Volume - 5, Issue- 5, May 2017 IC Value : 56.46 e-ISSN : 2347 - 9671| p- ISSN : 2349 - 0187
EPRA International Journal of Economic and Business Review SJIF Impact Factor(2016) : 6.484
ISI Impact Factor (2013): 1.259 (UAE)

Research Paper

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COTTON ACREAGE RESPONSE TO PRICE IN THE PRE AND POST REFORM PERIOD IN VIRUDHUNAGAR MARKET CENTER OF TAMIL NADU STATE (PART C)

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ABSTRACT

To quantify the influence of price and non-price variables on cotton acreage, two models, the traditional and the Nerlovian adjustment lag models were used for the study area of Virudhunagar in pre and post reform periods. It is evident from the analysis that the coefficient of adjustment (¥) estimated from the equations indicate that in the pre-reform period the peasants in Virudhunagar district take 2 years and two months and in the post reform period they take 4 years and 4 months for full adjustment.

KEYWORDS: *Cotton, crop acreage, rainfall, yield, substitute crop*

INTRODUCTION

Cotton being a cash crop grown for market, price is likely to exert more influence on acreage allocation. Acreage response to price is conditioned by several factors such as rainfall, yield, substitute crop and these factors may differ from one area to another area. To quantify the influence of price and non-price variables on cotton acreage, two models, the traditional and the Nerlovian adjustment lag models were used for the study area of Virudhunagar in pre and post reform periods.

THE DATA

The study covers pre reform period (1971–72 TO 1989–90) and post reform period (1990 – 91 TO 2014 – 15) for which continuous time series data have been made available from the various issues of Government of Tamil Nadu. The estimating model included prices, lagged acreage, yield, rainfall, time trend and substitute crop acreage as independent variables with acreage considered as a dependent variable. The effect of the above six independent variables on cotton acreage in this select region has been examined individually because it is not only the price but the quantum of other variables which are important for acreage allocation of cotton.

The results and interpretations of this analysis are based on two models, the adjustment lag model and the traditional model to obtain the response relation. Non-linear (logarithmic) regression equations have been fitted to the absolute values of the variables. The logarithmic functions gave consistently better fit and therefore for the study area, they were selected for discussion in this paper.

For Virudhunagar cotton market region a set of sixteen equations are presented. The first eight relate to the adjustment lag model using the first four price specifications namely, (a) Twelve - month annual average price in previous year (p_1), (b) Three - month post-harvest average price in previous year (p_2), (c) Three - month pre-sowing average price in current year (p_3), and (d) Average of previous year's post harvest and current year's pre-sowing prices (p_4) with and without a trend value. The remaining eight are the equations based on the traditional model. In the traditional model with no recognition to past acreage, the first four prices are the same as used in the adjustment lag equations and the last four involve three

year average price specifications namely (e) Three - year average of twelve - month annual average price (p_5), (f) Three - year average of three - month post harvest average price (P_6), (g) Three - year average of three - month pre sowing average price (p_7) and (h) Three year average of three - month post harvest and three monthpre sowing average prices (p_8). On the basis of these sixteen functions the best price expectation has been chosen for discussion.

ANALYSIS OF DATA

To start with, simple zero order and first order partial correlations were worked out for Virudhunagar region for the variables used in this study and are given below.

TABLE – 1
ESTIMATION OF ZERO-ORDER AND FIRST-ORDER CORRELATIONS IN PRE-REFORM PERIOD (1971–72 TO 1989–90) AND POST REFORM PERIOD (1990 – 91 TO 2014 – 15)
VIRUDHUNAGAR

PRE-REFORM PERIOD

At	At_1	Yt_1	Wt	Tt	St
1.000	.725(**)	-.238	-.124	.529(*)	-.014
	1.000	-.188	-.399	.681(**)	.083
		1.000	-.138	-.656(**)	.158
			1.000	-.322	-.573(*)
				1.000	.235
					1.000

POST REFORM PERIOD

	At	At_1	Yt_1	Wt	Tt	St
At	1.000	.966(**)	.335	-.342	.984(**)	-.128
At_1		1.000	.300	-.261	.979(**)	-.224
Yt_1			1.000	-.180	.335	-.310
Wt				1.000	-.294	.294
Tt					1.000	-.468(*)
St						1.000

