SUSTAINABILITY OF SLOW GROWTH FOODGRAIN CROPS IN MAHARASHTRA: ISSUES AND OPTIONS

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Introduction:

India has shown significant expansion in foodgrain production over time mainly due to introduction of seed-fertilizer-water technology in the post-green revolution period. Nonetheless, this technological breakthrough could gain momentum only in some select regions of the country and that too in terms of some cereal crops like rice and wheat. In fact, in the race of output growth, pulses and coarse cereals have lagged so far behind that these can be categorized as 'also ran'. A number of earlier studies have also shown a sluggish and erratic growth in pulses and coarse cereal production, though most of the studies are area specific (Moorti et. al. 1991; Bhatia, 1991, Shah, 1997). In the late 1970's and early 1980's, a number of studies raised concerns about a possible deceleration in the growth of foodgrain production, indicating a decline in the momentum of the green revolution and possible exhaustion of the potential of available technology (Alag and Sharma, 1980; Desai and Namboodiri, 1983). A significant section has also shown serious doubts about the productivity of modern inputs that are used in increasing quantities to sustain growth. The Government of India is now giving top priority for boosting the production of pulses and coarse cereals in the country with the objective of meeting their domestic requirement and also to reduce their import bill.[1]

As for course cereals, Maharashtra is reckoned as one of the most important states since it not only accounts for maximum area but also the highest output of coarse cereals in India. Similarly, it also accounts for significant area and output of pulses in the country. During 1996-97, this state ranked 3rd in area and 4th in output of pulses in India (Appendix 1). However, the yield levels of these crops are so low in this state that it finds lowest place among various pulses and course cereals growing states in the country. These facts clearly make it necessary to understand not only the pattern of growth and variability in various pulses and course cereal crops but also the reasons for their slow growth in the state. With this perspective in view, this paper attempts to analyze the performance of Maharashtra's foodgrain production over time

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taking into account growth associated with instability with the extension to component and profitability analyses and, thus, traces the reasons for slower growth performance of some of the important foodgrain crops in the state.

Data and Methodology:

Data used for this study were collected from secondary sources. Time series data encompassing the period from 1980-81 to 1996-97 on selected parameters were collected from 'Districtwise Agricultural Statistical Information of Maharashtra, Part-II, Office of the Commissioner Agriculture, Pune' and also from 'Bulletin on Food Statistics, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi'.

In this study, semi-log exponential trend equations have been fitted to the time series data in order to compute compound rates of growth. Further, in order to capture year to year fluctuation in growth trends, an index of instability as suggested by Coppock (1962) has also been incorporated in the analyses, which appears to have taken care of the trend component in the time series data. A decomposition of production increase in the current period over that of the base period has also been done using the method outlined by Vidya Sagar (1980) in order to measure relative importance of area, yield and their interactions on the changes in production.[2] Further, in order to have more logical observations, this study has also made use of field level estimates, especially with respect to various foodgrain, vegetable and oilseed crops with a view to compare relative profitability of growing these crops on farmers' fields. For this, fifty farmers from Nasik district of Maharashtra have been selected.[3]

The results of this study are presented in two sections. The first section provides an insight into the growth and instability in area, production and yield of foodgrain crops in Maharashtra vis-à-vis India. This section also includes component analysis. The second section compares the profitability in growing various field crops and, thus, traces reasons as to why farmers are inclined to grow certain crops having comparative advantage. The second section also includes policy suggestions based on the findings of present investigation.

Section – I

Cereal-Pulses Ratio:

Despite the efforts initiated through the National Pulses Development project, the production of pulses in the country has not gone up in proportion to the rise in

