Research Paper

Growth dynamics and acreage response of paddy in eastern Vidarbha zone of Maharashtra

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ABSTRACT : The present study entitled "Acreage response of paddy in eastern Vidarbha (M.S.)" was undertaken to know rate of growth in area, magnitude of instability, correlation, acrage response, price elasticity of paddy. The study has been undertaken in eastern Vidarbha zone. Data pertains for the year 1984-2014. The decomposition analysis model (Minhas, 1964) and regression model of the Nerlovian lagged adjustment model (1958) was used in the present study. The following conclusions were drawn from the study. The growth rate for area and production under paddy has increased in all the districts of eastern Vidarbha region of Maharashtra for the study period. The area, production and productivity instability in paddy was observed in almost all districts in the state. It may be because the crop largely depends on vagaries of nature which causes heavy losses. Per cent contribution of area effect was more responsible for paddy production in the initial period but later yield effect was more pronounced. In the overall period of 30 years, area effect and interaction effect showed proportional share (177.59 % and 54.79 %, respectively) in the Bhandara district. The lagged acreage variable was found significant in Bhandara and Gadchiroli districts of eastern Vidarbha mostly with 5 per cent level of significance. The current year acreage was influenced by farm harvest price nor by one year lagged yield of the paddy in all the districts. The regression co-efficient for lagged area was positive and statistically significant in two districts indicated more rigidity in the adjustment of area under paddy. Long run price elasticities were more than short run elasticities in paddy indicating that farmers was not market oriented in short run period.

KEY WORDS : Paddy, Growth rate, Instability, Elasticity, Decomposition

INTRODUCTION :

The supply response of crop or acreage response of agricultural crop is one of the important procedure tools predicting crop production. Agriculture is the most important sector in the economy of nation. In India during the last two decades increase in population has been more pronounced then increase in agricultural production, creating a lag in the availability and requirement of food crop. Thus to feed and cloth the teaming millions of India, the pace of agricultural production has to be increased by proper planning and policy formulating. It is a matter of paramount importance of study the behavior of farmer's attitude towards area allocation to different crops.

Rice contribute 42 per cent of the total food production in India. Rice commended recognition as a

supreme commodity to mankind because rice is truly life, culture, tradition and men's livelihood to million. It is an important staple food providing 60-70 per cent of body calories intake consume. Rice is the more popular staple food of more than 80 per cent of the world population. In India rice is grown over 36.95 million hectares with total production of 80.41 million tonnes in the year 2010-11. Rice is an important food crop contributing to more than half the daily requirement of calories. It contains 6 to 7 percent proteins and 2 to 5 per cent fat only. Grain contain calcium and Vitamin in B. The byproduct of rice is used for cattle and poultry feed. The important rice growing region in Eastern zone of Vidarbha Bhandara, Chandrapur, Gadchiroli and Gondia in the. During the year 1995-96 Bhandara, Chandrapur, Gadchiroli and Gondia districts which are major rice producing area of Eastern Vidarbha, contributes about 90 per cent of total production and cover nearly 6.00 lakh hectares area with an annual production of approximately 96.7 lakh tones.

In Maharashtra during 2012-13 area under paddy cultivation was 15164 (00 ha) with annual production of 27846 (00 tones) with an average productivity of 1836 kg/ha. In Eastern Vidarbha Zone district during 2011-2012 area under paddy cultivation was 7409 (00 ha) with annual production of 11026 (00 tones) with an average productivity of 1488 kg/ha.

The breeders have to face the challenge of evaluating new varieties which are less prone to the natural calamities and ensure stability in production. Thus the study of instability in crop production is important. However inspite of this increase in the production of rice there is instability in the production is mainly on account of uncertain nature of monsoon and attack of pest. Therefore, it is important to study instability in paddy production as it will help the researchers to develop more stable varieties of paddy. Which are suited for both rainfed and irrigated area. Inspite of this, output growth in paddy is important for policy point of view. Such study can provide information to take appropriate measure to increase paddy production with this issues in mind, the study of growth and instability in production of paddy.