** Correlation is significant at 0.01 level. * Correlation is significant at 0.05 level.

TABLE – 2

ESTIMATION OF SIMPLE PRICE CORRELATION COEFFICIENTS IN PRE-REFORM PERIOD (1971–72 TO 1989–90) AND POST REFORM PERIOD (1990 – 91 TO 2014 – 15) VIRUDHUNAGAR

PRE-REFORM PERIOD

	P1	P2	P3	P4	P5	P6	P7	P8
P1	1.000	.987(**)	.751(**)	.937(**)	.853(**)	.841(**)	.821(**)	.832(**)
P2		1.000	.709(**)	.921(**)	.801(**)	.786(**)	.760(**)	.774(**)
P3			1.000	.928(**)	.959(**)	.963(**)	.961(**)	.964(**)
P4				1.000	.976(**)	.971(**)	.957(**)	.965(**)
P5					1.000	.999(**)	.992(**)	.997(**)
P6						1.000	.993(**)	.998(**)
P7							1.000	.998(**)
P8								1.000

** Correlation is significant at 0.01 level.

POST REFORM PERIOD

		P1	P2	P3	P4	P5	P6	P7
P1	P1	1.000	.920(**)	.601(**)	.849(**)	.893(**)	.881(**)	.860(**)
P2	P2		1.000	.642(**)	.916(**)	.858(**)	.877(**)	.786(**)
P3	P3			1.000	.895(**)	.731(**)	.680(**)	.774(**)
P4	P4				1.000	.885(**)	.870(**)	.864(**)
P5	P5					1.000	.981(**)	.936(**)
P6	P6						1.000	.865(**)
P7	P7							1.000
P8	P8							

* Correlation is significant at 0.05 level.

In pre reform period the correlation between area and lagged area were positive in the study area. This association reveals that a substantial portion of acreage allocation in cotton flows from past behaviour. Equally surprising is the positive correlation found between area and trend in the study region. It was really unique, variables like rainfall and substitute crop acreage emerged with negative signs in Virudhunagar region. The relationship between area and time trend was positive in this market region.

In the post reform period, there was positive association between area and lagged area, area and yield, and area and trend value in Virudhunagar study region. Cotton acreage and rainfall emerged with a negative sign in this select region taken for the study. The relationship of area with substitute crop acreage had a mixture of positive and negative signs.

It may be mentioned that no definite indication could be obtained from the zero order correlations worked out for the acreage and non price variables as the association between them in the study area came to be neither uniform nor powerful, not significant enough to suggest any definite choice.

The extent and direction of association between the relative prices was attempted with the help of simple correlation coefficients. P_1 price showed a very good significant association with P_3 price in Virudhunagar, in pre and post reform periods. All values are positively correlated in the study area. Out of the eight price variables P_3 emerges significantly correlated with remaining price variables in this study area of Tamil Nadu.

Regressions were run for Virudhunagar district and the estimated acreage response function based on the selection of price for this district is given below.

TABLE – 3

ESTIMATED ACREAGE RESPONSE FUNCTIONS WITH DIFFERENT PRICE EXPECTATIONS USED FOR COTTON LINT PRICES IN VIRUDHUNAGAR IN PRE-REFORM PERIOD (1971–72 TO 1989–90) - LOGARITHMIC

