigated) wheat in this region. Third in importance is 'fruits and vegetables' and we may recall that in the previous chapter on irrigation, these three crops came out as receiving a substantial part of increased irrigation.

Table 6.7 further reveals that among unirrigated crops which account for 32 per cent of total N consumption following turn out as significant.

Crop	% N consumed by unirrigated crops (KSS)	% of State Gross unirri- gated area (1970-71)
Rice	42.92	6.06
Jowar	16.93	31.71
Cotton	13.75	15.59
Bajra	8.23	11.52
(All unirrigated crops)	(100.00)	(100.00)

Now jowar, cotton and bajra have rather low irrigated area (2 to 5 per cent) while rice has 23 per cent area under irrigation. Thus for jowar, cotton and bajra, the production-productivity depends upon the unirrigated components.

When we consider crops as a whole (irrigated and unirrigated components together) following crops emerge as significant, consuming large part of State N consumption.

Crop	% of State N consumption (KSS)	% of State GCA (1970-71)
Sugarcane	24.66	1.09
Rice	21.67	7.22
Jowar	12.68	30.44
Wheat	10.67	4.33
Fruits and Vegetables (other crops commodities)	9.29	1.13
Cotton	7.86	14.67

So far, we considered irrigated and unirrigated crops separately and hence comparison between irrigated and unirrigated crops (and also irrigated and unirrigated components within a crop) is difficult in assessing importance of crops in fertiliser consumption. Using the same material as in Table 6.7, we now present Table 6.8 where taking State N consumption and State Gross

Table 6.8 : Percentage Shares in State M Consumption of Irrigated and Unirrigated Components as Separate Crops

Crop	Percentage share in total M Consumption (MS)		Percentage share in State Cropped Area (1970-71)		Percentage share in State Gross area under Irrigation (1970-71)		
	Irrigated	Unirrigated	Total	Irrigated	Unirrigated	Total	
1 Rice	7.75	13.92	21.67	1.67	5.55	7.22	23.13
2 Jowar	7.19	5.49	12.68	1.39	29.05	30.44	4.57
3 Bajra	3.72	2.68	6.40	0.32	10.56	10.88	2.94
4 Wheat	10.08	0.59	10.67	1.47	2.86	4.33	33.95
5 Other Cereals	0.06	0.40	0.46	0.10	2.11	2.21	4.52
6 Gram	0.14	0.06	0.20	0.25	1.41	1.66	15.06
7 Tur	-	0.29	0.29	-	3.35	3.35	0.00
8 Other Pulses	0.12	0.46	0.58	0.01	8.64	8.65	0.12
9 Sugarcane	24.66	0.00	24.66	1.09	0.00	1.09	100.00
10 Cotton	3.40	4.46	7.86	0.39	14.28	14.67	2.66
11 Groundnut	0.21	1.36	1.57	0.11	4.72	4.83	2.28
12 Other Oilseeds	-	0.09	0.09	0.04	4.38	4.42	0.90
13 Spices and condiments	1.80	1.41	3.21	0.37	0.63	1.00	37.00
14 Other crop commodities (fruits and vegetables)	8.39	0.90	9.29	0.97	0.16	1.13	85.84
15 Not recorded	-	0.37	0.37	0.18	3.94	4.12	4.37
16 Total	67.52	32.48	100.00	8.38	91.62	100.00	8.38

Cropped Area equal to 100, we express percentage shares of irrigated and unirrigated crops in N consumption (NSS based percentages) and in gross cropped area. Thus irrigated and unirrigated components are comparable. Treating irrigated component and unirrigated components of a crop as separate crops, following important crops may be mentioned.

<u>Crop</u>	<u>% of State N consumption (NSS 70-71)</u>	<u>% of State GCA(70-71)</u>	<u>% of total crop area under irrigation (70-71)</u>
Sugarcane irrigated	24.66	1.09	100.00
Rice unirrigated	13.92	5.55	23.13
Wheat irrigated	10.08	1.47	33.95
Fruits & Vegetables irrigated (other crop commodities)	8.39	0.97	85.84
Rice irrigated	7.75	1.67	23.13
Jowar irrigated	7.19	1.39	4.57
(All crops)	(100.00)	(100.00)	(8.38)

These crops together cover 12.14 per cent of State GCA and account for 72 per cent of N consumption in the State. This is rather expected because these are all irrigated crops barring unirrigated rice and it was pointed out earlier that irrigated crops occupying 8.38 of GCA, consume 68 per cent of State N consumption.

Should this get reflected in the growth of production-productivity of individual crops at the State level? It is difficult to say. On the one hand we do not know production-productivity separately for irrigated crops and hence direct reflection in production-productivity cannot be assessed. Further, the importance of individual crops in N consumption need not necessarily imply their

increasing preference for fertilization or even cultivation over a period of time. On the other hand, for crops like sugarcane and fruits and vegetables with the predominance of irrigated component (see last column in the above list) one could relate production-productivity and importance in N consumption. Further, certain districts or regions have large proportion of irrigated area under a given crop (for example rice, wheat, jowar) and total production-productivity in those regions should reflect their importance in N consumption. All this of course requires the assumption that preference for N consumption (in 1970-71) also implies preference for cultivation-extension of area under a crop or higher doses of N. Anticipating the production-productivity growth rates in the following chapters, we present these for the above mentioned crops. It should be mentioned again that area, production-productivity growth rates are for 'total' crops (irrigated and unirrigated together).

Crop	Growth rates of area-production-productivity (1960-61 to 1969-70) Growth Rates % p.a. (60-61 to 69-70)		
	Area	Production	Productivity
Sugarcane	3.90	4.50	0.58
Rice	0.11	-0.76	-0.88
Wheat	-1.04	-0.90	0.14
Jowar (kharif+ rabi)	-0.92	-0.16	0.77
Jowar kharif	0.06	2.20	2.14
Jowar rabi	-1.63	-2.55	-0.94

Now sugarcane is entirely irrigated crop and with its first place in N consumption, the production-productivity could be directly related. Here we see that area, production and productivity have all increased over time.¹⁰

¹⁰ More about this in Chapter 8.

For rice in spite of increased area, production and productivity have both gone down. We note that irrigated and unirrigated rice both figure in important N consuming crops but its performance is rather unsatisfactory. Irrigated rice is mainly in Bhandara and Chandrapur districts (covering 75 per cent of state irrigated rice in 70-71) and within these districts 45 per cent of rice is irrigated. Area production productivity have increased in these two districts (growth rates of production-productivity for Bhandara 0.90 and 0.51 per cent p.a. and for Chandrapur 1.70 and 0.52 respectively). Rice in Konkan area (Thana-Kolaba-Ratnagiri districts covering 31 per cent State rice area in 1970-71) is nearly entirely unirrigated and as noted earlier, these districts had high levels of N consumption per hectare in both initial and end periods. The production and productivity growth rates for these three districts together is 0.24 per cent and 0.62 per cent p.a. respectively (area growth rate being -0.38 per cent) and thus we see that the production-productivity have shown increase. But in rest of Maharashtra declines in production and productivity of rice have overwhelmed increases in Konkan and Bhandara-Chandrapur regions.

Regarding wheat, it should be noted that one-third of the crop is irrigated and irrigated wheat is the consumer of N, unirrigated wheat receiving only half a per cent of total State N consumption (see Table 6.8). Most of the irrigated wheat is in Region II of Nasik-Dhulia-Jalgaon districts whose growth in area under irrigated wheat has been phenomenal. In Poona Division, Ahmednagar, Poona and Sholapur districts (Region III) have good growth rates of irrigated wheat. Proportions of irrigated wheat to total wheat (1970-71) within Regions II and

Table 6.9 : Cropwise N and P Nutrients Consumption (1970-71)

(Nutrients in kilograms per hectare)

Crop	Nitrogen			Phosphorous		
	Irrigated	Unirrigated	Total	Irrigated	Unirrigated	Total
1 Rice	27.72	14.82	17.77	11.52	7.61	8.51
2 Jowar	30.81	1.11	2.47	21.44	0.60	1.55
3 Bajra	69.64	1.49	3.47	20.87	0.68	1.27
4 Wheat	40.73	1.18	14.59	13.30	0.06	4.55
5 Other cereals	3.50	1.12	1.21	1.75	0.57	0.63
6 Gram	3.26	0.25	0.70	2.40	-	0.35
7 Tur	-	0.50	0.50	-	0.34	0.34
8 Other pulses	28.33	0.31	0.39	0.62	0.08	0.08
9 Sugarcane	135.29	-	135.29	71.09	-	71.09
10 Cotton	52.42	1.84	3.17	13.93	0.93	1.28
11 Groundnut	11.31	1.70	1.93	8.26	1.65	1.81
12 Other oilseeds	-	-	-	-	-	-
13 Spices & condiments	28.68	13.08	18.84	4.13	2.66	3.21
14 Other crop commodities fruits & Vegetables	51.54	30.92	48.51	18.65	16.25	18.30

III were 70 per cent, 64 per cent respectively and with the dominance of irrigated wheat, the area-production-productivity growth rates for (total) wheat are as follows :

	Growth Rates for Wheat		
	Area	Production	Productivity
Region II	0.78	4.70	3.89
Region III	0.38	3.30	2.91

Thus it is possible to see some evidence of fertilizer use in these regions. These two regions cover however less than 40 per cent of total area under wheat in the State. The remaining 60 per cent area in Aurangabad (Region IV) and Vidarbha Division (Region V) with limited irrigated proportion have shown declines in the unirrigated wheat and area-production-productivity have gone down significantly in these regions resulting in the total State behaviour of declined area and production and small gain in productivity.

The picture for jowar is rather muddled because although irrigated jowar features in important K consuming crops, less than 5 per cent of jowar is irrigated. While the performance of kharif jowar in production-productivity is on the positive side, kharif jowar is almost entirely unirrigated. The irrigated (and rabi) jowar lies mainly in Poona (76 per cent of state) and Aurangabad (23 per cent, 1970-71) Divisions. In Poona division (Region III) rabi jowar (irrigated) has gone down considerably while in Aurangabad division (Region IV) it has gone up. But within these Divisions, proportions irrigated are again low (9 and 6 per cent respectively) and both these regions show negative performance

in area-production-productivity for rabi jowar. Thus on the whole, N consumption by irrigated jowar cannot be tied up with production-productivity aspects.

Given the paucity of data, this is perhaps the best (which is admittedly vague) one could do in associating crops with fertilizer use and trying to find a reflection in production-productivity performance of these crops. We have anticipated some of the production-productivity results in this chapter but we will present these aspects in greater details in subsequent chapters.

6.6 Now we try to estimate level of N use per hectare for individual crops by taking up the percentage shares obtained from ESS study and applying them to N and P consumptions for the State as a whole. The N and P consumption for the state reported for 1970-71 are 111238 tonnes and 52053 tonnes respectively, while the cropwise shares were as obtained in Table 6.7 from ESS. Dividing by appropriate crop areas in 1970-71 we present per hectare levels of use of N and P in Table 6.9. Comparing these with recommended doses (Table 6.2) we find that for important (areawise) crops like unirrigated jowar, unirrigated bajra and unirrigated cotton the difference is as follows : (We leave out pulses because mostly FYM is recommended for them).

Crop	% of State GCA(1970-71)	Per hectare level of N in kg.	
		Actual use estimates (Table 6.9)	Recommended (Table 6.2)
Unirrigated jowar	29.05	1.11	25
Unirrigated bajra	10.56	1.49	12
Unirrigated cotton	14.28	1.84	12
Unirrigated rice	5.55	14.82	49 (Assured rainfall required)
Unirrigated groundnut	4.72	1.70	12
Unirrigated wheat	2.86	1.18	25

The actual use levels are indeed low and barring unirrigated rice, fertilizers seem to be doing little for these major unirrigated crops covering 67 per cent of the state gross cropped area. Since nearly 40 per cent of State gross cropped area is drought-prone in the sense that not only the extent of rainfall is low in these areas (about 600-700 mm annually) but it is erratic between years and between weeks within a given year, the low level of fertilizer application is rather expected and perhaps this is one of the major reasons of the depressed condition of agriculture in the State. We also note that N estimates of use per hectare for irrigated crops are also lower than the recommended doses especially for sugarcane (135 kg. compared with recommended doses from 272 kg. to 472 kg. depending upon the particular variety of sugarcane) but we note that sugarcane emerges as the highest single consumer of N.

Table VI.1 : Fertiliser Consumption for Maharashtra State and the Districts, 1960-61 to 1971-72 (Tonnes of Nutrients)

Year	As per Fertiliser Statistics (Set - I)		State total as per districtwise statistics (Set - II)	
	N	P	N	P
1960-61	24673	11828	11780	4673
1961-62	34151	5844	17017	5622
1962-63	32602	11011	16714	7664
1963-64	48190	10068	28969	9273
1964-65	55007	19840	52044	14159
1965-66	57626	17113	33601	18356
1966-67	67896	31095	71758	18305
1967-68	96000	50000	94175	44059
1968-69	85000	36000	77574	34978
1969-70	92233	30370	92143	30370
1970-71	111238	51973	111238	52053
1971-72	130148	67400	127743	67400

See Section 6-2 for the description of these two sets of data, viz. Set I and Set II.

(Continued)

Table VI.1 (Continued)

District	2-Thana		3-Kolaba		4-Ratnagiri		5-Nasik		6-Dhulia		7-Jalgaon	
	M	P	M	P	M	P	M	P	M	P	M	P
1960-61	304	146	569	130	319	133	317	158	715	358	955	478
1961-62	406	146	759	130	423	133	1756	666	953	408	1247	637
1962-63	367	183	326	163	430	166	1881	833	1170	510	2302	1143
1963-64	504 ⁶⁵⁴	209	715	229	540	173	2712	868	1600	531	3722	1191
1964-65	1572	274	1402	51	1243	601	3384	503	1796	308	5465	1066
1965-66	1637	247	2188	242	687	764	2512	709	1422	771	1961	687
1966-67	1915	1152	2791	1043	2879	1332	4406	939	2859	460	3492	530
1967-68	4281	1152	1750	1043	2122	1332	7086	3205	5832	2716	8030	4015
1968-69	2309	852	2185	777	2543	1119	4086	1360	3758	1277	4611	1974
1969-70	2509	752	2386	677	2743	1019	4398	1260	4288	1277	4911	1474
1970-71	3219	1294	2929	2382	3369	1614	5389	1859	5218	1899	5934	2702
1971-72	3620	1799	3315	2654	3371	2112	6375	2084	6232	2592	7105	3509

*Bombay District (No. 1) deleted as it is of no consequence agriculturally.

(Continued)

Table VI.1: (Continued)

District	8-Ahmednagar		9-Poona		10-Satara		11-Sangli		12-Sholapur		13-Kolhapur	
	H	P	H	P	H	P	H	P	H	P	H	P
1960-61	987	417	568	184	375	151	706	353	485	155	2531	1021
1961-62	1316	417	757	256	500	151	942	466	647	155	3375	1021
1962-63	1541	521	1554	320	579	189	1163	581	389	194	2553	1276
1963-64	1697	543	1041	333	1061	340	1995	638	674	216	6819	2182
1964-65	5375	923	2737	1579	2654	1176	2227	707	613	260	5916	650
1965-66	1262	1181	2013	1554	2385	1233	2289	1234	788	469	3079	2063
1966-67	2738	1085	5820	1559	2455	1562	2669	1215	1658	230	4458	1187
1967-68	6714	3357	6293	4246	3407	1703	4211	2105	2318	1159	6037	3019
1968-69	4670	1653	5304	1759	3464	1844	2861	2099	2788	1209	4614	2021
1969-70	5770	1653	9477	1659	4154	1344	3761	1373	3888	1809	6714	2001
1970-71	7094	2358	9849	2364	5076	2474	4817	2609	4714	2494	7189	2892
1971-72	8505	3150	10351	3178	5887	2269	5670	2894	5372	3190	9871	3749

(Continued)

Table VI.1: (Continued)

District	14-Aurangabad		15-Parbhani		16-Bhir		17-Nanded		18-Comanabad		19-Buldhana	
	H	P	H	P	H	P	H	P	H	P	H	P
1960-61	225	73	30	15	10	-	83	41	120	59	576	288
1961-62	300	73	42	21	14	-	111	55	160	59	768	294
1962-63	249	91	64	32	25	4	153	76	341	74	838	367
1963-64	296	95	160	51	211	87	271	87	240	77	1198	383
1964-65	1091	223	930	232	83	-	479	731	968	119	4243	1094
1965-66	1195	365	1040	618	766	220	1067	295	627	571	1357	1522
1966-67	3567	423	2572	264	2645	178	1968	426	2058	530	3302	474
1967-68	5177	2588	1842	921	736	154	1425	426	2724	1141	6137	3068
1968-69	3340	1711	2875	1541	1417	1410	2962	1658	2581	1384	2285	1180
1969-70	3790	1011	3325	441	1787	810	2122	858	2831	1259	3230	1180
1970-71	4719	2612	4109	2066	2311	1964	2809	2014	3517	2199	4010	1786
1971-72	5195	3163	4732	2702	3115	2620	3432	2668	4098	2672	4517	2430

(Continued)

Table VI.1: (Continued)

District	20-Akola		21-Amaravati		22-Yeotmal		23-Wardha		24-Nagpur		25-Bhandara		26-Chandrapur	
	H	P	H	P	H	P	H	P	H	P	H	P	H	P
1960-61	655	140	436	195	172	69	35	17	91	45	380	182	136	65
1961-62	874	140	582	195	229	69	47	23	122	61	506	182	181	65
1962-63	486	135	786	244	182	66	393	41	323	126	456	228	163	81
1963-64	569	182	783	254	280	90	136	43	409	131	794	254	332	106
1964-65	2276	719	2880	631	1915	672	629	213	982	558	860	565	724	244
1965-66	602	584	1014	501	423	413	404	309	1190	601	477	393	536	390
1966-67	3569	418	2844	487	3077	441	1994	144	2295	751	725	861	2103	614
1967-68	4130	2565	1926	963	1338	441	1232	314	3665	751	2416	861	1344	614
1968-69	2773	1058	2009	1007	2811	1708	3123	976	2845	1176	2286	1159	2874	1066
1969-70	3223	1068	2408	1407	3000	1408	2523	976	3045	1076	2536	1050	3124	1008
1970-71	3917	1682	3237	2086	3797	2086	3217	1569	3891	1679	3077	1681	3810	1688
1971-72	4480	2346	3945	2643	4383	2629	3822	2219	4395	2342	3718	2285	4217	2181

Table VI.2 : Change in Consumption of Nutrients N and P for different districts in Maharashtra (1960-61 to 1971-72)

(Nutrients in tonnes)

District	Nutrient N				Nutrient P				Kg of N per hectare of GCA	
	Average first 3 years	Average 69-72	LPI (tonnes p.a.)	Growth rate (% p.a.)	Average first 3 years	Average 69-72	LPI (tonnes p.a.)	Growth rate (% p.a.)	Average first 3 years	Average last 3 years
2. Thana	357 (2.27)	3116 (2.81)	327	27.20	158 (2.58)	1282 (2.57)	137	22.90	1.19	11.90
3. Kolaba	551 (3.48)	2877 (2.59)	256	19.90	141 (2.30)	1904 (3.82)	203	35.10	2.41	14.13
4. Ratnagiri	391 (2.47)	3161 (2.85)	319	27.00	144 (2.35)	1582 (3.18)	169	31.10	1.06	8.85
<u>Region I</u>	1301 (8.22)	9154 (8.24)	902	24.20	443 (7.24)	4768 (9.57)	509	31.10	1.45	11.13
5. Nashik	1318 (8.32)	5387 (4.85)	480	20.80	552 (9.02)	2001 (4.02)	191	20.00	1.35	6.24
6. Dhulia	946 (5.97)	5246 (4.72)	510 (4.76)	22.00	425 (6.95)	1923 (3.86)	191	20.10	1.25	7.23
7. Jalgaon	1501 (9.48)	5983 (5.39)	496	16.70	753 (12.31)	2562 (5.14)	234	16.20	1.75	7.05
<u>Region II</u>	3765 (23.77)	16616 (14.96)	1486	17.80	1750 (28.28)	6486 (13.02)	616	16.80	1.45	6.82
8. Ahmednagar	1281 (8.09)	7123 (6.41)	646	21.10	452 (7.39)	2387 (4.79)	238	21.40	0.96	5.66
9. Poona	960 (6.06)	9892 (8.91)	1002	32.40	253 (4.14)	2400 (4.82)	267	29.60	0.88	9.42
10. Satara	485 (3.06)	5039 (4.54)	494	28.40	164 (2.68)	2229 (4.48)	239	32.70	0.65	7.81
11. Sangli	937 (5.92)	4816 (4.34)	419	19.10	466 (7.62)	2299 (4.62)	225	12.50	1.37	7.77
12. Solapur	507 (3.20)	4665 (4.20)	461	28.80	188 (2.75)	2498 (5.02)	256	35.20	0.41	3.81
13. Kolhapur	2820 (17.81)	7925 (7.14)	470	9.80	1106 (18.08)	2881 (5.78)	201	11.30	6.64	19.34
<u>Region III</u>	6990 (44.14)	39460 (35.54)	3692	21.20	2609 (42.65)	14694 (29.50)	1426	21.20	1.26	7.57

(contd.)

Table VI.2 : (Contd.)

	Nutrient N				Nutrient P				KG of N per hectare of GLA	
	Average first 3 years	Average 69-72	LRI (tonnes p.a.)	Growth rate (% p.a.)	Average first 3 years	Average 69-72	LRI (tonnes p.a.)	Growth rate (% p.a.)	Average first 3 years	Average last 3 years
14. Aurangabad	258 (1.63)	4568 (4.11)	521	40.00	79 (1.29)	2262 (4.54)	271	48.00	0.19	3.52
15. Parbhani	45 (0.28)	4055 (3.65)	455	65.40	23 (0.38)	1736 (3.49)	221	54.40	0.05	4.02
16. Ahir	16 (0.10)	2404 (2.16)	269	72.70	1 (0.02)	1798 (3.61)	207	117.30	0.02	2.91
17. Nanded	116 (0.73)	2786 (2.51)	322	44.00	57 (0.93)	1847 (3.71)	207	45.20	0.16	3.71
18. Osmanabad	207 (1.31)	3482 (3.14)	384	40.70	64 (1.05)	2043 (4.10)	230	50.00	0.19	3.11
<u>Region IV</u>	642 (4.05)	17297 (15.58)	1251	40.00	224 (3.66)	9686 (19.45)	1139	50.00	0.13	3.45
19. Buldhana	727 (4.59)	3919 (3.53)	358	20.00	316 (5.17)	1799 (3.61)	180	21.40	1.04	5.40
20. Akola	672 (4.24)	3673 (3.49)	376	23.00	138 (2.26)	1699 (3.41)	190	32.30	0.87	4.78
21. Amravati	601 (3.80)	3197 (2.88)	276	19.90	211 (3.45)	2045 (4.11)	199	27.80	0.87	4.48
22. Yavatmal	194 (1.22)	3728 (3.36)	391	38.40	75 (1.23)	2041 (4.10)	220	43.70	0.26	4.53
23. Warana	158 (1.00)	3187 (2.87)	352	53.10	27 (0.44)	1588 (3.19)	173	57.43	0.38	7.34
24. Nagpur	179 (1.13)	3777 (3.40)	425	43.70	77 (1.26)	1699 (3.41)	183	42.00	0.33	6.77
25. Haddara	447 (2.82)	3117 (2.81)	304	24.30	197 (3.22)	1672 (3.36)	159	27.10	0.86	6.11
26. Chandrapur	150 (1.01)	3717 (3.35)	400	41.80	70 (1.14)	1526 (3.26)	177	42.00	0.24	5.24
<u>Region V</u>	3138 (19.82)	28515 (25.68)	2894	30.00	1111 (18.16)	14159 (28.45)	1491	40.00	0.62	5.40
Maharashtra	15836 (100.00)	111042 (100.00)	10724	24.40	6117 (100.00)	49803 (100.00)	5181	27.00	0.84	5.92

LRI = Linear Rate of Increase per annum. Growth rates and linear rates calculated by the regression method.

7. PRODUCTION

7.1 Before going into the growth of agricultural production, it is necessary to note the scope of the discussion incorporated in this chapter. Agricultural production consists of a variety of crops like cereals, pulses, sugarcane, chillies, fruits, vegetables, cotton, edible oilseeds, non-edible oilseeds, fodder, etc., and the major problem is of coverage and aggregation. While the Season and Crop Reports, our main source of data, contain production figures of various cereals, pulses, sugarcane, chillies, potatoes, cotton, groundnut and other oilseeds, the coverage is not complete and further, the problem of aggregation remains. Indices of agricultural production are, however, available in the Bureau of Economics and Statistics publication of Statistical Abstract of Maharashtra State with base year as the agricultural year 1956-57. Here individual crops are allotted weights and the production indices of individual crops are aggregated to form an index for 'all commodities.'

Such indices of total production are available at the State level only and we will examine these at the outset and then go on to the districtwise data in Season and Crop Reports for detailed analysis. This detailed analysis will be undertaken for various cereals, pulses, sugarcane, cotton and groundnut. Incidentally the weights allotted to these crops in the Bureau's index add upto 97.55 out of 100 and our detailed coverage is obviously adequate.

7.2 In Table 7.1 Bureau's indices for total agricultural production and the indices for the major component of foodgrains production are presented along with similar

indices based on Season and Crop Reports data which is an unweighted addition (Bureau's index allots different weights for various cereals and pulses within foodgrains) of production of cereals and pulses. For easy comparison, Bureau's indices are presented by converting the original series with 1960-61 as the base year.

Table 7.1 : Indices of Agricultural Production in Maharashtra (1960-71 to 1971-72).

	Bureau's index of total Agri- cultural pro- duction *	Bureau's index of foodgrains production	Season & Crop Report based index of foodgrains production
1960-61	100.00	100.00	100.00
1961-62	85.65	86.44	83.40
1962-63	88.62	88.14	86.54
1963-64	90.34	88.20	85.74
1964-65	91.04	89.28	87.10
1965-66	65.73	61.36	60.62
1966-67	76.05	77.37	76.86
1967-68	87.38	87.59	85.68
1968-69	91.14	88.99	87.26
1969-70	88.49	86.30	83.78
1970-71	75.52	76.95	69.91
1971-72	73.22	67.50	62.71

Note : Bureau of Economics and Statistics, Government of Maharashtra indices have the base year 1956-57=100, the series is converted to 1960-61 as base for easy comparison. Bureau's index of foodgrains production is different from the index of foodgrains production based on Season and Crop Report data because in the former each cereal and pulse is allotted a weightage (and to other non-foodgrains crops) while in the latter production figures are simple unweighted additions of production of various cereals and pulses.