The study was confined to four districts of Eastern Vidarbha of Maharashtra state namely Bhandara, Gondia, Gadchiroli and Chandrapur district for the analytical purpose. The four districts constituted more or less in the middle of India peninsular and forms parts of the Deccan plateau, name as Eastern Vidarbha region.

MATERIALS AND METHODS :

The study based on the analysis of growth rates, decomposition and acreage response, the period was divided into two sub periods of 15 years and overall period as shown below.

Period I -1984-85 to 1998-99
Period II -1999-00 to 2013-14
Overall period –1983-84 to 2013-14

Nature and source of data :

Data used for the present study were collected from various published sources. Time series secondary data on the area, production and productivity of paddy, annual rainfall, farm harvest price and other data were collected from various government published sources *viz.,* District wise General Statistical Information of Agriculture Department (Epitome of Agriculture in Maharashtra), Agricultural situation in India, *http//agricrop.nic.in/ Agristatistics.htm* (a govt. Website)

Analytical techniques employed for analyzing the data :

The present study was based on time series secondary data of paddy in Eastern Vidarbha. The study was conducted on the following aspects.

– Growth rate and Instability
– Decomposition of output growth
– Acreage response analysis with short run and long run elasticity.

Growth rate and instability :

The compound growth rate of area, production and productivity of paddy was estimated for two sub periods as Period I-1984-85 to 1998-99, Period II -1999-00 to 2013-14

The district-wise compound growth rates of area, production and productivity were estimated by using following exponential model.

Y= abt
Log Y = loga + t logb
CGR= [Antilog (logb-1)] ×100
where, CGR = Compound growth rate
 t = Time period in year
Y = Area/production/yield of paddy in the district
a and b =Regression parameters.
The t test will applied to test of significance of 'b'

Instability analysis :

To measure the instability in area, production and productivity, an index of instability was used as a measure of variability.

The co-efficient of variation (CV) was calculated by using the formula.

$$C.V.(\%) = \frac{\text{Standerd deviation}}{\text{Mean}} \times 100$$

Correlation analysis :

The analysis to correlation between (i) Area and production and (ii) Production and productivity has been worked out and test of significance carried out to assess the strength of relationship between each pair of characteristic for period I-1984-85 to 1999-98, Period II -1998-99 to 2013-14 and Overall period –1984-85 to 2013-14.

Decomposition of output growth :

To measure the relative contribution of area, yield to the total output change for the major crops, Minhas (1964), the decomposition analysis model as given below was used. Sharma (1977) redeveloped the model and several research workers (Kalamkar *et al.*, 2002) used this model and studied growth performance of crop in the state. Ao, Po and Yo are area, production and productivity in base year and An, Pn and Yn are values of the respective variable in n^{th} year item, respectively.

$$P_o = A_o \times Y_o \text{ and}$$
$$P_n = A_n \times Y_n \tag{1}$$
where,

A_o and A_n represent the area and Y_o and Y_n represents the yield in the base year and n^{th} year respectively.

$$P_n - P_o = \cup P$$
$$A_n - A_o = \cup A$$
$$Y_n - Y_o = \cup Y \tag{2}$$
For equ. (1) and (2) we can write

$$P_o + \cup P = (A_o + \cup A)(Y_o + \cup Y)$$
Hence,

$$P = \left[\frac{A_0 \Delta Y}{\Delta P} \times 100\right] + \left[\frac{Y_0 \Delta A}{\Delta P} \times 100\right] + \left[\frac{\Delta Y \Delta A}{\Delta P} \times 100\right]$$

Production = Yield effect + area effect + interaction effect

Thus, the total change in production can be decomposed into yield, area and interaction effect due to change in yield and area.