Equation No.	Price Expectation used	Constant	Pt_1	At_1	Yt_1	Wt	Tt	St	R^2	Adj. R^2
5.01	P1	-0.964	0.08203 (0.213)	0.609 * (0.367)	0.06139 (0.22)	0.134 (0.217)	0.642 (1.506)	0.07285 (0.242)	0.485	0.175
5.02	P2	0.539	0.01802 (0.18)	0.639 * (0.374)	0.03599 (0.227)	0.143 (0.226)	0.305 (1.46)	0.0859 (0.257)	0.477	0.164
5.03	P3	-6.119	0.2 (0.18)	0.695 *** (0.309)	0.05914 (0.184)	0.194 (0.198)	1.104 (1.19)	0.182 (0.222)	0.574	0.342
5.04	P4	-6.466	0.268 (0.295)	0.584 * (0.347)	0.119 (0.219)	0.13 (0.208)	1.599 (1.803)	0.08809 (0.228)	0.517	0.227
5.05	P1	1.109	0.01185 (0.13)	0.71 *** (0.271)	-0.01246 (0.131)	0.143 (0.208)	-	0.112 (0.216)	0.475	0.237
5.06	P2	1.357	-0.01022 (0.114)	0.692 *** (0.264)	-0.002718 (0.125)	0.151 (0.213)	-	0.111 (0.216)	0.475	0.237
5.07	P3	-1.112	0.0859 (0.131)	0.827 **** (0.273)	-0.06033 (0.13)	0.16 (0.193)	-	0.169 (0.22)	0.541	0.35
5.08	P4	0.479	0.04356 (0.15)	0.745 *** (0.292)	-0.02942 (0.139)	0.139 (0.206)	-	0.125 (0.221)	0.479	0.242
5.09	P1	-1.462	0.188 (0.219)	-	0.272 * (0.194)	0.02394 (0.223)	2.248 ** (1.245)	-0.008488 (0.256)	0.342	0.043
5.10	P2	0.400	0.121 (0.184)	-	0.265 (0.199)	0.01091 (0.23)	1.984 * (1.172)	-0.02413 (0.27)	0.325	0.018
5.11	P3	-2.565	0.159 (0.208)	-	0.261 * (0.185)	0.07573 (0.221)	2.336 ** (1.223)	0.05801 (0.249)	0.379	0.12
5.12	P4	-7.495	0.375 (0.311)	-	0.322 * (0.198)	0.03233 (0.216)	3.192 ** (1.657)	0.03328 (0.243)	0.38	0.098
5.13	P5	-17.556	0.714 ** (0.392)	-	0.357 ** (0.183)	0.117 (0.205)	4.568 *** (1.869)	0.146 (0.235)	0.461	0.216
5.14	P6	-17.718	0.708 * (0.399)	-	0.384 ** (0.191)	0.152 (0.211)	4.589 *** (1.923)	0.12 (0.233)	0.455	0.207
5.15	P7	-13.134	0.553 (0.471)	-	0.341 * (0.207)	0.05258 (0.216)	3.976 * (2.313)	0.117 (0.254)(0.653)	0.376	0.093
5.16	P8	-15.940	0.648 * (0.438)	-	0.366 ** (0.2)(0.094)	0.0978 (0.212)	4.369 * (2.131)	0.123 (0.244)	0.415	0.148

** - Significant at 20% level* *** - Significant at 10% level* **** - Significant at 5% level*

***** - Significant at 1% level*

Figures in the Parenthesis are standard errors

P1 – Twelve – month annual average price in previous year. *P5 – Three – year average of twelve – month annual average price.*

P2 – Three – month post harvest average price in previous year. *P6 – Three – year average of three – month post harvest average price.*

P3 – Three – month pre sowing average price in current year. *P7 – Three – year average of three – month pre sowing average price.*

P4 – Average of previous years post harvest and current year pre sowing prices.P8 – Three – year average of three – month post harvest and three-month pre sowing average price

PRE REFORM PERIOD

Virudhunagar district is the third major market area for cotton in the state. Table 3 provides the regressions relating acreage and other variables including different price specifications. The price coefficients have positive signs both in the Nerlovian adjustment lag model and traditional model. Similar is the case with substitute crop acreage equations 5.01 to 5.04 which give the positive values with respect to lagged acreage, lagged yield, rainfall and trend values. Between these equations, R^2 is the highest for P_3 price over other prices. Hence for the entire state in pre reform period P_3 price is taken into account in the finally estimated cotton acreage response functions. In this lag model results do not support the generally expected positive supply yield response relationship from equations 5.05 to 5.08 (Table 4).

In traditional model all variables are found to be positive except S_t for equations 5.09 and 5.10. R^2 value for P_5 is high under this model considered independently. Estimates of elasticities for acreage response functions calculated for different variables are given in Table 5. The coefficient of adjustment ranges from .7450 to .8410. For P3 price specification the state takes 2 years and 2 months for full adjustment as shown in Table 5.