From this table, we see that there is a decline in total agricultural production and the major component of foodgrains¹ appears to be responsible for this phenomenon. Year 1965-66 appears to be the worst year and not much better are the last two years of 1970-71

¹ In the Bureau's indices, foodgrains draw a weightage of 65.81 out of 100.

and 1971-72. Another striking feature is the fact that the production level of 1960-61 is never attained in the subsequent eleven years. When we analysed growth in cultivated area, year 1960-61 did not show exceptionally high values for cropped area and it is obvious that abnormally favourable conditions must have prevailed in that year to reach that level of production. In fact, looking at the districtwise data on foodgrains production one sees that in 19 districts out of 25 (excluding the essentially urban Bombay district) the production level of 1960-61 was not exceeded in the next eleven years, thus showing that the State level phenomenon is the result not attributable to a few districts, but due to most of the districts in Maharashtra. We note that such a situation of the first year in the series having exceptionally high values would have a depressing effect on the compound growth rates for the State as well as for the individual districts.

7.3 The compound growth rates for these three series based on the regression method are incorporated in Table 7.2. Here we start with the entire twelve year period

Table 7.2 : Regression based compound growth rates of production (% p.a.), 1960-61 to 1971-72.

	Total produc- tion(B)	Foodgrains production (B)	Foodgrains production (SCR)
i) For all the twelve years n=12	-1.55	-1.63	-2.30
ii) Deleting 1970-71 and 1971-72, n=10	-0.96	-1.17	-1.21
iii) Deleting 1965-66 n=9	-0.78	-0.94	-1.00
iv) Deleting 1960-61 n=8	-0.07	-0.23	-0.14

B = Bureau's indices of production. SCR = Index based on production figures in Season and Crop Reports.
Refer to Note to Table 7.1 on page 224.

and then delete the last two scarcity years in the first instance, in our quest for the underlying trend. Then we further drop year 1965-66 (the worst year) and again delete first year 1960-61, the exceptionally good year. Thus by these deletions we try to delete years which are likely to affect the growth rates adversely.

Looking at the last line of this table, we note that in spite of such deletions, there is little growth. While total agricultural production 'improves' from a growth rate of -1.55 per cent per annum to a growth rate of -0.07 per cent per annum, the growth rates for food-grains production after such deletions are -0.23 per cent per annum (Bureau data) and -0.14 per cent per annum (Season and Crop Report data). There is a choice only between decline and stagnancy.

7.4 In the analysis that follows, we do not use the regression method for the calculation of growth rates for regionwise-districtwise study. As in the chapter on total cropping pattern, we use triennial averages for the initial period and the end periods with the difference that the initial period average is now based on years 1961-62 to 1963-64 since we want to avoid exceptionally good first year of 1960-61. (As mentioned above, there was nothing exceptional in the cropped area - gross or net - for the year 1960-61 and hence it was not deleted in the analysis of either land use or area under crops.) The end period average is again based on the years 1967-68 to 1969-70. With these two points, we calculate the compound growth rates.

Such rates will differ from the regression-method rates because another not so good year of 1966-67 gets 'deleted' in the process. The growth rates for the three

series by this two-point method are only slightly better as follows :

Total Agricultural Production (Bureau data)	Growth rate of 0.15 per cent per annum
Foodgrains production (Bureau data)	Growth rate of 0.01 per cent per annum
Foodgrains production (Season and Crop Reports data)	Growth rate of 0.07 per cent per annum

The stagnancy in agricultural production is still apparent and especially so far the major component of foodgrains production.

7.5 In the analysis that follows, we will leave the Bureau's indices which are available only for the State as a whole and concentrate entirely on the Season and Crop Reports data. We will use the two-points method for calculation of growth rates, as mentioned above. Further, it may again be emphasised that production figures are not available separately for irrigated and unirrigated components of crops and effects of increased irrigation cannot be immediately identified in production performance. One has to do that in a round about way.

I

State Level Performance

7.6 In this part we will confine the analysis to performance for the State as a whole. While the districtwise data on production are incorporated in a separate volume of data tables, the State level data are set out in Table VII-1 at the end of this chapter for reference.

For the analysis of growth of production of crops, we consider the 'initial position' as the average of

1961-62 to 1963-64 and end position as the average of 1967-68 to 1969-70 as mentioned in Section 7.4. From these two points we work out the compound growth rates and absolute changes in production. As mentioned earlier, we omit 1960-61 which was an exceptionally good year because its early appearance in the series would have a depressing effect on the growth. We also delete the last two scarcity years (1970-71 and 1971-72) as these were scarcity years and occurring at the end of the series, would also depress the growth. In the process of thus obtaining initial position and 'end position' year 1965-66 (worst year for agricultural production and the not-so-good year of 1966-67). As mentioned earlier, this deletes all the years that are likely to have a depressing effect on production growth rates (deletion including). Thus the method adopted allows maximum opportunity for the underlying positive trend, if it exists, to surface.

In Table 7.3 cropwise details of production are presented and as mentioned in the Section 7.1, these would cover most (though not all) of the production in agriculture. From this table we see that production of most important crops like rabi jowar, rice, wheat and tur among foodgrains declined over the period. Only kharif jowar and bajra show any notable gains. These gains are neatly offset by the declining production of other major cereals to leave a gain of 429 Hmt² in cereals over the entire period or a growth rate of 0.12 per cent per annum. In pulses, pulses other than gram and tur show gains in production but declines in gram and tur leave an overall decline of 158 hmt and a

2 Hmt = hundred metric tonnes.

Table 7.3 : Initial and End Period Levels of Production and Growth Rates of Production of Principal Crops for Maharashtra (1961-62 to 1969-70)

(Production in hundred metric tonnes = Hmt)

Crop	Initial Period Triennial average 1961-62 to 1963-64 (Hmt)	% Share in Foodgrains	End Period Triennial average 1967- 68 to 1969-70 (Hmt)	% Share in Foodgrains	Absolute Change (Hmt)	Growth Rate (% p.a.)
1 Rice	14296	21.66	13661	20.61	-635	-0.76
2 Wheat	4055	6.14	3842	5.80	-213	-0.90
3 Kharif Jowar	14966	22.71	17078	25.77	2092	2.20
4 Rabi Jowar	16735	25.36	16342	21.64	-2393	-2.25
5 Total Jowar	31720	48.06	31420	47.41	-300	-0.16
6 Bajra	4858	7.36	6355	9.59	1497	4.60
7 Other Cereals	2622	3.97	2705	4.08	83	0.60
8 <u>Total Cereals</u>	57553	87.20	57982	87.50	429	0.12
9 Gram	1318	2.00	1028	1.55	-290	-4.06
10 Tur	3373	5.11	2993	4.52	-380	-1.97
11 Green Gram	1092	1.65	1263	1.94	191	2.68
12 Black Gram	1181	1.79	1387	2.09	206	2.68
13 Other Pulses	1480	2.24	1595	2.41	115	1.30
14 <u>Total Pulses</u>	8444	12.79	8286	12.50	-158	-0.31
15 <u>Total Cereals and Pulses (Foodgrains)</u>	65997	100.00	66268	100.00	271	0.07
16 Sugarcane (Cur)	10909	-	14207	-	3298	4.50
17 Chillies	885	-	903	-	18	0.31
18 Potato	638	-	488	-	-150	-4.37
19 Cotton (Lint)*	12105	-	12854	-	749	1.00
20 Groundnut (pod)	7898	-	6260	-	-1618	-3.75
21 Other Edible Oilseeds	263	-	333	-	70	4.00
22 Non-Edible Oilseeds	493	-	335	-	-158	-6.24

* In hundred bales of 180 Kg.

Growth rates based on the two-point method.

growth rate of -0.31 per cent. For foodgrains as a whole, a gain of mere 271 Hmt results, with a per annum growth rate of 0.07 per cent,³ clearly inadequate for the population growth rate of 2.40 per cent per annum between the two censuses of 1961 and 1971.

Among other crops (non-foodgrains), sugarcane stands out with its production growth rate of 4.50 per cent and so does cotton to some extent with its growth rate of 1.00 per cent. Edible oilseeds show a considerable decline due to the decline in major edible oilseed of groundnut (growth rate -3.75 per cent).

On the whole, growth rate in production somewhat commensurate with growth rate in population appears in kharif jowar (growth rate 2.20 per cent), bajra (4.60 per cent), green gram and black gram (growth rate 2.68 per cent for both) and sugarcane (growth rate 4.50 per cent) with both cereals and pulses as a whole having negligible (or negative) growth rates. Total agricultural production has a dismal growth rate of 0.15 per cent, as mentioned in Section 7.4.

In the list of crops covered in Table 7.3, fruits and vegetables do not get covered because of lack of data. In our analysis of area under crops, irrigation and fertilizers we saw that this group is important although it occupies a small proportion of gross cropped area. The earlier analysis clearly indicates possibility of gains in this group, but in absence of data we have to leave it at that. In any case, the overall stagnancy or decline could only be marginally touched by the gains in fruits and vegetables.

What happened to crops which had grown in area or received more irrigation and featured in fertiliser

consumption? While growth rates of area, production and productivity will be analysed in another chapter, in Table 7.4 we present area changes and irrigated area changes for different crops along with percentage irrigated area in both the periods. The initial period refers here to average 1960-61 to 1962-63, i.e. including 1960-61 which was not exceptional in terms of cropped area. (Though there is a slight difference in coverage in this table relating to area compared to Table 7.3 relating to production, the conclusion is not affected because if we were to use same coverage for Table 7.3, most of the figures for production change get further reduced; for example cereals would show a decline in production by 2792 Hmt instead of a gain of 429 Hmt while foodgrains would show a decline of 3411 Hmt).

From Table 7.4 we see that although wheat showed considerable gains in irrigated area, total area under wheat inclined. This means that decline in rainfed wheat area was substantial and hence the decline in wheat production (Table 7.3). Irrigated wheat also featured as an important fertiliser consumer but apparently the area and productivity declines in rainfed wheat have been overwhelming.

The case of rice is rather puzzling. Area under the crop increased and so did irrigated crop area but the production has declined by 637 Hmt with a growth rate of -0.76 per cent. Unirrigated rice is apparently an important consumer of fertilisers. Area with predominantly unirrigated rice (Konkan region) did show increases in fertiliser consumption but apparently the resultant productivity gains have been inadequate to offset declines in other areas.

Table 7.4 : Cropwise Percentage Irrigated Area in the Initial and End Periods and Changes in Area under Crops and Irrigated Area under Crops Maharashtra State (1960-61 to 1969-70)

	Percent Irrigated Area		Crop Area (Hha)	Irrigated Area (Hha)	Growth Rate of Crop Area
	Initial Period (Av. 60-63)	End Period (Av. 67-70)			
Rice	20.69	23.08	105	340	0.11
Wheat	15.63	28.72	-633	993	-1.04
Kharif Jowar	0.38	0.82	109	110	0.06
Rabi Jowar	7.38	8.44	-4003	51	-1.63
Total Jowar	4.54	1.22 542	-3894	161	-0.92
Bajra	1.97	2.30	3936	146	3.07
Other Cereals	2.88	5.60	-40	103	-0.12
Total Cereals	7.03	8.72	-527	1743	-0.07
Gram	9.07	14.45	-439	148	-1.69
Tur	*	*	704	*	1.70
Green Gram	*	*	1108	*	3.50
Black Gram	*	*	849	*	2.60
Other Pulses	*	*	438	*	1.00
Total Pulses	1.79 1.79	2.22	2661	188	1.53
<u>Total Cereals + Pulses (Food grains)</u>	6.07	7.44	2136	1930	0.23
Sugarcane	100.00	100.00	454	454	3.90
Chillies	41.07	44.19	7	53	0.07
Cotton	1.81	2.30	1257	158	0.67
Groundnut	1.18	1.75	-1998	28	-2.78

* Pulses other than Gram have together 0.35 and 0.48 per cent irrigated area. The absolute increase in irrigated area is only 40 Hha.

Kharif jowar, on the other hand, has shown a marginal increase in total area as well as irrigated area but the crop as a whole has done well with a growth rate of 2.20 per cent per annum. In fertiliser analysis, it was seen that compared to its area, the jowar crop as a whole (kharif and rabi) has its share in fertiliser consumption on the lower side. Further, since kharif jowar is mostly unirrigated, the gains in production are rather unexpected. In case of rabi jowar, the substantial decline in area under the crop (of 4003 Hha) coupled with negligible increase in irrigated area result in the decline in production with a growth rate of -2.25 per cent. Looking at the lack of preference for rabi jowar even with its 7 to 8 per cent irrigated component, it is doubtful whether it received increased fertilisers, although area with considerable rabi jowar (Region III) showed impressive increases in fertiliser consumption. It should be mentioned that this area also covers the sugarcane tract and the increases in fertiliser use were most probably due to this crop of sugarcane.

Bajra, another kharif crop with little irrigated component, has done rather well in production due to an addition of 3936 Hha to its area. Being mostly an unirrigated crop, it would not have attracted higher fertiliser consumption and the analysis of fertiliser consumption also supports this conclusion.

Among pulses gram and tur show declines in production. While the gains in production of other pulses partly offset the declines in gram and tur, on the whole, a net decline of 158 Hmt results. Various categories of pulses share between 2 to 3 per cent of

gross cropped area but gram and tur have relatively higher shares in production of pulses. Irrigated component for gram, a rabi pulse, is rather significant and while irrigated gram area has increased, total area under gram declined and the production too, declined significantly with a growth rate of -4.06 per cent per annum. Tur, a major pulse (with 5 per cent share in foodgrains production) which is mostly rainfed shows a decline in spite of area increase of 704 Hha. Area increases for green gram and black gram have been substantial and these short duration kharif pulses have relatively substantial gains in production. Since pulses do not attract fertilizers, one can conclude that on the whole, neither irrigation nor fertilizers have played any part in gains in green gram or black gram.

In fact looking at the foodgrains production as a whole, wherever gains have appeared for the crops in this category, one cannot relate it directly to either increased irrigation or increased use of fertilizers. It is increased rainfed area that has caused important gains in crops like kharif jowar, bajra, green gram and black gram. It is obvious that whatever the gains in production in crops like rice and wheat that were caused due to increased irrigated component and increased fertilizers use, were neatly offset by the rainfed components of these crops. In short, increased irrigation and fertilizer use have not been able to make any impression on the production of foodgrains. We again underline the fact that this state of affairs exists in spite of deletions of years which would have a depressing effect on the production of

foodgrains. This is a disquieting situation indeed.

Of the remaining crops, sugarcane stands out with its impressive growth rate of 4.50 per cent per annum and the discussion in the preceding chapters indicate how it has had a large share of increased irrigation water consumed by crops and how it has also received considerable share of fertilizers. It may also be noted that the crop is entirely irrigated.

Cotton, another important non-foodgrains crop has a production growth rate of just 1 per cent. Looking at Table 7.4 we further see that it is mostly un-irrigated. Although area under cotton increased by 1257 Hha, irrigated area increased only marginally. With all-round increase noted in fertilizer use, one could assume that in the cotton growing tract of Nagpur division (Region V) with the assured rainfall, this crop received fertilizers but the gains in production are not adequate.

Decline in edible and non-edible oilseeds is to be noted. Edible oilseeds form an important component of oilseeds and groundnut among edible oilseeds has a growth rate of -3.75 per cent. Area under groundnut declined by 1998 Hha while irrigated area increased only marginally. The decline in this important cooking medium is certainly a serious matter. Among the remaining crops, although production of potato has a growth rate of -4.37 per cent, we refrain from commenting on this decline because we know that fruits and vegetables as a group showed gains in total area, irrigated area and in its share in increased irrigation water consumed by crops. The production performance of this group of fruits and vegetables cannot be assessed because production data are available only for potato.

Thus by and large, the production performance, for the period under consideration has been dismal in the State when one realises that this state of affairs results even after allowing maximum opportunity for the underlying positive trend, if any, to surface.

II

Regionwise Performance

7.7 In this part we move on to regions/districts performance of individual crops. For brevity, we will present analysis for pulses as a whole (with usual coverage for cereals) among feedgrains and among non-feedgrains the analysis will be confined to important crops of sugarcane, cotton and groundnut as in the State level analysis. The districtwise-regionwise details of levels of production, absolute changes as well as growth rates for the period are incorporated in Table VII-2 at the end of the present chapter. For our comments we will mainly refer to the regionwise analysis.

In Tables 7.5 and 7.6 we present absolute changes in production and growth rates for the individual crops. As mentioned in Section 7.4, we again note that the period covered is 1961-62 to 1969-70. The 'initial period' is the triennial average 1961-62 to 1963-64 (where the first year 1960-61 which was exceptionally good is deleted) and does not coincide exactly with the initial period for area analysis while 'end period' is the same as in the earlier analysis, viz., triennial average 1967-68 to 1969-70. In Table 7.7 are presented changes in area under crops changes in

Table 7.5 : Regionwise Growth in Production of Different Foodgrains (1961-62 to 1969-70)

	Rice	wheat	Kharif Jowar	Rabi Jowar	Total Jowar	Bajra	Other Cereals	Total Cereals	Total Pulses	Total Foodgrains
Region I										
Initial Share (%)*	40.25	0.00	0.01	0.00	0.01	0.00	38.59	11.75	1.21	10.39
Absolute Change (Hmt)	3	-	-	-	-	-	95	98	18	116
Growth Rate (% p.a.)	0.00	-	-	-	-	-	1.50	0.24	2.80	0.27
Region II										
Initial Share (%)	4.00	19.88	13.86	7.05	10.26	42.64	25.78	12.83	16.39	13.28
Absolute Change (Hmt)	-138	253	-325	-452	-777	546	-70	-188	90	-98
Growth Rate (% p.a.)	-4.52	4.70	-2.79	-7.74	-4.43	4.00	-1.81	-0.44	1.10	-0.18
Region III										
Initial Share (%)	17.87	14.07	19.86	49.19	35.33	41.23	29.56	29.72	17.84	28.21
Absolute Change (Hmt)	-751	121	-968	-923	-1892	369	0	-2153	12	-2142
Growth Rate (% p.a.)	-5.64	3.30	-6.35	-1.96	-3.04	2.90	0.00	-2.23	0.10	-2.00
Region IV										
Initial Share (%)	3.92	28.28	26.92	36.95	32.21	15.08	4.05	22.18	29.20	23.08
Absolute Change (Hmt)	-160	-213	728	-1029	-300	542	35	-99	347	250
Growth Rate (% p.a.)	-5.44	-3.37	2.80	-2.99	-0.51	9.60	4.90	-0.12	2.20	0.27
Region V										
Initial Share (%)	33.96	37.77	39.35	6.81	22.19	1.05	2.02	23.52	35.36	25.04
Absolute Change (Hmt)	424	-372	2655	10	2664	47	26	2790	-625	2163
Growth Rate (% p.a.)	1.40	-4.50	6.40	0.10	5.50	11.50	6.40	3.17	-3.84	2.08

* Initial Share is based on average 1961-62 to 1963-64.
This is expressed as Percentage of the State.

Table 7.6 : Growth in Production of Important Non-Food-grain Crops (1961-62 to 1969-70)

		Sugarcane	Cotton	Groundnut
Region I				
Initial Share (%)	0.05	-	0.06	
Absolute Change (Hha)	27		-	
Growth Rate (% p.a.)	36.20		-	
Region II				
Initial Share (%)	7.07	22.75	25.79	
Absolute Change (Hha)	696	-970	-786	
Growth Rate (% p.a.)	11.40	-6.97	-7.81	
Region III				
Initial Share (%)	84.26	6.79	39.92	
Absolute Change (Hha)	1171	-306	-507	
Growth Rate (% p.a.)	2.03	-7.47	-2.88	
Region IV				
Initial Share (%)	7.90	23.26	26.78	
Absolute Change (Hha)	1234	634	-458	
Growth Rate (% p.a.)	16.00	3.50	-3.97	
Region V				
Initial Share (%)	0.72	47.20	7.45	
Absolute Change (Hha)	178	1379	133	
Growth Rate (% p.a.)	21.90	3.67	3.50	

Table 7.7 : Change in Total Area and Irrigated Area under each Crop, and Growth Rate of Area, Regionwise Details (1960-61 to 1969-70)

	Region I			Region II			Region III			Region IV			Region V		
	Change* Total Area	Change* Irrigated Area	GR Total Area	Change Total Area	Change Irrigated Area	GR Total Area	Change Total Area	Change Irrigated Area	GR Total Area	Change Total Area	Change Irrigated Area	GR Total Area	Change Total Area	Change Irrigated Area	GR Total Area
Rice	-22	8	-0.07	-134	55	-2.82	-162	67	-1.12	17	20	0.29	422	190	1.10
Wheat	-	-	-	87	523	0.78	32	109	0.38	-234	216	-1.30	-316	146	-2.20
Kharif Jowar	2	-	-	-166	4	-1.11	-511	-10	-2.69	117	102	0.22	662	14	0.74
Rabi Jowar	-	-	-	-962	5	-7.47	-2183	-112	-1.53	-995	157	-1.40	138	2	0.74
Bajra	-	-	-	1075	62	2.56	1542	25	2.50	1257	55	5.63	64	3	2.92
Total Cereals	-149	13	-0.38	-1	662	0.00	-1340	122	-0.53	161	586	0.09	813	361	0.47
Total Pulses	-6	8	-0.21	438	88	1.53	305	37	0.95	1614	44	2.53	306	9	0.65
Total Foodgrains	-155	20	-0.37	437	750	0.36	-1035	157	-0.36	1775	632	0.74	1119	370	0.50
Sugarcane	3	3	-	18	18	1.67	350	350	4.09	77	77	4.28	12	12	5.39
Cotton	-	-	-	76	52	0.33	-134	-46	-3.03	225	110	0.43	1088	42	1.02
Groundnut	4	1	-	-1159	28	-5.35	-9	-14	-0.03	-776	14	-3.68	-44	-	-0.53

* Change in Area in hundred hectares between Average 1960-61 to 1962-63 and 1967-68 to 1969-70.

GR : Compound growth rate % p.a.

irrigated area components of crops and growth rates of (total) area under crops taken from the preceding chapters. This table is auxiliary to Tables 7.5 and 7.6.

7.8 Foodgrains : Cereals and Pulses

We have already noted that foodgrains (cereals + pulses) production growth rate is 0.07 per cent and the absolute change is of 271 Hmt over the period of triennial average 1961-62 to 1963-64 and 1967-68 to 1969-70 at the State level (section 7.6 Table 7.4). This was the result of a growth rate of 0.12 per cent for cereals and the growth rate of -0.31 per cent per annum for pulses.

From Table 7.5 (last column) we further see that Regions II and III have the foodgrains growth rate at -0.18 per cent (absolute change -98 Hmt) and -2.00 per cent (absolute change -2142 Hmt) respectively. Thus these two regions covering over 40 per cent of production in the initial period have a declining foodgrains production. The State level growth rate for foodgrains (0.07 per cent) showing stagnancy is the result of moderate production growth rates for regions I and IV (0.27 per cent each) and a relatively substantial growth rate of 2.08 per cent for Region V, the Nagpur Division. Thus there are three layers of performances, negative for area which shared 40 per cent of State production in the base period, low but positive for area which had nearly one-third share of State production in the base period (Regions I and IV) and relatively substantial for area which covered

one-fourth of State production (Region V). (The last mentioned 'substantial growth' is 2.08 per cent and it is 'substantial' only relatively. It is still below the State population growth rate of 2.40 per cent per annum). The auxiliary Table 7.7 further tells us that foodgrains area itself declined for Region III (growth rate -0.36 per cent absolute change -1035 Hha). We further note that Region IV of Aurangabad division has highest addition to area under foodgrains (1775 Hha, growth rate 0.74 per cent) followed by Region V of Nagpur division (1119 Hha, growth rate 0.53 per cent) and yet, the production performance for the latter region is much superior. One reason may be that the area increases in Region IV are mainly in pulses while area increases in Region V are mainly in cereals. As we shall note presently, the performance of cereals has been exceptionally good in Region V.

Cereals

Table 7.5 further reveals that the State production growth rate of 0.12 per cent for cereals is due to the production growth rate of 3.17 per cent in Region V (and to a much smaller extent Region I) while Region II, III and IV register growth rates of -0.44 per cent, -2.23 per cent and -0.12 per cent respectively. Thus area which contributed a share of 63 per cent to the total cereals production in the base period has negative growth rates. Table 7.7 reveals that in Region III area under cereals declined (-1340 Hha, growth rate -0.53 per cent), was stagnant in Region II and with only a marginal increase in Region IV. We note that in Region II and IV although area increase was

not substantial, irrigated area increased impressively (662 Hha and 586 Hha respectively) but could not prevent the declining production.

In Region V the production growth rate of cereals is 3.15 per cent per annum as noted above while the area growth rate has been just 0.65 per cent. This means the productivity of cereals has gone up sharply in that region. The productivity aspect will be dealt with in the next chapter on area-production-productivity growths.

The poor performance of Region III in feedgrains and cereals production may be noted. As mentioned in the chapter on irrigation, although this region has had a substantial growth in irrigation facility, most of it went to sugarcane. This is likely to be true of the increased consumption of fertilizer also.

In most of the regions, area under pulses increased and so did production. The exception is the performance of Region V, the major producer of pulses. This region which covered 35 per cent of production of pulses, has a growth rate of -3.84 per cent, in spite of a growth rate of 0.65 per cent for area. The decline in production of pulses in absolute terms is -625 Hmt and the major pulse of Tur shows a decline of -488 Hmt in spite of increased area. In fact, the production of pulses in the area shows an indifferent, generally declining performance in spite of overall increasing area. The area and production figures of pulses for this region along with indices are presented in Table VII-3 at the end of this chapter. It is obvious that productivity is declining in this region where cereals have shown good performance in production. More about this later in the present chapter.

7.9 Import Cereals

Now we take up production behaviour of important cereals. The comments are based on Tables 7.5 and 7.7 as mentioned earlier and we will not refer to these table numbers in the discussion.

Rice

As noted in the State level discussion, rice covered 22 per cent of the foodgrains production in the base year. The production growth rate is -0.76 per cent or in absolute terms, it means a decline of 637 Hmt over the period in spite of increased area under the crop. Now we see that in Region I, the major rice producer (40 per cent of State production in base year) the production is stagnant. Area under rice marginally declined but with the slight increase in the irrigated area and possibly use of fertilizers, the decline in area has not affected production. This area is a rice tract with mainly unirrigated rice and as noted in the chapter on fertilizer consumption, has been a major fertilizer consuming region in the base year. On the whole one must rate the performance of this region as unsatisfactory.