Acreage response analysis :

The model adaptive expectations or (Distributed Lagged) which generally based on time series data called as Regression model of the Nerlovian Lagged Adjustment model (1958) has been used in the present study. The acreage response means the change in acreage with the unit change in the variables affecting on during the period of study.

$$A_t = a + b_1 A_{t-1} + b_2 FHP_{t-1} + b_3 Y_{t-1} + b_4 W_t + b_5 P_R + b_6 Y_R$$
where,

A_t =Area under paddy at time 't' (00ha)

a=Intercept

A_{t-1} =One year lagged area under paddy (00ha)

FHP_{t-1} =Lagged year farm harvest price of paddy (Rs./q)

Y_{t-1} =One year lagged yield (q/ha)

W_t =Weather variable as rainfall data per year

P_R =Price risk (co-efficient of variation of last three years)

Y_R =Yield risk (co-efficient of variation of last three years)

$b_1 \ldots\ldots b_6$ =Parameters of multiple liner regression.

The two model *viz.,* Linear regression model and Cobb-Douglas model were tested and out of these two models finally Linear Regression model was selected on the basis of number of significant variables, desired signs of estimated regression co-efficient and highest R^2 values.

Short run and long run elasticity :

The elasticity's of variables shows that the influence of unit change in variable on acreage decisions of crop. In the present study, variable elasticity's were estimated for short run as well as for long run period.

Moreover, the short run and long run elasticity were estimated as-

$$\text{Short run eiasticity (SRE)} = \text{Regression co-efficient of price} \times \frac{\text{Mean of price}}{\text{Mean of area}}$$

$$\text{Long run eiasticity (LRE)} = \text{Regression co-efficient of price} \times \frac{\text{SRE}}{\underset{(r)}{\text{Co-efficient of area adjusment}}}$$

where, r = 1-(co-efficient of lagged area)

RESULTS AND DATA ANALYSIS :

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Growth dynamics of paddy :

In this study, the growth in area, production and productivity of paddy were estimated indicated in the methodology chapter. The general growth performance of the crop in Eastern Viidrbha zone were examined by fitting exponential growth function with time normalization on area, production and productivity. The growth performance of the crop pertaining to three periods and overall is discussed separately for each district as under.

The growth performance of paddy pertaining to two sub period and overall period was presented in the Table 1, which revealed due to introduction of paddy in the region during period I, the growth rate of area, production and productivity was recorded positive. The highest increasing trend in area was recorded in Bhandara district *i.e.* 0.92 per cent per annum and highest production and productivity was recorded in Chandrapur district *i.e.* 3.41 per cent per annum and 2.52 per cent per annum, respectively. The lowest increase in area, production and productivity was recorded in Gadchiroli district *i.e.* 0.38

per cent per annum, 0.07 per cent per annum and 0.28 per cent per annum, respectively. Statistically the production of Chandrapur district shows significance in 1 per cent level and Bhandara district shows significance in 5 per cent level and productivity of Chandrapur district shows significance in 5 per cent level.

The result revealed that during period II picture has been drastically changed, the growth rate has been decreased in area, production and productivity. In Bhandara district it has been found non-significant in both area, production and productivity and Gondia district shows significance of 5 per cent per annum and 1per cent per annum in compound growth rate of production and productivity respectively in this period whereas as a whole Eastern Viidrbha shows non-significance of compound growth rate only in Gondia district production and productivity at 5 and 1 per cent level of significance.

