



Performance of Major Crops in Maharashtra State, India

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ABSTRACT

The present study discusses the growth performance of major agricultural crops in Maharashtra state, India. Important variables like area, production and yield were compiled for the period 1992-93 to 2011-12 from various published sources. There is a marked shift from the cultivation of food grains to commercial crops. Among food grains, the yield under coarse wheat declined 1.34 per cent between 1992-93 to 2011-12. Similarly, the performance of cotton, soybean, maize and gram in terms of area, production and yield was impressive during the study period. The use of modern varieties, irrigation and fertilizers were important factors that ensured higher growth in crop production. The results of crop growth indicate that the enhanced capital formation, better irrigation facilities, normal rainfall and improved fertilizer consumption helped to improve crop output in the state.

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Introduction

The Indian economy has undergone structural changes over time with the anticipated decline in the share of agriculture in the GDP. Despite a fall in its share from 55.1 per cent in 1950-51 to 14.1 per cent in 2011-12. The importance of agriculture has not diminished for two major reasons. First, the country achieved self-sufficiency in food production at the macro level, but still is a food deficit country facing massive challenges of high prevalence of malnourished children and high incidence of rural poverty. The pressure on agriculture to produce more and raise farmer's income is high. Second, the dependence of the rural workforce on agriculture for employment has not declined in proportion to the sectorial contribution to GDP. This has resulted in widening the income disparity between the agricultural and non-agricultural sectors. This had brought enhanced productivity growth in agriculture and hence, higher income (Gollin *et al.*, 2002).

Maharashtra, which occupies relatively better position in the country in terms of its contribution to the total production of different commodities at all-India level, regional differences in agricultural development has remained a subject of concern for policy-makers and administrators. The State is economically among the most developed states in the country. But it is not counted among the advanced states in India in terms of agricultural development. Though agricultural performance improved during the last five decades, its progress showed wide fluctuations. The important characteristics of State agriculture are instability in crop production and significant regional variations. The recent farmers' suicides in Vidarbha and Marathawada region have once again highlighted the regional disparity in Maharashtra. Social dimensions of growth pattern also remain a major concern. In recent years problems in the agricultural sector are further compounded by rapid climatic variability. Enhanced agricultural growth should be more inclusive, encompassing marginal and small farmers, social groups and regions/districts left out by the growth process and policies that have not been favourable to them. In Vidarbha the area under cereals show decreasing trend with compound growth

rate of 2.1% per annum, and the area under pulses and oilseeds were increased at the rate of 3.45%, 5.57 % respectively (Marawar *et al.* 2003)

The agriculture sector in Maharashtra was expected to show a negative growth of 9.1 per cent as per the economic survey for 2011-12. Though the state was about to achieve the five year plan target of 4 per cent growth in this sector, the year wise performance of this sector depicts a different scenario. The GSDP as per advance estimates was expected to grow at 8.5 per cent during 2011-12 as against 11.3 per cent during the previous year. The production of food grains in 2011-12 was expected to register a decrease of 23 per cent with the production of 118.09 lakh metric tonnes as against 154.19 lakh metric tonnes during the previous year. Production of oil seed and cotton (lint) are also expected to decrease by eight per cent and 15 per cent respectively. This has resulted in widening the income disparity between the agricultural and non-agricultural sectors (Chand and Chauhan, 1999). Under this backdrop, the paper attempts to analysis the performance of major crops in Maharashtra.

Methodology

The study is based on secondary data which are compiled from various published source. Data on area, production and yield were collected from the Directorate of Economics and Statistics (DES), Ministry of Agriculture. Data were collected for nine crops for the period 1992-93 to 2011-12. The study period divided into three phases. I.e. period I (1992-93 to 2001-02), period II (2002-03 to 2011-12) and overall period (1992-93 to 2011-12).

The performance of different crops was examined by estimating (a) Growth rates of area, production and yield (b) Degree of instability in area, production and yield area, production and yield.

Estimation of growth rates

The growth in area, production and yield were studied estimating compound growth rates at different period. The growth rate was estimated using exponential trend model.

$$Y = a b^t$$

Where, Y= Area / production / yield.