TABLE – 4
FINALLY ESTIMATED COTTON ACREAGE RESPONSE FUNCTIONS – VIRUDHUNAGAR IN PRE REFORM PERIOD

Equation No.	Price Expectation Selected	Constant	Regression Coefficients						Coefficient of Multiple Determination R^2	Adjusted Coefficient of Multiple Determination on $\bar{R}^2$
			Relative Price P_{t-1}	Cotton Acreage in A_{t-1}	Yield Y_{t-1}	Rainfall W_t	T_t	Substitute Crop S_t		
5.03	P3	-6.119	0.2 (0.18)	0.695 *** (0.309)	0.05914 (0.184)	0.194 (0.198)	1.104 (1.19)	0.182 (0.222)	0.574	0.342
5.11	P3	-2.565	0.159 (0.208)	-	0.261 * (0.185)	0.07573 (0.221)	2.336 ** (1.223)	0.05801 (0.249)	0.379	0.12

** - Significant at 20% level* *** - Significant at 10% level* **** - Significant at 5% level*

***** - Significant at 1% level*

Figures in the Parenthesis are standard errors

TABLE – 5
ACREAGE ELASTICITIES AND COEFFICIENT OF ADJUSTMENT FOR COTTON LINT PRICES IN VIRUDHUNAGAR
IN PRE-REFORM PERIOD (1971-72 TO 1989-90)

Equation No.	Elasticity with respect to prices		Elasticity with respect to yield	Elasticity with respect to weather	Elasticity with respect to substitute crop	~		Coefficient of adjustment (¥)	Years required for 95 percent effect of price
	Short run elasticity	Long run elasticity							
5.03	0.130	0.426	0.297	0.404	0.570	-20.06	0.6557	0.3050	2.234
5.11	0.103	0.103	0.072	0.098	0.138	-2.57	0.1590	-	-

POST REFORM PERIOD

The estimated acreage response function based on the selection of price for Virudhunagar district in the post reform period is given below.

TABLE – 6

ESTIMATED ACREAGE RESPONSE FUNCTIONS WITH DIFFERENT PRICE EXPECTATIONS USED FOR COTTON LINT PRICES IN VIRUDHUNAGAR IN POST-REFORM PERIOD (1990-91 TO 2014 - 15) - LOGARITHMIC

Equation No.	Price Expectation used	Constant	Pt_1	At_1	Yt_1	Wt	Tt	St	R^2	Adj. R^2
6.01	P1	-0.546	0.05434 (0.141)	0.559 *** (0.253)	-0.01461 (0.107)	-0.258 * (0.153)	0.537 *** (0.243)	0.459 ** (0.232)	0.976	0.964
6.02	P2	-1.565	0.09833 (0.108)	0.579 *** (0.245)	-0.001185 (0.105)	-0.275 ** (0.146)	0.536 *** (0.236)	0.512 *** (0.221)	0.977	0.966
6.03	P3	2.059	-0.109 (0.139)	0.507 ** (0.247)	-0.05068 (0.109)	-0.201 (0.15)	0.547 *** (0.238)	0.362 * (0.205)	0.977	0.966
6.04	P4	-0.054	0.02913 (0.144)	0.55 *** (0.254)	-0.01609 (0.111)	-0.249 * (0.154)	0.537 *** (0.244)	0.434 ** (0.225)	0.976	0.964
6.05	P1	-4.724	0.05864 (0.16)	1.095 **** (0.083)	0.09292 (0.108)	-0.36 *** (0.166)	-	0.548 ** (0.26)	0.966	0.954
6.06	P2	-5.716	0.101 (0.124)	1.113 **** (0.077)	0.106 (0.107)	-0.377 *** (0.16)	-	0.6 *** (0.25)	0.968	0.955
6.07	P3	-2.325	-0.09371 (0.16)	1.054 **** (0.072)	0.06172 (0.112)	-0.308 ** (0.164)	-	0.455 ** (0.232)	0.967	0.954
6.08	P4	-4.322	0.03914 (0.163)	1.087 **** (0.08)	0.09302 (0.112)	-0.353 ** (0.167)	-	0.526 ** (0.251)	0.966	0.953
6.09	P1	5.224	-0.00804 (0.157)	-	-0.129 (0.107)	-0.144 (0.164)	1.051 **** (0.08)	0.284 (0.248)	0.966	0.954
6.10	P2	4.189	0.05331 (0.123)	-	-0.121 (0.106)	-0.163 (0.161)	1.073 **** (0.076)	0.339 * (0.243)	0.967	0.954
6.11	P3	7.015	-0.158 (0.153)	-	-0.159 (0.106)	-0.1 (0.158)	1.02 **** (0.068)	0.227 (0.217)	0.969	0.957
6.12	P4	5.573	-0.03255 (0.16)	-	-0.134 (0.109)	-0.137 (0.164)	1.045 **** (0.076)	0.269 (0.239)	0.967	0.954
6.13	P5	7.131	-0.164 (0.217)	-	-0.15 * (0.107)	-0.113 (0.161)	1.025 **** (0.072)	0.222 (0.23)	0.968	0.956
6.14	P6	6.482	-0.105 (0.188)	-	-0.147 * (0.109)	-0.123 (0.161)	1.035 **** (0.07)	0.24 (0.232)	0.967	0.955
6.15	P7	7.627	-0.21 (0.226)	-	-0.146 * (0.104)	-0.07721 (0.17)	1.003 (0.081)	0.192 (0.235)	0.969	0.956
6.16	P8	7.043	-0.154 (0.21)	-	-0.149 * (0.107)	-0.104 (0.165)	1.022 **** (0.075)	0.217 (0.235)	0.968	0.955