The growth rate were also worked for the overall period (pooled period of 30 years) for paddy where two district to be positive. only in Chandrapur and Bhandara

Table 1 : District wise compound growth rate for paddy

Particular		Bhandara	Gondia	Gadchiroli	Chandarpur
Period-I	Area	0.92	-	0.38	0.73
	Production	2.75*	-	0.07	3.41**
	Yield	1.82	-	0.28	2.52*
Period-II	Area	-0.18	0.53	0.77	0.09
	Production	1.41	5.02**	0.06	0.32
	Yield	1.59	4.48**	1.80	0.23
Overall period	Area	-2.60	0.53	0.65	-0.01
	Production	-1.61	5.02**	1.17	-0.09
	Yield	1.02	4.48**	0.22	-0.11

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 2 : District wise instability indices in paddy

Name of district	Particular	Period-I CV(%)	Period-II CV(%)	Overall CV(%)
Bhandara	Area	11.38	23.49	30.76
	Production	28.57	33.24	37.14
	Yield	24.63	27.98	26.85
Gondia	Area	-	6.715	6.715
	Production	-	36.54	36.54
	Yield	-	34.29	34.29
Gadchiroli	Area	2.77	4.42	6.34
	Production	25.76	30.74	29.24
	Yield	32.94	28.61	30.34
Chandrpur	Area	6.17	11.10	8.83
	Production	25.30	32.03	28.45
	Yield	23.63	28.22	25.70

CV = Co-efficient of variation

district whereas found negative. Statistically Compound growth rate in productivity. Unexcept in all other districts shows non-significance was registered in whole 30 years period.

In whole Eastern Viidrbha Gondia district shows positive in area, production and productivity in paddy.

Instability in paddy :

One should not obvious of instability by taking the growth rates only. Because the growth rates will explain only the rate of growth over the period, whereas, instability will Judge, whether the growth performance is stable or unstable for the period for the pertinent variable. To facilitate better understanding of the magnitude and pattern of changes in the level of production, cropped area and productivity of paddy in the different soybean growing region, instability of production, area and productivity of paddy have been worked out as per the period discussed in Chapter III. The simple co-efficient of variation (CV) often contains the trend component

and thus overtimes the level of instability in the time series data characterized by long term trend.

In order to know the instability in area, production and yield of paddy, the fluctuation measured with the help of co-efficient of variation. The results are presented in Table 2 and discussed as under for the period I, II and overall period. Fluctuation in area, production and productivity due to the uncontrollable factors like climatic conditions can cause upward bios in co-efficient of variation.

The Table 2 revealed that during period I, co-efficient of variation for the area was less as compared to production except in Gadchiroli. In Gadchiroli co-efficient of variation for the area was 2.77per cent per annum whereas co-efficient of variation for the production and yield is 25.76 per cent per annum and 32.94 per cent per annum. Highest co-efficient of variation for area was found in Bhandara district *i.e.* 11.38 per cent per annum. For the production Bhandara district has got the highest co-efficient of variation *i.e.* 28.57 per cent per annum

Table 3 : District wise co-efficient of correlation for the period 1984-85 to 2013-14

District		Correlation between	
		Area and production	Production and yield
Bhandara	Period I	0.79**	0.98**
	Period II	0.58	0.78**
	Overall	0.78**	0.54**
Gondia	Period I	-	-
	Period II	0.58	0.99**
	Overall	0.58	0.99**
Gadchiroli	Period I	0.63	0.77**
	Period II	0.57	0.98**
	Overall	0.53**	0.83**
Chandrapur	Period I	0.49	0.96**
	Period II	0.56	0.93**
	Overall	0.53**	0.94**

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 4 : Per cent contribution of area, yield and their interaction for increasing production of paddy

Period	Particular	Bhandara	Gondia	Gadchiroli	Chandrpur
Period-I	Area effect	-28.35	-	-9.11	-23.89
	Yield effect	122.5	-	107.2	137.81
	Interaction effect	5.77	-	1.9	4.87
Period-II	Area effect	17.93	8.47	28.29	49.08
	Yield effect	75.81	72.68	61.5	40.39
	Interaction effect	13.12	18.84	10.22	10.57
Overall	Area effect	177.59	8.47	64.01	251.37
	Yield effect	-132.36	72.68	29.18	-136.84
	Interaction effect	54.79	18.84	6.78	-38.94

and for yield Gadchiroli district has recorded highest co-efficient of variation *i.e.* 32.94 per cent per annum. On the other hand high production instability than area and yield instability was estimated for all the districts of eastern Vidharba zone as well as zone as a whole contributed towards production fluctuation in the period I.