Region V has two districts of Bhandara and Chandrapur where rice cultivation is concentrated. The region itself covered one-third of rice production in the base year. Here we see that the production growth rate is 1.40 per cent (absolute change 424 Hmt) while the area growth rate is 1.10 per cent. This region has considerable tank irrigated rice and irrigated area also increased substantially. On the whole the performance in rice is relatively satisfactory. Like other regions, there was substantial growth in

fertilizer use and rice production may have benefitted to some extent.

Region III is next in importance (18 per cent of rice production in the base year) followed by relatively minor rice regions to Region II and IV (about 4 per cent each, of the State rice production in base year). All these regions have negative growth rates which are substantial, in the neighbourhood of -5 per cent per annum.

In Region III area under rice declined with -1.12 per cent growth rate, (-162 Kha in absolute term) but irrigated rice increased (67 Kha). The decline in production is much higher with a growth rate of -5.64 per cent, indicating considerable productivity losses.

Thus by and large, the major rice tracts (Regions I and V) had production stagnant or increasing moderately while the other regions have declines in production larger than declines in area suggesting productivity losses. Thus on the whole, no region indicates that improved varieties, improved irrigation and use of fertilizers is of a significant nature to make any impact on productivity of rice.

Wheat

Region IV (Aurangabad division) and Region V (Nagpur division) are the two major producers of wheat (28 and 38 per cent share in the state production in the base period respectively) but both these regions have substantially declining production (growth rates -3.37 and -4.50 per cent respectively) and these explain the negative growth rate of wheat for the State as a whole.

It was noted earlier that in Regions II and III there was considerable growth in irrigated wheat and we note that production growth rates are 4.70 and 3.30 per cent respectively. The area growth rates are 0.78 and 0.38 per cent for these two regions and obviously these have been considerable productivity gains in these regions. Among cereals, the impact of improved varieties, irrigation and fertilizer use are apparent only for this crop (among foodgrains) and for these two regions, in the entire State.

For the major wheat regions (Region IV and V) however, area declined with growth rates of -1.30 per cent and -2.20 per cent respectively and although irrigated area increased, the proportion of irrigated wheat being small (12 per cent and 3 per cent for Region IV and V compared with 23 per cent 49 per cent for Regions II and III in the base period) the production declined. Thus the production performance has two levels; major wheat regions (65 per cent of base period production) declining considerably while minor regions (35 per cent of base period production) doing exceptionally well. The overall result, of course, is a decline in production at the rate of 0.90 per cent per annum.

Kharif Jowar

This crop which shared 23 per cent of foodgrains production (second only to rabi jowar with 25 per cent share) in the base period has a positive performance at the State level with a growth rate of 2.20 per cent. Looking at the regionwise performance, we see that unlike wheat, the major producers (again Regions IV and V) have done exceptionally well with growth rates of 2.80 and 6.40 per cent respectively. We know that for

the State less than one per cent of kharif jowar is irrigated. The percentages for Regions IV and V are no different (in spite of 102 Hha addition to irrigated kharif jowar in Region IV) and this exceptional performance has not much to do with increased irrigation and hence possibly with improved-hybrid varieties-fertilizer use either. Thus the slightly increasing production growth rate for cereals which is due mainly to this crop and bajra (see Table 7.4) does not appear to have much to do with the new technology in agriculture.

Regions II and III, on the other hand, with 14 and 20 per cent shares of kharif jowar production in the base period, have very poor growth rates of -2.79 and -6.35 per cent per annum. The area growth rates are -1.11 per cent and -2.69 per cent respectively, indicating productivity losses too, in these two regions.

It is true that in kharif season with the rainfall, one may choose to apply fertilizers and also take to hybrid cultivation. But if this is true of Regions IV and V (Aurangabad and Nagpur divisions) where good growth rates are achieved, why the farmers in Regions II and III failed to do the same? One can think of various reasons. Firstly, in Region II (Nasik-Dhulia-Jalgaon districts) apart from considerable increase in irrigated wheat there is substantial increase in area under banana (Jalgaon district mainly) with a high requirement of fertilizer input and sugarcane (Nasik district mainly) to some extent, also requiring high fertilizer inputs. In Region III as we saw all along, sugarcane cultivation is increasing substantially. Both banana and sugarcane being

crops requiring high input level, farmers cannot think of cultivation of these crops without proper fertilizer use. Thus crop like kharif jowar may not receive fertilizers in adequate doses. Secondly, these two regions are highly drought-prone and risking fertilizer input on a rainfed crop like kharif jowar crops may not be an attractive proposition. Further, we saw that irrigated area takes about 68 per cent of N consumption at the State level and this may be due to reluctance of farmers in drought-prone areas to apply fertilizers to rainfed crops. Unfortunately, detailed and reliable data on area under hybrid cultivation and extent of fertilizer use are not available and it is generally accepted that area under hybrid varieties (and growth in such area) has not been substantial in the State.⁴

Rabi Jowar

It was seen in Table 7.4 that this crop formed the largest proportion (one-fourth) of the basket of foodgrains production of the State. This is also the crop that has suffered the most, among foodgrains. At the State level the production growth rate is -2.25 per cent and in absolute terms a decline of 2323 Hmt, swamping out the gains in kharif jowar. The irrigated component of this crop is 7 to 8 per cent of area which is much higher than the proportion for kharif jowar. From Table 7.5 we see that this crop has suffered almost throughout the State except for Region V where the increase is negligible. Major rabi jowar

⁴ See B.N. Ashturkar, Impact of High Yielding Varieties Programme on Production of Major Cereals in Maharashtra, Ph.D. Thesis submitted to University of Poona (1977).

regions are Regions III and IV covering together more than 85 per cent of base period production and the growth rates for these two regions are -1.96 per cent and -2.99 per cent respectively. From table 7.7 we further see that in Region III both the total area as well as irrigated area under rabi jowar declined, giving way to wheat but the gains in wheat output (121 Hmt) are comparatively small.

Bajra

This kharif crop ranking fourth in the order of importance in foodgrains (7.36 per cent of State foodgrains production in the base period) has the highest growth rate of 4.60 per cent per annum, or an addition of 1497 Hmt in absolute terms (next to kharif jowar with its addition of 2092 Hmt, see Table 7.4). Table 7.5 reveals that this crop has done well in all the regions. Regions II and III are the major regions, each covering over 40 per cent of State bajra production. The production growth rates for these two regions are 4 and 2.90 per cent per annum respectively or in absolute terms, additions of 546 and 369 Hmt respectively. Region IV of Aurangabad division with a small State bajra share of 15 per cent has done even better with a growth rate of 9.60 per cent or net addition of 542 Hmt.

This is mainly an unirrigated crop (around two per cent of bajra is irrigated) and the additions to irrigated area are negligible. In all these three important bajra regions (Regions II, III and IV) area growth rates (see Table 7.7) are 2.56, 2.50, and 5.63 per cent respectively or absolute increases between 1000 and 1500 Hha each. Production growth rates being higher than area growth rates especially for Regions

II and IV, productivity gains are indicated.

Can this gain be attributed to the new technology? Although hybrid varieties have had a limited impact in the State, hybrid bajra appears to be preferred to hybrid jowar. With its low irrigated component, it is difficult to attribute the gains in bajra to hybrid varieties. Similarly to what extent fertilizers played a part, is difficult to specify. But looking at its better performance relative to other crops and the success in all the regions growing the crop, it is possible that the new technology (with the exception of irrigation resource) has had a hand in this phenomenon.

7.10 To make a quick regionwise assessment, we see that in Region I (Konkan Region) the rice tract, production of rice has been stagnant in spite of marginal reduction in area while 'other cereals' (mainly ragi, vari, asva etc.) have done marginally well so that we get an overall foodgrains production growth rate of 0.27 per cent.

In Region II of Nasik-Dhulia-Jalgaon districts falling in the drought zone, except for wheat and bajra, all the other cereals declined while pulses recorded a marginal increase with the result that foodgrains have a production growth rate of -0.18 per cent, improving from -0.44 per cent for the cereals. It was noted in the chapter on irrigation that in this region the increased irrigation facility was used mainly for wheat and the gains in wheat production have helped in reducing the extent of decline in foodgrains production although the major credit of controlling the decline goes to mainly rainfed crop of bajra.

In Region III (Poona division districts, the sugar tract) the position is somewhat similar with only wheat and bajra showing gains while pulse production remaining stationary. The declines in both kharif and rabi jowar and to an appreciable extent in rice, are so large that gains in wheat and bajra are swamped out resulting in a growth rate of -2.00 per cent or loss of 21½2 Hmt for foodgrains as a whole, clearly affecting the State's performance in foodgrains production and hence the overall agricultural performance. It was noted that there was considerable increase in irrigation facility in the region (the exercise in chapter on irrigation indicating half the increased irrigation water consumed by crops coming from this region) but barring wheat, foodgrains were not preferred for irrigation. The clear preoccupation of this region with sugarcane cultivation appears to be the main reason for this unsatisfactory performance.

In Region IV of Aurangabad Division, significant gains are recorded in kharif jowar, bajra and pulses which manage to cover the deficits in rice, wheat and rabi jowar, resulting in production growth rate for foodgrains of 0.27 per cent, or an addition of 250 Hmt of foodgrains. Considering the fact that area under foodgrains increased at the rate of 0.74 per cent, the production gains are not commensurate, especially with a substantial increase in irrigated area. But one-third of the increased irrigated area under foodgrains is accounted for by wheat where decline in rainfed wheat (area as well as production) has been of a much higher order.

Region V of Nagpur Division has done much better

with foodgrains registering a growth rate of 2.08 per cent per annum. Gains in kharif jowar and rice are substantial enough to offset effectively the declines in wheat and especially pulses. The performance of production of pulses, as pointed out at the end of Section 7.6, is rather puzzling. It was pointed out that in spite of the overall area under pulses having an increasing trend (growth rate 0.65 per cent) the production growth rate is -3.84 per cent. It is not easy to specify the reasons for the decline in production-productivity but one wonders why even with such declines, area continues to increase however marginally?

One reason may be that tur (the main pulse) is taken as a mixed crop with cotton and since area under cotton (Table 7.7) increased with a growth rate of 1.02 per cent, area under tur also increased. The effects of such mixed sowing may be beneficial to cotton and may be involving only marginal additional cost of cultivation and the area under tur kept increasing. Another factor may be prices. From Appendix B where growth rates of farm harvest prices are presented, we see that farm harvest prices of turdal (and gram) have growth rates of 10.10 per cent which are about two per cent higher than any cereal. If the margin is slightly more in reality, there may not be much to choose between another kharif crop and tur (whose productivity is declining). Further the price growth rate of cotton being as low as 4.20 per cent per annum, the cotton-tur mix may continue to be profitable. This area being a major cotton tract, alternatives to cotton (and tur) may be limited.

Thus, as pointed out earlier, the stagnation in foodgrains production is a result of performance at three levels. One region having a reasonable growth rate of production, three regions with marginal additions or declines while one region registering a major decline.

Non-foodgrains : Sugarcane, Cotton and Groundnut

7.11 We consider only three major non-foodgrains viz. sugarcane, cotton and groundnut, leaving out chillies, potato and 'other oilseeds' which were considered for the State level comments. Production data on fruits and vegetables other than potato and crops like fodder and miscellaneous crops are not available as mentioned earlier.

Regionwise production growth rates, absolute changes etc., are presented in Table 7.6. We will take these crops one by one.

Sugarcane

The State level growth rate is 4.50 per cent or a linear addition of 3298 Hmt of gur. Major sugarcane area, as often mentioned earlier, is Region III of Peena division where 84 per cent of base period State production is concentrated. The production growth rate is 2.03 per cent, in this region whereas the area growth rate is higher at 4.09 per cent (Table 7.7) indicating productivity losses. This region has a very high level of productivity in the base year and the continuous expansion of area has reduced the productivity over years. On the other hand, for Region IV of Aurangabad division, production growth rate is 16.00 per cent while area growth rate is much lower at 4.28 per cent. The

obvious gains in productivity are due to increases from the relatively much lower level in the base period (around half the level for Region III). The absolute increase of 123½ Hmt of gur for this region is an indication how sugarcane cultivation is spreading to regions other than the traditional sugar tract of Peena division. This significance of the preference for sugarcane cultivation is already discussed in the chapter on irrigation and we will not elaborate on this further. But we note that impact of new technology (irrigation, use of chemical fertilizers) is obvious in this hundred per cent irrigated crop.

Cotton

This is an important crop occupying about 14 per cent of the State gross cropped area. It was noted in Part I of this chapter that the production growth rate is 1.00 per cent per annum for this crop which is mostly unirrigated (2.00 to 2.30 per cent area receiving irrigation over the period).

Major cotton tracts are Region V (Nagpur division) and Region IV (Aurangabad division) with 47 and 23 per cent shares of State cotton production respectively in the base period. Both these regions have good production growth rates around three and a half per cent per annum but it is the declines in Regions II and III (which covered 22 and 6 per cent of base period state cotton output) that reduce the overall growth rate of just 1 per cent. Half the irrigated cotton is in Region II (50 per cent of cotton area in the region) while Regions II and IV have 4 and 2 per cent of cotton area irrigated (Region V has only a negligible proportion). Over years total cotton area as well as irrigated cotton area increased in all the regions

except Region III of Poona division. The (total) cotton area growth rates are much lower than the production growth rates indicating productivity gains in Region IV and V and it appears that fertilizer use and improved varieties have had some impact here.

Groundnut

This is another important crop occupying about 6 per cent of State cropped area. It was noted that production of this important cooking medium declined, the State growth rate being -3.75 per cent per annum. The area under groundnut declined at the rate of -2.78 per cent per annum.

From Table 7.6 we further see that Regions II, III and IV are the important groundnut producing regions, with Region III of Poona division covering 40 per cent of State groundnut production in the base year while the remaining two regions contributing about 25 per cent each. All these three regions have shown declines, the growth rates ranging from -2.88 per cent (Region III) to -7.81 per cent (Region II). Area under groundnut has also declined and on the whole, the groundnut crop has gone down in the preference table. With the harvest price of groundnut having increased at the rate of over 10 per cent per annum (Appendix B) this decline in area, production (and productivity) is surprising and from the consumer's point of view, serious.

7.12 Thus on the whole, the production performance is unsatisfactory in the State and we again mention that even after allowing maximum opportunity to any underlying positive trend to surface, such disappointing state of affairs exists.

Region V of Nagpur division appears to have a relatively good all round performance in spite of declines in pulses. Region IV of Aurangabad division has by and large, managed only a slight improvement while Regions II and III have fared badly. We again note that this analysis leaves out fruits and vegetables (due to lack of data) which have gained in total area, irrigated area and hence in production but the overall dismal agricultural performance would only be marginally touched even if the production gains of this group were accounted for.

Table VII.1 : Total Outturn of Principal Crops in Maharashtra State for the Years 1960-61 to 1971-72

		Rice	Wheat	Kharif Jowar	Rabi Jowar	Total Jowar	Bajra	Other Cereals	Total Cereals	Gram	Tur	Green Gram	Black Gram	Other Pulses	Total Pulses	Total Foodgrains
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1960-61	(1)	13692	4011	22019	20216	42235	4886	2725	67549	1341	4683	1032	1273	1560	9889	77439
	(2)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	(3)	17.68	5.18	28.43	26.11	54.54	6.31	3.52	87.23	1.73	6.05	1.33	1.64	2.02	12.77	100.00
1961-62	(1)	15094	4225	14402	15265	29667	4320	2728	56034	1364	3440	1045	1173	1525	8547	64581
	(2)	110.24	105.34	65.41	75.51	70.24	88.42	100.11	82.95	101.72	73.46	101.26	92.14	97.76	86.43	83.40
	(3)	23.38	6.54	22.30	23.64	45.94	6.69	4.22	86.77	2.11	7.25	1.60	1.81	2.36	13.23	100.00
1962-63	(1)	12671	4522	15593	17881	33474	5538	2534	58739	1440	3076	1140	1175	1448	8279	67018
	(2)	92.54	112.74	70.82	88.45	79.26	113.34	92.99	86.96	107.38	65.68	110.47	92.30	92.82	83.72	86.54
	(3)	18.91	6.75	23.27	26.68	49.95	8.26	3.78	87.65	2.15	4.59	1.70	1.75	2.16	12.35	100.00
1963-64	(1)	15130	3419	14962	17058	32020	4715	2603	57887	1149	3604	1090	1194	1469	8506	66393
	(2)	110.50	85.24	67.95	84.38	75.81	96.50	95.52	85.70	85.68	76.96	105.62	93.79	94.17	86.01	85.74
	(3)	22.79	5.15	22.54	25.69	48.23	7.10	3.92	87.19	1.73	5.43	1.64	1.80	2.21	12.81	100.00
1964-65	(1)	14546	4077	16884	15704	32588	4783	2876	58870	1213	3516	1080	1269	1503	8581	67451
	(2)	106.24	101.65	76.68	77.68	77.16	97.89	105.54	87.15	90.45	75.08	104.65	99.69	96.35	86.77	87.10
	(3)	21.57	6.04	25.03	23.28	48.31	7.09	4.27	87.28	1.80	5.21	1.60	1.88	2.23	12.72	100.00
1965-66	(1)	8843	2800	11455	11492	22947	3698	2085	40373	769	2479	978	1003	1325	6574	46947
	(2)	64.59	69.81	52.02	56.85	54.33	75.69	76.51	59.77	58.84	52.94	94.77	78.79	84.94	66.48	60.62
	(3)	18.84	5.96	24.40	24.48	48.88	7.88	4.44	86.00	1.68	5.28	2.08	2.14	2.82	14.00	100.00
1966-67	(1)	10521	3636	13793	16813	30606	4680	2423	51846	1052	3075	1097	1126	1322	7672	59518
	(2)	76.84	90.65	62.64	83.17	72.47	95.37	88.92	76.75	78.45	65.66	106.30	88.45	84.74	77.58	76.86
	(3)	17.68	6.11	23.17	28.25	51.42	7.83	4.07	87.11	1.77	5.17	1.84	1.89	2.22	12.89	100.00
1967-68	(1)	14126	3516	16208	16065	32273	5537	2839	58291	950	3040	1206	1400	1464	8060	66351
	(2)	103.17	87.66	73.61	79.47	76.41	113.32	104.18	86.29	70.84	64.92	116.86	109.98	93.85	81.50	85.68
	(3)	21.29	5.30	24.43	24.21	48.64	8.34	4.28	87.85	1.43	4.58	1.82	2.11	2.21	12.15	100.00
1968-69	(1)	13183	4131	18559	13976	32535	6387	2896	59132	1183	3015	1212	1382	1649	8441	67573
	(2)	96.28	102.99	84.29	69.13	77.03	130.72	106.28	87.54	88.22	64.38	117.44	108.56	105.71	85.36	87.26
	(3)	19.51	6.11	27.47	20.68	48.15	9.45	4.29	87.51	1.75	4.46	1.79	2.05	2.44	12.49	100.00
1969-70	(1)	13673	3878	16467	12985	29452	7140	2380	56523	951	2923	1432	1378	1673	8357	64880
	(2)	99.86	96.88	74.79	64.23	69.73	146.13	87.34	83.68	70.92	62.42	138.76	108.25	107.24	84.51	83.78
	(3)	21.07	5.98	25.38	20.01	45.39	11.00	36.88	87.12	1.46	4.51	2.21	2.12	2.58	12.88	100.00
1970-71	(1)	16622	4403	8879	6895	15574	8241	2527	47367	866	2711	823	1064	1306	6770	54137
	(2)	121.40	109.77	40.32	33.12	36.87	168.67	92.73	70.12	64.58	57.89	79.75	83.58	83.72	68.46	69.91
	(3)	30.70	8.13	16.40	12.37	28.77	15.22	4.67	87.49	1.60	5.01	1.52	1.97	2.41	12.51	100.00
1971-72	(1)	13945	4955	10799	8015	18814	2633	2285	42632	1320	2277	512	744	1079	5932	48564
	(2)	101.85	123.54	49.04	39.65	44.55	53.89	83.85	63.11	98.43	48.62	49.61	58.44	69.17	59.99	62.71
	(3)	28.72	10.20	22.24	16.50	36.74	5.42	4.71	87.79	2.72	4.59	1.05	1.53	2.22	12.21	100.00

Note : Line (1) : Production in Hundred M. Tonnes. Line (2) : Index of Production. Line (3) : Percentage of Cereals & Pulses to Total Foodgrains.

(Contd.)

Table VII.1 : (Contd.)

	Sugarcane in Tons of CWT	Onions	Potatoes	Cotton (Lint) in Hundred Bales of 180 Kgs. each	Groundnut	Seasame	Other edible oilseeds	Non-edible oilseeds	Tobacco
	(10)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1951-52	153.25	13.22	10.72	155.1	63.01	65.22	30.00	13.20	13.20
1952-53	117.21	10.40	6.52	52.11	13.52	65.20	52.00	28.22	45.52
1953-54	132.86	66.08	10.32	150.1	15.22	108.13	42.00	6.22	46.22
1954-55	130.32	22.26	14.31	67.02	85.12	140.52	60.00	22.22	52.52
1955-56	113.22	26.32	11.12	61.20	80.32	131.22	30.00	22.22	11.22
1956-57	108.10	28.12	42.08	105.1	26.22	103.22	30.00	6.22	6.22
1957-58	103.16	22.26	8.12	65.22	22.12	22.12	32.00	6.22	25.02
1958-59	102.12	102.12	102.12	122.12	102.12	22.12	30.00	12.22	6.12
1959-60	82.22	22.02	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1960-61	82.22	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1961-62	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1962-63	82.22	22.02	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1963-64	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1964-65	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1965-66	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1966-67	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1967-68	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1968-69	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1969-70	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1970-71	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22
1971-72	102.12	102.12	22.02	122.12	22.12	22.12	30.00	6.22	6.22

Table VII.2 : Districtwise Change in Production of Crops and Growth Rates of Production for Maharashtra State (1961-1970)

District	Rice				Wheat				Kharif Jowar				Rabi Jowar				Total Jowar			
	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR
2. Thane	2325 (10.30)	2134	-191	-1.42	-	-	-	-	2 (0.01)	2	-	-	-	-	-	-	2 (0.01)	2	-	-
3. Kolaba	2002 (14.04)	2030	28	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Ratnagiri	1413 (9.91)	1579	166	1.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u>Region I</u>	5740 (40.25)	5743	3	0.00	-	-	-	-	2 (0.01)	2	-	-	-	-	-	-	2 (0.01)	2	-	-
5. Nasik	385 (2.70)	320	-65	-3.04	366 (9.06)	452	86	3.60	87 (0.58)	36	-51	-2.87	237 (1.42)	101	-136	-13.24	324 (1.02)	137	-187	-13.36
6. Dhulia	148 (1.04)	82	-66	-9.37	244 (0.04)	344	100	5.90	289 (1.93)	208	-81	-5.34	759 (4.54)	485	-274	-7.19	1048 (3.30)	693	-355	-6.65
7. Jalgaon	37 (0.26)	30	-7	-3.44	193 (4.78)	260	67	5.10	1700 (11.35)	1507	-193	-1.30	183 (1.09)	141	-42	-4.26	1883 (5.94)	1648	-235	-2.19
<u>Region II</u>	570 (4.00)	432	-138	-4.52	803 (19.88)	1056	253	4.70	2076 (13.86)	1751	-325	-2.79	1179 (7.05)	727	-452	-7.74	3255 (10.26)	2478	-777	-4.43
8. Ahmednagar	111 (0.78)	66	-45	-8.30	157 (3.89)	215	58	5.40	8 (0.05)	10	2	-	2388 (14.27)	2159	-229	-1.67	2396 (7.55)	2170	-226	-1.60
9. Poona	631 (4.42)	412	-219	-6.83	90 (2.23)	119	29	4.70	147 (0.98)	27	-120	-24.59	1378 (8.23)	1210	-168	-2.14	1526 (4.81)	1237	-289	-3.44
10. Satara	267 (1.87)	247	-20	-1.28	100 (2.48)	104	4	0.70	451 (3.01)	451	-	-0.00	885 (5.29)	730	-155	-3.15	1330 (4.21)	1181	-155	-2.03
11. Sangli	135 (0.95)	133	-2	-0.26	74 (1.83)	82	8	1.70	1760 (11.75)	1069	-691	-7.98	316 (1.89)	262	-54	-3.08	2076 (6.54)	1330	-746	-7.15
12. Solapur	79 (0.55)	45	-34	-8.95	135 (3.34)	154	19	2.20	23 (0.15)	14	-9	-	3256 (19.46)	2925	-331	-1.78	3279 (10.34)	2939	-340	-1.81
13. Kolhapur	1327 (9.30)	896	-431	-6.33	12 (0.30)	15	3	-	588 (3.92)	438	-150	-4.79	9 (0.05)	23	14	-	597 (1.86)	461	-136	-4.21
<u>Region III</u>	2550 (17.87)	1799	-751	-5.64	568 (14.07)	689	121	3.30	2977 (19.86)	209	-968	-6.35	8232 (49.19)	7309	-923	-1.96	11210 (35.33)	9318	-1892	-3.04

NOTE : First two columns for each crop shows production in the initial period and the end period respectively. Figures in parenthesis are percentages to State production of the crop

Hmt : Hundred metric tonnes

GR : Compound growth rate per cent per annum by two-point method.
Bombay district (district no. 1) deleted as it is not important agriculturally.

(Contd.)

Table VII.2 : (Contd.)

