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Factors Influencing Cropping Pattern Changes in Coastal Andhra Region - An Economic Analysis

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ABSTRACT

The present study is an attempt to identify the important factors influencing the cropping pattern changes in the selected districts of coastal region of Andhra Pradesh by applying multiple regression analysis for a set of explanatory variables. The results revealed that in Vizianagaram district area under paddy, greengram, groundnut, mesta, sugarcane and sesamum were significantly influenced by their own lagged prices. Rainfall significantly influenced the area under blackgram and groundnut only. Gross irrigated area exerted non-significant influence on paddy and sugarcane acreage. In Prakasam district area under paddy, redgram, bengalgram, chilly and tobacco were positively influenced by their own lagged prices. Increase in gross irrigated area had a significant positive influence on the area under paddy.

Key words : : Cropping patter

In recent decades, agricultural diversification is increasingly being considered as a panacea for many ills in the agricultural development of the country for its large potentialities of increasing income and employment and providing strength through reduced instabilities particularly under the situation of risk and capital constraints as revealed by several studies. The process of crop diversification in Indian agriculture commenced after the objective of agricultural development strategy was changed from maximizing the production of foodgrains to evolving a production pattern in line with the demand pattern in early eighties (Acharya, 2003). The cropping pattern is determined by agro-climatic factors such as soil type, temperature and rainfall pattern etc. Besides these factors, other factors like relative prices of crops, expansion of irrigation facilities, labour, fertilizer consumption etc., are also responsible for cropping pattern changes. Therefore keeping in view both the advantages and disadvantages of crop diversification and in order to identify the factors responsible for this situation the present study is attmpted.

MATERIAL AND METHODS

Multiple regression analysis was carried out for the time series data with respect to different factors affecting the area changes under different crops in Vizianagaram district from north coastal and Prakasam district from south coastal districts of coastal Andhra region. Data for the period 1981-82 to 2008-09 was collected from various published and unpublished sources.

Multiple Regression Analysis:

A number of regressions were run separately with area under the crop as the dependent variable and different combinations of explanatory variables for each crop in the districts and best fit equations were selected.

The functional form used was of the following type.

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots\ldots + u$$

where,

Y = Area under the crop in ´000 hectares
X_1 = Price of the crop output lagged by one year (Rs/qtl)
X_2 = Price of the competing crop lagged by one year (Rs/qtl)
X_3 = Total rainfall received during the current year (in mm)
X_4 = Gross irrigated area (‘000hectares) of selected crops
X_5 = Labour wage rate (Rs/ man day)
X_6 = Composite fertilizer price (Rs/kg)
b_o = Intercept

b_1, b_2,……..b_n = Regression coefficients
u = Error term

RESULTS AND DISCUSSION

The results of the study are presented in Table I and Table II for Vizianagaram and Prakasam districts respectively.

Factors influencing cropping pattern changes in Viziangaram district

The influence of various factors on the cropped area of the important crops in Vizianagaram district is presented in Table I.

The response of area under different crops to their causal factors indicated that except the areas under blackgram and horsegram, the areas under remaining crops viz., paddy, greengram, groundnut, sugarcane, mesta, and sesamum were significantly influenced by their own lagged prices. Gajja *et al* (2008) revealed that own lagged price of sesamum had a positive and significant influence on its acreage allocation.

Groundnut was found to be the important competing crop to blackgram, mesta and sesamum. Sugarcane was the competing crop to paddy and paddy was the competing crop to sugarcane, whereas blackgram, greengram and horsegram were found as the competing crops to greengram, horsegram and groundnut. The crops which were significantly influenced by lagged prices of their competing crops were blackgram, greengram and mesta. Rainfall which is an important determinant of area in the dry land areas influenced significantly the area under blackgram and groundnut only. Gross irrigated area considered for paddy and sugarcane crops only, exerted non-significant influence on their area. Labour wage rate exhibited negative and significant influence on horsegram, groundnut, sugarcane and sesamum areas. Similarly, composite fertilizer price indicated negative and significant influence on the cropped area of greengram and groundnut but had a positive and significant influence on horsegram only.

The own price and cross price elasticities were also calculated to know the area response of the major crops to the changes in its own price and the price of competing crops. It is observed that groundnut had a high own price elasticity of 1.1248 followed by greengram and sugarcane with 0.6782 and 0.4276 respectively. The response of mesta and sesamum to their own price was low. Paddy, blackgram and horsegram exhibited very low own price elasticities of 0.0986, 0.0512 and 0.0437 respectively. Groundnut was a very strong competing crop to blackgram and blackgram to greengram with cross price elasticities of -1.1943 and -1.1201 respectively. The degree of competition of groundnut with mesta was reasonably strong with a cross price elasticity of -0.5255. The competition of greengram with horsegram and horsegram with groundnut was moderate with -0.2184 and -0.2987 cross price elasticities respectively. The degree of competition of sugarcane with paddy and paddy with sugarcane was low eith cross price elasticities 0.0986 and -0.0602 respectively.