The instability in area and production was found to be increased in II period as compared to I period in almost all the districts and this period compared to period I almost the range of 20 to 25 per cent per annum. Highest co-efficient of variation was recorded in the productivity of Gondia *i.e.* 34.29 per cent per annum, respectively.

During the overall period *i.e.* 30 years as a whole, Gadchiroli district recorded lowest degree of instability in area *i.e.* CV 6.34 per cent per annum. Similarly in production and yield Chandrapur district was recorded with lowest which shows CV 28.45 per cent annum and CV 25.70 per cent annum, respectively whereas Bhandara recorded highest instability in area *i.e.* CV 30.79 per cent per annum. Gadchiroli in the production as well *i.e.* 29.24 per cent annum and in the yield Gadchiroli again shows highest CV *i.e.* 30.34 per cent per annum in the 30 years overall period. This all indicates least consistency in terms of area, production and productivity during overall period of 30 years.

Correlation analysis of paddy :

It is revealed that the relationship between production and productivity were stronger than that

between area and production in all the four district of eastern vidarbha region. Table 3 indicative the fact that the growth in the output of paddy need greater bearing on the technological developments than on the area planted with paddy.

Decomposition analysis of paddy :

A quantitative assessment of contribution of the various factors to growth of crop in Bhandara, Gondia, Gadchiroli and Chandrapur districts of eastern vidarbha region is helpful in reorienting the programmes and setting priorities of agricultural development so as to achieve higher growth rates of agricultural production. There are many factors which affect the growth of crop output. These factors believed to affect the production of crop *viz.*, area, yield and their interaction have been considered in present study. The result of decomposition scheme was worked for two sub period and overall period.

The decomposition of paddy production in area, yield and interaction effect presented in Table 4 and results demonstrate that per cent contribution of area, yield and their interaction for increasing production of paddy in district of Eastern Vidarbha of Maharashtra.

During period I , the result clearly indicate that the area effect -28.35 per cent was responsible for decreasing the production of paddy in Bhandara district with yield effect 122.5 per cent and interaction effect 5.77 per cent. During period I Gondia district was not in existence and the area effect -9.11 per cent was

Table 5 : Estimated co-efficient for acreage response function of paddy

Particulars	Variables	Co-efficient			
		Bhandara	Gondia	Gadchiroli	Chandarpur
	Intercepts	2141.77	1377.70	827.41	918.08
One year lagged area	A_{t-1}	0.59 (0.16)	0.17 (0.29)	0.34 (0.16)	0.31 (0.19)
One year lagged farm harvest price	FHP_{t-1}	-0.66 (0.44)	-0.01 (0.19)	0.21 (0.04)	0.04 (0.08)
One year lagged yield	Y_{t-1}	-0.43 (0.29)	-0.06 (0.10)	-0.01 (0.01)	0.06 (0.08)
Annual rainfall	W_t	-0.15 (0.31)	0.19 (0.14)	0.017 (0.02)	0.03 (0.09)
Yield risk	Y_r	-9.23 (6.51)	-1.044 (3.04)	0.36 (0.47)	-2.67 (2.14)
Price risk	P_r	13.04 (15.68)	1.27 (7.17)	-2.5 (1.15)	1.07 (3.99)
Co-efficient of determination	R^2	0.70**	0.28	0.87**	0.26

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 6 : District wise price elasticity of paddy in eastern Vidarba

Sr. No.	Name of districts	SRE	LRE
1.	Bhandara	-0.14	0.220
2.	Gondia	-0.002	6.630
3.	Gadchiroli	0.079	0.026
4.	Chandrapur	0.017	0.001

responsible for decreasing the production of paddy in Gadchiroli district with yield effect 107.2 per cent and interaction effect 1.9 per cent. And also for Chandrapur district area effect was -23.89 per cent which was responsible for decreasing the production of paddy Interaction effect was positive for all the districts In all the districts yield effect was also shown positive. In all district yield effect had played a driving force in the differential production of paddy in during I period.