population to meet the domestic demand. As can be discernible from Table 1, cereal-pulses ratio in India has increased from 11:1 during the early eighties to 13:1 by the mid-nineties. Thus, the share of pulses in total foodgrain output showed a continuous decline over time in the country. Its share in total foodgrain output came down to about 7 per cent by the triennium ending 1996-97 from 9 per cent in triennium ending 1982-83. Further, while rice and wheat showed an output growth of 56 per cent and 69 per cent respectively between the periods I and III, the growth in output of pulses, on the other hand, was only to the tune of 20 per cent and that of course cereals was 6 per cent between this period. On the other hand, cereal-pulses ratio in Maharashtra has come down from 9:1 during the early eighties to 6:1 by the mid-nineties. This is an indication of rise in pulses output in Maharashtra. However, most of the increase in pulses output was witnessed during the period between early- and the late eighties and thereafter a slowing down was seen to caught up with pulses output in Maharashtra. Similarly, growth in coarse cereal output has also slowed down during the later half after showing a reasonable growth in the same during the first half of the overall period. Not only this, the cereal pulses ratio has also stagnated at 6:1 in Maharashtra during the second half of the given period. These facts amply demonstrate lack of attention being given to these important crops in Maharashtra, especially in more recent times. It is to be noted that despite India being the second largest producer of pulses in the world, the country regularly imports pulses mainly because of sluggish and erratic growth in output caused by low productivity. To augment domestic supplies, import of pulses is allowed without any license restriction.

Growth and Instability:

Various research workers have presented different views in terms of country's growth rates of foodgrain output. The annual compound growth rate comes to 1.91 per cent for the period 1967-68 to 1975-76 and 2.54 per cent for the period of 1967-68 to 1983-84 if the estimates of IFPRI study are taken into account (Sharma and Gandhi, 1990). On the other hand, growth rate estimates of another study by Bhatia (1983) show that growth rate increases to 3.4 per cent for the period 1964-65 to 1970-71 and falls to 2.4 per cent if 1981-82 is taken as the terminal year. The present study, which encompasses the period from 1980-81 to 1996-97, shows a reasonable growth in total foodgrain output in India (Table2). Analysis shows that compared to output,

yield growth is faster. However, there is continuous decline in area under most of the foodgrain crops in India. This holds especially true in the case of pulses and course cereals. The area under coarse cereals has also declined in Maharashtra mainly due to sharp decline in area under *jowar*, which is one of the major foodgrain crops in the state. However, area under pulses has grown in this state during the given period of time.

The analysis here also shows differences in growth rates across different crops. Between 1980-81 and 1996-97, the output levels of *bajra* and gram have grown at the rate of 6-8 per cent a year, which is more than three and a half times of the overall growth rate in foodgrain output of Maharashtra. Both area as well as yield have contributed to this higher growth rate. However, contribution of yield growth is much higher compared to area growth rate. In general, the growth rate in pulses output is seen to be nearly 5 per cent a year, which turns out to be nearly twice the growth rate of course cereals.

Growth rates generally fail to explain fluctuation or instability in the time series data. Though it is said that growth with stability is ideal but growth with instability is more often the reality. The results of instability analysis indicate that production instabilities are higher as compared to yield as well as area instabilities in Maharashtra. In this state, the degree of instability in terms of area, production and yield is noticed to be the highest in case of gram among pulses crops and *bajra* among coarse cereals. At the same time, these instabilities are seen to be associated with positive growth in area, production and yield of pulses and declining growth in case of area under coarse cereals. This indicates that the gain in output due to increase in yield are offset by production losses due to decrease in area sown and thus adversely affecting the coarse cereals. As for instability, Hanumantha Rao (1968) stated that inputs like fertilizers and improved seeds if used under the conditions of assured irrigation may promote growth with stability, but if used under the conditions of uncertain rainfall may increase the range of fluctuations in output with growth. Since *jowar*, *bajra* and almost all the pulses crops are grown on marginal lands under rainfed conditions, these crops have shown very high degree of instability/fluctuation in output with positive and high growth. Thus, the above statement undoubtedly holds good for Maharashtra.

It is to be noted that Aurangabad, Pune and Nasik are the major coarse cereal growing regions/divisions of Maharashtra and that the area under these crops have declined in these regions during the period between 1980-81 and 1996-97 (Appendix 2). However, this decline in area has not affected the course cereal production as the yield levels have gone up considerably over time in these regions, though still below the national average. On the other hand, Aurangabad and Amravati are noticed to be the major pulses growing regions of Maharashtra. These are considered as dry land regions of the state with unassured irrigation facilities. As can be noticed from Appendix 2, there has been sharp increase in area under various pulses crops in these two regions of Maharashtra during the given period of time. Added to this, these two regions have also shown increase in productivity levels of various pulses crops. The cumulative effect of rise in area and yield has resulted in a sharp increase in output of various pulses crops in these two regions of Maharashtra. And, this is the reason as to why pulses crops have shown very high fluctuation in their output growth in Maharashtra. Further, in course of time there has been sharp increase in the distribution of certified/truthful labeled seeds (HYV) through public sector in Maharashtra.[4] This has invariably raised productivity levels of pulses and coarse cereals in Maharashtra.

