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Dynamics of Land Use and Cropping Pattern and Growth Trends in Area, Production and Productivity of Major Crops in Satara District of Maharashtra

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Abstract: *Agriculture plays an essential role in the process of economic development of less developed countries like India. Besides providing food to nation, agriculture generates employment also contributes to market of industrial goods and earns foreign exchange. Agricultural production is influenced by physical, socio-economic, technological and organizational factors. An endeavour is made to study the major crops and their growth trends in Satara district for different years. The region having 10,582 sq.km area comprises 11 tahsils of Satara district. This study is based on secondary data collected from socio–economic review and district statistical abstract of Satara district. This present study is the answer to many questions relating to land use, cropping pattern and growth trends in area production and productivity of major crops of the district as we emphasis on land use pattern, cropping pattern and growth trends in area production and productivity of major crops in this study. The study will let us know the existing pattern of land use and cropping pattern in the district. With the help of this study we can know those various changes or factors which will help in improving land use pattern, cropping pattern and growth trends in area production and productivity of major crops of the Satara district. Such type of study represents real situation of land use pattern, cropping pattern and growth trends in area production and productivity of major crops in Satara district and helps to planners and agricultural scientist for agricultural planning at tahsil level.*

Keywords: *Land use pattern, cropping pattern, growth trends.*

INTRODUCTION

The development of agriculture is a process through which the shift takes place from the stage of traditional agriculture to the stage of modernized agriculture resulting in increased productivity and production per unit of resource due to use of modern technology.

During the process of transformation, the position of original equilibrium changes and production function shifts to a higher level and occupies a new equilibrium position, where the profits are maximum. Land is an important input in agricultural sector but the yield of agricultural crops mainly depend upon fertility of land for raising different crops, cropping pattern is the central element of agricultural land use. Cropping means the proportion of area under various crops at a point of time. Satara district is situated in the central Maharashtra and lies between 17°50′ and 18°11′ North latitude and 73°33′ and 74°54′ East longitude. The district has slight circular shape and it is located in the Nira and Krishna basin. The length of region east to west is about 144 km and North to South is about 120 km. The soils of the tract under study are deep black, medium and light soils. In general, soils of the study area are found to be the productive and responsive. There are several rivers like Krishna, Koyana, Venna, Vasana, Kudali, Tarali, Urmodi, Yerala, Nira, Manganga and many other smaller tributaries drain the district. The climate of Satara district is very favorable for agriculture. The district neither experiences abrupt changes of temperature nor extremes of heat and cold. The area of Satara district is 10,582 sq. km. It is 3.40 per cent of the area of the Maharashtra state. Among 35district of the state it ranks 15th in the terms of area.

According to 2011 census population of the district is 30.04 lakh out of with 15.11 lakh are male and 14.93 lakh are female. The density of population is 287 persons per sq.km. Out of total population 80.99 per cent is rural as against 19.01 per cent of urban.

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Agriculture is one of the important occupations of the study region. The economy of study region is depending on agricultures.Considering the above facts it was necessary to study the "Dynamics of Land use and cropping pattern and growth trends in area, production and productivity of major crops in Satara district of Maharashtra" with the following specific objectives,

(i) To study the changes in land use and cropping pattern,

(ii) To study the growth rates in area, production and productivity of major crops

DATABASE AND METHODOLOGY

The study is based on the secondary time series data obtained from various sources *viz*., published statistical literature and by contacting officials of *ZillaParishad*, District Statistical Office, Directorate of Economics and Statistics, Pune central building, Gokhale Institute of Politics and Economics, Pune.

The data on the land use, cropping pattern for the selected thirty three years, area, production and productivity of selected crops covering the period from 1980-81 to 2012-13 in respect of Satara district were obtained by referring the Socio-Economic Review published by Directorate of Economics and Statistics, Maharashtra state and the data were analysed by simple tabular method.