In the contrary during period II, it was noticed that yield effect has got domination over the area effect. In Bhandara district area effect was found 17.93 per cent whereas yield effect was 75.81 per cent and interaction effect was 13.12 per cent. Lowest area effect was found in the Gondia district *i.e.* 8.47 per cent and highest yield effect was also found in this district with 72.68 per cent. In all the districts yield effect has got higher record *i.e.* more than 60 per cent. It is also recorded in this period that interaction effect is positive in all the districts in eastern vidarbha region of Maharashtra.

During overall period, area effect was found most responsible factors for increasing paddy production in all district of eastern vidarbha region. Highest area effect was recorded in Chandrapur district *i.e.* 251.37 per cent with both negative yield and interaction effect *i.e.* -136.84 and -38.94 per cent, respectively. Bhandara district also recorded negative yield in this overall 30 years period *i.e.* -132.36 per cent, respectively where remaining districts has got all the positive effect. And it is also recorded that highest interaction effect was found in Bhandara district *i.e.* 54.79 per cent and yield effect was found in Gadchiroli district *i.e.* 29.18 per cent, respectively.

Acreage response of paddy :

Acreage response functions were fitted to examine the effect of price and non price factors on farmer's decision in allocating the area of paddy in eastern Vidarbha. The results obtained are presented and discussed in this section. Out of two, Linear regression model and Cobb- Douglas model, on the basis of number of significant variables, desired signs of estimated regression co-efficient and higher R^2 values Linear Nerlovian lagged adjustment model was selected with the price and non price variables. With a view of estimating the response of producers in terms of paddy area towards price and non price factors the actual area in the current year was expressed as a linear function of one year lagged area, one year lagged farm harvest prices, one year

lagged yield, average annual rainfall, yield risk and price risk. The regression co-efficient of these explanatory variables are presented in Table 5 revealed that, the lagged area was found to be positively influential factors in the farmer's decision regarding area allocation to paddy and found significant at 1 per cent level of significance in Bhandara district and 5 per cent level of significance in Gadchiroli district of eastern Vidarbha region which indicated lesser rigidity in the adjustment of area under paddy.

The co-efficient of farm harvest price were very less *i.e.* 0.04, -0.01 and -0.66 in Chandrapur, Gondia and Bhandara districts, respectively. It was significant at 1 per cent level of significance only in Gadchiroli district which implies less and negative relationship between the variations in the hectareage of paddy and farm harvest price. It implied that prices had not shown any impact in the increase on area of paddy in the study period. One year lagged yield was also included in the function but the co-efficient turned out to be very small and negligible and negative significant which implies that one year lagged yield had no impact or vey less impact to area allocation of paddy in all the districts of eastern Vidarbha zone of Maharashtra.

The annual rainfall was employed as a proxy for combating the weather influence on the paddy hectarage allocation decisions. The co-efficient of annual rainfall variable showed positive relationship for Gondia, Gadchiroli and Chandrapur districts and negative relations to Bhandara district and statistically insignificant in all the districts which showed annual rainfall favourably didn't influence the area allocation decision of the farmers and in Bhandara district it did not produced the negative relationships.

The yield risk variable was incorporated in the model to gauge the impact of risk over the variation in the hectarage under paddy. The co-efficient of variable had a negative and statistically insignificant response in Bhandara, Gondia and Chandrapur districts of eastern Vidarbha and positive insignificant in Gadchiroli district which shows farmers are relatively better risk bearers.