Component Analysis:

The effects of yield, area and their interactions towards increase/decrease in total production of all the foodgrain crops have been worked out for both India and Maharashtra and estimated results of these effects are brought out in Table 3.

An analysis of decomposition shows that in majority of foodgrain crops grown in Maharashtra as well as in India the increase in output is due to yield expansion rather than area. In Maharashtra, the increase in output growth of coarse cereals is seen to be due mainly to yield expansion as the effect of area towards rise in output growth of these crops is negative. On the other hand, in the case of pulses in general, not only yield but area as well as interaction between area and yield have contributed significantly towards rise in output. However, among pulses crops, the increase in output of *tur* is due to area effect. Interestingly, the contributions of yield, area and their interactions towards rise in foodgrain output are by and large same for Maharashtra and India with yield showing positive effect and area and interaction between area and yield showing negative effect.

Section - II

Profitability Analysis:

Various concepts of costs such as cost A_1, A_2, B and C have been used to assess the structure of various components of costs.[5] The cost and return estimates with respect to various field crops grown by the sampled onion farmers of Nasik district of Maharashtra are brought out in Table 4.

Among various field crops grown on the sampled farms, the highest per hectare net return over cost C was found to be in the case of tomato and onion among various horticulture crops and groundnut and *soyabean* among oilseed crops. The returns from various coarse cereals such as *jowar* and *bajra* were not seen to be lucrative proposition. In fact, the cultivation of pulse crop like gram was found to be the most unprofitable proposition since total cost (cost C) of production was much higher than gross return from the main produce, though main and by produce together yielded a positive return over cost. These estimates clearly show a much higher net return in growing various horticulture crops as compared to other field crops. However, these results may not be generalized for the state as Nasik is not a pulse growing district of the state. Moreover, pulses like gram were grown on the sampled farms for the farmers own family consumption requirements. As for coarse cereals and other oilseed crops, lower profitability are due mainly to the fact that farmers attention was concentrated more towards growing high value horticultural crops. Obviously, other field crops received less attention with respect application inputs and other related aspects.

Implications and Concluding Remarks:

The findings of this study showed tremendous increase in pulses output over the past decade and a half in majority of the pulses growing regions of Maharashtra. Both yield and area expansion have contributed to this increase in pulses output. However, coarse cereals have shown very slow growth in their output, especially after the late eighties period. Although there has been perceptible rise in yield of coarse cereals over time, this yield expansion could not raise coarse cereal output as majority of the regions of Maharashtra have shown a decline in area under these crops. In fact, the effect of area reduction is so intense that it has outweighed the effect of yield expansion and consequently there has been a very slow growth in output of coarse cereals. The decline in area under coarse cereals is especially noticed in Nasik and

Pune regions of Maharashtra, which of late are concentrating on the cultivation of various horticulture crops because of their comparative advantage. The present study also shows much higher net return in the cultivation of horticulture crops like onion and tomato as compared to net returns emanating from coarse cereals and oilseed crops. Obviously, there has been shift in area from coarse cereals to horticulture crops. Now the Government has introduced a number of crop-oriented schemes to improve the output of pulses and coarse cereals. However, the success of Government schemes will depend on the extent of adoption as the farmers grow these crops on poor and unirrigated land with generally low levels of inputs like fertilizers, pesticides, etc. Added to this, pulses crops are more susceptible to pest and disease than cereal crops and, thus, involving high risk. However, in order to augment pulses production in the country, Sidhu and Sidhu (1991) have put forward a number of suggestions, which encompass development of draught-disease-and past resistant high yielding varieties of pulses for different agro-climatic regions, diversification of agriculture through introduction of pulses crops in wheat-paddy monoculture, etc. On the other hand, Kadrekar (1991) has suggested a number of strategies to increase pulses production in Maharashtra with major emphasis on protective irrigation, soil fertility management, improved crop production technique, plant protection measures, and diversification of cropping pattern. However, these strategies and schemes have not yielded the desired results so far as pulses and coarse cereal production in the country are concerned.