Factors influencing cropping pattern changes in Prakasam District

The findings a Table 2 revealed that area under paddy, redgram, bengalgram, chilly and tobacco were positively influenced by their own lagged prices. Lagged prices of competing crops were found influencing the area under jowar, cotton and tobacco negatively. Cotton was found to be the competing crop for paddy and chilly. Chilly was an important competing crop for redgram and cotton. The competing crops for jowar, bajra, bengalgram and tobacco were bajra, bengalgram, jowar and redgram respectively. There was a significant negative effect of rainfall on bajra and redgram areas. Bhatia and Tewari (1990) in their study observed rainfall influencing significantly with a negative sign on different crop acreages.

Increase in gross irrigated area had a significant positive influence on the area under paddy. Singh *et al.* (1997) also observed a positive and significant impact of irrigated area on the paddy acreage. Labour wage rate did not influence any crop significantly. Price of composite fertilizers had a negative significant influence on the area under jowar only, for others, its influence was non-significant.

The response of the area to the changes in its own price and price of competing crops was studied by computing the own price and cross price elasticities. Jowar had a high own price elasticity of 1.6621 followed by bengalgram, paddy and chilly with their respective own price elasticities of 0.9666, 0.7460 and 0.6444. Redgram, tobacco and

Table I. Factors influencing cropping pattern changes in major crops in Vizianagaram district.

S.No.	Crop	Intercept	Regression coefficients: Price of the crop lagged by one year(X_1)	Price of the competing crop lagged by one year (X_2)	Total rainfall(X_3)	Gross irrigated area (X_4)	Labour wage rate(X_5)	Composite fertilizer price(X_6)	$\overline{R}^2$	D value	Competing crop	Own price elasticity	Cross price elasticity
1. Foodgrain Crops													
1.	Paddy	123.3201	0.0340**	-0.0175	-0.0084	0.1935	0.2600	-0.0852	0.564**	0.826	Sugarcane	0.0986	-0.0986
		(22.3953)	(0.0194)	(0.0234)	(0.0140)	(0.1150)	(0.2679)	(2.2932)					
2.	Blackgram	-6.0792	0.0004	-0.01015*	0.0037*	-	-0.0321	0.1844	0.895**	0.992	Groundnut	0.0512	-1.1943
		(2.2467)	(0.0010)	(0.0031)	(0.0017)		(0.0437)	(0.2285)					
3.	Greengram	-0.4945	0.0085***	-0.0153**	0.0009	-	-0.0900	-1.1190*	0.749**	1.130	Blackgram	0.6782	-1.1201
		(4.4743)	(0.0048)	(0.0039)	(0.0035)		(0.0724)	(0.3930)					
4.	Horsegram	19.6868	0.0028	-0.0056	0.0024	-	-0.3877*	2.0562*	0.521**	1.957	Greengram	0.0437	-0.2184
		(11.3298)	(0.0264)	(0.0090)	(0.0087)		(0.1798)	(0.9028)					
II. Non-Foodgrain Crops													
1.	Groundnut	55.3861	0.0816*	-0.0456	0.0228***	-	-0.8590*	-4.0686*	0.603**	1.090	Horsegram	1.1248	-0.2987
		(16.1514)	(0.0225)	(0.0330)	(0.0124)		(0.2911)	(1.6462)					
2.	Sugarcane	1.1697	0.0066**	-0.0017	0.0033	-0.0039	-0.1007*	0.1720	0.826**	1.922	Paddy	0.4276	-0.0602
		(3.2018)	(0.0033)	(0.0114)	(0.0020)	(0.0164)	(0.0383)	(0.3279)					
3.	Mesta	68.9699	0.0162***	-0.0321*	-0.0092	-	-0.2256	1.9592	0.636**	1.770	Groundnut	0.1944	-0.5255
		(8.2183)	(0.0086)	(0.0112)	(0.0065)		(0.1414)	(0.8337)					
4.	Sesamum	2.2503	0.0036*	0.0148	0.0057		-0.2763*	0.1598	0.377***	1.500	Groundnut	0.2171	0.7020
		(6.6014)	(0.0017)	(0.094)	(0.0051)		(0.1308)	(0.6520)					

Note : **, *, *** denote significance at 1, 5 and 10 per cent respectively
Figures in parentheses are standard errors.

