

Original Research Article

Estimation of Growth Rates of Area, Production and Productivity of Major Crops Grown in Solapur District of Maharashtra

V. S. Talekar*, K. V. Deshmukh, R. R. Mali and D. T. Pathrikar

Department of Agriculture Economics, College Of Agriculture, VNMKV, Parbhani (M.S.), India

**Corresponding author*

ABSTRACT

Agriculture is the backbone of Indian economy, and is still the largest source of livelihood for the Indian people. Agriculture sector employs more than 50 percent of the total workforce in India and contributes around 17-18 per cent to the country's GDP. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Many efforts had been taken for improving the agriculture sector in the country to increase the production by adopting new improved technology for that initiate the Five Year Plans from 1950-51. It has given priority for agriculture sector and paid attention purposively in each plan towards agriculture development. The linear growth rate and compound growth rates were computed for land utilization pattern, area, production and productivity of major crops for 15 years from 2003- 04 to 2017- 18 in Solapur district. For the purpose of scientific assessment of the agricultural development, linear and compound growth rates of the major crops were separately estimated for land utilization pattern, area, production and productivity for 3 different periods viz., 2003-04 to 2009-10, 2010-11 to 2017-18 and 2003-04 to 2017-18. This attempt also made to identify major factors influencing agricultural production during the study period. The period wise linear and annual compound growth rates of land utilization pattern for the period 2003-04 to 2017-18.

Keywords

Agriculture,
Growth rate, Area,
Production,
Productivity,
Significant

Introduction

Agriculture is the backbone of Indian economy. It has been the livelihood of the Indian people since ancient times, and is still the largest source of livelihood for the Indian people. Agriculture sector which employs more than 50 percent of the total workforce in India and contributes around 17-18 per cent to the country's GDP. Irrigation is the key factor in agricultural development. The linear growth rate and compound growth rates were computed for land utilization pattern, area, production and productivity of major crops for 15 years from 2003- 04 to

2017- 18 in Solapur district. For the purpose of scientific assessment of the agricultural development, linear and compound growth rates of the major crops were separately estimated for land utilization pattern, area, production and productivity for 3 different periods viz., 2003-04 to 2009-10, 2010-11 to 2017-18 and 2003-04 to 2017-18. This attempt also made to identify major factors influencing agricultural production during the study period. The period wise linear and annual compound growth rates of land utilization pattern for the period 2003-04 to 2017-18 where computed below. The area

under forest, land under non agriculture use, cultivable waste, permanent pasture significant during the study period and the barren and cultivable area non significant during study period. The area under rice, jowar, bajara, tur, gram groundnut, sesamum, niger seed non significant during study period. Area under wheat, maize, other cereal, mug, udid, sunflower, soybean, safflower, linseed significant during the study period. The production of bajara, tur, mug, udid, other pulses, groundnut, sesamum, sunflower non-significant during the study period and the production of jowar, bajara, wheat, maize, total cereal, gram, linseed significant during study period. The productivity of rice, jowar, bajara, tur, mug, udid non-significant and the wheat, maize, total cereal, gram, groundnut, safflower, total food grain significant during the study period. Area under the surface irrigation, well irrigation, net irrigated area, ner area sown, per cent of NIA to NAS, gross irrigated area, gross cropped area, per cent of GIA to GCA significant during study period.

Materials and Methods

Since the major objective of the study is to estimate growth rates of area, production and productivity of major crops grown in Solapur District during last 15 years. A time series data are necessary to study the growth rate of selected parameters. Such data can be available only through secondary sources. The required secondary data will be obtained from the different records of state governments and co-operative institutions viz. Department of Agriculture, Government of Maharashtra, Socio-economic Review, Directorate of Economics and Statistics, Government of Maharashtra.

For studying the growth rate in area, production and productivity of major crops, linear growth rate will be estimated by using

following linear functions.

$$Y = a + bx + e$$

Where, Y = Dependent variable for which growth rate is estimated

a = Intercept/Constant

b = Regression/trend coefficient

x = period in years

e = error term with zero mean and constant variance.

Compound growth rate of area, production, productivity were worked out to know the percentage increase or decrease in selected parameters. The exponential growth function of this type was used purposively.

$$Y = a.b^x$$

Where, Y = Dependent variable for which growth rate is estimated

a = Intercept or constant

b = Regression/ trend coefficient

x = period in years

b = (1+r)

r = is compound growth rate

Solapur District will be purposively selected for present study because Solapur district has made progress in Agricultural development due to increase of irrigation facilities through major irrigation dam via. Ujani dam.