End Notes:

1. Despite the fact that India itself is the second largest producer of pulses in the world, the country remained a regular importer of pulses over a decade or so because of sluggish growth in output caused by low productivity.
2. Decomposition of production increase can be given as

$$Q^1 - Q^0 = A^1 Y^1 - A^0 Y^0 \quad \text{……..(1)}$$

$$= (A^1 - A^0) Y^0 + (Y^1 - Y^0) A^1 \quad \text{…….(2)}$$

The right hand side of the identity (2) can be further decomposed as

$$Q^1 - Q^0 = (A^1 - A^0) Y^0 + (Y^1 - Y^0) A^0 + (A^1 - A^0) (Y^1 - Y^0)$$

$$\Delta Q = \Delta A Y^0 + \Delta Y A^0 + \Delta A \Delta Y$$

Change in production = Area effect + Yield effect + Interaction effect

Here, (Q^1, Q^0), (A^1, A^0) and (Y^1, Y^0) represent current period and base period of production, area and yield, respectively. Three year average has been taken on each side.

3. It was decided to select 50 onion producing farmers from five villages of Nasik district of Maharashtra. These farmers belonged to various categories such as marginal, small, medium and large. The categorization was done based on their land holding size. The probability proportion to size technique was used for their final selection. The number of onion producing households selected were 12 in marginal, 13 in small, another 13 in medium, and 12 in large category. However, in this study an overall position with respect to various parameters is brought out with 50 farmers put together.

4. The distribution of certified/truthful labeled seeds of pulses through public sector in Maharashtra has increased from 39,209 quintals during 1987/88 to 63,812 quintals by 1997/98. However, *jowar* seed distribution through public sector in the state has come down from 1,09,952 quintals during 1987/88 to 41,023 quintals by 1997/98, though *bajra* seed distribution during this period has gone up from 11,497 quintals to 14,321 quintals.

5. The details of cost concepts are given as follows:

   Cost A_1 = Cost of inputs such as seed (both farm produced and purchased), manure (owned and purchased), fertilizers, insecticides and pesticides + value of hired labour + value of hired as well as owned bullock labour + hired machinery charges + value of owned machine labour + depreciation on implements and farm buildings + irrigation charges + land revenue and other taxes + interest on working capital + miscellaneous expenses.

   Cost A_2 = Cost A_1 + rent paid for leased-in land

   Cost B = Cost A_2 + rental value of owned land (net of land revenue) and interest on owned fixed capital excluding land.

   Cost C = Cost B + imputed value of family labour.

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Table1:Comparative Positions of Maharashtra and India in Cereal-Pulses Ratio: 1980/81- 1996/97

(Quantity in '000' tonnes)

Crop	Triennium Average			% Change		
	P-I	P-II	P-III	II over I	III over II	III over I
India						
Rice	51332	66975	80034	30.47	19.50	55.91
Wheat	38853	50043	65713	28.80	31.31	69.13
Jowar	11082	11755	9793	6.07	-16.69	-11.63
Bajra	5337	5909	6815	1072	15.33	27.69
Other Cereals	12866	13199	14453	2.59	9.50	12.33
Coarse Cereals	29285 (22.39)	30863 (19.24)	31061 (16.31)	5.39	0.64	6.06
Total Cereals	119470 (91.34)	147881 (92.17)	176808 (92.86)	23.78	19.56	47.99
Tur	2061	2585	2384	25.28	-7.67	15.67
Gram	4753	4324	5723	-9.06	32.35	20.41
Other Pulses	4516	5650	5495	25.11	-2.74	21.68
Total Pulses	11330 (8.66)	12556 (7.83)	13602 (7.14)	10.82	8.33	20.05
Total Foodgrains	130800 (100.00)	160437 (100.00)	190410 (100.00)	22.66	18.68	45.57
Cereal-Pulses Ratio	10.54	11.78	13.00			
Maharashtra						
Rice	2233	2245	2525	0.54	12.47	13.08
Wheat	893	859	1057	-3.81	23.05	18.37
Jowar	4651	5621	5268	28.86	-6.28	13.27
Bajra	640	1005	1303	57.03	29.65	103.59
Other Cereals	394	443	640	12.44	44.47	62.44
Coarse Cereals	5685 (58.28)	7070 (59.98)	7211 (57.30)	24.36	1.99	26.84
Total Cereals	8811 (90.33)	10173 (86.31)	10793 (85.76)	15.46	6.09	22.49
Tur	382	610	616	59.69	0.98	61.26
Gram	154	320	448	107.79	40.00	190.91
Other Pulses	407	684	728	68.06	6.43	78.87
Total Pulses	943 (9.67)	1614 (13.69)	1792 (14.24)	71.16	11.43	78.87
Total Foodgrains	9754 (100.00)	11787 (100.00)	12585 (100.00)	20.84	6.77	29.02
Cereal-Pulses Ratio	9.34	6.30	6.02			