The data obtained on area, production and productivity of major crops *viz*., Paddy, *kharif*jowar, *rabi*jowar, wheat, gram, tur, groundnut, cotton, bajra, mug, udid, sugarcane for the period from 1980-81 to 2012-13 in respect of Satara district were used for estimation of compound growth rates. The data was analysed to have compound growth rates in area, production and productivity of the above said crops for three different period's*viz*., Period I 1980-81 to 1994-95, Period II 1995-96 to 2012-13 and for overall period1980-81 to 2012-13. This became useful for studying the changes in the performance of the selected crops during the aboveperiods in Satara district.

COMPOUND GROWTH RATE

The compound growth rates were worked out by fittingexponential function of the following type to the data for threeperiods explained above

$$Y = ab^t$$

Where,

Y = Area in hectares, production in quintals and yield inquintals per hectare

a = Intercept

b = Regression coefficient

t = Time period in year

Finally the annual rate of compound growth in area, production and productivity of the crops was worked out by using the formula.

$$r = (\text{Antilog } b - 1) \times 100$$

The significance of the estimated compound growth rates were tested with the help of students't' test.

RESULT AND DISCUSSION

Changes in Land Use Pattern

The period-wise land use pattern of Satara district is presented in Table 1.

The area under Permanent pastures and land under miscellaneous trees showed, decreasing trend continuously over the period of time.The proportion of permanent pastures to the total geographical area from 1980-81 to 2012-13 is decreasing continuously.

The net sown area was 5,80,000 hectares *i.e*. 54.81 per cent in 1980-81 which has declined to 5,46,600 hectares *i.e.* 51.65 per cent in 1995-96 and latter on decreased to 5,39,900 hectares *i.e.* 51.02 per cent in 2012-13. This means that there was decreasing trend observed in the net sown area. On detailed examination of the net sown area, the unirrigated area showed significant decline from 45.18 to 34.14 per cent of the total, while irrigated area was increased from 1,01,900 hectares *i.e.*, 9.62 per cent to1,78,600 hectares *i.e.* 16.87 per cent during the period under study. This shows that the dry area declined by 24.43 per cent while the irrigated area increased by 75.26 per cent during the period under study.

The gross cropped area was declined by 28,800 hectares *i.e.* 4.36 per cent during the period under study. The intensity of cropping which is a measure of land use efficiency did show increase during period from 1980-81 to 2012-13 increased from 113.75 per cent to 116.87 per cent. The area under forest did not show any change while the land under cultivable waste and fallows showed decreasing trend during the period under study. The net sown area declined by 6.91 per cent while the dry area showed significant decline of 24.43 per cent during the whole period of study. It is significant to note that the area under irrigation increased by 75.26 per cent. The intensity of cropping has increased from 2.56 to 2.74 per cent during the period under study.

Changes in the Cropping Pattern

It can be seen from the Table 2, that the area under Rice and Wheat has increased (5.17 to 6.74 and 3.65 to 3.83 per cent) to the gross cropped area. The area underbajra, *kharif* and *rabi* Jowar has decreased but there was increase in area during 1995-96 over base year. Area under total cereals declined continuously during the year 1995-96 and 2012-13 over the base year.

Area under black gram declined but total pulses decreased from 66,100 hectares to 27,700 hectares *i.e.* 10.01 per cent to 4.38 per cent during 1980-81 to 2012-13. Area under total foodgrains decreased from 4,82,300 hectares to 2,93,700 hectares during 1980-81 to 2012-13.

Area under sugarcaneshowed tremendous increase in area. It was 17,600 hectares in 1980-81 and increased upto 51,400 hectares in 2012-13. Area under Fruits and vegetables increased from 7,700 hectares to 42,200 hectares due to Maharashtra Government's Orchard planning programme which is linked with Horticulture Development Programme. Area under cotton showed, decreasing trend. Among oil seeds groundnut and sunflower showed decreasing trend while in case of soyabean there is tremendous increase in area after its introduction in 1988-89 in the district. Total oilseeds increased from 68,200 hectares to 72,200 hectares during 1980-81 to 2012-13. It can be seen from the table that the area under commercial crops is increasing *viz*., Sugarcane except cotton.