It was also recorded that regression co-efficient of price risk variable or factors were positive in Bhandara, Gondia and Chandrapur districts except Gadchiroli district. In all these three districts cases, it indicate that farmers were relatively better risk bearers but are statistically non-significant whereas in Gadchiroli negative relationship testified to the farmers risk aversion behaviour in paddy

production.

The value of the co-efficient of multiple determinations ranged from 0.26 to 0.87 for all the districts of eastern Vidarbha. 0.26 was found in Chandrapur district and it was 0.70, 0.28, and 0.87 found in Bhandara, Gondia and Gadchiroli district, respectively which indicates that variables included in the model explained most of the variations in area under paddy in the study period.

Short run and long run elasticity :

The price elasticities show the influence of unit change in price on acreage allocation of the crop. In the present study price elasticity were estimated for short run as well as for long run period. The variations in the magnitude of short run and long run price elasticity factors between different districts of Eastern Vidharba zone were evident from the Table 6. The short run and long run price elasticities of paddy showed positive price responsiveness of farmers in all the districts of Eastern Vidharba except Bhandara and Gondia district which turned out to be surprisingly negative. The short run price elasticity for different districts are -0.141, -0.002, 0.079 and 0.017 for Bhandara, Gondia, Gadchiroli and Chandrapur districts, respectively. The highest short run price elasticity was found in the Gadchiroli district and negative price elasticity was found in the Bhandara and Gondia district *i.e.* -0.14 and -0.002 which is fairly highest and is called for further investigation.

The long run price elasticity for Bhandara, Gondia, Gadchiroli and Chandrapur districts are 0.220, 6.630, 0.026 and 0.001, respectively. It is also recorded from the table that long run price elasticities are comparatively higher than the short run price elasticity indicated that the farmers were relatively market oriented in their decisions in the long run than in the short run in respect to the paddy in the eastern Vidharba region of the Maharashtra.

Conclusion :

It is concluded from the study that the growth rate for area and production under paddy was positive for all the districts of eastern Vidarbha region of Maharashtra for the study period. The area, production and productivity instability in paddy was observed in almost all districts in the state. It may be because the crop largely depends on vagaries of nature which causes heavy losses. Per cent contribution of area effect was more responsible for paddy production in the initial period but later yield effect

was more pronounced. The lagged acreage variable was found significant in Bhandara and Gadchiroli districts of eastern Vidarbha with 5 per cent level of significance. The current year acreage was influenced by farm harvest price nor by one year lagged yield of the paddy in all the districts. Long run price elasticities were more than short run elasticities in paddy indicating that farmers were not market oriented in short run period.

Implications :

– Paddy appeared to be one of the important emerging crop in the eastern Vidarbha zone and it becomes additional crop in the cropping pattern of the region. Hence, there is a very big need to concentrate on this crop by policy maker and researcher.

– The area, production and productivity instability in paddy crop was observed in almost all districts in region. It may be because the crop largely depends on vagaries of nature of rainfall and there for paddy production is subject to fluctuation from year to year and thus, causing heavy losses. The growth in production was to advancement in research pertaining to evolution of high yielding and drought resistance varieties of paddy over period of time. In order to maintain stability in production of paddy concerned efforts should be made in the state.

– In almost all the studied district the area effect was found to be most responsible factor for increasing production during overall period. But there is a scope to increase yield in rain fed farming by introducing new development programmes and increase in technical efficiency at farm level.

– Farmer's need to be protected by crop insurance coverage against yield fluctuation of paddy.

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Literature Cited :

Achary, S.S. and Bhatia, S. (1974). Acreage response to price, yield and rainfall changes in Rajasthan. *Agric. Situ. India,* **29**(4) :209-217.

Choudhary, V.K. and Lalwani, N.R. (2004). Trends in area production and productivity of pigeonpea in Chhattisgarh region. *Plant Archives*, **4** (2) : 303-306.

Dhindsa, K.S. and Sharma, A. (1997). A regional analysis of growth and supply responses on pulses- A study of Punjab. *Indian J. Agric. Econ.*, **52**(1):87-100.