Source: Calculations are based on figures obtained from (i) Districtwise Agricultural Statistical Information of Maharashtra, Part-II, 1996-97 &1997-98, Office of the Commissioner Agriculture, Pune, (ii) Districtwise General Statistical Information of Agriculture Department, 1988-89, Part-II, Epitome of Agriculture in Maharashtra, Office of the Commissioner Agriculture, Pune, and (iii) Bulletin of Food Statistics, 1996-97, Fortieth Issue, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.

Notes: i) P-I = 1980/81 – 1982/83 ; P-II = 1987/88 – 1989/90 ; P-III = 1994/95 – 1996/97
ii) Figures in parentheses are percentages to total foodgrain production

Table 2: Growth and Instability in Area, Production and Productivity of Foodgrain Crops in Maharashtra and India: 1980/81 – 1996/97

Crop	Area			Production			Productivity		
	CGR (%)	CII (%)	R^2	CGR (%)	CII (%)	R^2	CGR (%)	CII (%)	R^2
India									
Rice	0.52	9.97	0.57	3.16	3.53	0.85	2.63	6.84	0.88
Wheat	0.73	7.05	0.64	3.67	3.35	0.94	2.91	5.29	0.96
Jowar	-2.54	23.38	0.85	-0.56^{NS}	5.53	0.04	2.02	18.30	0.45
Bajra	-1.09	50.20	0.38	1.62^{NS}	13.09	0.09	2.73^{NS}	37.21	0.28
Other Cereals	-2.05	11.73	0.96	0.87^{NS}	2.89	0.24	2.98	9.82	0.83
Coarse Cereals	-1.95	16.46	0.92	0.52^{NS}	4.40	0.06	2.53	13.16	0.66
Total Cereals	-0.32	7.25	0.45	2.77	3.04	0.89	3.11	4.63	0.95
Tur	1.32	13.97	0.70	0.73^{NS}	3.98	0.12	-0.58^{NS}	11.13	0.11
Gram	-0.40^{NS}	21.84	0.04	0.85^{NS}	14.27	0.09	1.25	12.96	0.43
Other Pulses	-0.37^{NS}	10.58	0.22	1.54	4.44	0.45	1.92	8.80	0.68
Total Pulses	-0.14^{NS}	11.59	0.04	1.13	5.24	0.40	1.27	7.49	0.64
Total Foodgrains	-0.29	7.41	0.35	2.64	3.27	0.88	2.94	4.61	0.95
Maharashtra									
Rice	0.22^{NS}	4.69	0.09	1.07^{NS}	18.79	0.16	0.85^{NS}	16.09	0.12
Wheat	-2.78	13.77	0.61	1.02^{NS}	29.11	0.05	3.91	15.15	0.70
Jowar	-1.18	6.35	0.67	1.57^{NS}	39.52	0.12	2.78	33.11	0.35
Bajra	0.97^{NS}	11.24	0.28	6.34	51.44	0.51	5.33	41.10	0.47
Other Cereals	0.19^{NS}	8.03	0.01	3.10	20.31	0.51	2.90	15.44	0.62
Coarse Cereals	-0.54	4.63	0.36	2.48^{NS}	37.41	0.27	3.83	31.55	0.51
Total Cereals	-0.71	4.60	0.56	1.92^{NS}	25.92	0.26	2.66	21.59	0.45
Tur	3.40	4.36	0.93	3.31	29.38	0.43	-0.08^{NS}	29.16	0.01
Gram	3.35	17.24	0.68	7.91	38.35	0.71	4.41	23.94	0.61
Other Pulses	0.28^{NS}	7.90	0.05	4.56	38.08	0.53	4.26	34.96	0.55
Total Pulses	1.72	6.17	0.78	4.77	29.98	0.62	2.99	25.42	0.46
Total Foodgrains	-0.18^{NS}	4.38	0.09	2.26	25.94	0.33	2.44	21.53	0.43

Source: As in Table 1.