Study area

Geographically Solapur is located between 17.10 to 18.32 degrees north latitude and 74.42 to 76.15 degrees east longitude. The district is situated on the south east fringe of Maharashtra State and lies entirely in the Bhima and Seena basins. Whole of the district is drain either by Bhima river or its tributaries. The district is bounded on the north by Ahmednagar and Osmanabad districts, on the east by Osmanabad and

Gulbarga (Karnataka State) districts, on the south by Sangli and Bijapur (Karnataka State) and on the west by Satara and Pune districts. There is no important hill system in the district. Only in the north of Barshi Taluka several spurs of Balaghat range pass south for a few kilometers. There are also a few scattered hills in Karmala, Madha and Malshiras Talukas. The district in general has flat or undulating terrain. The low table land and small separate hills in Karmala and Madha Talukas act as a Watershed between Bhima and Seena rivers. The district covers geographical area of 14844.6 sq.kms. which is 4.82% of the total area of Maharashtra State. Out of the total area of the district 338.8 sq.kms (2.28%) is Urban area whereas remaining 14505.8 sq.kms. (97.72%) is Rural area. Area wise Karmala taluka is biggest covering an area of 1609.7 sq.kms and North Solapur is smallest covering an area of 736..3 sq.kms.

Results and Discussions

Growth rate of land utilization pattern

The linear growth rate and compound growth rates were computed for land utilization pattern, area, production and productivity of major crops for 15 years from 2003- 04 to 2017- 18 in Solapur district. For the purpose of scientific assessment of the agricultural development, linear and compound growth rates of the major crops were separately estimated for land utilization pattern, area, production and productivity for 3 different periods viz., 2003-04 to 2009-10, 2010-11 to 2017-18 and 2003-04 to 2017-18. This attempt also made to identify major factors influencing agricultural production during the study period. The period wise linear and annual compound growth rates of land utilization pattern for the period 2003-04 to 2017-18 presented in Table 1.

The area under the forest highly significant at 1 per cent in overall period. Land under the non agriculture use also highly significant at 5 per cent and 1 per cent for period I and overall. A cultivable waste land negatively significant at 5 per cent for period II and positively significant at 1 per cent for period overall. The land under permanent pasture highly significant at 1 per cent for period I and overall and negatively significant at 5 per cent for II period. Land under miscellaneous tree significant at 5 per cent for II period and 1 per cent significant for overall period.

A current fallow land negatively significant at 1 per cent in I period and overall period. Land under the other fallow negatively significant at 1 per cent in period I and overall. Area sowed more than once highly significant at 1 per cent during study period. And the gross cropped area positive highly significant at 1 per cent during II and overall period.

Growth rate of area under different crops

The linear growth rate and compound growth rates were computed for area, production and productivity of major crops for 15 years from 2003- 04 to 2017- 18 in Solapur district. For the purpose of scientific assessment of the agricultural development, linear and compound growth rates of the major crops were separately estimated for area, production and productivity for 3 different periods viz., 2003-04 to 2009-10, 2010-11 to 2017-18 and 2003-04 to 2017-18. This attempt also made to identify major factors influencing agricultural production during the study period. The period wise linear and annual compound growth rates of area under different crops for the period 2003-04 to 2017-18 presented in Table 2.

The growth rate for area under the wheat highly significant at 1 per cent for period I

and for maize also significant at 1 per cent and 5 per cent for period I and overall. Area under the other cereal negatively significant for period I. The area under the mug crop positively significant at 5 per cent during II period and udid also positively significant for II period at 1 per cent.

The growth rate for area under sunflower negatively significant at 5 per cent for overall period and the soybean also highly significant at 1 per cent during period I, II and overall. Growth rate for safflower are negatively significant at 1 per cent during study period. Area under the linseed negatively significant at 5 per cent and 1 per cent for period II and overall.

Growth rate of production of different crops

The linear growth rate and compound growth rates were computed for production of major crops for 15 years from 2003- 04 to 2017- 18 in Solapur district. For the purpose of scientific assessment of the agricultural development, linear and compound growth rates of the major crops were separately estimated for production of major crops for 3 different periods viz., 2003-04 to 2009-10, 2010-11 to 2017-18 and 2003-04 to 2017-18. The trend in production of different crops were studied and depicted in table 3.

The total rice production significant at 1 per cent during II period and the production of jowar significant at 1 per cent during I period. Wheat production recorded the positive significant growth rate during period I and overall and the growth rate was 117.57 and 42.54 which was significant at 1 per cent and 5 per cent. Total cereal recorded the positive significant growth rate at 5 per cent for period I and the growth rate 711.46 per cent. Gram production recorded the positive significant growth rate at 1 per cent during

period I and the growth rate 4.25 and 27.02 per cent.