Annual compound growth rates in area, production and productivity of cereals and pulses The periodwise annual compound growth rates in area, production and productivity of cereal crops for the period 1980-81 to 2012-13 are presented in Table 3.

The compound growth rates of area, production and productivity of all cereals and pulses fluctuated widely during the period under consideration. The production and productivity of cereals like wheat andmaize are positive and highly significant for the entire period of 33 years. The production of total cereals increased slightly *i.e.* 0.08 per cent per annum during the study period. The productivity of total cereals increased slightly *i.e.* 0.95 per cent per annum during the study period. It clearly showed for Satara district the production of total cereals during the span of 33 years had increased non-significantly.

Table 1
Land use pattern of Satara district (1980–81 to 2012–13)

Sr. No.	*Particulars*	*1980-81 (Base Year)*	*1995–96*	*2012–13*	*Per cent change over base year*	
					1995–96	*2012–13*
1.	Geographical area	10582.00	10582.00	10582.00	00	00
2.	Forest	1486.00(14.04)	1376.00(13.00)	1427.00(13.49)	–7.40	–3.97
3.	Barren and uncultivable land	1153.00(10.90)	931.00(8.80)	1232.00(11.64)	–19.25	6.85
4.	Land under non–agril. use	285.00(2.69)	277.00(2.62)	319.00(3.01)	–2.80	11.93
5.	Cultivable waste	414.00(3.91)	424.00(4.01)	401.00(3.79)	2.41	–3.14
6.	Permanent Pastures	831.00(7.85)	740.00(6.99)	792.00(7.48)	–10.95	–4.69
7.	Land under Miscellaneous tree	46.00(0.44)	66.00(0.62)	77.00(0.73)	43.47	67.39
8.	Current fallow	104.00(0.98)	869.00(8.21)	351.00(3.32)	735.57	237.5
9.	Other fallow	463.00(4.38)	433.00(4.09)	584.00(5.52)	–6.47	26.13
10.	Net sown area	5800.00(54.81)	5466.00(51.66)	5399.00(51.02)	–5.75	–6.91
	(a) Irrigated area	1019.00(9.63)	1722.00(16.28)	1786.00(16.88)	68.98	75.26
	(b) Unirrigated area	4781.00(45.18)	3744.00(35.38)	3613.00(34.14)	–21.69	–24.43
11.	Area sown more than once	798.00(7.54)	911.00(8.60)	911.00 (8.60)	14.16	14.16
12.	Total cropped area	6598.00 (62.35)	6377.00(60.26)	6310.00 (59.63)	–3.34	–4.36
13.	Cropping intensity (%)	113.75	116.67	116.87	2.56	2.74
14.	Sunflower	–	20.00(0.31)	1.00(0.02)	–	–95
15.	Soybean	–	89.00(1.40)	395.00(6.25)	–	343.82
16.	Other Oilseeds	14.00(0.21)	5.00(0.08)	51.00(0.81)	–64.29	264.29
	Total oilseeds	682.00(10.34)	640.00(10.04)	722.00(11.44)	–6.15	5.86
17.	Sugarcane	176.00(2.67)	511.00(8.01)	514.00(8.15)	190.34	192.04
18.	Cotton	71.00(1.07)	38.00(0.60)	1.00(0.02)	–46.47	–98.59
19.	Fruits and vegetables	77.00(1.16)	203.00(3.18)	422.00(6.69)	163.63	448.05
20.	Other crops	769.00(11.66)	370.00(5.80)	1714.00(27.16)	–51.88	122.89
	Gross cropped area	6598.00(100.00)	6377.00(100.00)	6310.00(100.00)	–3.49	5.44

(Figure in parentheses indicate the percentage to geographical area)

Table 2
Cropping pattern of Satara district (1980–81 to 2012–13)

