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Agricultural Trends in Yavatmal Maharashtra - A District Level Analysis

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ABSTRACT

This paper attempts to assess the changes in cropping pattern in Yavatmal district for the period from 1991 to 2010. We divide the period into two distinct periods: 1991-2000 and 2001-2010. The trends in the production of cereal crops, pulses and cash crops were observed using mean comparison *t* test and dummy variable regression model. The statistical and simple econometric exercises support the noticeable change occurred in the cropping pattern in the Yavatmal district during the period of economic reforms. The production of wheat was increased marginally during the period, but production of *jowar* crops drastically declined. The crops such as soybean and sunflower took over *jowar* during the study period. The trend showing decrease in overall production of cereals is a cause of concern for the government in particular and public in general. If the trend continues, it would be worrisome in terms of production of traditional crops.

Keywords: Cropping pattern, trends, Maharashtra, economic reforms

Maharashtra has more heterogeneity in crop production and cropping pattern arising from its varied agro-climatic conditions. Cropping pattern in the state varies from region to region. Few changes have been taken place in the cropping pattern in certain regions and these changes are continuing as new crops are being introduced. Remunerative price for crops, high yield and low water intake varieties were the major motivating factors for changing cropping pattern in Maharashtra. Publicity drive and exposure to information flows also divert mind-set of farmers to give up traditional crops.

Maharashtra state has eight revenue administrative divisions; Nashik, Pune, Kolhapur, Aurangabad, Latur, Amravati and Nagpur. Yavatmal comes under Amravati division. Akola, Buldhana, Amravati and Washim districts are under this division located between the Northern latitude of 20° 23′ 50.51″ and East longitude 78° 07′ 42.42″ at altitude 451 m. It consists of 16 *Talukas*. It is a major cotton producing district of Maharashtra. The district boundary touches five districts of Maharashtra namely Nanded, Parbhani, Washi, Wardha and Chandrapur. Andhra Paradesh remains the neighbouring state of Yavatmal.

According to Agro climatic zone, Yavatmal falls in the category of western plateau and hills region zone XI. It can be subdivided into four sub agro-climatic zones namely the Deccan plateau, the hot semi-arid region, western Maharashtra Plateau and hot moist semi-arid eco sub-region. The annual normal rainfall in the study area is 886.4 mm, including 775.2 mm from south-west monsoon (June-September), 69.6

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mm rainfall from north-east monsoon (October-December), 29.4 mm in winter and 12.2 mm in summer. Rainy season generally starts on June 11 and ends till October 7.

Yavatmal district spread over an area of 13,52,000 ha, including cultivable area of 8,84,000 ha, out of which 8,39,300 ha is rainfed. Yavatmal has three types of soil namely; shallow black soil (52.2 per cent), deep black soil (34.7 percent) and medium deep black (13 per cent). 15000 hectares area sowed more than once in a year hence gross cropped area increases to 8,99000 ha. The major sources of irrigation include open wells (78.4 percent) and canals (21.6 per cent). The previous studies revealed that the large part of Marathawada comes under the rain shadow and agriculture is characterised with low rainfall and low irrigation (Dev, 1996). Maharashtra lags behind in the productivity of all crops as compared to the national averages (Dastane, 2002). There is an asymmetry in the response to monsoon variability (Gadgil 2006). Therefore indirect impact of drought on the purchasing power of the majority of the population in this region remains very significant in the modern era as well.

Credit plays vital role in effecting a significant change in cropping pattern in favour of more remunerative crops (Ray, 2009). Further, in order to have commercialisation of agriculture, there is a need to design an appropriate crops wise credit policy to ensure food security in India. The adoption of innovation into cultivating practice can ensure sustainable agricultural productivity (Rahman, 2009). There is a need to speed up efforts to evolve climate resilient crop varieties, cropping patterns and management policies (Vasanta, 2013). As the temperature rises, the rice production falls and complete crop failure is possible if severe drought takes place during the crucial seasons.