Table 1. Compound Growth Rates of Area, Production and Yield of major crop in Maharashtra

Major Crop	Period I (1992-93 to 2001-02)			Period II (2002-03 to 2011-12)			Overall Period (1992-93 to 2011-12)		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Wheat	2.33**	2.33	-0.001	4.80**	8.57***	3.60***	2.30***	3.68***	1.34***
Jowar	-1.95**	-4.92***	-3.03**	-3.14***	-1.39	1.817	-2.38**	-3.15**	-0.79
Cotton	2.76***	0.75	-1.96	4.53***	13.83***	8.80***	1.50***	6.68***	5.109***
Soybean	13.65***	15.84***	1.92	9.06***	9.05***	-0.012	11.85***	11.95***	0.088
Tur	0.13	2.53	2.39	1.65**	2.79	1.12	0.79***	2.31***	1.51**
Rice	-0.29	-0.37	-0.08	-0.035	1.95	1.98	0.015	0.34	0.33
Gram	2.33*	1.92	-0.41	5.75***	11.58***	5.51***	3.85***	6.02***	2.09***
Sugarcane	4.34***	5.16***	0.59	10.32***	14.04***	3.36***	4.29***	4.10***	-0.17
Maize	5.54***	3.96*	-1.49	11.64***	16.76***	4.59***	8.34***	12.24***	3.60***

Note: *, **, *** significant at 10, 5, 1 per cent level of significance.

Table 2. Coefficient of Variation(%) in area, production and yield of major crop in Maharashtra

Major Crop	Period I (1992-93 to 2001-02)			Period II (2002-03 to 2011-12)			Overall Period (1992-93 to 2011-12)		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Wheat	15.58	21.94	12.86	23.31	33.24	12.72	22.64	34.10	13.86
Jowar	7.65	20.89	15.60	10.84	12.20	9.86	14.81	24.77	13.78
Cotton	9.66	21.02	20.22	14.90	41.96	30.35	13.19	52.44	40.54
Soybean	36.64	44.32	14.70	25.42	33.59	23.70	59.13	62.72	19.18
Tur	2.63	22.70	23.03	7.97	18.04	13.44	7.19	22.21	18.89
Rice	1.76	8.36	8.77	1.69	14.72	13.77	1.72	11.82	11.31
Gram	17.17	26.68	14.84	21.94	38.04	18.54	27.69	47.01	19.88
Sugarcane	16.61	18.91	5.30	37.12	43.32	12.08	37.19	39.90	9.79
Maize	19.21	26.05	17.89	32.71	47.48	16.72	51.60	78.05	27.07

Table 3. Coppock instability index (%) of area, production and yield of major crop in Maharashtra

Major Crop	Period I (1992-93 to 2001-02)			Period II (2002-03 to 2011-12)			Overall Period (1992-93 to 2011-12)		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Wheat	11.88	12.64	8.04	12.35	14.72	10.37	12	15.93	9.72
Jowar	7.25	13.29	11.54	7.63	10.96	8.05	11.81	13.3	9.42
Cotton	4.96	12.7	11.8	4.71	29.49	26.56	6.47	28.62	21.23
Soybean	14.36	33.91	12.11	11.6	31.18	15.07	40.08	38.01	15.40
Tur	2.56	15.33	15.79	6.79	11.11	10.97	2.16	15.6	15.3
Rice	1.33	7.9	7.76	1.29	12.43	12.96	1.53	8.55	9.94
Gram	10.08	15.44	12.27	18.21	33.81	15.15	16.2	17.27	17.4
Sugarcane	11.15	12.13	3.51	14.76	17.94	10.39	15.43	17.41	8.32
Maize	12.48	18.04	11.78	8.74	20.46	16.3	41.92	52.41	18.75

a= Intercept

b= Regression coefficient

t= Time variable

From the estimated function the compound growth rate was worked out by

$$CGR(r) = [(Antilog (\log b - 1)] \times 100$$

CGR(r)= Compound growth rate

(a) The Degree of instability in area, production and yield of major crops at different period was measured using coefficient of variation and coefficient of instability.

Coefficient of Variation (CV) = $(\sigma / \bar{X}) \times 100$

Where,

σ = Standard deviation

\bar{X} =Arithmetic means

Coefficient of instability was worked out using Coppock Instability Index

$$V \log = \frac{\sum \left(\log \frac{X_{t+1}}{X_t} - m \right)}{N}$$

The instability index= Antilog $(\sqrt{V \log - 1}) \times 100$

Where,

X_t = Area / Production / yield of crop in year t

N= Number of years minus one

M= Arithmetic mean of the differences between the log of X_t and X_{t-1} , X_{t-2} etc.

V log = Logarithmic variance of the series.

Result and Discussion

It is well documented in the literature that growth in area was the major source of production growth until early 1960s (Bhalla and Singh, 2001 and Vaidyanathan, 1992). The performance of major crops was estimated and a pertained through studding the growth in Area, Production and Yield of the study area. The compound growth rates of Area, Production and Yield of major crop where worked out for Maharashtra state the results which were obtained are presented in Table 1.