Notes: i) CGR = Compound Growth Rates ; CII = Coppock Instability Index

ii) All Growth Rates Significant at 1 per cent Level of Probability

iii) NS = Growth Rates Not Significant at 1 per cent Level of Probability

Table 3: Contributions of Area, Yield and their Interactions towards Increasing Output of Foodgrain Crops in Maharashtra and India: (1980/81-1982/83 and 1994/95-1996/97)

(per cent)

Crop	India			Maharashtra		
	YE	A E	IE	YE	A E	IE
Rice	78.71	14.87	6.42	86.92	12.46	0.62
Wheat	72.45	18.39	9.16	364.31	-158.06	-106.25
Jowar	-217.54	253.18	64.36	972.25	-600.93	-271.32
Bajra	173.46	-50.85	-22.61	72.72	14.53	12.75
Other Cereals	399.21	-200.19	-99.02	75.42	16.89	7.69
Coarse Cereals	641.29	-389.71	-151.58	100.17	-0.24	0.07
Total Cereals	111.07	-7.28	-3.79	154.63	-41.16	-13.47
Tur	-14.92	116.52	-1.60	8.16	87.99	3.85
Gram	100.42	-2.07	1.65	36.92	36.89	26.19
Other Pulses	132.05	-25.64	-6.41	93.27	4.33	2.40
Total Pulses	104.92	-4.53	-0.39	55.29	30.16	14.55
Total Foodgrains	109.85	-6.63	-3.22	109.77	-7.63	-2.14

Note : YE = Yield Effect ; AE = Area Effect ; IE = Interaction Effect

Table 4: Cost of Production and Returns from Various Field Crops on the Average Sampled Farms of Onion Producers in Maharashtra

(Amount in Rupees /Hectare)

Crop	Average	Crop	Average	Crop	Average
Kharif Onion		**Bajra**		**Soyabean**	
1. Cost: A_1	13373	1. Cost: A_1	3396	1. Cost: A_1	8786
A_2	13765	A_2	3396	A_2	8786
B	22267	B	7022	B	12427
C	23833	C	7494	C	13084
2. Yields (qtls)	210.67	2. Yields (qtls)	15.41	2. Yields (qtls)	17.29
3. Gross Return		3. Gross Return		3. Gross Return	
- Main Produce	41439	- Main Produce	7558	- Main Produce	17290
- By Produce	-	- By Produce	2305	- By Produce	3211
Total	41439	Total	9863	Total	20501
4. Net Return		4. Net Return		4. Net Return	
- Over Cost A_1	28066	- Over Cost A_1	6467	- Over Cost A_1	11715
A_2	27674	A_2	6467	A_2	11715
B	19172	B	2841	B	8074
C	17606	C	2369	C	7417
Rabi Onion		**Wheat**		**Gram**	
1. Cost: A_1	15919	1. Cost: A_1	4898	1. Cost: A_1	2648
A_2	16309	A_2	4898	A_2	2648
B	24814	B	8524	B	6202
C	26678	C	9413	C	6563
2. Yields (qtls)	227.76	2. Yields (qtls)	18.38	2. Yields (qtls)	4.94
3. Gross Return		3. Gross Return		3. Gross Return	
- Main Produce	47510	- Main Produce	10344	- Main Produce	4940
- By Produce	-	- By Produce	2769	- By Produce	2164
Total	47510	Total	13113	Total	7104
4. Net Return		4. Net Return		4. Net Return	
- Over Cost A_1	31591	- Over Cost A_1	8215	- Over Cost A_1	4456
A_2	31201	A_2	8215	A_2	4456
B	22696	B	4589	B	902
C	20832	C	3700	C	541
Jowar		**Groundnut**		**Tomato**	
1. Cost: A_1	3685	1. Cost: A_1	10791	1. Cost: A_1	14002
A_2	3685	A_2	10791	A_2	14002
B	7356	B	14388	B	22707
C	8003	C	15492	C	23944
2. Yields (qtls)	18.87	2. Yields (qtls)	16.15	2. Yields (qtls)	233.42
3. Gross Return		3. Gross Return		3. Gross Return	
- Main Produce	8978	- Main Produce	21225	- Main Produce	46681
- By Produce	3164	- By Produce	5967	- By Produce	-
Total	12142	Total	27192	Total	46681
4. Net Return		4. Net Return		4. Net Return	
- Over Cost A_1	8457	- Over Cost A_1	16401	- Over Cost A_1	32679
A_2	8457	A_2	16401	A_2	32679
B	4785	B	12804	B	23974
C	4139	C	11700	C	22737