District	Bajra				Other Cereals				Total Cereals				Total Pulses				Total Foodgrains Cereals + Pulses			
	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR	Average 61-64 (Hmt)	Average 67-70 (Hmt)	(Hmt)	GR
2. Thana	-	-	-	-	253 (9.64)	326	73	4.30	2580 (4.49)	2462	-118	-0.78	38 (0.45)	41	3	1.30	2618 (3.97)	2503	-115	-0.74
3. Kolaba	-	-	-	-	211 (8.05)	259	48	3.50	2212 (3.85)	2289	77	0.60	30 (0.35)	33	3	1.60	2242 (3.40)	2322	80	0.60
4. Ratnagiri	-	-	-	-	548 (20.90)	522	-26	-0.81	1962 (3.41)	2101	139	1.20	35 (0.41)	47	12	5.10	1997 (3.02)	2148	151	1.20
<u>Region I</u>	- (0.00)	-	-	-	1012 (38.59)	1107	95	1.50	6754 (11.75)	6852	98	0.24	103 (1.21)	121	18	2.80	6857 (10.39)	6973	116	0.27
5. Nasik	1183 (24.37)	1534	351	4.40	542 (20.67)	454	-88	-2.91	2800 (4.87)	2896	96	0.60	370 (4.53)	380	10	0.40	3170 (4.83)	3276	106	0.60
6. Dhulia	662 (13.64)	762	100	2.30	129 (4.92)	146	17	2.10	2231 (3.88)	2027	-204	-1.60	292 (3.45)	339	47	2.50	2523 (3.82)	2366	-157	-1.05
7. Jalgaon	225 (4.63)	320	95	6.00	8 (0.19)	6	1		2344 (4.08)	2264	-80	-0.58	711 (8.41)	744	33	0.80	3054 (4.63)	3008	-46	-0.26
<u>Region II</u>	2070 (42.64)	2616	546	4.00	676 (25.78)	606	-70	-1.81	7375 (12.83)	7187	-188	-0.44	1373 (16.39)	1463	90	1.10	8747 (13.28)	8650	-97	-0.18
8. Ahmednagar	671 (13.82)	874	203	4.50	71 (2.71)	76	5	1.10	3406 (5.92)	3401	-5	0.00	268 (3.17)	294	26	1.60	3671 (5.57)	3695	21	0.10
9. Poona	603 (12.42)	672	69	1.80	164 (6.25)	173	9	0.90	3014 (5.24)	2613	-401	-2.34	203 (2.40)	199	-4	-0.32	3217 (4.88)	2812	-405	-2.21
10. Satara	406 (8.36)	438	32	1.30	108 (4.12)	77	-31	-5.48	2217 (3.85)	2046	-171	-1.32	258 (3.05)	232	-26	-1.76	2475 (3.75)	2278	-197	-1.37
11. Sangli	229 (4.72)	180	-49	-3.93	48 (1.83)	36	-12	-4.68	2562 (4.15)	1762	-800	-6.04	322 (3.81)	310	-12	-0.62	2884 (4.37)	2072	-812	-5.36
12. Sholapur	89 (1.83)	205	116	14.90	53 (2.02)	90	37	9.20	3635 (6.32)	3433	-202	-0.94	355 (4.20)	408	53	2.30	3990 (6.05)	3841	-149	-0.64
13. Kolhapur	4 (0.08)	2	-2	-	331 (12.62)	323	-8	-0.41	2471 (3.94)	1697	-574	-4.74	102 (1.21)	77	-25	-4.57	2373 (3.59)	1773	-600	-4.74
<u>Region III</u>	2002 (41.23)	2371	369	2.90	775 (29.56)	775	-	0.00	17105 (29.72)	14952	-2153	-2.23	1508 (17.84)	1520	12	0.10	18613 (28.21)	16471	-2142	-2.00

(Contd.)

Table VII.3 : Area and Production of Pulses in Nagpur Division (Region V) 1960-61 to 1971-72

	Area	Production
1960-61	6520 (100.00)	4392 (100.00)
1961-62	6549 (100.14)	3018 (68.72)
1962-63	6562 (100.34)	2787 (63.46)
1963-64	6778 (103.64)	3171 (72.20)
1964-65	7022 (107.37)	3101 (70.61)
1965-66	6119 (93.56)	1859 (42.33)
1966-67	6374 (97.77)	2292 (52.18)
1967-68	6771 (103.53)	2198 (50.04)
1968-69	6729 (102.89)	2420 (55.10)
1969-70	7077 (108.21)	2477 (56.40)
1970-71	6955 (106.34)	2351 (53.53)
1971-72	7098 (108.53)	2449 (55.76)

8. AREA, PRODUCTION AND PRODUCTIVITY

8.1 In the earlier chapters we considered changes in area under crops, area under irrigated crops and production. It would have been appropriate to take up the issue of productivity as an independent topic. But we will discuss productivity independently only briefly and take up the three aspects, viz. area, production and productivity, together for various reasons. Firstly, having discussed area and production changes, productivity becomes a related aspect and the discussion of three aspects together becomes more meaningful. Secondly, we mentioned frequently in earlier chapters, production and hence productivity of irrigated crops is not available separately in the official data and we cannot go into the comparison of productivity on irrigated area and unirrigated area. Lastly, in our previous analysis we had deleted some years in our search for the underlying trend and the time period covered for area and production do not match exactly and instead of considering the available productivity time series we have to devise some other method for identifying the 'underlying' trend in productivity. How this trend is obtained will be discussed later in the discussion on methodology.

This is not to say that we have altogether ignored the productivity time series. While the district-wise productivity time series for major crops is presented in the separate volume of Data Tables, time series data at the State level is incorporated in Table VIII-1 at the end of the present chapter for reference. We will discuss productivity briefly in Part I and take up area-productivity-production together in Part II of the

present chapter.

I

PRODUCTIVITY8.2 Level of Productivity

From the above-mentioned Table VIII-1 where the State productivity series is presented for 19 crop-heads, we see that the productivity level for foodgrains as a whole (Col. 15) is between 4 and 6 quintals per hectare and this appears to be on the low side. What are the comparable productivity levels for the country as a whole? In Table 8.1 productivities for eight important crops (covering about three-fourth of State's gross cropped area) for Maharashtra, All-India and the

Table 8.1 : Productivity levels in Maharashtra compared to All-India for some crops.
(Average of 1967-68 to 1969-70.)

Crops	Yield (Kg/ha)		
	Maharashtra 1/	All-India 2/	Highest* productivity State
Rice	1027	1060	1777 (Mysore)
Wheat	460	1160	2075 (Punjab)
Jowar	541	530	701 (M.P.)
Bajra	308	383	473 (Gujarat)
Gram	294	682	974 (Haryana)
Sugarcane (Gur)	7321	4931	8005 (Mysore)
Cotton	84	122	342 (Punjab)
Groundnut (Pod)	686	708	950 (Tamil Nadu)

(* With at least 10 per cent share in the All-India production).

1/ Yield for Maharashtra based on Season and Crop Report data.

2/ Yield for All-India and for highest productivity State from 'Estimates of area and production of principal crops in India 1969-70 (Summary Table)', Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India, reproduced in 'Fertilizer Statistics' (1970-71), The Fertilizer Association of India (1971).

State with highest productivity are presented for the average of three years 1967-68 to 1969-70 for comparison.

Here we see that productivities of almost all crops except sugarcane are lower than the All-India figures and much lower than the highest productivity state. This could be due to various reasons like low and uncertain rainfall, limited irrigation, poor soils, etc., but we shall not go into these reasons. For sugarcane the productivity is indeed very high compared to the All-India level. Unlike the major sugarcane growing state like U.P., sugarcane in Maharashtra is entirely irrigated.

8.3 But we are interested not in a static picture. Our interest is in the change over the years. From Table VIII-1 one gets an impression that there is a general decline in productivity. What is the overall situation? We assess this by using index numbers of productivity prepared by the Bureau (Directorate) of Economics and Statistics, Government of Maharashtra. We will cover index numbers of productivity at two levels only : productivity for all (agricultural) commodities and productivity for foodgrains. As mentioned in the previous chapter, Bureau's index is obtained after weighting index numbers for individual crops and within foodgrains also, crops have different weights. The foodgrains productivity index given by Bureau is thus somewhat different from the index in Table VIII-1. Also noted in the previous chapter was the fact that 'fruits and vegetables' group is absent (except for potato) in Bureau's index.

In Table 8.2 the two indices are presented and the impression of overall decline in productivity is confirmed. But as noted in the earlier analysis, last

Table 8.2 : Index Numbers of productivity for all crops and foodgrains.

	All commodities	Foodgrains
1960-61	100.00	100.00
1961-62	84.52	86.44
1962-63	88.23	88.87
1963-64	88.81	88.33
1964-65	89.44	89.48
1965-66	65.37	61.90
1966-67	75.07	75.86
1967-68	86.16	86.33
1968-69	89.59	87.46
1969-70	87.15	85.54
1970-71	75.63	77.36
1971-72	73.77	67.36

(Based on the productivity indices from Statistical Abstract of Maharashtra State for the year 1973-74 Directorate of Economics and Statistics, Government of Maharashtra, the base year being 1956-57. The indices in the above table are expressed with 1960-61=100 for convenience. Foodgrains have a weightage of 65.81 out of a total of 100.)

two years were drought-affected, year 1965-66 was bad with not much reduction in cropped area but a significant fall in production while year 1960-61 was an exceptionally good year. The compound growth rates by the regression method come out as follows after various deletions of years : (see next page.) Thus even after deleting the years likely to depress the growth rate, the 'best' rate of productivity comes out as -0.12 per cent for all (agricultural) commodities and -0.51 per cent for foodgrains. Foodgrains draw a

**State-level Growth Rates (per cent
per annum) of productivity**

	(Based on Bureau's indices)	
	<u>All commodities</u>	<u>Foodgrains</u>
1. Entire twelve year period	-1.51	-1.93
2. Deleting years 1970-71, 1971-72	-1.07	-1.37
3. Deleting 1965-66	-0.90	-1.19
4. Deleting 1960-61	-0.12	-0.51

weight of 65.81 in the Bureau's weighting pattern and it is obvious that the decline is higher for foodgrains than non-foodgrains crops.

II

Area-Production-Productivity

8.4 Looking at the Bureau's indices again, following growth rates emerge for the State as a whole after deletions of four years mentioned above.

**State-level Growth Rates (per cent
per annum, regression method)**

	(Based on Bureau's indices)		
	<u>Area</u>	<u>Production</u>	<u>Productivity</u>
All commodities	0.05	-0.07	-0.12
Foodgrains	0.28	-0.23	-0.51

Although this becomes an exercise in small magnitudes, we see that there is decline or stagnancy in the agricultural performance. There is a slight increase in area but a slightly higher decline in productivity and hence the decline in production.

8.5 Now we leave the Bureau's index numbers and come back to the data in Season and Crop Reports. Here we

will consider important individual crops and changes in their area-production-productivity. Feedgrains area or production is now a simple sum of production (or area) of individual crops, unlike the Bureau's index. With Season and Crop Report data we can have a districtwise analysis for the major crops. But as mentioned in Section 8.1, a slightly different methodology for obtaining the underlying productivity trend is called for.

Methodology for Productivity Growth Rate

In our previous analysis of area and production, we had deleted some unfavourable years. In the analysis of area, we deleted years 1970-71 and 1971-72 occurring at the end of the time period covered (being the scarcity years) to find out the underlying trend. The area growth rates were obtained by taking the 'initial period' and 'end period' as follows :

Initial period: Triennial average
1960-61 to 1962-63

End period : Triennial average
1967-68 to 1969-70

Based on these two points (centred on 1961-62 and 1968-69 respectively) growth rates and absolute changes were worked out.

For production analysis, year 1960-61 was also deleted because it was an exceptionally good year in the sense that although area cropped in 1960-61 was exceeded frequently, the production of 1960-61 was not exceeded in the next eleven years. Such a high initial level (even if triennial average 1960-61 to 1962-63 were to be considered) would naturally depress the growth rates. To find out the underlying trend (or to allow maximum opportunity for any positive trend to surface), year 1960-61 was thus deleted. The two

points for production then are :

Initial period : Average 1961-62 to 1963-64
 End period : Average 1967-68 to 1969-70

The two points were thus centred on 1962-63 and 1968-69 respectively and growth rates and absolute changes were worked out in the preceding chapter. Thus the time span covered differs between area and production (although both automatically 'delete' the bad year of 1965-66). This creates a difficulty : we have to arrive at a growth rate for productivity consistent with area and production (otherwise it would be meaningless) and there is no relevant productivity time series (or two points viz. initial period and end period productivities required in the present analysis) to work on.

We get around this difficulty by noting that whenever time periods are identical, the growth rates of area, production and productivity are mathematically related.¹ Using this relationship and substituting the relevant per annum growth rates of production and area, one could arrive at a consistent productivity growth rate and we identify that productivity growth rate as an indicator of the 'underlying trend', even if the time periods for area and production rates are not identical.

3.6 State-level Performance

Taking the relevant growth rates for area and

1 By the equation $r_z = r_x + r_y + \frac{r_x \cdot r_y}{100}$ where r_z , r_x and r_y are growth rates of production, area and productivity respectively in per cent per annum. This equation holds irrespective of whether growth rates are calculated by the regression method or by the two-point method. The time period covered being, of course, identical.

production from previous chapters and working out productivity growth rates by the methodology described above, we arrive at the area-production-productivity growth rates for major crops. The State-level rates are presented in Table 8.3 where area shares and production shares in foodgrains for each crop are incorporated to mark important crops. Here we see that for foodgrains as a whole the area-production-productivity rates are 0.23 per cent, 0.07 per cent and -0.16 per cent respectively, differing from the Bureau index based rates in Section 8.4. These differ because in that section growth rates were based on regression method while the rates for foodgrains as a whole in the present analysis are based on the two-point method which 'eliminate' bad year 1965-66 (and not so good year 1966-67). Further various cereals and pulses do not have different weights and the productivity rate is obtained by a different methodology explained in Section 8.5. The stagnant or declining trends, however, are apparent in both.

Looking at the present table we find that the performance of nearly all major crops is unsatisfactory on one count or another. As mentioned in the previous chapter, production gains are apparent in kharif jowar, bajra, green gram, black gram, sugarcane and cotton but productivity gains are appreciable for only kharif jowar and bajra which are kharif crops with little irrigation. While the two pulses mentioned above (both kharif) increase in area and production, productivity shows no gains. Major pulses of tur and gram have done badly for all the three aspects of area-production-productivity.

Table 8.3 : Area, Production, Productivity Growth Rates for Maharashtra State (1960-61 to 1969-70)

	Area		Production		Productivity
	% of base period GCA	Growth Rate (% p.a.)	% of base period food-grains	Growth Rate (% p.a.)	Growth Rate (% p.a.)
1 Rice	(6.96)	0.11	(21.66)	-0.76	-0.88
2 Wheat	(4.74)	-1.04	(6.14)	-0.90	0.14
3 Kh.Jowar	(13.26)	0.06	(22.71)	2.20	2.14
4 Rabi Jowar	(19.38)	-1.63	(25.36)	-2.55	-0.94
5 Total Jowar	(32.64)	-0.92	(48.06)	-0.16	0.77
6 Bajra	(8.80)	3.07	(7.36)	4.60	1.48
7 Other Cereals	(2.47)	-0.12	(3.97)	0.60	0.72
8 <u>Total Cereals</u>	(55.60)	-0.07	(87.20)	0.12	0.19
9 Gram	(2.07)	-1.69	(2.00)	-4.06	-2.41
10 Tur	(2.88)	1.70	(5.11)	-1.97	-3.61
11 Green Gram	(2.15)	3.50	(1.65)	2.68	-0.79
12 Black Gram	(2.29)	2.60	(1.79)	2.68	0.08
13 Other Pulses	(3.14)	1.00	(2.24)	1.30	0.30
14 <u>Total Pulses</u>	(12.53)	1.53	(12.79)	-0.31	-1.81
15 <u>Total Foodgrains</u>	(68.13)	0.23	(State=100)	0.07	-0.16
16 Sugarcane	(0.78)	3.90	-	4.50	0.58
17 Cotton	(13.80)	0.67	-	1.00	0.33
18 Groundnut	(5.88)	-2.79	-	-3.79	-0.99
	(State GCA = 100)				

Sugarcane, the crop most favoured in the State receiving enormous irrigation and fertilizers, has a production growth rate of 4.50 per cent but a negligible gain in productivity. Cotton, an important crop covering 14 per cent of State gross cropped area, has done moderately well in production (growth rate 1.00 per cent) but gain in productivity is negligible. On the whole a conclusion of decline-stagnancy is justified. If the new technology in agriculture is identified as due to three main factors, viz. irrigation, improved or hybrid varieties and use of chemical fertilizers, then crops receiving all three are sugarcane and wheat. While situation for wheat is stagnant, sugarcane shows production (and area) gains but stagnancy in productivity as mentioned above and the new technology has failed to improve productivity. Gains in kharif jowar and bajra may be due to hybrid cultivation but the meagre available data on extent hybrid cultivation prevents a firm conclusion although it is sure that increased irrigation has no hand in this.

8.7 Regionwise Analysis

We now turn to a similar regionwise analysis. The relevant growth rates for individual districts are incorporated in Table VIII-2 at the end of the chapter for easy reference. For brevity, we will limit ourselves to regional analysis. In Table 8.4 area-production-productivity rates for foodgrains crops are presented along with the base period shares of each region in State area and production for each crop. These shares give us the importance of each region for a given crop in the State and the growth rates of each region can be suitably interpreted. But there is also

Table 8.4 : Regionwise Growth Rates of Area, Production and Productivity for Foodgrains (1960-61 to 1969-70)

(Growth Rate % per annum)

	(1) Rice			(2) Wheat			(3) Kh. Jowar			(4) Rabi Jowar		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
<u>Region I</u> (Konkan)	-0.07 (31.45)	0.00 (40.25)	0.07	-	-	-	(0.02)	-	-	-	-	-
<u>Region II</u> (Nasik-Dhulia Jalgaon Dist- riets)	-2.82 (5.59)	-4.52 (4.00)	-1.75	0.78 (17.27)	4.70 (19.88)	3.89	-1.11 (8.76)	-2.79 (13.86)	-1.70	-7.47 (6.24)	-7.74 (7.05)	-0.29
<u>Region III</u> (Poona Division)	-1.12 (16.25)	-5.64 (17.87)	-4.57	0.38 (13.10)	3.30 (14.07)	2.91	-2.69 (11.68)	-6.35 (19.86)	-3.76	-1.53 (57.99)	-1.96 (49.19)	-0.44
<u>Region IV</u> (Aurangabad Division)	0.29 (6.37)	-5.44 (3.92)	-5.71	-1.30 (29.80)	-3.37 (28.28)	-2.10	0.22 (30.14)	2.80 (26.92)	2.57	-1.40 (28.73)	-2.99 (36.95)	-1.61
<u>Region V</u> (Nagpur Division)	1.10 (40.13)	1.40 (33.96)	0.30	-2.20 (39.83)	-4.50 (37.77)	-2.35	0.74 (49.40)	6.40 (39.35)	5.62	0.74 (7.03)	0.10 (6.81)	-0.64
Maharashtra	0.11 (100.00)	-0.76 (100.00)	-0.88	-1.04 (100.00)	-0.90 (100.00)	0.14	0.06 (100.00)	2.20 (100.00)	2.14	-1.63 (100.00)	-2.55 (100.00)	-0.94

Base period area and production shares in State total shown in parenthesis.

(contd.)

Table 8.4 : (contd.)

	(5) Total Jowar			(6) Bajra			(7) Other Cereals			(8) Total Cereals		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
<u>Region I</u> (Konkan)	-	-	-	-	-	-	-1.14	1.50	2.67	-0.38	0.24	0.62
	(0.01)						(35.58)	(38.59)		(5.54)	(11.75)	
<u>Region II</u> (Nasik-Dhulia Jalgaon Districts)	-4.04	-4.43	-0.41	2.56	4.00	1.40	1.25	-1.81	-3.02	0.00	-0.44	-0.44
	(7.27)	(10.25)		(33.26)	(42.64)		(23.11)	(25.78)		(12.72)	(12.83)	
<u>Region III</u> (Poona Division)	-1.67	-3.04	-1.39	2.50	2.90	0.39	-0.66	0.00	0.66	-0.53	-2.23	-1.71
	(39.18)	(35.33)		(48.89)	(41.23)		(27.49)	(29.55)		(35.10)	(29.72)	
<u>Region IV</u> (Aurangabad Division)	-0.72	-0.51	0.21	5.63	9.60	3.76	0.06	4.90	4.84	0.09	-0.12	-0.21
	(29.30)	(32.21)		(16.12)	(15.08)		(10.01)	(4.06)		(23.53)	(22.18)	
<u>Region V</u> (Nagpur Division)	0.74	5.50	4.73	2.92	11.50	8.34	3.47	6.40	2.83	0.47	3.17	2.69
	(24.25)	(22.79)		(1.72)	(1.05)		(3.81)	(2.02)		(23.10)	(23.52)	
Maharashtra	-0.92	-0.16	0.77	3.07	4.60	1.48	-0.12	0.60	0.72	-0.07	0.12	0.19
	(100.00)	(100.00)		(100.00)	(100.00)		(100.00)	(100.00)		(100.00)	(100.00)	

(contd.)

Table 8.4 : (contd.)

	(9) Total Pulses			(10) Total Foodgrains		
	Area	Produ- tion	Produ- tivity	Area	Produ- tion	Produ- tivity
<u>Region I</u> (Konkan)	-0.21 (1.69)	2.80 (1.21)	3.02	-0.37 (4.84)	0.27 (10.39)	0.64
<u>Region II</u> (Nasik-Unhulia- Jalgaon Districts)	1.53 (16.43)	1.10 (16.39)	-0.44	0.36 (13.41)	-0.18 (13.28)	-0.54
<u>Region III</u> (Poona Division)	0.95 (18.68)	0.10 (17.84)	-0.84	-0.36 (32.08)	-2.00 (28.21)	-1.65
<u>Region IV</u> (Aurangabad Division)	2.53 (35.62)	2.20 (29.20)	-0.32	0.74 (25.75)	0.27 (23.08)	-0.47
<u>Region V</u> (Nagpur Division)	0.65 (27.58)	-3.84 (35.36)	-4.46	0.50 (23.93)	2.08 (25.04)	1.57
Maharashtra	1.53 (100.00)	-0.31 (100.00)	-1.81	0.23 (100.00)	0.07 (100.00)	-0.16

another advantage : with the area as well as production shares in State total, we know the level of productivity in the base period (whether above or below average, i.e. State-level productivity). The fact that the base periods do not exactly match is no obstacle in this as a rough idea suffices.

The role of irrigation in the production performance of each crop was discussed in the previous chapter and we do not go into the explanation for the area of production growth rates. We will comment on the juxtaposition of the three rates. Looking at the growth rates for total foodgrains (crop No. 10) we see that productivity gains are in Region I of Konkan area which a rice tract and Region V of Nagpur division which a cotton-kharif jowar and wheat tract. Production-productivity growth rates for Region I are positive but small, at 0.27 and 0.64 per cent, area having declined marginally. The main crop of rice in this region (covering 31 per cent of State rice area and 40 per cent of State rice production) has little contribution to this. It is the 'other cereals' consisting mainly of ragi which has gains in production and productivity. In Region V the crops responsible for production-productivity gains are kharif jowar for which production growth rate of 6.40 per cent is mainly due to the productivity gains, the productivity rate being as high as 5.62 per cent per annum. The overall (total foodgrains) production rate is reduced to 1.57 per cent because of declines in wheat and pulses. The decline in production of main pulse, tur, in spite of increasing area under it, was already noted in the previous chapter.

The two regions discussed above cover about 35 per cent of base period foodgrains production. The remaining three regions have declining productivities. For the third region of Poona division covering about 30 per cent of base period State foodgrains production, all the three rates are negative while in Region IV of Aurangabad division, in spite of a negative productivity growth rate, production rate is marginally positive because of increasing area. This region has a relatively substantial addition to area under pulses and the positive production growth rate for pulses offsets the negative growth rate of cereals (-0.12 per cent) in this region. However, the growth in pulse production is not commensurate with growth in area and pulses reinforce the declining productivity in cereals and we have the foodgrains productivity rate at -0.47 per cent.

The main reason for the declining foodgrains production is the performance of Region III. From Table 8.3 it can be seen that rabi jowar forms one-fourth of the State foodgrains production in the base year. From the present table we see that half the rabi jowar production came from Region III. This crop has suffered with area, production and productivity rates being -1.53 per cent, -1.96 per cent and -0.44 per cent per annum respectively. In fact rabi jowar has had setbacks in nearly all the regions.

Gains in wheat production-productivity in Regions II and III are mainly on account of productivity increases while bajra in these two regions shows gains in production due more to area increases than productivity increases. These gains are more than offset by

declines in kharif and rabi jowar and the feedgrains performance comes out negative for these two regions.

Coming to overall good bajra performance again, we observe that although in Regions II and III gains are due to area, in Regions IV and V gains are as much due to productivity. Further while kharif jowar declined in all aspects in Regions II and III, in the last two regions of Aurangabad and Nagpur divisions the increases in production are due to productivity, area contribution being relatively small. This fact was also underlined in the previous chapter.

6.6 Looking at the regionwise performance for foodgrains as a whole, one can see clearly that no region has a production growth rate for foodgrains commensurate with the population growth rate for the State at 2.40 per cent per annum between the two censuses of 1961 and 1971. Are there any districts at all which have comparable production growth rates? From Table VIII-2 containing districtwise data we find there are five such districts. These are Handed (Region IV) and Buldhana, Akola, Yeotmal and Wardha (Region V). The details of their performance are noted in Table 8.5.

From this table we see that these districts have production growth rates between 3.30 per cent and 4.50 per cent per annum. (If we look for the next best district, it comes out to be Ehir in Region IV with only 1.60 per cent production growth rate.) Although area growth rates are also positive, main contributor to the increased production is productivity. The productivity growth rates range from 2.08 to 4.19 per cent per annum. Was this increased productivity due to increased irrigation?

Table 8.5 : Districts with Good Performance in Foodgrains Production (1960-61 to 1969-70)

(GR = Growth Rate % p.a.)

Total Food Grains	Nanded		Buldhana		Akola		Yectmal		Wardha	
	Base period proportion(%)	GR	Base period proportion(%)	GR	Base period proportion(%)	GR	Base period proportion(%)	GR	Base period proportion(%)	GR
1. Area	(3.43)	0.20	(2.94)	1.20	(3.06)	1.10	(3.09)	0.60	(1.76)	0.20
2. Production	(3.37)	3.40	(3.11)	3.30	(2.82)	4.50	(2.70)	4.00	(1.53)	4.40
3. Productivity		3.19		2.08		3.36		3.38		4.19
	Base period	End period	Base period	End period	Base period	End period	Base period	End period	Base period	End period
4. Proportion of food-grains area irrigated	0.90	3.03	1.82	2.26	0.08	1.11	0.10	0.65	0.40	1.28
5. Crops with good growth rates	Base period proportion(%)	GR	Base period proportion(%)	GR	Base period proportion(%)	GR	Base period proportion(%)	GR	Base period proportion(%)	GR
1) Kharif Jowar										
Area	(8.97)	0.42	(9.55)	1.23	(9.42)	1.14	(10.41)	1.06	(4.90)	1.07
Production	(8.56)	5.50	(10.25)	4.40	(8.02)	7.50	(7.06)	7.80	(3.22)	9.80
Productivity		5.06		3.13		6.29		6.67		8.64
ii) Total pulses										
Area	(3.93)	3.41								
Production	(3.62)	5.80								
Productivity		2.31								

(Base period area and production shares in respective State totals shown in parenthesis)

These districts have mainly kharif jowar and cotton which are both kharif crops and very little area under these crops is irrigated. From item 4 of the present table we see that at the end of the period less than 3 per cent of foodgrains area is irrigated, rising from less than 1 per cent. It is not possible to link increased productivity with increased irrigation. The irrigation growth rates may be high for this region but these are deceptive because they result due to very low initial irrigation levels. Further in item 5 of the table main crop responsible for the increase is noted. It is kharif jowar (and total pulses for only Handed) and the increased irrigated area in all these districts is mostly put to wheat, kharif jowar a mostly unirrigated crop receiving little additional irrigated area.