MATERIALS AND METHODS

This study is undertaken to understand the trends in the cropping pattern of Yavatmal district. Therefore, the time series data of major crops were collected from the office of Directorate of Agriculture, Pune, Maharashtra and office of the Commissioner of Land Record for the period 1991-92 to 2010-11. To observe the trends in major crops and cropping patterns, data period was divided into two time periods, namely 1991 to 2000 and 2001 to 2010. After calculating mean and standard deviation of each crops, independent sample mean comparison test was used to see where there was any significant difference in the mean of the two periods. Besides, four regressions including dummy variables were employed to assess the structural change as given below:

$$Total\ cereal_i = \alpha + \beta_2 D_{2i} + \mu_i \quad \ldots(1)$$

Where, Total cereal is dependant variable and α is constant term and β_2 is coefficient value of dummy variable shown by D. μ is error term. Dummy variable takes value 0 and 1 for the period 1991-2000 and 2001-2010 respectively.

$$Total\ pluses_i = \alpha + \beta_2 D_{2i} + \mu_i \quad \ldots(2)$$

$$Cotton_i = \alpha + \beta_2 D_{2i} + \mu_i \quad \ldots(3)$$

$$\text{Soybean} = \alpha + \beta_2 D_{2i} + \mu_i \quad \ldots(4)$$

RESULTS AND DISCUSSION

Baseline characteristics

Land use Pattern

The pattern of land use was quite similar after the liberalisation period in India. Cultivable and Forest area are 8,84000 ha and 2,43000 ha, respectively, whereas land under non-agriculture use is 25,000 ha and permanent pastures is 35,000 ha. Cultivable waste land and miscellaneous tree crops and groves are 22,000 ha and 29,000 ha, respectively.

Cropping Pattern

Cotton is the most important crop of rainfed (MH-8) zone occupying 4,05,000 ha of area. It is largely grown during *kharif* season. Soybean and pigeon pea are *cultivated* on cultivated on 2,87,000 ha and 1,06,000 ha area. Sorghum, green pea and black gram are also grown in this rainfed area covering around 70,000 ha, 12,000 ha, and 10,000 ha, respectively. Although some crops like gram, wheat and safflower were grown in *rabi* season, but the main crop remains wheat during post rainy season. The most prominent cropping pattern followed by the farmers of Yavatmal was Cotton followed by *Tur*. The analysis did not provide strong evidence in favour of changing cropping pattern.

Weather related contingencies

Due to the majority of rainfed area, farmers in Yavatmal district many times face drought situation. Farmers sow Bt-cotton in scanty moisture in deep to medium deep black soil. Other crops preferred by farmers include *tur*, soybean, pigeon pea, sorghum, as per the recommendations and guidance of Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola.

Trends in production of major crops (Mean Comparison Test)

Cotton, soybean, pigeon pea, sorghum, green gram and black gram are the major crops grown in *kharif*/ rainy season in Yavatmal district with cotton being the key crop. Besides, wheat and chickpea are major crops during the *rabi* / winter season. The Mean Comparisons Test for trends in major crops for the period 1991-2010 is given in Table 1.

The production of rice was declined from mean value 40.4 in 1991-2000 to 12.1 in 2001-2010 and the change was significant. However, the production of wheat was increased during the same period, as indicated by the mean value of 212.8 to 347.7, significant at 8% level of significance. One of the striking observations was that the production of *Jowar* crop drastically declined from mean value of 2206.3 to 990.4, replaced by soybean and sunflower. The shift was probably due to good price and market availability for soybean and sunflower. Supportive price for maize has resulted in increased production from mean value of 2.6 to 7.6. The overall trend in cereal production was a cause of concern which has declined from mean value of 2515.6 to 1266.7, significant at 1% level.

Under pulses, the production of gram was significantly increased. *Tur* production did not increase at all during the span of 10 years, whereas the production of *moong* and *urd* was significantly declined. The aggregate production of pulses was also declined from mean value 1482.8 to 979.8. This change is also a worried sign for the government and also public. The price level of pulses also increased because of shortfall in the production.