Engale, B.D. and Bhise, V.B. (2009). Acreage responses of oilseed crops in a backward region. *Agric. Situ. India*, vii + 165.

Ghosh, M. (2002). Supply response behaviour of slow growth crops in India Agriculture: A study of oil seed and pulses. *Indian J. Agric. Econ.*, **57**(3): 379.

Jahagirdar, S.W., Ratanalikar, D.V. and Kokde, S.J. (2004). Growth rate of cotton in Maharashtra. *Agric. Situ. India,* **61**(2):79-82.

Kalamkar, S.S., Shende, N.V. and Atkare, V.G. (2002). Course cereals and pulses production in India: Trends and decomposition analysis. *Agric. Situ. India,* **59**(1):581-587.

Maibangsa, M. and Subramania, S.R. (2001). Performance of cotton production and factors affecting acreage under cotton in Assam. *Bihar J. Agric. Mktg.,* **9**(3):286-292.

Mathur, P.K. and Henry, A. (2005). Compound growth rate of area, production and productivity of pulses (moth bean, cow pea and mung bean) I arid district of Rajasthan. *J. Arid Legumes,* **2** (1) : 50-53.

Minhas, B.S. (1964). Analysis of crop output growth by component analysis (mimeograped).

Munish Alagh (2004). Aggregate agricultural supply responses function in india. *Econ. & Political Weekly*, **39**(2):202-206.

Padamnaban, N.R., Singh, V.V. and Singh, M. (1996). Cotton production in Tamil Nadu- A decomposition analysis. *Agric. Situ. India*, **53**(3):169-173.

Pandy, L.M., Kumar, Sant and Mruthyunjaya (2005). Instability, supply and insurance in oil seed production in India. *Agril. Econ. Res. Rev.* , **18**(confo No.):103-114.

Raghuwashi, R.S.,Gupta, M.K., Sahu, R.M. and Raghuwanshi, N.K. (2005). Status of pigeonpea in Madhya Pradesh. *JNKVV Res. J.,* **39** (2): 122-124.

Shaheen, F.A. and Shiyoni, R.L. (2004). Growth and instability in area, production and yield of fruit crops in Jammu and Kashmir: a disaggregate analysis. *Agric. Situ. India*, **60** (10) : 657-659.

Sharma, K.L. (1977). Measurement of the effects to Area, yield and prices in the increase of value of crop output in India. *Agric. Situ. India,* **32** (1-9): 348-350.

Shende, N.V. (2002). Impact of price on acreage of major crops. *Indian J. Agric. Mktg.,* **16**(2):102-106.

Shende, N.V. and Suryawanshi, G.K. (2009). Growth, instability and decomposition of cotton production in Maharashtra. *J. Cotton Res. & Development,* **23** (2) : 325-337.

Shende, N.V. Ganvir, B.N. and Thakare, S.S. (2011). Growth and instability of selected crops in Western Vidarbha. *Internat. Res. J. agril. Econ. & Stat.*, **2** (1) : 19-27.

Shende, N.V., Thakare, S.S. and Roundhal, P.S. (2011). Acreage responses and Decomposition analysis of soybean in Western vidharbha. *J. Food Legumes,* **24** (2) : 133-137.

Shukla, N.D. (1998). Growth and istability I pulses production ad inter-state analysis. *Agric. Situ. India,* **14** (10):639-641.

Singh, J.P. (2006). Green revolution versus instability in food grain production in India. *Agribusiness*, **9** (5) :481-493.

Singh, O.P. (1998). Growth and supply response of oil seed in Uttar Pradesh. *Agric. Situ. India,* **55**(1): 3-8.

Tuteja, Usha (2006). Growth performance and acreage response of pulse crop: A state level Analysis. *Indian J. Agril. Econ.* , **61**(2):237-248.

WEBLIOGRAPHY

http//agricrop.nic.in/Agristatistics.htm

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