Thus the productivity gains of these districts have nothing to do with irrigation. It may have something to do with hybrid jowar but a firm conclusion is difficult for want of reliable data. Fertilizer use growth rates are impressive for all the districts as noted in the chapter on fertilizer use but wheat and cash crops like fruits-vegetables and sugarcane (and perhaps cotton) may be receiving priority for fertilizer use. In any case 1970-71 NSS data had revealed that unirrigated jowar with 29 per cent share in State gross cropped area received only 5.49 per cent of N consumption in that year (Table 6.8, Chapter 6). Irrigated wheat which has increased in these districts appears to be a more likely candidate for fertilizer use.

Thus only these five districts which covered 13 to 14 per cent of area and production of the State

in the base period have a 'good' performance in food-grains and the two factors of irrigation and use of fertilisers in the new technology have not much to do with these.

8.9 Sugarcane, Cotton and Groundnut

Sugarcane : In Table 8.6 regionwise area-production-productivity rates for these three important non-foodgrains crops are presented. For sugarcane, the striking feature is the fact that in the main sugar tract of Region II of Poona division (which covered 85 per cent of production in base period) the production gains are on account of area. Productivity has actually declined in this region. From the area-production shares it is obvious that this region has a relatively high productivity level in the base period.

On the other hand remaining regions where sugarcane is slowly gaining in area, the base period level of productivity is lower but the gains in production are much more due to increased productivity (productivity growth rates are 10 to 19 per cent per annum). In fact, the contrast between Region III (Poona division, the traditional sugarcane tract) and Region IV (Aurangabad division) is striking. While the base period area and production share of Region IV are 15 and 8 per cent of State area and production of sugarcane it was seen earlier that the absolute addition to production in this region over the period is higher than that for Region III with its area and production shares of 73 and 84 per cent of the State although the growth rate for area is same for both the regions, around 4 per

Table 8.6 : Regionwise Growth Rates of Area, Production and Productivity for Sugarcane, Cotton and Groundnut (1960-61 to 1969-70)

(Growth Rates % per annum)

	Sugarcane			Cotton			Groundnut		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
<u>Region I</u> (Konkan)	14.00 (0.14)	36.20 (0.05)	19.47	-	-	-	-	-	-
<u>Region II</u> (Nasik-Dhule-Jalgaon-District)	1.67 (9.86)	11.40 (7.07)	9.57	0.33 (12.50)	-6.57 (22.75)	-7.28	-6.35 (28.26)	-7.81 (25.79)	-1.56
<u>Region III</u> (Poona Division)	4.09 (72.92)	2.03 (84.26)	-1.98	-3.03 (2.64)	-7.47 (6.79)	-4.58	-0.03 (30.54)	-2.88 (39.92)	-2.85
<u>Region IV</u> (Aurangabad Division)	4.28 (15.26)	16.00 (7.90)	11.24	0.43 (28.23)	3.50 (23.26)	3.06	-3.68 (30.14)	-3.97 (26.78)	-0.30
<u>Region V</u> (Nagpur Division)	5.39 (1.82)	21.90 (0.72)	15.67	1.02 (56.63)	3.67 (47.20)	2.62	-0.53 (11.05)	3.50 (7.45)	4.05
Maharashtra	3.90 (100.00)	4.50 (100.00)	0.58	0.67 (100.00)	1.00 (100.00)	0.33	-2.79 (100.00)	-3.75 (100.00)	-0.99

Percentage shares in State totals for the base period shown in parenthesis.

cent per annum. This is due to considerable productivity gains of Region IV (growth rate of productivity 16 per cent per annum) compared to the productivity declines in Region III. If the irrigation water consumption per hectare of sugarcane is not much different, clearly, returns to this important limited resource of irrigation water (as well as other resources like fertilisers) are much higher in the 'new' regions than in the region which has the bulk of sugarcane tract. From the cultivation point of view, it would be clearly desirable to control sugarcane acreage in traditional areas and encourage it in 'new' areas. This, of course, does not take into account other considerations like infrastructure of sugar factories, etc., which may have even a more decisive role.

As regards the reducing productivity in the main sugarcane tract, the reasons for this phenomenon could be many. As indicated above, with infrastructure of sugar factories available in the region, cultivation of lands with lower productivity of sugarcane may still be profitable and it is in the interest of factories to encourage more cultivation of sugarcane in its command area to increase its turnover. Further, it is often stated that water drainage facilities are often inadequate and due to waterlogging the lands under sugarcane are affected, lowering the productivity. Then, again, with the heavy use of fertilisers, corrective measures to restore the soil balance are necessary and these may not be in force. It is difficult to provide any data on such factors affecting fertility, but there are indications that such factors are operating.

With the productivity declining in the main

sugarcane tract (Region III) at 2 per cent per annum, at the State-level the gains in productivity are negligible. The growth rate of production of sugarcane (in terms of gur) at the rate of 4.50 per cent per annum is due to the increasing area.

Cotton : This is another important non-foodgrains crop covering 14 per cent of gross cropped area of the State. The performance is moderately well at the State level with production increasing at 1 per cent per annum, two-thirds of which is due to area increases and one-third due to productivity increases. With less than three per cent cotton being irrigated, we can say that this is mostly an unirrigated crop. The major cotton tracts are Region V of Nagpur division covering 56 per cent of area and Region IV of Aurangabad division covering 28 per cent of cotton area in the base period. Both these regions have production growth rates around 3.50 per cent, mostly due to increased productivity. But the Regions II and III with their lower area shares have registered declining production and productivity and the overall performance is reduced. Region II with its 12 per cent area share and 23 per cent production share in the base period (relatively high productivity region) has registered production growth rate of -6.972 per cent due to decreasing productivity, the growth rate being -7.28 per cent. And yet, as seen in previous chapter (Table 7.7) both total and irrigated cotton increased in this region. It is difficult to account for the sizable declines in production-productivity in this region.

Bulk of the irrigated cotton lies in Regions II and III and the two together covered 30 per cent of production in the base year. With this part of production

having a negative growth rate of about 7 per cent per annum, the gains in the last two regions (covering 70 per cent of production and growth rate about 3.50 per cent) are drastically reduced and a moderate State level performance results.

Groundnut : This important oilseed has suffered in production mostly due to declining area, at the State level. All the major groundnut areas (Regions II, III and IV) shows declines in area, production and productivity. This crop, like rabi jowar, has suffered throughout the State. Area reductions are mainly responsible for the declining production performance with the exception of Region III of Poona division where productivity reduction is substantial. Very little part of the area is irrigated (less than 2 per cent, see Table 7.4) and over years there has been a negligible change (addition) in this.

The overall decline in groundnut is a little surprising in view of the fact that the farm harvest price of groundnut increased at the rate of 10.60 per cent per annum comparable with the sugarcane (gur) harvest price growth rate of 13.20 per cent per annum (Appendix B), which is well over the price increases for foodgrains.

8.10 To sum up, the production-productivity performance of agriculture in the State has been decidedly poor. While the important foodgrain crop of rabi jowar has a negative performance throughout the State, kharif jowar has done well in two regions and the State level performance for the crop is somewhat satisfactory. Wheat has done well in the two regions (where kharif jowar did not) due to increases in irrigated area but

the main producers of unirrigated wheat did badly so that overall wheat performance shows stagnation-decline. Bajra, a less important foodgrain crop (covering 7 per cent of the State foodgrains production in base period) has done well throughout the State but this, like kharif jowar, has little to do with irrigation. Rice (covering one-fifth of foodgrains production) indicates declines but the major region (Region V) has some positive performance, to arrive at an overall stagnancy-decline condition.

Sugarcane has done remarkably well, but the production increases in the main sugar tract are due to area, with productivity on the decline. With the 'new' areas rising from low productivity levels, the overall productivity trend is marginally positive. There is little doubt that irrigation has played a big hand in the growth of this hundred per cent irrigated crop. Other non-foodgrains crop of cotton has done moderately well while groundnut has suffered.

The overall performance gives little basis for looking confidently to the future. There are just five districts which have a foodgrains production growth rate better than population growth rate. The gains in these districts have nothing to do with irrigation - a resource which forms the backbone of the modern technology in agriculture. At best, irrigation has improved a completely negative performance to a stagnant one (e.g. wheat). Our assessment is not unduly pessimistic because the overall situation of stagnancy-decline is apparent even after removing the unusual years that are likely to have a depressing effect on the assessment of growth.

Table VIII.1 : Yield per hectare of different Crops for Maharashtra State, 1960-61 to 1971-72

Line (1) : Yield (kg.)

Line (2) : Index of Yield

Year		Rice	Wheat	Kharif Jowar	Rabi Jowar	Total Jowar	Bajra	Other Cereals	Total Cereals
		1	2	3	4	5	6	7	8
1960-61	(1)	1053.4	442.3	863.9	541.1	672.0	298.8	569.3	636.9
	(2)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1961-62	(1)	1144.6	465.5	593.6	409.4	482.0	255.9	591.3	532.1
	(2)	108.65	105.24	68.71	75.66	71.72	85.67	103.86	83.54
1962-63	(1)	944.6	513.9	607.3	502.1	546.2	329.6	546.7	559.7
	(2)	89.66	116.17	70.30	92.79	81.27	110.30	96.02	87.86
1963-64	(1)	1120.0	384.7	596.1	468.1	520.3	275.5	557.2	548.3
	(2)	106.32	86.97	69.00	86.51	77.43	92.54	99.62	86.08
1964-65	(1)	1061.7	459.9	662.0	446.0	536.8	274.9	627.6	559.3
	(2)	100.78	103.97	76.63	82.43	79.87	92.01	110.24	87.81
1965-66	(1)	669.2	336.1	439.9	332.7	378.8	203.7	432.8	384.1
	(2)	63.52	75.99	50.92	61.49	56.37	68.08	76.02	60.30
1966-67	(1)	776.8	433.1	525.3	488.0	504.2	230.8	508.3	481.8
	(2)	73.74	97.90	60.80	90.19	75.02	77.26	89.29	75.65
1967-68	(1)	1055.2	424.5	633.3	469.1	539.3	273.2	613.7	547.8
	(2)	100.16	95.96	73.30	86.69	80.25	91.43	107.78	86.01
1968-69	(1)	992.6	492.1	733.0	416.7	552.8	313.9	629.4	560.6
	(2)	94.22	111.24	84.85	77.00	82.25	105.06	110.54	88.01
1969-70	(1)	1032.3	463.5	662.9	426.3	532.6	336.3	507.7	549.7
	(2)	97.99	104.79	76.73	78.78	79.25	112.56	89.18	86.30
1970-71	(1)	1129.0	542.2	349.9	211.4	273.0	404.2	610.5	458.9
	(2)	110.66	122.57	34.99 40.51	39.07	40.63	135.28	107.22	72.05
1971-72	(1)	1041.0	506.4	473.1	211.7	310.0	200.6	581.4	422.4
	(2)	98.82	114.49	54.76	39.12	46.13	67.14	102.11	66.32

(Contd.)

Table VIII.1 : (Contd.)

Year	Line (1) : Yield (Kg.)						Line (2) : Index of Yield.					
	Gram 9	Tur 10	Green Gram 11	Black Gram 12	Other Pulses 13	Total Pulses 14	Total food grains 15	Sugarcane (Hr) 16	Chillies 17	Cotton 18	Groundnut 19	
1960-61	(1) 333.6 (2) 100.00	883.5 100.00	265.7 100.00	283.6 100.00	267.9 100.00	420.5 100.00	597.7 100.00	7430.5 100.00	563.4 100.00	115.1 100.00	738.6 100.00	
1961-62	(1) 337.9 (2) 101.28	612.5 69.32	246.8 92.88	272.7 96.17	250.6 93.54	357.1 83.73	498.4 83.39	7453.7 100.31	534.2 94.81	62.9 54.65	699.8 94.74	
1962-63	(1) 386.8 (2) 115.95	565.2 63.97	277.5 104.46	275.6 97.17	243.1 90.77	352.4 83.81	521.8 87.31	7543.6 101.52	535.8 95.10	85.5 74.33	704.9 95.43	
1963-64	(1) 305.9 (2) 91.68	637.0 72.10	259.0 97.51	275.1 98.39	245.6 92.81	357.3 84.95	513.2 85.85	8032.0 108.09	553.5 98.22	91.5 79.51	667.1 93.02	
1964-65	(1) 337.7 (2) 101.23	601.5 68.07	260.0 97.87	283.1 99.84	253.7 93.97	355.9 84.87	521.7 87.28	7602.0 102.30	562.5 99.83	70.3 68.88	749.1 101.41	
1965-66	(1) 252.6 (2) 75.71	439.5 49.74	226.3 85.20	217.6 76.73	235.4 87.89	201.9 67.03	365.5 61.16	6536.4 67.96	528.7 93.82	65.4 56.85	423.4 57.32	
1966-67	(1) 311.8 (2) 93.47	510.9 57.82	241.3 90.81	234.0 82.51	220.6 85.34	312.7 74.36	450.4 75.36	6925.0 93.19	533.6 94.69	73.1 63.48	464.5 62.88	
1967-68	(1) 275.7 (2) 82.64	503.0 56.93	258.3 97.23	281.4 99.21	247.2 92.27	321.7 76.49	504.7 84.45	7185.7 96.70	568.7 100.93	85.0 73.85	699.1 94.64	
1968-69	(1) 333.3 (2) 99.90	490.8 55.55	243.6 91.70	259.9 91.65	259.9 97.02	320.6 76.24	512.7 85.77	7489.3 100.79	554.0 98.32	90.7 78.76	708.7 95.94	
1969-70	(1) 274.3 (2) 82.20	464.9 52.61	242.3 91.22	257.6 91.54	242.1 90.38	299.7 71.27	496.4 83.05	7287.5 98.07	560.1 99.40	77.5 67.33	649.6 87.94	
1970-71	(1) 279.0 (2) 83.64	432.3 48.92	162.1 61.03	214.6 75.67	208.7 77.91	263.8 62.72	420.1 70.28	8047.0 108.29	425.7 75.55	29.9 26.00	640.5 87.80	
1971-72	(1) 304.4 (2) 91.25	451.6 51.11	141.0 53.08	172.4 60.80	196.1 73.21	259.9 61.80	392.4 65.66	7383.4 99.36	457.0 81.11	87.1 75.66	604.3 81.81	

Table VIII.2 : Growth Rates of Area, Production and Productivity of Major Crops in Districts of Maharashtra (1960-61 to 1969-70)
(Growth Rates - per Annum)

District	Rice			Wheat			Kharif Jowar			Rabi Jowar			Total Jowar		
	Area	Produ- tion	Produc- tivity	Area	Produ- tion	Produc- tivity	Area	Produ- tion	Produc- tivity	Area	Produ- tion	Produc- tivity	Area	Produ- tion	Produc- tivity
2 Thane	-0.64 (11.35)	-1.42 (16.30)	-0.79	-	-	-	-	-	-	-	-	-	-	-	-
3 Kolaba	0.17 (10.19)	0.20 (14.04)	0.03	-	-	-	-	-	-	-	-	-	-	-	-
4 Ratnagiri	0.30 (9.90)	1.90 (9.91)	1.60	-	-	-	-	-	-	-	-	-	-	-	-
<u>Region I</u>	-0.07 (31.45)	0.60 (10.25)	0.07	-	-	-	(0.02)	-	-	-	-	-	(0.01)	-	-
5 Nashik	-1.77 (2.95)	-3.04 (2.70)	-1.29	-1.17 (10.26)	3.60 (9.06)	4.83	-9.43 (0.73)	-2.87 (0.58)	7.24	-11.45 (2.10)	-13.24 (1.42)	-2.02	-11.04 (1.54)	-13.36 (1.02)	-2.61
6 Dhulia	-5.76 (2.23)	-9.37 (1.04)	-3.83	3.99 (3.82)	5.90 (6.04)	1.84	-2.15 (2.25)	-5.34 (1.93)	-3.26	-5.63 (3.25)	-7.19 (4.54)	-1.65	-4.39 (2.85)	-6.65 (3.30)	-2.36
7 Jalgaon	2.96 (0.49)	-3.44 (0.26)	-6.22	2.41 (3.20)	5.10 (4.78)	2.63	0.05 (5.78)	-1.30 (11.35)	-1.35	-6.36 (0.89)	-4.26 (1.09)	2.24	-0.96 (2.88)	-2.19 (5.94)	-1.24
<u>Region II</u>	-2.82 (5.59)	-4.52 (4.00)	-1.75	0.78 (17.27)	4.70 (19.88)	3.89	-1.11 (8.76)	-2.79 (13.36)	-1.70	-7.47 (6.24)	-7.74 (7.05)	-0.25	-4.04 (7.27)	-4.43 (10.25)	-0.41
8 Ahmednagar	-3.54 (0.78)	-8.30 (0.78)	-4.93	-0.03 (4.92)	5.40 (3.89)	5.43	(0.03)	(0.05)	-	-2.61 (7.68)	-1.67 (14.27)	0.97	-2.60 (10.51)	-1.60 (7.55)	1.03
9 Poona	-1.65 (3.99)	-6.83 (4.42)	-5.27	0.61 (2.29)	4.70 (2.23)	4.07	-3.56 (0.99)	-24.59 (0.98)	-21.85	-1.33 (11.33)	-2.14 (8.23)	-0.82	-1.44 (7.13)	-3.44 (4.81)	-2.03
10 Satara	0.56 (1.98)	-1.28 (1.87)	-1.86	0.69 (1.57)	0.70 (2.48)	0.01	-0.02 (2.42)	0.00 (3.01)	0.02	-3.13 (4.26)	-3.15 (5.29)	-0.02	-2.21 (3.51)	-2.03 (4.21)	0.18
11 Sangli	1.88 (1.03)	-0.26 (0.95)	-2.10	-1.56 (1.60)	1.70 (1.83)	3.31	-3.88 (0.20)	-7.98 (11.75)	-4.27	-2.24 (2.84)	-3.08 (1.89)	-0.86	-3.19 (4.21)	-7.15 (6.54)	-4.09
12 Sholapur	-4.85 (0.77)	-8.95 (0.55)	-4.31	1.94 (2.48)	2.20 (3.34)	0.26	2.02 (0.08)	-	-	-0.47 (21.79)	-1.78 (19.46)	-1.32	-0.46 (12.97)	-1.81 (10.34)	-1.36
13 Kolhapur	-1.18 (7.70)	-6.33 (9.30)	-5.21	-	-	-	-2.72 (1.97)	-4.79 (3.92)	-2.13	5.64 (0.09)	-	-	-2.58 (0.85)	-4.21 (1.88)	-2.18
<u>Region III</u>	1.12 (16.25)	-5.64 (17.87)	-4.57	0.38 (13.70)	3.30 (14.07)	2.91	-2.69 (11.68)	-6.35 (19.66)	-3.76	-1.53 (57.99)	-1.96 (49.19)	-0.44	-1.67 (39.18)	-3.04 (35.33)	-1.39

Note : Growth rates based on two point method. For details of methodology, see the relevant chapters.
Figures in parenthesis are base period area and production shares in the State as a whole.
Growth rates not given for crops with negligible shares in State total. District Bombay (no. 1) is excluded.

Table VIII.2 : (Contd.)

District	Bajra			Other Cereals			Total Cereals			Total Pulses		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
2 Thana	-	-	-	-0.81 (8.54)	4.30 (9.64)	5.15	-0.66 (1.80)	-0.78 (4.49)	-0.12	-0.30 (0.60)	1.30 (0.45)	1.60
3 Kolaba	-	-	-	0.05 (8.25)	3.50 (8.05)	3.45	0.14 (1.55)	0.60 (3.85)	0.46	-0.64 (0.48)	1.60 (0.35)	2.25
4 Ratnagiri	-	-	-	-1.65 (20.80)	-0.81 (20.90)	0.85	-0.50 (2.16)	1.20 (3.41)	1.71	0.15 (0.61)	5.10 (0.41)	4.90
<u>Region I</u>	-	-	-	-1.14 (35.58)	1.50 (38.59)	2.67	-0.38 (5.54)	0.24 (11.75)	0.62	-0.21 (1.69)	2.80 (1.21)	3.02
5 Nashik	2.06 (20.80)	4.40 (24.37)	2.29	-0.19 (14.68)	-2.91 (20.57)	-2.73	-0.29 (6.09)	0.60 (4.87)	0.29	-0.40 (4.44)	0.40 (4.53)	0.80
6 Dhulia	3.50 (8.10)	2.30 (13.64)	-1.16	3.51 (8.22)	2.10 (4.92)	-1.36	0.02 (3.92)	-1.60 (3.88)	-1.62	3.29 (4.07)	2.50 (3.45)	-0.76
7 Jalgaon	3.13 (4.36)	6.00 (4.63)	2.78	-	-	-	0.61 (2.71)	-0.58 (4.08)	-1.18	1.60 (7.92)	0.80 (8.41)	-0.79
<u>Region II</u>	2.56 (33.26)	4.00 (42.64)	1.40	1.25 (23.11)	-1.81 (25.78)	-3.02	0.00 (12.72)	-0.44 (12.83)	-0.44	1.53 (16.43)	1.10 (16.39)	-0.44
8 Ahmednagar	4.97 (15.55)	4.50 (13.82)	-0.45	-1.41 (2.93)	1.10 (2.71)	2.55	-0.12 (9.27)	0.00 (5.92)	0.12	0.74 (4.61)	1.60 (3.17)	0.85
9 Poona	0.56 (10.84)	1.80 (12.42)	1.23	-0.75 (5.41)	0.90 (6.25)	1.66	-0.85 (6.83)	-2.34 (5.24)	-1.50	-1.59 (3.01)	-0.32 (2.40)	1.29
10 Satara	0.01 (9.07)	1.30 (8.36)	1.29	-2.36 (4.17)	-5.48 (4.12)	-3.20	-1.12 (4.04)	-1.32 (3.85)	-0.20	-0.72 (2.88)	-1.76 (3.05)	-1.05
11 Sangli	1.18 (7.87)	-3.93 (4.72)	-5.05	-2.18 (1.35)	-4.68 (1.83)	-2.56	-1.48 (4.04)	-6.04 (4.45)	-4.63	-0.04 (3.07)	-0.62 (3.81)	-0.58
12 Sholapur	4.38 (5.43)	14.90 (1.83)	10.08	6.28 (1.37)	9.20 (2.02)	2.75	0.14 (8.84)	-0.94 (6.32)	-1.08	0.00 (4.26)	2.30 (4.26)	-2.57
13 Kolhapur	-6.62 (0.13)	-	-	-0.69 (12.26)	-0.41 (12.62)	0.28	-1.29 (2.05)	-4.74 (3.94)	-3.50	-4.23 (0.85)	-4.57 (1.21)	-0.36
<u>Region III</u>	2.50 (48.89)	2.90 (41.23)	0.39	-0.66 (27.49)	0.00 (29.55)	0.66	-0.53 (35.10)	-2.23 (29.72)	-1.71	0.95 (18.68)	0.10 (17.84)	-0.84

(Contd.)

Table VIII.2 : (Contd.)

District	Total Foodgrains Cereals + Pulses			Sugarcane			Cotton			Groundnut		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
2 Thane	-0.63 (1.58)	-0.74 (3.97)	-0.11	0.00	26.00 (0.01)	26.00	-	-	-	-	-	-
3 Kolaba	0.09 (1.36)	0.60 (3.40)	0.51	-	-	-	-	-	-	-	-	-
4 Ratnagiri	-0.46 (1.88)	1.20 (3.02)	1.67	10.40 (0.14)	38.30 (0.04)	25.27	-	-	-	-	(0.06)	-
<u>Region I</u>	-0.37 (4.24)	0.27 (10.39)	0.64	14.00 (0.14)	36.20 (0.05)	19.47	-	-	-	-	(0.06)	-
5 Nasik	-0.31 (5.79)	0.80 (4.83)	0.91	2.61 (6.82)	10.40 (5.66)	7.59	-5.02 (0.58)	-12.16 (1.62)	-7.52	-6.65 (6.58)	-8.93 (6.10)	-2.44
6 Dhulia	0.69 (3.95)	-1.05 (3.82)	-1.73	3.59 (1.61)	19.90 (0.80)	15.74	-0.05 (3.02)	-8.74 (5.63)	-8.69	-3.95 (11.94)	-5.39 (11.03)	-1.50
7 Jalgaon	1.01 (3.67)	-0.26 (4.63)	-1.26	-8.19 (1.35)	5.30 (0.61)	14.69	0.75 (8.90)	-5.92 (15.50)	-6.62	-9.65 (9.73)	-10.48 (8.66)	-0.92
<u>Region II</u>	0.36 (13.41)	-0.18 (13.28)	-0.54	1.67 (9.86)	1.40 (7.07)	9.57	0.33 (12.50)	-6.97 (22.75)	-7.28	-6.35 (28.26)	-7.81 (25.79)	-1.36
8 Ahmednagar	-0.03 (8.42)	0.10 (5.57)	0.13	3.89 (23.16)	-2.00 (33.40)	-5.67	-4.46 (1.53)	-14.14 (3.83)	-10.13	-3.64 (2.83)	-8.65 (2.66)	-5.20
9 Poona	-0.92 (6.13)	-2.21 (4.88)	-1.30	3.42 (8.64)	-0.46 (10.22)	-3.75	0.43 (0.25)	-4.52 (0.88)	-4.93	-1.55 (2.16)	-1.76 (3.14)	-0.21
10 Satara	-1.06 (3.85)	-1.37 (3.75)	-0.31	3.77 (6.62)	4.70 (5.72)	0.90	10.68 (0.11)	1.60 (0.40)	-8.20	1.20 (5.54)	-0.07 (9.65)	-1.25
11 Sangli	-1.26 (3.86)	-5.36 (4.37)	-4.15	9.32 (6.55)	8.40 (6.18)	-0.84	-10.88 (0.21)	-15.82 (0.49)	-5.54	1.50 (7.37)	-4.90 (9.48)	-6.31
12 Sholapur	0.69 (8.00)	-0.64 (6.05)	-1.32	2.50 (7.16)	1.40 (7.65)	-1.07	-1.26 (0.45)	0.30 (1.11)	1.58	-1.58 (7.80)	-5.16 (7.10)	-3.64
13 Kolhapur	-1.52 (1.83)	-4.74 (3.59)	-3.27	3.28 (20.80)	5.80 (21.09)	2.64	-16.39 (0.08)	-	-	0.90 (4.84)	-1.19 (7.89)	-2.07
<u>Region III</u>	-0.36 (32.06)	-2.00 (28.21)	-1.65	4.09 (72.92)	2.03 (84.26)	-1.98	-3.03 (2.64)	-7.47 (6.79)	-4.58	-0.03 (30.54)	-2.98 (39.92)	-2.85

(Contd.)