It is interesting to observe a relative higher growth in area, production of all major crops during 1992-93 to 2001 to 02 i.e. period I. It indicates that a crop other than soybean, tur and sugarcane the yield growth was decline with negative growth. Cotton recorded a growth rate of 2.76 per cent with significant in area and 0.75 per cent in production. Similarly, soybean, sugarcane and maize in area by 13.65 per cent, 4.34 per cent and 5.54 per cent respectively and production by 15.84 per cent, 5.16 per cent and 3.96 per cent respectively with significant. Wheat and tur also recorded a high in growth in area and production.

However, the impressive growth in crop production observed during period I was sustained and increase during the period II i.e. 2002-03 to 2011-12. The growth of wheat was 4.8 per cent and 8.57 per cent in area and production respectively. Soybean area and production also showed splendid growth of 9.06 per cent and 9.05 per cent respectively. Whereas cotton marked high growth in area by 4.53 per cent, production by 13.83 per cent and yield 8.80 per cent. Maize has led growth in area and production by 11.64 per cent and 16.76 per cent respectively.

However, the long term growth rate (during 1992-93 to 2011-12) shows positive growth in respect to all major crops by area, production and yield. In these phase, soybean has end growth in area and production by 11.85 per cent and 11.95 per cent respectively, which was increased from the period II. In overall period, the growth rate of wheat, cotton, gram, sugarcane and maize by area, production and yield declined. The result was in conformity with results obtained by Marawar et al. (2003). Instability in area, production and yield:

The agriculture performance of state during the period was measured not only from the point of view of increase in area, production and yield rate of any crop. Here, in order to examine the extent of instability, coefficient of variation and Coppock instability index worked out. The result of Coefficient of Variation obtained were presented and discussed in the table 2 below.

As seen from the table 2 that the coefficient of variation in period I for soybean crop has led coefficient of variation in area and production by 36.64 per cent and 44.32 per cent respectively. Other than tur and rice all the crops has higher coefficient of variation.

The impressive per cent of coefficient of variation in crop production observed during the period II was sustained. In this phase except area of rice, production of soybean, tur and yield of wheat, Jowar, tur all the coefficient of variation are increased.

In the overall period the coefficient of variation of soybean in area and production by 59.13 per cent and 62.72 per cent and maize in area and production by 51.60 per cent and 78.05 per cent respectively which was higher as compare to the period I and period II. Wheat, cotton, tur, gram and sugarcane were also showed splendid coefficient of variation in this phase.

The Coefficient of Variation measures the absolute variation while coefficient of instability, which also called as 'instability index', increases the variation around the trend. It is close approximation of the average year to year percentage variation adjusted for trend. Thus the variation sound the trend is more performance from the index are presented in table 3.

It could be seen the table 3 that the instability index of wheat, soybean, gram, sugarcane, maize marked by 11.88 per cent, 14.36 per cent, 10.08 per cent, 11.15 per cent and 12.48 per

cent respectively in area. During the first period the instability for area and production was a bit low which means that there was stability in area and production.

Table present instability index of wheat, cotton, soybean, gram, sugarcane and maize was 14.72 per cent, 29.49 per cent, 31.18 per cent, 33.81 per cent, 17.94 per cent and 20.46 per cent respectively. The foregoing discussion revealed that the variability and instability in production was higher in second than the first period. This indicates that the farmers were getting higher yield recently than the previous year.

However, the long term instability index (during 1992-93 to 2011-12) shows higher percentage in respect to all major crops by area, production and yield. In this phase under area and production has led percentage by 41.92 per cent and 52.41 per cent respectively and under yield soybean by 21.23 per cent. The study thus indicates that instability in area and production was on a higher side during the study period.

Conclusions

The present study has discussed the growth performance of major crops at state of Maharashtra. The overall yield growth rate of wheat, cotton, tur, gram and maize was significant. In overall period the growth of area and production of all studied major crops are significant except rice. Soybean has led growth rate in area and production.

The coefficient of variation for soybean, sugarcane and maize for overall period was 59.13 per cent, 37.19 per cent and 51.60 per cent respectively. The state witness a high instability of production of cotton, soybean, gram, sugarcane, maize were higher and under yield the coefficient of variation for the major crops were higher from the period I and period II.

The instability index was found to be higher in period I and period II. Instability study in major crops exhibited less variation. It means that the production of major crops over the period has been almost constant.

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