Niger seed recorded the negative significant growth rate at 1 per cent during period II and overall and the growth rate -0.09, -27.72 and -11.80 per cent. Soybean production recorded the positive significant at 5 per cent and 1 per cent during overall period and the growth rate 13.54 and 20.48 per cent. Safflower production recorded the negative significant at 5 per cent during overall period and the growth rate -3.46 and -14.15 per cent. Production of linseed crop recorded the highly negatively significant at 1 per cent during overall period and the growth rate -0.08 and -12.68 per cent.

Growth rate of productivity of different crops

The linear growth rate and compound growth rates were computed for productivity of major crops for 15 years from 2003- 04 to 2017- 18 in Solapur district. For the purpose of scientific assessment of the agricultural development, linear and compound growth rates of the major crops were separately estimated for productivity of major crops for 3 different periods viz., 2003-04 to 2009-10, 2010-11 to 2017-18 and 2003-04 to 2017-18. The trend in productivity of different crops were studied and depicted in table 4.

The productivity of wheat recorded the positive significant at 5 per cent during period I and the growth rate 119.18 per cent. Maize recorded the positive significant growth rate at 5 per cent and 1 per cent during period I. Total cereal productivity recorded the positive significant growth rate at 5 per cent during I period and the growth rate 296.43 per cent. Gram recorded the positive significant growth rate at 5 per cent during I period.

Table.1 Growth rate of land utilization pattern in Solapur District

Sr. No.	Particular	LGR			CGR		
		I	II	Overall	I	II	Overall
1	Forest	0.64	0.00	3.28**	0.20	0.00	0.98**
2	Barren & uncultivable area	1.07	5.38	2.06	0.17	0.77	0.30
3	Land under non-agriculture use	1.89**	2.61	1.77*	1.23**	1.55	1.06*
4	Cultivable waste	0.96	-3.96*	4.29**	1.17	-0.98*	1.14**
5	Permanent pasture	1.61**	-2.11**	7.77**	0.42**	-0.45*	1.87**
6	Land under miscellaneous tree	-0.25	1.45*	1.69**	-0.50	2.21*	2.93**
7	Current fallow	-34.00**	-33.08	-57.34**	-1.83**	-2.62	-3.63**
8	Other fallow	-75.46**	2.33	-61.00**	-4.34**	0.19	-4.04**
9	Net sown area	316.11	27.42	36.73	3.22*	0.27	0.40
10	Area sown more than once	102.50**	115.36**	111.07**	18.03**	7.78**	11.66**
11	Gross cropped area	242.00	142.77**	172.80**	2.39	1.21**	1.60**
12	Cropping intensity	0.51**	1.05**	0.76**	0.46**	0.92**	0.67**

Note- ** Significant at 1 per cent, * Significant at 5 per cent

Table.2 Growth rate of area under different crops

Sr. No.	Particular	LGR			CGR		
		I	II	Overall	I	II	Overall
1	Rice	-0.36	-0.45	0.08	-16.77	-10.61	2.04
2	Jowar	15.11	172.24	-50.97	0.26	3.09	-0.82
3	Bajara	-10.00	21.56	0.26	-12.68	13.33	-0.09
4	Wheat	67.82**	6.43	-4.31	13.58*	3.57	-0.73
5	Maize	25.79*	34.68	30.43**	10.86	6.65	8.13**
6	Other cereals	-6.50	-3.10	-1.26	-27.17*	-13.73	-5.77
7	Total cereals	91.82	231.52	-25.76	1.30	3.47	-0.38
8	Tur	12.68	-5.27	7.12	7.25	-1.00	4.55
9	Mug	-2.61	13.75*	3.71	-18.36	31.49*	6.86
10	Udid	2.32	19.70*	5.95	-0.04	20.89	7.44
11	Gram	19.89	36.23	10.95	5.57	9.01	2.25
12	Other pulses	-8.43	2.08	-1.61	-20.56	2.40	-0.42
13	Total pulses	23.86	66.75	26.21	4.17	8.23	3.22
14	Groundnut	6.82	-6.08	-3.89	16.05	-7.98	-3.97
15	Sesamum	-0.25	-0.14	-0.01	-10.35	-6.59	0.10
16	Niger seed	-0.18	0.00	-0.03	-4.83	0.00	-2.45
17	Sunflower	-9.00	2.14	-9.51*	-2.64	1.33	-3.61*
18	Soybean	3.68**	40.99**	17.22**	25.25*	35.97**	26.08**
19	Safflower	-12.11**	-4.50	-10.22**	-10.73**	-12.53	-17.88**
20	Linseed	0.04	-0.37*	-0.27**	1.03	-21.89*	-13.42**
21	Total oil seed	-13.00	29.42	-8.08	-1.90	6.85	-1.80
22	Total Food Grain	115.68	298.31	0.47	1.53	3.98	-0.05