Table III.2 : (Contd.)

District	Rice			Wheat			Kharif Jowar			Rabi Jowar			Total Jowar		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
14 Aurangabad	-2.22 (0.47)	-7.92 (0.29)	-5.83	-0.31 (9.36)	-3.53 (8.57)	-3.23	-3.83 (4.04)	-6.56 (3.82)	-3.14	-0.74 (8.66)	-4.52 (11.16)	-3.81	-1.37 (6.78)	-4.99 (7.69)	-3.67
15 Parbhani	-3.00 (1.14)	-6.01 (0.70)	-3.10	-3.56 (6.66)	-4.90 (6.66)	-1.39	0.48 (6.14)	3.00 (4.81)	2.51	-1.33 (5.73)	-1.40 (6.69)	-0.07	-0.53 (5.90)	0.50 (5.80)	0.03
16 Bhir	-0.86 (0.64)	-7.06 (0.41)	-6.25	0.54 (4.33)	0.00 (3.72)	-0.54	1.14 (2.89)	7.20 (2.05)	5.99	-0.24 (6.14)	-1.44 (8.09)	-1.20	0.10 (4.82)	0.40 (5.24)	0.30
17 Nanded	0.73 (1.87)	-4.41 (1.27)	-5.10	-1.28 (2.84)	0.30 (2.67)	1.60	0.42 (8.97)	5.50 (8.56)	5.06	-0.31 (1.85)	-4.61 (2.01)	1.81	-0.92 (4.74)	3.90 (5.11)	4.86
18 Osmanabad	2.13 (2.24)	-5.21 (1.25)	-7.19	-1.91 (6.62)	-5.55 (6.66)	-3.71	1.10 (8.10)	1.90 (7.68)	0.79	-2.36 (6.35)	-3.51 (9.00)	-1.18	-0.67 (7.06)	-1.00 (8.37)	-0.33
<u>Region IV</u>	0.29 (0.37)	-5.44 (3.92)	-5.71	-1.30 (29.80)	-3.37 (28.28)	-2.10	0.22 (30.14)	2.80 (26.92)	2.57	-1.40 (28.73)	-2.99 (36.95)	-1.61	-0.72 (29.30)	-0.51 (32.21)	0.21
19 Buldhana	-0.48 (0.23)	-	-	-4.13 (4.79)	-4.37 (4.43)	-0.25	1.23 (9.55)	4.40 (10.25)	3.13	(0.03)	(0.05)	-	1.20 (3.90)	4.30 (4.87)	3.06
20 Akola	0.18 (0.59)	-1.40 (0.26)	-1.58	-1.51 (5.06)	-5.55 (5.94)	-1.10	1.14 (9.42)	7.50 (8.02)	6.29	-	-	-	1.10 (3.83)	7.50 (3.79)	6.33
21 Amravati	6.89 (0.56)	8.10 (0.22)	1.13	-1.47 (4.42)	-2.48 (4.61)	-1.03	-0.12 (7.17)	3.60 (6.08)	3.72	-	-	-	-0.12 (2.91)	3.60 (2.87)	3.72
22 Yeotmal	1.71 (0.84)	0.90 (0.35)	-0.80	-5.44 (2.41)	-9.86 (2.40)	-1.67	1.06 (10.41)	7.80 (7.06)	6.67	(0.02)	(0.02)	-	1.00 (4.24)	7.70 (3.35)	6.63
23 Wardha	9.21 (0.26)	-	-	-2.73 (4.93)	-3.99 (4.46)	-1.30	1.07 (4.90)	9.80 (3.22)	8.64	-10.46 (0.07)	-	-	0.90 (2.03)	9.40 (1.56)	8.42
24 Nagpur	4.50 (1.74)	1.60 (1.59)	-2.78	-2.88 (9.20)	-5.92 (8.89)	-3.13	-0.22 (6.47)	9.40 (3.73)	9.64	0.34 (1.47)	1.90 (1.25)	1.55	-0.07 (3.50)	6.00 (2.42)	6.07
25 Bhandara	0.39 (20.02)	0.90 (17.67)	0.51	0.30 (3.65)	-0.41 (2.97)	-0.71	8.51 (0.16)	-	-	0.72 (0.94)	-2.75 (0.85)	-3.45	-0.05 (0.63)	-2.75 (0.49)	-2.70
26 Chanda	1.17 (15.89)	1.70 (13.66)	0.52	-0.67 (4.37)	-3.77 (4.46)	-3.12	0.73 (1.30)	6.10 (0.90)	5.33	1.09 (4.50)	0.50 (4.57)	-0.58	1.00 (3.20)	1.40 (2.84)	0.40
<u>Region V</u>	1.10 (40.13)	1.40 (33.96)	0.30	-2.20 (39.83)	-4.50 (37.77)	-2.35	0.74 (49.40)	6.40 (39.35)	5.62	0.74 (7.03)	0.10 (6.81)	-0.64	0.74 (4.25)	5.50 (22.19)	4.73
Maharashtra	0.11 (100.00)	-0.76 (100.00)	-0.88	-1.04 (100.00)	-0.90 (100.00)	0.14	0.06 (100.00)	2.20 (100.00)	2.14	-1.63 (100.00)	-2.55 (100.00)	-0.94	-0.92 (100.00)	-0.16 (100.00)	0.77

(Contd.)

Table VIII.2 : (Contd.)

District	Bajra			Other Cereals			Total Cereals			Total Pulses		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
14 Aurangabad	4.88 (10.03)	8.00 (9.27)	2.97	8.08 (1.39)	- (0.50)	-	0.61 (6.49)	-2.39 (1.72)	-2.98	1.22 (11.05)	-0.87 (8.57)	-2.06
15 Parbhani	7.65 (0.24)	- (0.23)	-	5.23 (0.30)	- (0.08)	-	-0.88 (4.23)	-0.28 (3.86)	0.61	3.24 (7.06)	5.40 (6.14)	2.09
16 Bhir	5.99 (4.58)	12.10 (4.49)	4.78	-8.02 (4.88)	-10.03 (1.87)	-2.19	1.21 (4.22)	1.60 (3.72)	0.39	3.80 (4.78)	1.80 (3.57)	-1.93
17 Nanded	4.80 (0.11)	- (0.08)	-	-5.15 (0.90)	- (0.31)	-	-0.82 (3.32)	3.00 (3.34)	3.89	3.41 (3.93)	5.80 (3.62)	2.31
18 Osmanabad	6.09 (1.16)	11.60 (1.01)	5.19	6.26 (2.55)	13.10 (1.30)	6.44	-0.16 (5.28)	-1.09 (5.54)	-0.93	2.39 (8.80)	0.90 (7.30)	-1.46
<u>Region IV</u>	5.63 (16.12)	9.60 (15.08)	3.76	0.06 (10.01)	4.90 (4.06)	4.84	0.09 (23.53)	-0.12 (22.18)	-0.21	2.53 (35.62)	2.20 (29.20)	-0.32
19 Bulchana	8.41 (0.30)	- (0.18)	-	- (0.15)	- (0.08)	-	0.68 (2.78)	3.90 (3.04)	3.20	2.78 (3.63)	-0.55 (5.58)	-3.24
20 Akola	2.54 (0.31)	- (0.21)	-	- (0.13)	- (0.04)	-	0.72 (2.89)	5.80 (2.59)	5.04	2.33 (3.78)	-1.65 (4.37)	-3.89
21 Amraoti	3.65 (0.34)	- (0.21)	-	3.62 (0.98)	- (0.53)	-	0.11 (2.25)	3.00 (2.00)	2.89	0.69 (2.55)	-7.38 (5.55)	-8.01
22 Yeotmal	1.32 (0.62)	- (0.37)	-	- (0.13)	- (0.04)	-	0.67 (2.71)	6.60 (2.14)	5.89	0.20 (3.90)	-3.68 (6.55)	-3.87
23 Wardha	- (0.10)	- (0.06)	-	-	-	-	0.23 (1.66)	7.00 (1.20)	6.75	0.00 (2.20)	-3.28 (3.71)	-3.28
24 Nagpur	-	-	-	- (0.06)	- (0.04)	-	-0.36 (3.08)	2.70 (2.36)	3.07	-1.59 (2.77)	-8.46 (3.74)	-6.98
25 Bhandara	-	-	-	0.70 (1.28)	- (0.68)	-	0.33 (3.24)	0.70 (4.89)	0.37	-0.35 (4.45)	-4.28 (4.15)	-3.94
26 Chanda	-	-	-	4.92 (1.07)	- (0.61)	-	0.98 (4.30)	1.40 (5.30)	0.42	0.26 (4.28)	-1.49 (3.71)	-1.75
<u>Region V</u>	2.92 (1.72)	11.50 (1.05)	8.34	3.47 (3.81)	6.40 (2.02)	2.83	0.47 (23.10)	3.17 (23.52)	2.69	0.65 (27.58)	-3.84 (35.36)	-4.46
Maharashtra	3.07 (100.00)	4.60 (100.00)	1.48	-0.12 (100.00)	0.60 (100.00)	0.72	-0.07	0.12	0.19	1.53	-0.31	-1.81

(Contd.)

Table VIII.2 : (Contd.)

District	Total Foodgrains Cereals + Pulses			Sugarcane			Cotton			Groundnut		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
14 Aurangabad	0.80 (7.32)	-1.87 (6.09)	-2.65	2.42 (6.68)	12.60 (3.41)	9.94	0.61 (7.35)	1.40 (7.14)	0.79	-7.88 (6.31)	-8.19 (3.44)	-0.34
15 Parbhani	0.40 (4.75)	0.90 (4.15)	0.50	1.00 (1.82)	9.70 (0.98)	8.61	1.93 (8.96)	7.60 (5.03)	5.56	-17.08 (3.56)	-12.12 (2.42)	5.98
16 Bhilr	1.80 (4.32)	1.60 (3.70)	-0.20	4.30 (1.35)	9.60 (1.01)	5.08	-5.17 (2.46)	-9.43 (2.85)	-4.49	-5.05 (6.16)	-9.31 (7.30)	-4.49
17 Nanded	0.20 (3.43)	3.40 (3.37)	3.19	9.10 (1.69)	25.00 (0.83)	14.57	0.82 (2.47)	6.50 (5.51)	5.63	2.40 (2.32)	3.70 (2.20)	1.27
18 Osmanabad	0.60 (5.98)	-0.74 (5.77)	-1.33	6.24 (3.71)	22.40 (1.67)	15.21	-2.89 (2.19)	0.30 (1.73)	3.28	-0.21 (11.79)	-0.60 (11.42)	-0.39
<u>Region IV</u>	0.74 (25.75)	0.27 (23.08)	-0.47	4.28 (15.26)	16.00 (7.90)	11.24	0.43 (28.23)	3.50 (23.26)	3.06	-3.68 (30.14)	-3.97 (26.78)	-0.30
19 Muldhana	1.20 (2.94)	3.30 (3.11)	2.08	5.10 (0.81)	25.10 (0.26)	19.03	-0.06 (9.70)	1.60 (9.23)	1.66	-9.47 (3.18)	-6.22 (1.58)	3.59
20 Akola	1.10 (3.06)	4.50 (2.82)	3.36	17.00 (0.13)	36.00 (0.06)	16.24	0.73 (12.19)	0.90 (9.69)	0.17	-5.63 (3.44)	-0.44 (1.91)	6.63
21 Amraoti	0.30 (2.31)	0.50 (2.46)	0.20	0.00 (0.07)	28.50 (0.02)	28.50	0.84 (13.21)	4.70 (11.41)	3.83	3.50 (1.84)	3.00 (1.75)	-0.48
22 Yeotmal	0.60 (3.09)	4.00 (2.70)	3.38	7.60 (0.20)	22.80 (0.08)	14.13	1.68 (1.63)	4.70 (10.18)	2.97	4.00 (1.93)	7.90 (1.53)	3.75
23 Wardha	0.20 (1.76)	4.40 (1.53)	4.19	0.00	30.80 (0.01)	30.80	1.71 (5.98)	5.40 (3.77)	3.63	-	(0.08)	-
24 Nagpur	-0.55 (3.01)	1.00 (2.53)	1.56	0.00	41.50 (0.01)	41.50	1.55 (2.89)	5.80 (2.31)	4.19	14.00 (0.54)	11.20 (0.57)	-2.46
25 Bhandara	0.20 (3.47)	0.10 (4.80)	-0.10	0.00 (0.41)	14.80 (0.16)	14.80	-	-	-	(0.04)	(0.03)	-
26 Chandr	0.80 (1.29)	1.10 (5.09)	0.30	-5.64 (0.20)	2.40 (0.12)	8.58	3.26 (1.02)	13.30 (0.61)	9.72	-	-	-
<u>Region V</u>	0.50 (23.93)	2.08 (25.06)	1.57	5.39 (1.82)	21.90 (0.72)	15.67	1.02 (56.63)	3.67 (47.20)	2.62	-0.53 (11.05)	3.50 (7.45)	4.05
Maharashtra	0.23 (100.00)	0.07 (100.00)	-0.16	3.90 (100.00)	4.50 (100.00)	0.58	0.67 (100.00)	1.00 (100.00)	0.93	-2.79 (100.00)	-3.75 (100.00)	-0.99

9. INVESTMENT IN AGRICULTURE

9.1 In this chapter we will consider the financial side of the development of resources needed for agriculture. We will consider outlay by the Government and term lending by the cooperative institutions and commercial banks over the period. It would be proper, however, to first set out the limitations of the analysis in this chapter.

The topic of investment in agriculture is really a vast one involving various agencies. An agency like Government undertakes direct investment while institutions like cooperative and commercial banks lend to individuals for the purpose. Investment also takes place purely on individual account, without involving any lending and leaving no consolidated record, creating a data availability problem. Outlay by the Government and lending by the agencies, while leaving a record, involve accounting under different heads, recording at different stages etc., and one has really to master a considerable accounting procedure to make a correct assessment of investment. Indeed, analysis of Government investment expenditure can itself be a topic for a separate volume.

Keeping these limitations in mind, we try to present an analysis in broad terms, having already examined the performance side in the preceding chapters. But there is another important difficulty to be noted : the outlays in various years contain a large element of inflation. For a meaningful analysis one has to use deflators and here the problem is one of suitability and availability of deflators. The deflators used in

the present analysis have their own inevitable limitations. Noting all these difficulties, we embark upon a broad analysis of investment finance in agriculture.

9.2 The data pertain to four agencies : Government, Maharashtra State Cooperative Land Development Banks (referred henceforth as LDB), Maharashtra State Cooperative Bank Ltd (MSC) and lending by Commercial Banks. The data on Government investment are taken from State Budgets. Data on cooperative lending were obtained from the relevant agencies. In case of Commercial Banks, the period under consideration covers data for four years only and after a good deal of correspondence, some data could be collected. It should be pointed out that returns which each commercial bank was required to file with the Reserve Bank of India as regards to their lending were omnibus type, divided into only two categories; direct finance and indirect finance. Some of the banks did oblige by furnishing yearwise and purposewise loans but the data could not be used directly as term lending was given under heads 'credit limits' or 'limits sanctioned' and 'outstanding loans' both of which were cumulative in nature as regards the period. Such detailed data pertained to 3 to 5 banks that did more than 80 per cent of the commercial banks' term lending to agriculture in the State. Based on analysis for some years for some banks, it appeared that actual annual disbursement formed 15 per cent of the credit limits or limits sanctioned. This proportion is applied to direct and indirect finance of these banks. Of the 15 commercial banks (including State Bank of India), seven banks had done any lending on a significant scale. Most of the expenditure or lending by these

three or four agencies is on provision of irrigation and we shall analyse the data in relation to growth in irrigation. The major agencies are of course Government and Cooperatives as we shall see in the next section.

9.3 In Table 9.1 data on investment expenditure by (State) Government and lending by cooperatives and commercial banks are presented for the twelve-year period. (Data on State expenditure in 1960-61 are not available as budget data are for the erstwhile undivided Bombay State.) These data are at current prices.

It can be seen here that the State has a large share of the investment in agriculture ranging from 50 to 75 per cent, over the twelve year period. The Cooperatives (LDB and Maharashtra State Cooperative Bank) are the next in importance covering 20 to 50 per cent of the total investment and commercial banks figure in these only from 1962-69 onwards and their share is 2 to 6 per cent. These percentages being related to the total investment expenditure-lending by these institutions; we again underline the fact that investment on purely private account is left out of this analysis.

Looking at the last row of the table we find that over the period the investment in agriculture amounts to Rs.530 crores at current prices. If we put the State expenditure for 1960-61 at 12 crores, the total investment would amount to Rs.542 crores. Since this amount needs to be deflated, we use Economic Adviser's All-India wholesale price index (all commodities) presented in Table II-2 at the end of this chapter as the deflator. We have expressed this index taking

Table 9.1 : State Expenditure and Term Lending to Agriculture during 1960-61 to 1971-72 at Current Prices

(Expenditure in thousand Rs.)

Year	State Expenditure	%	Term lending by cooperatives			Commercial Banks Amount	%	Total at current prices	%	Total at constant (1960-61) prices	
			LDB	MSC Bank	Total						
1960-61	-	-	20996	27163	48159	-	-	48159	-	48159	
1961-62	137521	71.9	29811	23883	53694	28.1	-	191215	100.0	190491	
1962-63	118457	52.8	86461	19559	106020	47.2	-	224477	100.0	215429	
1963-64	120633	50.7	98414	19029	117443	49.3	-	238076	100.0	215220	
1964-65	179340	53.7	134758	19854	154612	46.3	-	333952	100.0	272014	
1965-66	278002	61.4	151511	23456	174967	38.6	-	452969	100.0	342899	
1966-67	271888	63.5	132300	23723	156028	36.5	-	427916	100.0	284386	
1967-68	347547	63.3	176768	24956	201724	36.7	-	549271	100.0	327064	
1968-69	336359	53.6	243197	30890	274087	43.7	17310	2.7	627756	100.0	378098
1969-70	391329	51.5	282889	39048	321897	42.3	47074	6.2	760300	100.00	441393
1970-71	464225	68.5	136415	37392	173807	25.7	39191	5.8	677223	100.00	372530
1971-72	535771	75.0	126622	17928	144550	20.3	33658	4.7	713979	100.0	377527
Total	3181072	60.1	1670102	306886	1976988	37.3	137233	2.6	5295293	100.0	3465210

* Data not available

LDB: Land Development Bank MSC: Maharashtra State Corp Bank.

1960-61 equal to 100. The last column in the present table then indicates the worth of money spent in terms of 1960-61 prices. This gives us a broad idea of the investment expenditure at constant (1960-61) prices. This comes to Rs.347 crores or if we again put the level of State investment in 1960-61 at about 12 crores, an investment expenditure at about Rs.359 crores. As we shall see subsequently, most of this investment is directly or indirectly related to irrigation and the increase in irrigation (irrigated area as well as means of irrigation) has already been looked into in the chapter on irrigation. However, in Table II-1 we have presented net area irrigated by sources as well as irrigated area over the twelve year period for reference.

If we exclude lending by cooperatives and commercial banks for bullocks and tractors then the irrigation oriented investment at current prices reduces from Rs.542 crores to Rs.526 crores. At constant (1960-61) prices, using all-commodities index as deflator mentioned above, this investment expenditure amounts to Rs.351 crores. This then is the broad estimate of the irrigation oriented expenditure over the 12 years : Rs.526 crores at current prices or Rs.351 crores at the constant (1960-61) prices.

What was the increase in irrigation resource? If we go only by area, Table II-1 shows that the net area increased steadily from 10,707 hundred hectares (Kha) in 1960-61 to 14,312 Kha in 1969-70 (we do not consider last two years where it was somewhat lower) or an increase of 3605 Kha (3.60 lakh hectares). The gross irrigated area increased from 12182 Kha (1960-61) to 16232 Kha (1969-70) or an increase of 4050 Kha (4.05 lakh hectares). This means that investment expenditure

of Rs.14,590 per hectare of increased net irrigated area at current prices or Rs.9,736 per hectare at constant (1960-61) prices. (For per hectare of increased gross gross irrigated area the cost works out to Rs.12,988 at current prices and Rs.8,667 at constant prices respectively but henceforth we will refer to net irrigated only).

9.4 The cost of irrigation worked out per hectare of increased net irrigated area in the preceding section appears certainly high, although we do not have comparable figures for other states. We note one or two basic reasons : Firstly as is amply evident in the chapter on irrigation, there is a preference for high irrigation requirement crops in Maharashtra. It was seen that crops like sugarcane and fruits and vegetables consume much of the increased irrigation. For example, in Poona division districts the growth of irrigated area is unimpressive because of a high preference for sugarcane cultivation although of the increased length of canals, number of wells and increased number of oil engines and electric pump sets, the region has a fairly large share. This tends to increase the cost of bringing additional unit of land under irrigation. Secondly, as regards well irrigation, investment in new wells is a risky proposition in the State with its impermeable layer of black basalt rock and striking water is much of a gamble. This results in infructuous wells. In a recent survey of wells financed by LDB's it is estimated that of the total wells financed, 41 per cent belong to Grade A. 9 per cent to Grade B, 26 per cent belong to Grade C and 24 per cent to Grade D. While Grade C wells have nominal potential Grade D wells are mainly infructuous.

In addition one may point out the progressive inadequacy of loan per well and oil engine or pump set over the years which may be resulting in ineffectiveness of well-loans in increasing irrigated area. Further, with the drought-proneness of the State, farmers may be tempted to misutilise the loan amount partly or fully to meet their immediate consumption or social needs.

With this broad picture of investment expenditure and the resultant increased irrigation facility we now turn to a more detailed agencywise and purposewise analysis.

9.5 In Table 9.1 State expenditure as a whole was presented in the first column of the table. We now take up detailed analysis of State outlay. In Table 9.2 State expenditure according to different types of irrigation is presented. These data are from State budgets and although all the detailed information one requires for such a classification is not available in the budgets, this is the broad allocation that emerges. The expenditure includes expenditure on infra-structural development pertaining to irrigation. From the table one sees that major and medium irrigation projects draw 60 to 90 per cent of State outlay over the years. Minor irrigation covers about 15 to 20 per cent outlay while lift irrigation and well irrigation cover about half a per cent and 7 per cent respectively. The detailed tables by expenditure heads for each type of irrigation are presented in Tables II-3(a) to 3(d) at the end of the chapter. These tables further reveal that expenditure under 'works' is substantial for major and medium irrigation between 80 to 95 per cent as it

Table 9.2 : State Expenditure on Different Types of Irrigation (Current Prices)

(Expenditure in thousand Rs.)

	Major and Medium Irrigation		Minor Irrigation		Ayatit		Lift Irrigation		Well Irrigation		Unspecified		Total	
	Amt.	%	Amt.	%	Amt.	%	Amt.	%	Amt.	%	Amt.	%	Amt.	%
1960-61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1961-62	117157	85.19	18790	13.66	-	-	208	0.15	1328	0.97	38	0.03	137521	100.00
1962-63	107500	90.75	7468	6.30	-	-	287	0.24	2784	2.35	418	0.35	118457	100.00
1963-64	80827	67.00	22543	18.69	-	-	523	0.43	15329	12.71	1411	1.17	120633	100.00
1964-65	127121	70.88	28585	15.94	-	-	1076	0.60	21144	11.79	1414	0.79	179340	100.00
1965-66	187000	67.26	58361	20.99	186	0.07	547	0.20	26566	9.56	5342	1.92	278002	100.00
1966-67	144499	53.15	62262	22.90	2052	0.75	1286	0.47	51459	18.93	10330	3.80	271888	100.00
1967-68	252560	72.67	55505	15.97	6394	1.84	3084	0.89	27724	7.98	2280	0.66	347547	100.00
1968-69	219443	65.24	77645	23.08	8151	2.42	1405	0.42	24845	7.39	4870	1.45	336359	100.00
1969-70	277914	71.02	72709	18.58	11282	2.88	1028	0.26	18873	4.82	9523	2.43	391329	100.00
1970-71	327395	70.53	99278	21.39	15828	3.41	800	0.17	17686	3.81	3238	0.70	464225	100.00
1971-72	366600	68.42	124292	23.20	22895	4.27	612	0.11	13923	2.60	7449	1.39	535771	100.00
Total	2208016	69.41	627438	19.72	66788	2.10	10856	0.34	221661	6.97	46313	1.46	3181072	100.00

should be, but 'special establishment' share is gradually increasing from 5 to 12 per cent over the years. For minor irrigation 'works' is 50 to 70 per cent while 30 to 50 per cent is on 'indirect capital formation'. In well irrigation and lift irrigation, indirect capital formation is again the major head. The indirect capital formation thus forms a significant proportion in State expenditure on minor irrigation, well irrigation and lift irrigation. This expenditure relates to incentives to irrigating farmers rather than making irrigation water directly available. In Table 9.3 State expenditure according to account heads is presented. Works cover 70 to 90 per cent of the outlay while indirect capital formation covers 3 to 20 per cent over the years. There is also an item of development expenditure which is undertaken by the State to develop necessary infrastructure for purposes of irrigation. This includes expenditure on research and development, irrigation units under Prototype Package Programmes, providing staff for lift irrigation and cheap (subsidised) electricity, expenditure on water finding schemes, underground water survey, oil engine training class, expansion of boring section etc.

9.6 We now turn to cooperative lending. In Table 9.4 details of the term lending by cooperative land development bank (LDB) are presented according to purpose. In Table 9.5 the percentage distribution is available. Construction of new wells covers more than half the lending while lending for oil engines and electric motors together exceeds 25 per cent share. Lending for irrigation purposes as a whole is over 90 per cent for most of the years. The total term lending rises continuously except for the last two drought-affected years of 1970-71

Table 9.3 : Total State Expenditure According to Account Heads at current prices

(Expenditure in thousand Rs.)