Sr. No.	*Particulars*	*1980-81 (Base Year)*	*1995–96*	*2012–13*	*Per cent change over base year*	
					1995–96	*2012–13*
1.	Rice	341.00(5.17)	365.00(5.72)	425.00(6.74)	7.04	24.63
2.	Wheat	241.00(3.65)	309.00(4.85)	242.00(3.84)	28.25	0.41
3.	*Kharif*–jowar	996.00(15.10)	638.00(10.01)	321.00(5.09)	–35.94	–67.77
4.	*Rabi*–jowar	1571.00(23.81)	1463.00(22.94)	1242.00(19.68)	–8.59	–20.94
5.	Bajra	848.00(12.85)	890.00(13.96)	152.00(2.41)	4.95	–82.07
6.	Maize	20.00(0.30)	94.00(1.47)	185.00(2.93)	370	825
7.	Other cereals	145.00(2.20)	48.00(0.75)	93.00(1.47)	–66.89	–35.86
	Total cereals	4162.00(63.08)	3807.00(59.70)	2660.00(42.16)	–8.52	–36.08
8.	Gram	118.00(1.79)	198.00(3.11)	158.00(2.50)	67.79	33.89
9.	Red gram	62.00(0.94)	75.00(1.18)	11.00(0.17)	20.96	–82.25
10.	Green gram	28.00(0.42)	38.00(0.60)	15.00(0.24)	35.71	–46.42
11.	Black gram	73.00(1.11)	31.00(0.48)	11.00(0.17)	–57.53	–84.93
12.	Other pulses	380.00(5.76)	466.00(7.30)	82.00(1.30)	22.63	–78.42
	Total Pulses	661.00(10.02)	808.00(12.67)	277.00(4.38)	22.23	–58.09
	Total foodgrains	4823.00(73.10)	4615.00(72.37)	2937.00(46.54)	–4.31	–39.10
13.	Groundnut	614.00(9.31)	471.00(7.39)	272.00(4.31)	–23.29	–52.72
14.	Safflower	54.00(0.82)	55.00(0.86)	3.00(0.05)	1.85	–94.44

(Figure in parentheses indicate the percentage to geographical area)

Among different cereals, the annual compound growth rates in production and productivity of wheat and maize for period II and III was positive and highly significant.In case of rice annual compound growth rate of area for 33 years under study was positive and significant, of production was positive and significant and productivity was non-significant. In general, the annual growth rates of area production and productivity of all cereals was fluctuating during entire period under study.

The per annum growth rates in production and productivity of total pulses in district have turned out to be positive and significant for production and for productivity it is highly significant during the entire period under study. The production and productivity of total pulses in district had increased at the rate of 0.80 and 0.98 per cent. The growth rate for area of total pulses is negative and non-significant.

Annual compound growth rates in area, production and productivity of total foodgrains, oilseeds and commercial crops

Table 4 depicted that,the area, production and productivity of total oilseeds, total foodgrains, cotton and sugarcane had fluctuated widely during the period under study in Satara district. The growth rates in area, production and productivity of total oilseeds for entire period have turn out to be positive.Thegrowth rates are highly significant for area and productivity at the rate of 1.12 and 1, respectively. Production for total oilseeds is significant at the rate of 1.74.Among different oilseeds growth rates of groundnut for area wasnegative and highly significant i.e.1.06. The growth rate for production was negative and non-significant while forproductivity was positive and non-significant.

Among different commercial crops cotton is showing declining trend for area, production and productivity.Sugarcane though it has positive and highly significant growth rates it is showing non-significant growth rate for productivity.This may be attributed to different causes of increased in insect and pest problems. Sugarcane positive and highly significant growth rate for area and production which was 3.73 and 4.02, respectively and for productivity it was positive and non significant *i.e.* 0.04 per cent.

From the above analysis, it can be concluded that there exist wide variability in the performance of individual crops in terms of changes in their performance, total production, productivity in the district over the period under study.Thus it signifies that the progress of agricultural development in Satara district is mainly based upon increase in productionwhich has its positive effect.