Note- ** Significant at 1 per cent, * Significant at 5 per cent

Table.3 Growth rate of production of different crops

Sr. No.	Particular	LGR			CGR		
		I	II	Overall	I	II	Overall
1	Rice	-0.04	-0.24**	-0.05	4.00	-16.75**	-3.71
2	Jowar	468.89*	88.25	22.42	35.32	2.97	3.51
3	Bajara	-7.68	4.50	-1.90	-14.95	16.70	-4.12
4	Wheat	133.71**	-4.04	-4.90	3.68*	2.91	0.46
5	Maize	117.57**	46.32	70.41**	42.54*	4.39	14.12**
6	Other cereals	-1.07	-1.31	-0.31	-17.24	-22.38	-7.41
7	Total cereals	711.46*	134.11	85.76	33.50	3.30	4.46
8	Tur	6.50	6.50	5.69	24.22	3.19	9.60
9	Mug	-1.96	2.99	0.51	-22.43	12.91	1.77
10	Udid	0.46	1.98	0.42	-9.42	2.80	2.56
11	Gram	4.25*	22.13	7.78	27.02*	8.28	4.07
12	Other pulses	-0.96	-0.75	-0.46	1.21	-3.00	1.38
13	Total pulses	44.46	33.10	14.03	21.52	7.15	4.56
14	Groundnut	14.93	-7.86	-3.46	35.52	-9.26	-1.55
15	Sesamum	-0.11	-0.01	-0.01	0.00	-4.21	-2.17
16	Niger seed	-0.11	0.02	-0.09**	0.00	-29.72**	-11.80**
17	Sunflower	3.96	0.63	-5.65	12.81	0.83	-3.73
18	Soybean	3.07	22.87	13.54*	21.37	9.92	20.48**
19	Safflower	2.32	-2.69	-3.46*	13.98	-11.84	-14.15*
20	Linseed	0.00	-0.09	-0.08**	0.00	-16.09	-12.68**
21	Total oil seed	22.71	11.71	1.56	18.36	0.80	1.55
22	Total Food Grain	755.86	167.06	99.74	32.37	3.66	4.44

Note- ** Significant at 1 per cent, * Significant at 5 per cent

Table.4 Growth rate of productivity of different crops

Sr. No.	Particular	LGR			CGR		
		I	II	Overall	I	II	Overall
1	Rice	46.14	-23.24	-26.23	1.81	-11.35	-7.46
2	Jowar	112.64	-1.96	-16.28	20.66	-1.16	-0.35
3	Bajara	-13.14	-45.45	20.45	-2.76	0.88	-1.77
4	Wheat	119.18*	-7.27	6.79	14.88	-0.64	1.23
5	Maize	296.43**	12.85	59.06	28.56*	0.39	5.52
6	Other cereals	61.00	-66.93	-3.77	10.93	-8.58	-0.45
7	Total cereals	91.61*	1.10	13.71	31.78	-0.17	4.85
8	Tur	32.50	25.91	15.91	20.31	4.20	5.71
9	Mug	-8.11	-60.92	-19.68	-2.97	-14.32	-5.01
10	Udid	-48.04	-63.29	-18.60	-9.36	-15.10	-4.55
11	Gram	81.86*	-0.36	5.08	20.41	-0.63	1.80
12	Other pulses	63.96**	-32.27	3.93	13.23	-4.64	1.48
13	Total pulses	56.86*	-1.11	4.04	15.84	-1.00	1.32
14	Groundnut	157.68*	-18.96	14.19	10.46	-1.08	1.17
15	Sesamum	-38.82	20.95	-15.00	-12.55	6.85	-1.53
16	Niger seed	-91.96	5.21	-18.28	-18.81	3.11	-3.31
17	Sunflower	45.07	-3.49	3.96	16.44	-0.83	2.27
18	Soybean	-97.79	-203.50	-37.43	-6.58	-19.07	-5.49
19	Safflower	73.93*	0.75	13.24	27.62*	0.19	4.55
20	Linseed	3.11	17.29	6.03	1.42	3.98	0.07
21	Total oil seed	75.54*	-30.88	16.10	20.62	-5.66	3.41**
22	Total Food Grain	89.36*	0.57	12.66	30.47	-0.31	4.51