Year	Special Establishment		Works		Tools & Plants		Suspense		Indirect Capital Formation		Development Expenditure		Total	
	Amt.	%	Amt.	%	Amt.	%	Amt.	%	Amt.	%	Amt.	%	Amt.	%
1960-61														
1961-62	5582	4.0	130669	95.0	1769	1.3	-1626	-1.2	993	.8	134	.1	137521	100.00
1962-63	7793	6.6	91082	76.9	2287	1.9	12806	10.8	4366	3.7	123	.1	118457	100.0
1963-64	6343	5.3	99486	82.5	11395	9.4	-11491	-9.5	14731	12.2	169	.1	120633	100.0
1964-65	8745	4.9	125193	69.8	16002	8.9	10081	5.6	18450	10.3	869	.5	179340	100.0
1965-66	10734	3.9	210159	75.7	16491	5.9	-2689	-1.0	42641	15.3	666	.2	278002	100.0
1966-67	16743	6.2	161599	59.4	30558	11.2	5596	2.1	54775	20.1	2617	1.0	271888	100.0
1967-68	18040	5.2	270821	77.9	14846	4.3	-7165	-2.1	44011	12.7	6994	2.0	347547	100.0
1968-69	20274	6.0	243239	72.3	16111	4.8	-1492	-.4	49874	14.8	8353	2.5	336359	100.0
1969-70	31448	8.0	276886	70.8	21030	5.4	11425	2.9	38809	9.9	11731	3.0	391329	100.0
1970-71	33878	7.3	348310	75.0	20569	4.5	-13072	-2.8	58200	12.5	16340	3.5	464225	100.0
1971-72	45920	8.6	424091	79.2	13121	2.4	-1665	-.3	52343	9.8	1961	.3	535771	100.0

Table 9.4 : Term Lending to Agriculture - L.D.B. Finance

(Amount in thousand Rs.)

	New Wells		Old Wells		Oil Engines		Electric Motors		Lift Irrigation		Land Development		Tractors		Special Schemes		Total Amount
	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	Loaned
1960-61	5486	10281	1371	1325	3169	8861	-	-	-	-	693	529	-	-	-	-	20996
1961-62	9536	17563	804	831	3889	10461	-	-	-	-	783	956	-	-	-	-	29811
1962-63	21096	48173	5150	6488	9806	28263	-	-	-	-	2783	3537	-	-	-	-	86461
1963-64	30563	42398	6882	5064	12730	40032	2209	4216	-	-	6682	6198	34	506	-	-	98414
1964-65	29959	63241	4563	5224	14793	49273	2561	5136	-	-	6022	8079	219	3805	-	-	134752
1965-66	27869	70530	5047	6071	14494	49736	5089	10918	-	-	5352	9100	308	5156	-	-	151511
1966-67	27122	74063	4612	6681	8929	28299	4765	13050	5	48	3996	2861	329	7298	-	-	132300
1967-68	35977	99281	4525	7544	10460	36702	7489	17012	12	671	4205	3280	156	4221	-	8057	176768
1968-69	41850	136863	5723	12277	13664	50802	8160	19170	401	5644	6642	5959	211	6042	12600	6440	243197
1969-70	39725	144448	6798	15866	7192	26699	7823	21168	1993	23974	7827	16904	198	5258	18051	28532	282849
1970-71	16028	81443	3943	12977	2930	11114	5187	14171	1270	20104	3051	10149	178	4231	10405	32226	186415
1971-72	13186	61936	2368	7971	1885	7005	4309	11492	912	16538	1864	4055	134	4683	4262	12942	126622
Total	298397	850220	51786	88319	103941	347247	47593	116333	4593	66979	49900	71607	1767	41200	45318	88197	1670102

LDB: Land Development Bank

and 1971-72. Total LDB lending over the twelve year period comes to Rs.167 crores at current prices which is over 30 per cent of the total investment in agriculture of about Rs.542 crores (see Section 9.3 and Table 9.1).

Details of term lending by Maharashtra State Cooperative Bank Ltd (MSC) are presented in Table 9.6. From this table one sees that total term lending by this bank is about 31 crores, which is about 6 per cent of total investment in agriculture over the 12 year period. This is because this apex cooperative institution mainly lends production loans to farmers. In addition it lends medium term loans of upto 5 years (loans beyond repayment duration of more than 5 years fall within the purview of LDB's) which figure in this table. From this table we see that purchase of machinery - oil engines and electrical motor and pump-set - draws a major portion (about 35 per cent) of the medium term lending by MSC followed by purchases of cattle (about 30 per cent). Loans for minor improvement of land are next in importance (20 per cent share) while sinking new well or repairs to old wells come last (with less than 15 per cent share).

In the tables on cooperative lending, subsidies are not taken into account as the State expenditure has an item 'indirect capital formation' which includes an element of subsidies.

9.7 Now we turn to 'progressive inadequacy' of co-operative loans for sinking new wells or purchase of oil engines mentioned in Section 9.4. For this purpose we consider loans for this purpose by the LDB system (considered in Table 9.4). Based on the data of number of new wells and amount of loan in that table and taking

Table 9.6 : Term (medium) Lending to Agriculture by M.S. Cooperative Bank

(Amount in thousand Rs.)

	Sinking or repairs of wells		Purchase of machinery OE & EMP		Purchase of Cattle		Minor improvement of Land		Total	
	Ant.	₹	Ant.	₹	Ant.	₹	Ant.	₹	Ant.	₹
1960-61	6951	25.59	11680	42.99	6222	22.90	2310	8.50	27163	100.00
1961-62	4128	17.28	8143	34.09	10488	43.91	1124	4.71	23883	100.00
1962-63	3119	15.93	5915	30.24	6943	35.50	3582	18.31	19559	100.00
1963-64	2241	11.78	4073	21.40	7000	36.79	5715	30.03	19029	100.00
1964-65	1759	8.86	2246	11.31	9071	45.69	6778	34.14	19854	100.00
1965-66	1927	8.21	7078	30.17	7907	33.71	6544	27.90	23456	100.00
1966-67	2282	9.62	7345	30.93	6104	25.72	7997	33.70	23728	100.00
1967-68	3297	13.21	10098	40.46	7305	29.27	4256	17.05	24956	100.00
1968-69	4292	13.90	15820	51.21	7062	22.86	3714	12.02	30890	100.00
1969-70	3656	9.36	13764	48.03	9700	24.84	6928	17.74	39048	100.00
1970-71	5775	15.44	14039	37.54	9558	25.56	8020	21.45	37392	100.00
1971-72	1457	8.13	5558	31.00	8868	49.46	2045	11.41	17928	100.00
Total	40886	13.32	110759	36.09	96228	31.36	59013	19.23	306886	100.00

(OE = Oil Engine, EMP = Electric motor and pump set)

loan amount per well for 1960-61 as the base (and equal to 100) we present indices of loans per new well at current prices for subsequent years in Column 3 of Table 9.7. Similarly in column 6 we present indices of loan per oil engine at current prices with 1960-61 as base. In column 2 we have indices of field labour rates which are based on the rates in Season and Crop Reports. Since human labour forms the major input in sinking a new well, a comparison of field labour index and loan per well index indicates that field labour rates have risen faster than the loan per well over the years. This fact is apparent in column 4 where indices of loan per well at current prices are deflated by labour indices.

Similarly, taking All-India wholesale price index for Machinery for comparison (column 5), we see that this index number has risen at a faster rate than the index number of loan per oil engine at current prices. This fact is obvious from column 7 where indices for loan per well are presented at constant (1960-61) prices using the machinery index as the deflator.

This progressive inadequacy of loans per well and oil engine may also have contributed to slower growth of irrigated area and consequent higher 'cost' of irrigating an additional acre in the State.

9.8 In Section 9.3 we calculated the cost of irrigating an additional hectare, which came to Rs.9,736 at constant (1960-61) prices. In that exercise we used All-India wholesale price index for all commodities as the deflator. We now try to work out similar cost for per hectare of canal irrigated area and well irrigated area (the two major sources of irrigation) using a slightly

Table 9.7 : Indices of Loan per Well and Loan per Oil Engine Over the Period

Year	Index: Field Labour (1960-61)	Loan/well LDB Finance (current prices)	Loan/well LDB Finance @ 1960-61 prices	Wholesale price index (Machinery) (1960-61)	Loan/oil engine LDB Finance (current prices)	Loan/oil engine LDB Finance (@ 1960-61 prices)
1	2	3	4	5	6	7
1960-61	100.0	100.0	100.0	100.0	100.0	100.0
1961-62	103.4	98.4	95.0	102.6	96.2	93.8
1962-63	108.9	121.9	111.9	108.8	103.1	94.9
1963-64	120.7	74.1	61.3	111.5	112.5	100.9
1964-65	132.4	112.7	85.1	116.8	119.1	102.0
1965-66	150.3	135.1	89.8	123.0	122.7	100.1
1966-67	171.7	145.7	84.9	136.3	113.3	83.2
1967-68	184.8	147.3	79.7	138.9	125.5	90.3
1968-69	190.3	174.5	91.7	140.3	133.0	94.8
1969-70	200.0	194.2	97.0	144.4	132.8	92.0
1970-71	208.7	271.3	129.9	156.6	135.7	86.6
1971-72	211.0	250.7	118.8	168.3	132.9	79.0

different approach. This again is essentially a rough exercise. In Table 9.8 State expenditure on major, medium and minor irrigation, expenditure on ayacut and 'unspecified' expenditure at current prices (taken from Table 9.2) is presented along with the deflated expenditure at constant (1960-61) prices. Instead of using all-commodities index number of prices as deflator, we use more purpose-specific index numbers. In major and medium works we assume that labour component is 75 per cent and machinery component is 25 per cent. Then the total amount spent is deflated by a 'composite price index'. This composite price index is arrived at by giving 75 per cent weight to field labour index and 25 per cent weight to machinery index (indices available in columns 1 and 5 in Table 9.7). The resultant figures of expenditure at constant prices are shown along with expenditure at current prices in Table 9.8 in columns 2 and 3. In minor irrigation, ayacut expenditure and expenditure under the head 'unspecified', labour is assumed to be the major component and expenditure at constant prices is arrived at by using field labour index as the deflator. The total expenditure at constant prices (last column) over the 11 year period (1960-61 data not being available) comes to Rs.178 crores. Between 1961-62 and 1971-72 area irrigated by Government canals increased by 705 hundred hectares (Table II-1) and thus cost for additional hectare of canal irrigated area comes to Rs.25,253 at constant (1960-61) prices.

One of the main reasons for such a high cost of irrigating an additional hectare by canal irrigation is surely the high preference for sugarcane cultivation in the State, as pointed out in Section 9.4. It was seen

Table 9.8 : State Expenditure on Major and Medium and Minor Irrigation, Ayacut and Unspecified Irrigation at 1960-61 prices

(Expenditure in Thousand Rs.)

Year (1)	Major and Medium		Minor Irrigation		Ayacut		Unspecified		Total at 1960-61 prices (10)
	Current (2)	1960-61 prices (3)	Current (4)	1960-61 prices (5)	Current (6)	1960-61 prices (7)	Current (8)	1960-61 prices (9)	
1960-61	-	-	-	-	-	-	-	-	-
1961-62	117157	113524	18790	18172	-	-	38	37	131733
1962-63	107500	98714	7468	6858	-	-	418	384	105956
1963-64	80827	68266	22543	18677	-	-	1411	1169	88112
1964-65	127121	98927	28585	21590	-	-	1414	1068	121585
1965-66	187000	130314	58361	38830	166	124	5342	3554	172822
1966-67	144499	88759	62262	36262	2052	1195	10330	6016	132232
1967-68	252560	145736	55505	30035	6394	3460	2280	1234	180465
1968-69	219443	123421	77645	40801	8151	4283	4870	2559	171064
1969-70	277914	149336	72709	36355	11282	5641	9523	4762	196064
1970-71	327395	167294	99278	47570	15828	7584	3238	1552	224000
1971-72	366600	183026	124292	58906	22895	10851	7449	3530	256312
Total		1367316		354056		33138		25865	1780375

Note: (2) Converted by the composite index of civil works & mechanical works at 75:25

in the chapter on irrigation that while Poona Division districts accounted for nearly half the increase in length of canals in the State over the period, canal irrigated area did not increase, but recorded a marginal fall. Growth of banana cultivation in Jalgaon district was also noted. Such preference for high irrigation requirement crops would naturally increase the cost of bringing additional hectare under canal irrigation.

9.9 Now let us turn to the cost of bringing an additional hectare under well irrigation. In Table 9.9 State expenditure on wells and lending by cooperatives and commercial banks for wells and oil engines and electrical motor pump-sets is presented at 1960-61 prices. State expenditure is taken exclusive of subsidies. Well expenditure is deflated by using the field labour index, as well construction is mainly composed of labour work. Further, for cooperative loans, share capital at the rate of 10 per cent is deducted from the loan amount to arrive at a realistic estimate of effective loan. Ten per cent of this effective loan is taken as the contribution by the borrower and added to the effective loan. This proportion has been verified from the LDB system and is also corroborated by a study of wells financed by LDB loans.¹ This study also estimates that of the actual disbursement, 18 per cent amount is misutilized for various reasons like purchase of bullocks, repayment of LDB interest, consumption, etc. Adjustment for this wastage is also made. For water-lifting machinery, price index for machinery is used as the deflator. From this table we see that at 1960-61 prices, over 95 crores of rupees are spent

1 D.B. Kadam, Utilization of Long-term Finance for New Wells, a Ph.D. Thesis submitted to University of Poona (March 1968).

Table 9.9 : Investment in Wells (1960-61 price level)

(Expenditure in thousand Rs.)

Year	Investment in Wells			Oil Engines & Electric Motor Pumps etc.		Total for well irrigation @ 1960-61 prices
	State expenditure	LDB + MSC lending	Commercial Banks lending	LDB + MSC lending	Commercial Banks lending	
1960-61	-	9636	-	18486	-	28122
1961-62	402	14630	-	16320	-	31352
1962-63	1055	40376	-	28272	-	69703
1963-64	8035	31630	-	38996	-	78661
1964-65	10265	41597	-	43655	-	95517
1965-66	6275	40998	-	49560	-	96833
1966-67	12624	37829	-	32153	-	82606
1967-68	5586	46500	-	41347	-	93433
1968-69	5230	63043	1243	55033	6441	130990
1969-70	5005	64480	5572	41529	14289	130875
1970-71	4260	36393	4531	22600	1186	68970
1971-72	1797	26649	2596	12864	714	44620
Total	60534	453761	13942	400815	22630	951682

on well irrigation. Over the years well irrigated area increased by 2273 hundred hectares (Table IX-1) which gives cost of irrigating additional hectare by well irrigation at Rs.4,187 at 1960-61 prices. The reasons for this estimate being on the higher side are already discussed in Section 9.4. To recollect, these are : preference for high irrigation requirement crops, a large proportion of infructuous wells and progressive inadequacy of loans.

9.13 To conclude, we recall the estimates of total investments and cost of irrigating an additional hectare. Total investment in agriculture in the State over the 12-year period comes to about Rs.542 crores at current prices or Rs.359 crores at constant (1960-61) prices. Most of this is related directly or indirectly irrigation and similar estimates for irrigation-oriented estimates are Rs.526 crores at current prices and Rs.351 crores at constant prices. The net irrigated area increased by 3605 hundred hectares which gives us per additional irrigated hectare cost at Rs.14,590 at current prices and Rs.9,736 per hectare at constant (1960-61) prices. Further exercise reveals that cost of irrigating additional hectare by canal irrigation comes to Rs.25,253 at constant prices and cost for irrigating additional hectare by well irrigation comes to Rs.4,187 at constant prices.

The apparent high cost of bringing additional hectare under irrigation in Maharashtra is due to preference for high-irrigation water requirement crop like sugarcane and fruits (mainly banana) and vegetables, a fact pointed out in Chapter 5 on irrigation. Further, proportion of infructuous wells is high in the State and consequently cost per additional hectare is pushed up.

As suggested in discussion on irrigation, better distribution of irrigation resource between regions and between crops appears desirable.

Table IX.1 : Net Area Irrigated Sourcewise and Their Indices for Maharashtra

(Area in '00 ha)

Year	Govt. Canal		Private Canals		Tanks		Wells		Other Sources		Total Area		Gross I Area	
	Area	Index	Area	Index	Area	Index	Area	Index	Area	Index	Area	Index	Area	Index
1960-61	2128	100.0	305	100.0	1925	100.0	5938	100.0	411	100.0	10707	100.0	12182	100.0
1961-62	2112	99.2	302	99.0	1866	96.9	6109	102.9	423	102.9	10812	101.0	12336	101.3
1962-63	2233	104.9	316	106.6	1997	103.7	6316	106.4	396	96.3	11258	105.1	12782	104.9
1963-64	2195	103.2	310	101.6	2071	107.6	6505	109.5	421	102.4	11502	107.4	13130	107.8
1964-65	2155	101.3	325	106.5	2128	110.5	6826	114.9	472	114.6	11906	111.2	13639	112.0
1965-66	2194	103.1	296	97.0	1901	98.7	7107	119.7	565	137.5	12063	112.7	13880	113.9
1966-67	2150	101.3	286	93.8	2130	110.6	6982	117.6	624	151.8	12172	113.7	14133	116.0
1967-68	2490	117.0	302	99.0	2185	113.5	7211	121.4	564	137.2	12752	119.1	14762	121.2
1968-69	2482	116.6	277	90.8	2243	116.5	7964	134.1	779	189.5	13754	128.5	15568	127.8
1969-70	2804	131.8	317	103.9	2251	116.9	8211	138.3	729	117.4	14312	133.7	16232	133.3
1970-71	2688	126.3	190	62.3	2051	106.5	7679	129.3	861	209.5	13469	125.8	15703	128.9
1971-72	2817	132.4	248	81.3	2128	110.5	7707	129.8	772	187.8	13672	127.7	16216	133.1

Table II.2 : All-India Wholesale Price Index Numbers

Year	All Commodities	Machinery
1960-61	100.00	100.00
1961-62	100.38	102.60
1962-63	104.20	108.80
1963-64	110.62	111.50
1964-65	122.77	116.80
1965-66	132.10	123.00
1966-67	150.47	136.30
1967-68	167.94	138.90
1968-69	166.03	140.30
1969-70	172.25	144.40
1970-71	181.79	156.60
1971-72	189.12	168.30

Source : Index Numbers of Wholesale Prices in India, New Series Annual Number, April 1962 to March 1970, Office of the Economic Adviser, Ministry of Industrial Development, Internal Trade and Company Affairs, Govt. of India.

Table IX.3(a) : Expenditure Heads of Major and Medium Irrigation by the State

Year	(Expenditure in Thousand Rs.)									
	Special Establishment		Works		Tools & Plant		Suspense A/c.		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
1960-61	-	-	-	-	-	-	-	-	-	-
1961-62	5582	4.8	112305	95.8	602	0.5	-1332	-1.2	117157	100.0
1962-63	7793	7.2	85967	80.0	1085	1.0	12655	11.8	107500	100.0
1963-64	6343	7.8	84865	105.0	1505	1.9	-11886	-14.7	80827	100.0
1964-65	8745	6.9	106669	83.9	2323	1.8	9384	7.4	127121	100.0
1965-66	10734	5.7	175773	94.0	4821	2.6	-4328	-2.3	187000	100.0
1966-67	16743	11.6	119748	82.8	9233	6.4	-1225	.8	144499	100.0
1967-68	18040	7.1	237038	93.8	3703	1.5	-6221	-2.4	252560	100.00
1968-69	20274	9.2	196647	89.6	4018	1.8	-1496	-.6	219443	100.0
1969-70	31448	11.4	231358	83.2	7280	2.6	7828	2.8	277914	100.0
1970-71	33878	10.3	295163	90.2	6840	2.1	-8486	-2.6	327395	100.0
1971-72	45920	12.4	316458	86.3	5849	1.6	-1127	-.3	366600	100.0

Table IX.3(B) : Expenditure Heads of Minor Irrigation *by the State*

(Expenditure in thousand Rs.)

Year	Works		Tools & Plant		Indirect capital Formation		Suspense a/c		Total	
	Ant.	₹	Ant.	₹	Ant.	₹	Ant.	₹	Ant.	₹
1960-61	-	-	-	-	-	-	-	-	-	-
1961-62	17921	95.4	1156	6.1	6	-	-293	-1.5	18790	-
1962-63	4954	66.4	17	.2	2565	34.3	-68	-.9	7468	-
1963-64	13670	60.6	124	.5	8753	38.9	-4	-	22543	-
1964-65	17920	62.7	-	-	10667	37.3	-2	-	28585	-
1965-66	32969	56.5	-	-	25392	43.5	-	-	58361	-
1966-67	37374	60.0	-	-	24888	40.0	-	-	62262	-
1967-68	28904	52.1	1	-	26600	47.9	-	-	55505	-
1968-69	42680	55.0	-	-	34965	45.0	-	-	77645	-
1969-70	42765	58.8	-	-	29944	41.2	-	-	72709	-
1970-71	49836	50.2	-	-	49442	49.8	-	-	99278	-
1971-72	82511	66.4	-	-	41781	33.6	-	-	124292	-

Table IX.3(c) : ^{State} Expenditure ^{by} Heads of Lift Irrigation

(Expenditure in thousand Rs.)

Year	works		Indirect Capital Formation		Development Expenditure		Total	
	Amt.	%	Amt.	%	Amt.	%	Amt.	%
1960-61	-	-	-	-	-	-	-	-
1961-62	41	19.7	75	36.1	92	44.2	208	100.0
1962-63	48	16.7	166	57.8	73	25.5	287	100.0
1963-64	51	9.8	348	66.5	124	23.7	523	100.0
1964-65	69	6.4	231	21.5	776	72.1	1076	100.0
1965-66	55	10.0	115	21.0	377	69.0	547	100.0
1966-67	109	8.5	104	8.1	1073	83.4	1286	100.0
1967-68	2004	65.0	10	.3	1070	34.7	3084	100.0
1968-69	525	37.4	131	9.3	749	53.3	1405	100.0
1969-70	320	31.2	2	.2	706	68.6	1028	100.0
1970-71	154	19.3	22	2.7	624	78.0	800	100.0
1971-72	143	23.4	-	-	469	76.6	612	100.0

Table IX.3(d) : Expenditure (State) Heads of Well Irrigation

(Expenditure in thousand Rs.)

Year	Works		Tools & Plant		Indirect Capital Formation		Development Expenditure		Total	
	Amt.	%	Amt.	%	Amt.	%	Amt.	%	Amt.	%
1960-61										
1961-62	402	30.3	-	-	912	68.7	14	1.0	1328	100.0
1962-63	14	.5	1126	40.5	1635	58.7	9	.3	2784	100.0
1963-64	-	-	9690	63.2	5630	36.7	9	.1	15329	100.0
1964-65	-	-	13585	64.2	7552	35.7	7	.1	21144	100.0
1965-66	538	2.0	8698	32.7	17134	64.6	196	.7	26566	100.0
1966-67	2962	5.7	18561	36.1	29783	57.9	153	.3	51459	100.0
1967-68	1744	6.3	8523	30.7	17401	62.8	56	.2	27724	100.0
1968-69	2031	8.2	8015	32.2	14778	59.5	21	.1	24845	100.0
1969-70	1190	6.3	8800	46.6	8863	47.0	20	.1	18873	100.0
1970-71	1189	6.7	7687	43.5	8794	49.7	16	.1	17686	100.0
1971-72	-	-	3781	27.2	10130	72.7	12	.1	13923	100.0

10. SUMMARY AND CONCLUSION

In this chapter we present a brief summary of results. Section 10.3 covers State-level results while Section 10.4 deals with the regionwise results. In the Section 10.5 a brief mention is also made of the post 1972 performance.

10.1 Coverage

The present study relates to the growth of agriculture in Maharashtra for the twelve-year period from 1960-61 to 1971-72. The study begins from the year 1960-61 because consistent data are available only from this year for post-reorganization Maharashtra. Apart from the State-level analysis, the study covers regionwise and districtwise analysis because mere State-level analysis cannot bring out contrasts in development within the State and further, a phenomenon at the State-level could be meaningfully discussed with such a detailed analysis. The study covers various aspects like scarcity areas in the state, land utilization, cropping pattern, irrigated cropping pattern, growth of irrigation resources, use of chemical fertilizers, production, productivity and investment finance.

10.2 Methodology

The basic data used are the official data published in the Season and Crop Reports. In addition, data published in Fertilizer Statistics are used for fertilizer consumption analysis while in the analysis of finance, data of Land Development Banks, Commercial Banks and those available in the Government Budgets are used. In addition, reports of various commissions, reports of organisations such as the National Sample Survey are utilized in the preparation of the report.

The analysis is carried out at two levels :
 Firstly, compound growth rates for various aspects are calculated. These help in a quick assessment of relative changes. Secondly, changes are also examined in absolute terms so that the behaviour at the State-level could be disaggregated at the regional or district-level and 'impacts' of different regions within the State could be brought out. The second approach is necessary because the first is not sufficient. For example, high growth rate in a given area could be inconsequential in explaining the State level change because the given region has a rather low share of the State aggregate. The growth rates are nevertheless relevant as they depict the strength of change in a given area.

The analysis itself is presented at the State-level and for five regions into which the State area is divided. Peculiarities of individual districts are brought out whenever necessary and in addition complete districtwise analytical tables are incorporated at the end of each chapter for ready reference.

10.3 Major Results

Some of the important findings may be mentioned here. These are as follows :

(1) Over the period, Maharashtra has not done well in agriculture. The compound growth rate of agricultural production for the period is -1.55 per cent per annum. Foodgrains, the major component of agricultural production, have particularly not done well with a growth rate of -1.63 per cent per annum. There are in fact four abnormal years in this period. The first year, 1960-61, was exceptionally good in the sense that although gross cropped area was not abnormal (high), production of foodgrains, for example, was so high that it is not exceeding

in the remaining eleven years. In 1965-66, on the other hand, with about normal cultivated area, total (and foodgrains) production was at its lowest. Lastly, the two terminal years of 1970-71 and 1971-72 have been particularly bad, both in terms of cultivated area and production. If we decide to eliminate these years in the quest for underlying trend, we have a state of stagnancy : compound growth rate for total production comes to -0.07 per cent and for foodgrains production it comes to -0.23 per cent. One has only a choice between decline and stagnancy.

(2) Examination of scarcity conditions reveals that nearly 40 per cent of the net sown area in the State is exposed to scarcity¹ with a frequency of 6 out of 10 years. This would introduce a strong element of randomness in State's performance in agriculture. Further, one could visualize a gradual weakening of an average cultivator with the frequent occurrence of scarcity years. This would affect their performance in normal years too, over a period of time.