Appendix 1: Ranking of States in Terms of Area, Production and Yield of Pulses and Coarse Cereals : 1996-97

States	Pulses				Coarse Cereals			
	A	P	Y	YA/BNA	A	P	Y	YA/BNA
Andhra Pradesh	6	6	15	**	7	7	9	*
Assam	13	14	13	**	15	16	10	*
Bihar	9	5	5	*	9	8	5	*
Gujarat	10	9	10	**	6	6	13	**
Haryana	11	10	2	*	10	10	7	*
Himachal Pradesh	16	18	18	**	11	11	3	*
Jammu & Kashmir	17	17	11	**	12	12	4	*
Karnataka	5	7	17	**	3	2	11	*
Kerala	18	16	1	*	17	18	15	**
Madhya Pradesh	1	1	7	*	4	5	17	**
Maharashtra	3	4	14	**	1	1	14	**
Orisa	8	8	9	**	14	15	16	**
Punjab	14	13	3	*	13	13	2	*
Rajasthan	2	3	12	**	2	3	18	**
Tamil Nadu	7	11	16	**	8	9	6	*
Uttar Pradesh	4	2	4	*	5	4	8	*
West Bengal	12	12	8	*	16	14	1	*
Others	15	15	6	*	18	17	12	**

Source: Based on figures obtained from Districtwise Agricultural Statistical Information of Maharashtra, Part-II, 1996-97 & 1997-98, office of the Commissioner Agriculture, Pune.

Notes: i) A-Area; P-Production; Y-Yield; YA/BNA-Yield Above/Below National Average
ii) * - Yield Above National Average; **- Yield Below National Average
iii) Coarse Cereals = Total Cereals – Rice – Wheat

Appendix 2: Changes in Area, Production and Yield of Coarse Cereals and Pulses in Maharashtra

(Area in '00' Hectares; Production in '00' Tonnes; Yield in Kgs per Hectare)

Divisions	Triennium Ending (Average)			
	1982-83		1996-97	
	Coarse Cereals	Pulses	Coarse Cereals	Pulses
Area- Konkan	1302 (1.51)	453 (1.69)	972 (1.24)	446 (1.31)
Nasik	12166 (14.15)	4164 (15.53)	11605 (14.77)	4420 (12.97)
Pune	23558 (27.39)	2787 (10.40)	23102 (29.41)	2619 (7.68)
Kolhapur	7872 (9.15)	1803 (6.73)	7484 (9.53)	1760 (5.16)
Aurangabad	24993 (29.06)	9794 (36.54)	25079 (31.92)	11315 (33.20)
Amravati	10229 (11.89)	4772 (17.80)	7175 (9.13)	9957 (29.21)
Nagpur	5876 (6.83)	3034 (11.32)	3144 (4.00)	3569 (10.47)
State Total	85996	26806	78560	34085
Production- Konkan	1085 (1.90)	115 (1.22)	861 (1.19)	248 (1.38)
Nasik	9004 (15.84)	1676 (17.78)	12748 (17.68)	2709 (15.12)
Pune	9193 (16.17)	820 (8.70)	12291 (17.04)	1316 (7.35)
Kolhapur	5668 (9.97)	646 (6.85)	7135 (9.89)	924 (5.16)
Aurangabad	17103 (30.08)	3072 (32.60)	25024 (34.70)	4847 (27.06)
Amravati	10940 (19.24)	2057 (21.83)	11553 (16.02)	5955 (33.24)
Nagpur	3858 (6.79)	1038 (11.01)	2500 (3.47)	1914 (10.68)
State Total	56850	9424	72111	17913
Yield- Konkan	833	255	886	555
Nasik	740	402	1098	613
Pune	390	294	532	503
Kolhapur	720	358	953	525
Aurangabad	684	314	998	428
Amravati	1069	431	1610	598
Nagpur	657	342	795	536
State Average	661	352	918	526

Note: Figures in parentheses are percentages to the state total area and production