CONCLUSIONS

1. The area under forest declined by, 3.97 per cent during the period under study in Satara district.

Table 3
Annual compound growth rates in area, production and productivity of major crops in Satara district

Sr. No.	Crop	Period I 1980-81 to 1994–95			Period II 1995-96 to 2012-13			Overall Period 1980-81 to 2012-13		
		A	*P*	*Y*	*A*	*P*	*Y*	*A*	*P*	*Y*
1.	Rice	1.17***	1.48	0.17	1.36***	0.75	–0.67	1.13***	0.94**	–0.25
2.	Wheat	2.29**	0.80	5.80**	0.79	1.32	0.52	1.85***	2.74***	2.41***
3.	*Kharif*–Jowar	–1.29**	–0.01	1.29	–3.83***	–4.81***	–1.01	–2.90***	–2.5***	0.33
4.	*Rabi*–Jowar	0.02	1.05	1.04	–0.61	–0.62	0.03	–0.59**	–0.36	0.24
5.	Bajra	0.96	7.27***	6.26***	–7.68**	–8.57**	–0.96	–3.79***	–1.29	2.60***
6.	Maize	7.53***	9.97***	2.27**	4.39***	7.06***	2.56***	9.60***	11.94***	2.12***
	Total cereals	0.33	1.74**	1.40**	–1.5**	–0.49	1.01	–0.87***	0.08	0.95***
7.	Gram	1.78	3.95**	2.13	1.16	3.15**	1.96	2.82***	4.54***	1.68***
8.	Red gram	3.05**	–0.67	–5.13	–7.74***	–7.53***	–0.08	–2.76***	–4.55***	–2.24***
9.	Green gram	10.23***	10.38***	1.99	–1.66	0.30	2.03	1.13	3.03***	1.22*
10.	Black gram	–3.90***	1.59	5.72***	–1.5	–2.55	–1.05	–1.90***	–0.39	1.52***
	Total pulses	1.51	1.50**	–0.01	–2.70**	–1.04	1.72**	–0.17	0.80*	0.98***

***, **, * indicates 1, 5, 10 per centlevel of significance, respectively

Table 4
Annual compound growth rates in area, production and productivity of total foodgrains, oilseeds and commercial crops in Satara district.

Sr. No.	Crop	Period I 1980-81 to 1994-95			Period II 1995-96 to 2012-13			Overall Period 1980-81 to 2012-13		
		A	*P*	*Y*	*A*	*P*	*Y*	*A*	*P*	*Y*
	Total foodgrains	0.46	1.74**	1.28	–1.6**	–0.46	1.17**	–0.78***	0.13	0.92***
1	Groundnut	1.27	1.78	0.50	–1.93**	–2.89**	–0.98	–1.06***	–0.77	0.30
2	Sunflower	–	–	–	–9.03***	–8.4***	0.58	–9.03***	–8.4***	0.58
3	Soybean	–	–	–	10.5***	10.8***	0.32	10.5***	10.8***	0.32
	Total oilseeds	2.57***	3.3**	0.71	1.26**	3.13	0.63	1.12***	1.74**	1.00***
4	Sugarcane	8.01***	7.9***	–0.6	2.22	1.93	–0.29	3.73***	4.02***	0.04
5	Cotton	–8.94	–5.57	3.55**	–11.3***	–13.6***	–1.65	–2.14	–2.44	–0.28

***, **, * indicates 1, 5, 10 per cent level of significance, respectively

(*Note:* Sunflower and soybean were introduced in the late 80's, annual compound growth rates were calculated for period II and overall period *i.e.* for 18 years from 1995-96 to 2012-13)

The area under barren and uncultivable land had increased over the period under the study. Land under non-agricultural use had been increasing steadily.

2. The area under rice and maize had increased. The area under cereals has predominance in cropping pattern in Satara district. Under pulses, the area under gram increased. There exist the changes of crops in area, production and productivity in the district over the period under study. The productivities of most of the crops had increased. The reason behind increase in productivity was the adoption of high yielding varieties.

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