(3) Net sown area has remained more or less stationary even if we base the analysis deleting the above-mentioned four abnormal years. The double cropped area has marginally gone down, the upward trend in area irrigated more than once being insufficient to offset the declining trend in rainfed area cropped more than once. In fact 70 per cent of the State's net sown area has recorded decline in the double cropped area.

The extent of irrigation is low in Maharashtra, and although it increased from 5 to 8 per cent of the net sown area over the period, a large part of it is

1 Scarcity year defined in terms of rainfall being below normal in more than 11 weeks out of 22 weeks of rainfall between June and October.

consumed by a high water requirement crop like sugarcane. This in turn fails to stabilize the net sown area or double cropped area.

(4) The growth in area under foodgrains (after deleting four abnormal years) comes to 0.23 per cent per annum but this is mostly on account of pulses, cereals having a growth rate of -0.07 per cent. In production, we may mention that pulses actually record a decline.

(5) The growth of irrigation is unable to check this decline because of high preference to sugarcane cultivation, as mentioned above. In traditionally drought-prone areas the net-work of canal-well irrigation appears to be geared to raise this crop. Other areas, like Marathwada and Vidartha on the other hand, have little irrigation. In fact, according to our estimates, of the increased irrigation water consumed by crops over the period, as much as 40 to 50 per cent is accounted by sugarcane alone. Further, 25 to 30 per cent of this increased consumption goes to fruits and vegetables, leaving 15 to 25 per cent only for foodgrains.

(6) Fertilizer consumption has increased substantially over the twelve year period. Compound growth rates of N and P nutrients are as high as 25 per cent per annum. In Table 10.1 we give data relating to the important crops receiving fertilizers. For the per hectare of gross cropped area, consumption of N has increased from 0.63 kg. to 7.16 kg. This increase also appears to be well distributed over different districts. However, cropwise consumption data are not available and if we use the National Sample Survey 26th round data for the reference year 1970-71 then our

Table 10.1 : Important Crops Receiving Fertilizers

Crop	% share of the State N consumption (RS:1970-71)	% of the State gross cropped area (1970-71)
Sugarcane (entirely irrigated)	24.66	1.09
Rice unirrigated	13.92	5.55
Wheat irrigated	10.08	1.47
Fruits and vegetables	8.39	0.97
Rice irrigated	7.75	1.67
Jowar irrigated	7.19	1.39
	71.99	12.14

analysis reveals that the crops in Table 10.1 are the major recipients.

When we examine production-productivity however, neither rice nor wheat show increases. It is only sugarcane, kharif jowar and bajra (the last two being kharif and mostly rainfed crops) that show some gains.

(7) From the available data on finance in agriculture, investment in agriculture ^{over the twelve year period} can be put around Rs.542 crores at current prices or Rs.359 crores at constant (1960-61) prices. Most of this investment (over 90 per cent) appears to be related directly or indirectly to irrigation. The cost of bringing additional hectares of land ^{under irrigation} comes to Rs.9,736 at constant (1960-61) prices. This is high because of two reasons : firstly, high-water requirement crop like sugarcane is preferred for cultivation and secondly large proportion of infructuous wells with the predominance of impermeable basalt rock in the State.

(8) (8) Area-Production-Productivity

Even after deleting the abnormal four years, for the remaining period we have compound growth rates for the State which are highly disappointing. These are presented in Table 10.2. We may note that the State population, on the other hand, increased between 1961 and 1971 at the compound growth rate of 2.40 per cent per annum.

Table 10.2 : Compound Growth Rates of Area, Production and Productivity for Important Crops (1960-61 to 1969-70)

Growth rates for crops	Area	Production	Productivity
1. Rice	0.11	-0.76	-0.88
2. Wheat	-1.04	-0.90	0.14
3. Kharif Jowar	0.06	2.20	2.14
4. Rabi Jowar	-1.63	-2.25	-0.94
5. Total Jowar	-0.92	-0.16	0.77
6. Bajra	3.07	4.60	1.48
7. Other Cereals	-0.12	0.60	0.72
8. Total Cereals	-0.07	0.12	0.19
9. Total Pulses	1.53	-0.31	-1.81
10. Total Foodgrains	0.23	0.07*	-0.16
11. Sugarcane (Gur)	3.90	4.50	0.58
12. Cotton	0.67	1.00	0.33

* These rates are based on the two-point method and differ somewhat from the rates mentioned in Section 10.3 which are based on the regression method. In the present study, the two-point method is mostly used, the two-points being triennial averages 1960-61 to 1962-63 and 1967-68 to 1969-70.

10.4 Performance of different districts in the State

As mentioned at the end of Section 10.2, complete districtwise analysis analytical tables are appended to

each chapter. For the purpose of comments, the districts are grouped into five regions in the study. It is difficult to incorporate all the relevant regionwise results in the present summary and here we mention only a few of these.

The five regions adopted are as follows :

Region I

Konkan : Includes three districts of Tiana, Kolaba and Ratnagiri covering 5 per cent of State gross cropped area (GCA). Bombay district which is essentially urban is excluded. Main crop is rice (46% of GCA) and minor cereals (18% of GCA). Meagre irrigation.

Region II

Comprises of Nasik, Dhulia and Jalgaon districts covering about 13 per cent of State GCA. Falls in the drought zone. Main crops are bajra (21% of GCA), Cotton (13%), Groundnut (12%) considerable increase in irrigated area over the period.

Region III

Consists of the Poona Division districts which are : Ahmednagar, Poona, Satara, Sangli, Sholapur and covers 29 per cent of State GCA. Falls in the drought zone (with the exception of the last mentioned district) but is also traditionally canal-well irrigated area. Main crops are : rabi jowar (39% of GCA), bajra (15%) and groundnut (6%). Sugarcane area of the State is mostly concentrated in this region and has grown considerably over the period but covers only about 2 per cent of GCA of the region.

Region IV

Covers Aurangabad Division districts which are : Aurangabad, Parbhani, Bhir, Kanded and Osmanabad. The

region forms 26 per cent of State GCA. Three districts fall in the drought zone. Main crops are : rabi jowar (22% of region's GCA), Cotton (16%), Kharif jowar (16%) and total pulses (17%).

Region V

Eight districts of Nagpur Division : Buldhana, Akola, Amraoti, Yetaal, Wardha, Nagpur, Bhandara and Chandrapur. Covers 27 per cent of State GCA. Barring the last two districts which have considerable tank irrigation (with rice as main crop), there is little irrigation. Major crops are : Kharif Jowar (25% of region's GCA), Cotton (29%), total pulses (13%) and rice (10%).

We may further mention that all these regions have foodgrains dominating the cropping pattern with a share of 60 to 75 per cent of gross cropped area. The area-production-productivity growth rates for these regions are presented in Table 10.3 for feedgrains as a whole and for sugarcane and cotton. One finds that Region V has done relatively much better in feedgrains production, while Region IV and the much small Region I have at least positive growth rates for feedgrains production. Region II and especially Region III have done badly. Although these two regions are in the drought zone, in our analysis we have deleted such years and further Region III has considerable irrigated area and the new technology has failed to make a break through even with the availability of this basic resource, viz. irrigation. Both these regions have good production-productivity rates for wheat, irrigated area under which rose sharply. But both the regions fared very badly in jowar (both kharif and rabi) and a positive performance in bajra has little to do with irrigation as it is a kharif,

Table 10.3: Regionwise Area, Production and Productivity Growth Rates in Maharashtra (1960-61 to 1969-70)

	(Growth rates % per annum)								
	Foodgrains			Sugarcane			Cotton		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
Region I	-0.37	0.27	0.64	14.30	36.20	19.47	-	-	-
(Konkan; 3 districts)	(4.84)	(10.39)		(0.14)	(0.05)				
Region II	0.36	-0.18	-0.54	1.67	11.40	9.57	0.33	-6.97	-7.28
(Nasik, Dhule and Jalgaon districts)	(13.41)	(13.28)		(9.86)	(7.07)		(12.50)	(22.75)	
Region III	-0.36	-2.00	-1.65	4.09	2.03	-1.98	-3.03	-7.47	-4.58
(Poona Division; 6 districts)	(32.08)	(28.21)		(72.92)	(84.26)		(2.64)	(6.79)	
Region IV	0.74	0.27	-0.47	4.28	16.00	11.24	0.43	3.50	3.06
(Aurangabad Division; 5 districts)	(25.75)	(23.08)		(15.26)	(7.90)		(28.23)	(23.26)	
Region V	0.50	2.08	1.57	5.39	21.90	15.67	1.02	3.67	2.62
(Nagpur Division)	(23.93)	(25.04)		(1.82)	(0.72)		(56.63)	(47.20)	
State:	0.23	0.07	-0.16	3.90	4.50	0.58	0.67	1.00	0.33
	(100.00)	(100.00)		(100.00)	(100.00)		(100.00)	(100.00)	

(Percentage shares in State totals for the base period, shown in parentheses).

mainly rainfed crop. In Region IV kharif jowar and bajra have done well to offset decline in rabi jowar and wheat (which is mostly rainfed unlike Regions II and III) but the positive foodgrains production rate is due to pulses, area under which grew considerably over the period. In Region V kharif jowar and to some extent rice gained in production while wheat production declined. The cereals production growth rate is as high as 3.17 per cent per annum and increased productivity appears to be the main reason (productivity growth rate 2.69 per cent per annum). The foodgrains production growth rate reduces to 2.08 per cent in this region on account of poor performance of pulses, especially tur, in spite of increased area under tur.

Thus by and large, the overall State performance in foodgrains production is the result of decline in two regions covering 57 per cent of State foodgrains area in the base period, stagnancy or slight gain in two regions (Regions I and IV) covering 30 per cent of area and appreciable gains in one region (Region V) covering 24 per cent of foodgrains area in the base period. Kharif jowar and bajra are the crops responsible for gains in production and these crops have little to do with irrigation and hence with fertiliser use, the components of new technology.

One may wonder whether there are no districts which have a foodgrains production growth rate comparable to the State population growth rate of 2.40 per cent. There are only five such districts and these are : Nanded (Region IV), Buldhana, Akola, Yestmal and Wardha (all from Region V) and the foodgrains production growth rates range from 3.30 to 4.50 per cent per annum. Increased productivity and to a smaller extent increased

area are responsible for these good growth rates but not unexpectedly, kharif jowar (and pulses in case of Handed) appears to be the main reason for the gains. Irrigated area does not exceed 3 per cent of foodgrains area for all these districts and it is obvious that whatever the increase in irrigated area in these districts over the period, irrigation has little to do with these gains. Incidentally, these five districts account for just over 14 per cent of State GCA and less than 14 per cent of State foodgrains production in the base period. There is a wide gap between these five districts and the next best district which is Ehir (Region IV) with a foodgrains production growth rate of 1.60 per cent per annum.

Regarding the non-foodgrains crops, we cover sugarcane and cotton in this brief summary. Sugarcane crop is covered because it is a substantial consumer of irrigation water and cotton because it covers as much as 14 per cent of State GCA. Table 10.3 reveals that in Region III, the main sugarcane tract, production growth rate of 2.03 per cent is due to large area increases, the growth rate being 4.09 per cent. It is obvious that productivity is declining in this main tract. On the other hand, in other regions area under sugarcane is increasing while productivity is increasing much faster. These 'new' sugarcane areas have very low initial productivity levels (less than half the State level productivity) while Region III has very high initial productivity level. In new areas more improved application of proper inputs may be showing large gains while in the main tract, sugarcane is probably extending to less fertile lands. It is already pointed out that

increased irrigation potential in this region (Region III) is being used almost entirely for sugarcane.

In case of cotton, a modest production growth rate of 1 per cent per annum at the State level is due to main cotton tracts in Region V and IV. The gains in production are mainly due to increased productivity and only partly due to increased area. But lesser important Regions II and III (especially the former) where most of the irrigated cotton is concentrated have large declines in production and productivity.

Thus the overall performance of the State is disappointing. The main component of foodgrains has not done well especially in irrigated areas. Crops like sugarcane, wheat, fruits and vegetables have shown gains due to irrigation, but it is mainly the rainfed crops in part of the State that have prevented a worse performance. If we refer to the Directorate (Bureau) of Economics and Statistics index numbers of area, production and productivity of all crops together and with deletions of bad years, production-productivity growth rates spell out only decline-stagnancy.

10.5 Growth in Post 1972 Years

Although over the twelve year period of 1960-61 to 1971-72 agricultural performance of the Maharashtra State has been disappointing, it is possible to end the present study on a slightly optimistic note. Since the study was undertaken, data for 1972-73 to 1974-75 have become available and these data allow some room for optimism. We take a brief look at the State-level performance here.

Of these three years, viz. 1972-73 to 1974-75, year 1972-73 is the worst since 1960-61 but years 1973-74 and especially 1974-75, are exceptionally good. Year 1972-73

is worst year in many respects. The drought period of 1970-71 and 1972-73 continues into the third year 1972-73 and gross cropped area touched a new low since 1960-61, at 169.8 lakh hectares (the previous lowest being in the preceding year 1971-72 at 181.2 lakh hectares). Production of foodgrains of 31042 hundred metric tonnes (Hmt) was lower than the previous lowest of 46947 Hmt in 1965-66 (or a comparable level of 48564 Hmt in 1971-72). In the earlier period even in drought years irrigated area kept on increasing but irrigated area in 1972-73 was lower than the post 1968-69 level. Double cropped area was also lowest since 1960-61 except for the year 1965-66.

Year 1973-74 is not only much better but surpasses in many respects, the twelve year period of 1960-61 to 1971-72 covered in the present study. Gross cropped area, net irrigated area, double cropped area all surpass the previous highest attained. Foodgrains production of 70451 Hmt is lower only in comparison with the peak achieved in 1960-61 of 77439 Hmt but surpasses all other years. (In fact we have deleted the year 1960-61 in production analysis in the present study because that level was not surpassed till 1971-72 and having an exceptional year at the beginning of the period depresses the production growth rates). Year 1974-75 is exceptional with all the previous best figures being surpassed. Gross cropped area at 195.1 lakh hectares is the highest. Net irrigated area, double cropped area also reach a new peak. Foodgrains production of 78999 Hmt surpasses the previous highest level of 1960-61. Sugarcane and cotton productions also reach new peaks.

Consistent with our approach in the present study, if we ignore the worst year 1972-73 and consider the end

period as average of the two years 1973-74 and 1974-75 to allow maximum opportunity for any positive trend that may exist to emerge, the production growth rates of major crops appear slightly better. In Table 10.4 production growth rates along with production levels are presented for period under study as well as the period ending 1974-75 for comparison.

From this table we note first of all, that foodgrains, the major component of agricultural production, show a production growth rate of 1.09 per cent per annum, unlike the stagnancy indicated by the 0.07 per cent growth rate for the period under study. Major crop of rabi jowar (with 25 per cent share in foodgrains production in the base period) still continues to show a negative growth rate, but now of a smaller magnitude, at -0.74 per cent. Of the next in importance crops of kharif jowar and rice, the former continues to show a positive growth rate (1.12 per cent per annum) through of a smaller order, while the latter now shows a positive growth rate of 0.70 per cent per annum. Wheat, though relatively of smaller importance in the State production basket of foodgrains, has an impressive growth rate of 4.50 per cent per annum (as against -0.90 per cent over the earlier period) while bajra continues to show good growth rate at 3.50 per cent. Pulses also record a good growth rate. Sugarcane and cotton continue to show positive growth rates of the same order as in the earlier period.

Growth in foodgrains production at 1.09 per cent, although now much better, falls considerably short of the State population growth rate of 2.40 per cent per annum. We again underline the fact that this is the 'best' growth rate that could emerge after deleting net

Table 10.A : Production Levels and Growth Rates for Major Crops for Maharashtra

Crops	Production Levels (Hmt)			Growth Rate (% p.a.)	
	Base period (Av. 61-64)	End period (Av. 67-70)	End period (Av. 73-75)	For period under study	For extended period
(1)	(2)	(3)	(4)	(2) ÷ (3)	(2) ÷ (4)
1 Rice	14298	13661	15506	-0.76	0.70
2 wheat	4055	3842	6505	-0.90	4.20
3 Kh.Jowar	14986	17078	17034	2.20	1.12
4 Kb.Jowar	16735	14342	15397	-2.25	-0.74
5 Total Jowar	31720	31420	32431	-0.16	0.20
6 Bajra	4858	6355	7209	4.60	3.50
7 Other Cereals	2622	2705	3184	0.60	1.70
8 Total Cereals	57553	57982	64835	0.12	1.04
9 Total Pulses	8444	8286	9890	-0.31	1.38
10 Total Foodgrains	65997	66268	74725	0.07	1.09
11 Sugarcane (Cur)	10909	14207	17881	4.50	4.38
12 Cotton	12105	12854	13334	1.00	0.84

Note : Growth rates based on the two-point method. Hmt = hundred metric tonnes. Production of cotton in hundred bales of 180 kg. each.

only the bad years but the exceptionally good first year of 1960-61. That is to say, this growth rate of foodgrains production deletes the excellent first year of 1960-61 as being due to exceptionally fair weather conditions while retaining an even better year of 1974-75 as being due to the development efforts over the period of about fifteen years rather than the result due to favourable weather conditions.

What about the productivity gains? In Table 10.5 area, production and productivity growth rates for the extended period ending 1974-75 (similar to those in Table 10.2) are presented. Apart from wheat and bajra, the growth rates are not impressive. In fact most of them are below one per cent but they are slightly better than the rates over the period under study. Thus although some improvement is indicated over the extended period ending 1974-75, a break through is nowhere in sight.

10.6 Conclusion

To conclude the analysis in the present study, performance of agriculture in Maharashtra is far from satisfactory. Foodgrains, the main component of agricultural production is not doing well. Foodgrains production should keep pace with the growth of the State population not only to increase internal availability but to provide employment and income to a multitude of farmers who are mainly foodgrain producers. Past experience shows that for decades to come, pressure on land is going to increase and if the benefits of economic growth are to reach the predominant proportion of population of the State which depends on agriculture, a scarce resource like irrigation should be utilised towards reducing the severity of the frequent scarcity years rather than using

Table 10.5 : Compound Growth Rates for Area, Production and Productivity for the Extended Period (1960-61 to 1974-75) for Major Crops in Maharashtra

(Growth Rates % p.a.)

Crop	Area	Production	Productivity
1 Rice	0.20	0.70	0.50
2 Wheat	0.51	4.20	3.67
3 Kh.Jowar	0.54	1.12	0.58
4 Eb.Jowar	-0.69	-0.74	-0.05
5 Total Jowar	-0.17	0.20	0.37
6 Bajra	1.58	3.50	1.89
7 Other Cereals	0.08	1.70	1.62
8 Total Cereals	0.24	1.04	0.80
9 Total Pulses	1.40	1.34	-0.06
10 Total Foodgrains	0.46	1.09	0.63
11 Sugarcane	3.60	4.38	0.75
12 Cotton	-0.62	0.84	1.47

(Growth rates based on the two-point method)

it for the production of a crop like sugarcane, cultivated in pockets by a small minority of cultivators. It is also necessary to develop and widely adopt the dry land farming techniques, given the limited availability of irrigation resource.

It is true that the agricultural policy should also be viewed in the national context but it should be emphasized that any policy that reaches the mass of cultivators in a populous state like Maharashtra and tries to contain poverty and unemployment, also coincides with the national interest.

Appendix A

It was pointed out in Section 3.5, Chapter 3 that the distribution of culturable waste, current fallows and 'fallows other than current fallows' available in the land use statistics in the Season and Crop Reports appears somewhat unreliable. Here we present some of the results of 'Surveys to Ascertain the Extent of Fallow Area'.² These surveys were conducted by the Statistician to the Directorate of Agriculture 1958-59 onwards. The surveys were based on a sample of villages from a few districts with different reference periods and data on current fallows, other fallows and culturable waste were collected. The results are presented in Table A-1.

From this table we note that estimates of area under culturable waste and total fallows together arrived at by the survey differ from the official estimates. But more importantly, the distribution of this area between the three categories of culturable waste, current fallows and 'other fallows' differ considerably. In the survey estimates current fallows are the smallest of three followed by other fallows and culturable waste in an ascending order. The highest component, viz. the culturable waste, shares 49 to 93 per cent of the (total) area under culturable waste and 'total' fallows!. In the official estimates, share of culturable waste in the total area under consideration lies between 5 to 29 per cent only and it is current fallows or 'other fallows' that dominate. Since the survey was conducted with the specific purpose of ascertaining the accuracy of the official estimates of these categories of land use, the survey estimates should be more acceptable. It is thus clear that the official estimates of these categories of land use are somewhat suspect.

Table A.1 : Sample Survey results of the Extent of Fallow Area

District year of survey	Osmanabad (59-60)	Buldhana (62-63)	Satara (62-63)	Poona (Not spe- cified)	Amaravati (Not spe- cified)
No. of villages surveyed	Not spe- cified	59	58	45	70
Official estimates of C.Waste + total fallows	730434 acres	58732 Ha	94957 Ha	249548 Ha	64387 Ha
Survey esti- mates of C.Waste + total fallows	638116 acres	71251 Ha	93457 Ha	241830 Ha	53315 Ha
Official esti- mates as compared to survey esti- mates of fallow area	14.5% over- estimate	17.0% under- estimate	Closely agreed	Closely agreed	20.0% over- estimate
<u>Percentage distribution of official estimates</u>					
(1) Current fallows	76	12	75	3	17
(2) Other fallows	19	59	15	90	63
(3) Culturable wastes	5	29	10	7	20
<u>Percentage distribution of survey estimates</u>					
(1) Current fallows	22	20	3	7	14
(2) Other fallows	29	26	4	7	19
(3) Culturable wastes	49	54	93	86	67

Total fallows = Current fallows + fallows other than current fallows					

Source : Annual Administration Reports, Department of Agriculture,
Govt. of Maharashtra (1960-61 to 1966-67)

Appendix 2 : Farm Harvest Prices of Principal Crops (State Average)

Line (1) : Price in Rs. per quintal

Line (2) : Index of Price

Year	Commodity									
	Rice	Wheat	Jowar	Bajri	Turdal	Gram	Cotton (unginned)	Sugar Pw (Cur)	Groundnut	
1960-61	(1) 38.69 (2) 100.00	(1) 51.17 (2) 100.00	(1) 35.18 (2) 100.00	(1) 49.92 (2) 100.00	(1) 59.24 (2) 100.00	(1) 45.25 (2) 100.00	(1) 97.76 (2) 100.00	(1) 38.18 (2) 100.00	(1) 61.22 (2) 100.00	
1961-62	(1) 37.40 (2) 96.67	(1) 52.97 (2) 103.52	(1) 37.78 (2) 107.39	(1) 44.39 (2) 88.92	(1) 58.30 (2) 98.41	(1) 44.72 (2) 98.83	(1) 94.12 (2) 96.28	(1) 40.38 (2) 105.76	(1) 62.32 (2) 101.80	
1962-63	(1) 38.21 (2) 98.78	(1) 51.25 (2) 100.16	(1) 40.30 (2) 114.85	(1) 45.17 (2) 90.48	(1) 60.60 (2) 102.30	(1) 43.30 (2) 95.69	(1) 113.54 (2) 116.14	(1) 57.74 (2) 151.23	(1) 62.16 (2) 101.54	
1963-64	(1) 51.68 (2) 133.57	(1) 70.17 (2) 137.13	(1) 44.45 (2) 126.35	(1) 48.23 (2) 96.81	(1) 81.37 (2) 137.36	(1) 53.56 (2) 118.36	(1) 121.29 (2) 124.07	(1) 91.47 (2) 239.58	(1) 65.61 (2) 107.17	
1964-65	(1) 65.94 (2) 170.43	(1) 102.02 (2) 199.37	(1) 48.63 (2) 138.23	(1) 73.37 (2) 148.18	(1) 95.59 (2) 161.36	(1) 101.57 (2) 224.46	(1) 131.01 (2) 134.01	(1) 88.71 (2) 232.35	(1) 87.56 (2) 143.03	
1965-66	(1) 82.33 (2) 212.77	(1) 112.19 (2) 217.25	(1) 59.17 (2) 168.19	(1) 100.38 (2) 201.08	(1) 100.32 (2) 169.34	(1) 131.24 (2) 290.03	(1) 113.59 (2) 116.19	(1) 71.37 (2) 186.93	(1) 122.21 (2) 179.62	
1966-67	(1) 76.39 (2) 197.44	(1) 116.55 (2) 227.77	(1) 59.79 (2) 169.95	(1) 81.06 (2) 162.38	(1) 153.59 (2) 259.27	(1) 153.08 (2) 338.30	(1) 141.66 (2) 144.91	(1) 140.29 (2) 367.44	(1) 123.96 (2) 202.48	
1967-68	(1) 82.89 (2) 214.24	(1) 123.85 (2) 242.04	(1) 60.14 (2) 170.95	(1) 87.20 (2) 178.69	(1) 157.86 (2) 266.48	(1) 138.81 (2) 306.76	(1) 97.61 (2) 99.85	(1) 201.56 (2) 527.92	(1) 119.93 (2) 195.90	
1968-69	(1) 76.97 (2) 198.94	(1) 113.71 (2) 222.22	(1) 62.91 (2) 178.82	(1) 81.84 (2) 163.94	(1) 122.20 (2) 206.28	(1) 103.15 (2) 227.96	(1) 127.06 (2) 132.02	(1) 135.40 (2) 354.64	(1) 131.41 (2) 214.65	
1969-70	(1) 73.83 (2) 190.82	(1) 109.04 (2) 213.09	(1) 63.20 (2) 179.65	(1) 82.03 (2) 164.32	(1) 132.85 (2) 224.25	(1) 113.18 (2) 250.12	(1) 132.96 (2) 136.01	(1) 85.09 (2) 222.87	(1) 156.65 (2) 255.88	
1970-71	(1) 78.28 (2) 202.33	(1) 100.14 (2) 195.70	(1) 77.94 (2) 221.55	(1) 76.14 (2) 152.52	(1) 130.99 (2) 221.12	(1) 100.23 (2) 221.50	(1) 164.35 (2) 168.12	(1) 102.44 (2) 268.31	(1) 158.43 (2) 258.79	
1971-72	(1) 82.87 (2) 214.19	(1) 101.34 (2) 198.05	(1) 84.85 (2) 241.19	(1) 84.45 (2) 169.17	(1) 155.55 (2) 262.58	(1) 103.97 (2) 229.77	(1) 169.93 (2) 173.82	(1) 144.44 (2) 378.31	(1) 145.97 (2) 238.44	
Growth rate % p.a.	8.10	7.80	7.90	6.40	10.10	10.10	4.20	13.20	10.60	

Data Source for Prices : Season and Crop Reports.