Dummy Variable Regression Model

The production of cereals (Regression I) fallen during the period 2001-2010 and same results were supported by minus sign of T test and R^2 value of 53% (Table 2). Regression II also indicated negative trend in the total production of pulses in the second period of study with coefficient significant at 9% level. The production of cotton increased significantly with coefficient value of 2.59, significant at 1% level (Regression III). Regression IV indicated positive trend in the production of the soybean (4.21) in

Table 1: Mean Comparisons Test for trends in major crops

Variable	1991-2000		2001-2010		t-Test	Prob.
	Mean	Std. Dev.	Mean	Std. Dev.		
Rice	40.4	9.191784	12.1	14.90302	5.11*	0.0001
Wheat	212.8	74.82097	347.7	282.204	-1.46***	0.0806
Jawar	2206.3	608.6672	990.4	427.526	5.16*	0.0001
Bajra	49	19.79338	14.9	10.35428	4.82*	0.0001
Maize	2.6	1.429841	7.6	7.136759	-2.17**	0.0200
Total cereal	2515.6	632.7698	1266.7	470.2619	5.00*	0.0001
Gram	80.6	25.49161	301.4	270.1811	-2.57*	0.0096
Tur	1031.3	282.0371	1033.9	279.584	-0.02	0.9837
Mung	259	67.82985	102.3	63.63621	5.32*	0.0000
Udid	111.4	41.56441	64.1	38.40558	2.64*	0.0165
Total pluses	1482.8	392.7263	979.8	630.5207	2.14*	0.0462
Sugarcane	4735.3	1550.238	4344.5	2907.285	0.37	0.712
Cotton	3015.9	992.263	5064.4	2492.529	-2.41*	0.0266
Sunflower	20.8	10.5704	0.9	0.7378648	5.93*	0.0000
Soybean	574.6	485.5371	1808.6	935.161	-3.70*	0.0016

* Significant at 1%, ** significant at 5% and *** significant at 10% level.

Table 2: Trends in production of major crops using Dummy Variable Regression Model

Regression Model	Dependent variable	Independent variable	Coef.	Std. Err.	T stats.	P>t	Number of Obs.	20
I	Total Cereal	Dummy	-0.72787	0.161462	-4.51	0.000	F (1, 18)	20.32
	Production	Cons.	7.797824	0.114171	68.3	0.000	Prob > F	0.0003
							R-squared	0.5303
							Adj R-squared	0.5042
							DW stat (2,20)	1.164277
II	Total Pulses	Dummy	-0.23759	0.132449	-1.79	0.090	Number of obs	20
	Production	Cons.	7.266405	0.093656	77.59	0.00	F (1,18)	4.80
							Prob > F	0.0897
							R-squared	0.1517
							Adj R-squared	0.1045
							DW stat (2,20)	0.953215
III	Total Cotton	Dummy	0.469808	0.181249	2.59	0.018	Number of obs	20
	Production	Cons.	7.96063	0.128162	62.11	0.000	F (1,18)	6.72
							Prob > F	0.0184
							R-squared	0.2718
							Adj R-squared	0.2314
							DW stat (2,20)	1.229129
IV	Total Soybean	Dummy	1.364844	0.324424	4.21	0.001	Number of obs	20
	Production	Cons.	6.016379	0.229403	26.23	0.000	F (1, 18)	17.7
							Prob > F	0.0005
							R-squared	0.4958
							Adj R-squared	0.4678
							DW stat (2,20)	0.751978

the period 2001-2010. The declining trends in the production of cereal and pulses were the cause of concern keeping in mind the food security and poverty reduction. Durbin Watson test was used to check the autocorrelation problem in the data. The results of DW test in the above mentioned four regressions were more than 0.511 and were valid as per Cointegrating regression Durbin Watson (CRDW) rule.

CONCLUSION

The comparison of two distinct periods i.e. 1991-2000 and 2001-2010 revealed that the production of wheat increased marginally but production of *jowar* has drastically declined replaced by soybean and sunflower. The production of *bajra* also declined during the same period. Among pulses, the production of gram and *tur* increased whereas the production of *mung* and *urad* significantly declined. We recommend policy makers to give push to production of cereals and pulses by offering motivational package in conjunction with non-cereal crops. The option of encouraging non-cereal crops appears to be more possible option open to the policy makers, as cropping pattern is already changing in favour of non-cereal crops. Better marketing conditions, provision of minimum support price and timely procurement of crops can reduce poverty of farmers in Yavatmal district.

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