Note- ** Significant at 1 per cent, * Significant at 5 per cent

Table.5 Growth rate of area irrigated by different sources

Sr. No.	Particulars	LGR			CGR		
		I	II	Overall	I	II	Overall
1	Surface irrigation & other than well	-51.25**	20.58	-1.92	-6.36**	2.66	-0.18
2	Well Irrigation	23.79	-42.12*	4.28	1.09	-2.39*	0.28
3	Net Irrigated Area	17.54**	-22.13**	-2.35	0.69**	-0.87**	-0.10
4	Net Area Sown	275.61**	27.42	65.08*	0.01**	0.27	0.67**
5	% of NIA to NAS	-0.54**	-0.27*	-0.19**	-2.09**	-1.11*	-0.75**
6	Gross Irrigated Area	-22.46	41.43**	-13.94	-0.84	1.53**	-0.50
7	Gross Cropped Area	242.00	-35.80	183.51**	2.39	-0.18	1.69**
8	% of GIA to GCA	-0.89*	0.07	-0.54**	-3.16*	0.31	-2.07**

Note- ** Significant at 1 per cent, * Significant at 5 per cent

Productivity of other pulses recorded the positive significant growth rate at 1 per cent during I period and the growth rate 63.96 per cent. Productivity of total pulses recorded the positive significant growth rate at 5 per cent during I period. Ground crop recorded the positive significant growth rate at 5 per cent during I period and the growth rate 157.68 per cent. Safflower recorded the significant growth rate at 5 per cent during I period. Total food production recorded the positive significant growth rate during I period and the growth rate 89.36 per cent.

Growth rate of area irrigated by different sources

Growth rate of area irrigated by different sources was recorded in table 5. The growth rate of surface irrigation and other than well was negatively significant at 1 per cent during I period and the growth rate was -51.25 and -6.36 per cent. Well irrigation recorded also negative significant growth rate at 5 per cent during II period. Net irrigated area recorded highly positive significant growth rate at 1 per cent during I period and during II period it was recorded the negative significant growth rate at 1 per cent.

Net area sown recorded the positive significant growth rate at 1 per cent during I and overall period and the growth rate 275.61 and 65.08 per cent. The growth rate of per cent NIA to NAS recorded negatively significant at 5 per cent and 1 per cent during I, II and overall period. Gross irrigated area recorded the positive significant growth rate at 1 per cent during II period. Gross cropped area shows the positive significant growth rate at 1 per cent during overall period and the growth rate 183.51 per cent. Per cent of GIA to GCA recorded the negatively significant growth rate at 1 per cent during overall period.

To conclude, growth is a necessary condition for the success of agriculture sector in any region/districts. The area under gross irrigation increases significantly by 1.77 per cent during the study period. The area under the jowar, bajara maize increases significantly. The cereal has predominance in cropping pattern in Solapur district. Area under the pulses red gram, green gram, black gram and gram had significantly increases. There were drastic changes observe in area and production and productivity of major crops in the district during study period.

References

- Bathla, S. (2012). Regional dimensions of inter crop diversification in India: implications for production and productivity growth. *Agricultural Situation in India*, 64 (12):601-620.
- David, R., Sarkar, J.D., Shrivastav, K.K and Suryavanshi, D.K. (2008). "Socio-economic characteristics of the trained farm women." *Journal of Soils and Crops*, 18 (1):255-256.
- Gill, A.S. and Singla, S. K. (2009). "Agricultural sector of Punjab: Trends in income, productivity and cropping pattern." *Agricultural Situation in India*, 66 (1): 25-30.
- Kumaravardan. R.J., Lenin and Pramod Kumar (2009). Growth, instability and acreage response of principal crops in Tamil Nadu. *Agricultural Situation In India*, 65 (11): 271-728.
- Madhusudhana, B. (2013). "A survey on area, production and productivity of groundnut crop in India." *IOSR Journal of Economics and Finance*, 1 (3): 01-07.
- Muthu, N. (2015). "The production and growth of major crops in Indian agriculture during 11th Five Year Plan

- period.” *International Journal of Applied Research*, 1 (8): 458-460.
- Pangayar Selvi, R., S. Murali Gopal and B. Swaminathan (2014). “Structural changes in the growth dimensions of Maize during Post – Liberalization period of Indian Agriculture.” *Trends in Biosciences*, 7 (20): 3247-3254.
- Saravanadurai, A and M. Kalaivani (2010). “Growth actions of selected cereal crops in Tamil Nadu State.” *Indian Journal of Applied Biology and Pharmaceutical Technology*, 1 (3): 778-785.