Table II. Factors influencing cropping pattern changes in major crops in Prakasam district.

S.No.	Crop	Intercept	Regression coefficients: Price of the crop lagged by one year(X_1)	Price of the competing crop lagged by one year (X_2)	Total rainfall(X_3)	Gross irrigated area (X_4)	Labour wage rate(X_5)	Composite fertilizer price(X_6)	$\overline{R}^2$	D value	Competing crop	Own price elasticity	Cross price elasticity
1. Foodgrain Crops													
1.	Paddy	40.5786	0.2336*	-0.0151	0.0254	0.2857*	0.9959	3.7428	0.450**	0.969	Cotton	0.7460	-0.1830
		(34.109)	(0.1017)	(0.0163)	(0.0301)	(0.1281)	(0.7268)	(3.9144)					
2.	Jowar	159.2815	0.2124	-0.1204*	-0.0358	-	0.6497	-7.1120*	0.853**	1.236	Bajra	1.6621	-0.9120
		(19.6871)	(0.1243)	(0.0564)	(0.0216)		(0.6932)	(2.5401)					
3.	Bajra	75.4611	0.0070	-0.0063	-0.0211*	-	0.2186	-3.1093	0.766**	1.293	Bengalgram	0.0807	-0.2150
		(9.1164)	(0.0237)	(0.0078)	(0.0098)		(0.3764)	(0.9853)					
4.	Redgram	30.3236	0.0182***	-0.0064	-0.0327*	-	0.1864	2.5584	0.802**	1.880	Chilly	0.4597	-0.3011
		(13.3326)	(0.0093)	(0.0039)	(0.0147)		(0.2976)	(1.6481)					
5.	Bengalgram	21.2129	0.0267*	-0.0086	-0.0490	-	1.0625	-1.2732	0.808**	1.134	Jowar	0.9666	-0.1082
		(19.5899)	(0.0106)	(0.0872)	(0.0220)		(0.8665)	(2.3468)					
II. Non-Foodgrain Crops													
1.	Cotton	71.0778	0.0078	-0.0139*	0.0028	-	-0.2849	-1.0665	0.323**	1.804	Chilly	0.2327	-0.5791
		(17.6937)	(0.0104)	(0.0050)	(0.0199)		(0.4285)	(2.5864)					
2.	Chilly	19.7852	0.0058**	-0.0043	0.0013	-	0.0950	-1.0777	0.305**	0.681	Cotton	0.6444	-0.3422
		(5.5982)	(0.0016)	(0.0033)	(0.0063)		(0.1356)	(0.8183)					
3.	Tobacco	42.8173	0.0070*	-0.0229***	0.0075	-	-0.2431	2.1016	0.433**	1.220	Redgram	0.3552	-0.4337
		(12.2263)	(0.0032)	(0.0118)	(0.0140)		(0.3693)	(1.6949)					

Note : **, *, *** denote significance at 1, 5 and 10 per cent respectively
Figures in parentheses are standard errors.

cotton responded moderately to their prices with the corresponding elasticities of 0.4597, 0.3552 and 0.2327 respectively. The response of bajra to its own price was very low at 0.0807.

Jowar had a high competition with bajra with a cross price elasticity of -0.9120, while cotton, tobacco, chilly and redgram indicated moderate competition to chilly, redgram, cotton and chilly with the cross price elasticities of -0.5791, -0.4337, -0.3422 and -0.3011 respectively. The degree of competition of bajra with bengalgram, paddy with cotton and bengalgram with jowar was low with respective cross price elasticities of -0.2150, -0.1830 and -0.1082.

CONCLUSION

It can be concluded that in Vizianagaram district, among all food grain crops studied, lagged price of the crop significantly influenced only the area of paddy and greengram and with respect to non-food grain crops, it influenced significantly the areas of groundnut, sugarcane, mesta and sesame. Gross irrigated area had no influence on either paddy or sugarcane. Among all the crops, groundnut had a high own price elasticity and horse gram with lowest own price elasticity. Highest and lowest cross price elasticities can be observed in the case of bengal gram and sugarcane.

In Prakasam district, within the food grain crops paddy, redgram and bengal gram areas were significantly influenced by their own lagged prices and among the non-food grain crops only chilly and tobacco areas had shown a significant increase because of increase in their own lagged prices. High own and cross price elasticities were seen in jowar whereas lowest own and cross price elasticities were observed in bajra and bengal gram respectively.

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