** - Significant at 20% level* *** - Significant at 10% level* **** - Significant at 5% level*

***** - Significant at 1% level*

Figures in the Parenthesis are standard errors

P1 – Twelve – month annual average price in previous year. *P5 – Three – year average of twelve – month annual average price.*

P2 – Three – month post harvest average price in previous year. *P6 – Three – year average of three – month post harvest average price.*

P3 – Three – month pre sowing average price in current year. *P7 – Three – year average of three – month pre sowing average price.*

P4 – Average of previous years post harvest and current year pre sowing prices.P8 – Three – year average of three – month post harvest and three-month pre sowing average price

TABLE – 7

FINALLY ESTIMATED COTTON ACREAGE RESPONSE FUNCTIONS – VIRUDHUNAGAR IN POST REFORM PERIOD

Equation No.	Price Expectation Selected	Constant	Regression Coefficients						Coefficient of Multiple Determination R^2	Adjusted Coefficient of Multiple Determination $\bar{R}^2$
			Relative Price P_{t-1}	Cotton Acreage in A_{t-1}	Yield Y_{t-1}	Rainfall W_t	T_t	Substitute Crop S_t		
6.03	P3	2.059	-0.109 (0.139)	0.507 ** (0.247)	-0.05068 (0.109)	-0.201 (0.15)	0.547 *** (0.238)	0.362 * (0.205)	0.977	0.966
6.11	P3	7.015	-0.158 (0.153)	-	-0.159 (0.106)	-0.1 (0.158)	1.02 **** (0.068)	0.227 (0.217)	0.969	0.957

** - Significant at 20% level* *** - Significant at 10% level* **** - Significant at 5% level*

***** - Significant at 1% level* *Figures in the Parenthesis are standard errors*

TABLE – 8
ACREAGE ELASTICITIES AND COEFFICIENT OF ADJUSTMENT FOR COTTON LINT PRICES IN VIRUDHUNAGAR IN POST-REFORM PERIOD (1990-91 TO 20014-15)

Equation No.	Elasticity with respect to prices		Elasticity with respect to yield	Elasticity with respect to weather	Elasticity with respect to substitute crop	~		Coefficient of adjustment (¥)	Years required for 95 percent effect of price
	Short run elasticity	Long run elasticity							
6.03	-0.092	-0.186	-0.118	-0.145	-0.201	4.18	-0.2211	0.4930	4.410
6.11	-0.133	-0.133	-0.084	-0.104	-0.144	7.02	-0.1580	-	-

In this period both three month post harvest price in previous year and three month pre sowing price in the current year showed the same best results (Table 6). Of these two prices P_3 price alone was selected for the analysis and the short run and long run elasticity withrespect to price obtained from the adjustment (Table 7) model was low but positive. There also a good response with respect to yield, weather and acreage elasticity with respect to substitute crop. This district takes 4 years and 4 months for full adjustment (Table 8).

CONCLUSION

Price thus plays an important role in acreage allocation. It is evident from the analysis that the coefficient of adjustment (¥) estimated from the equations indicate that in the pre reform period the peasants in Virudhunagar district take 2 years and two months and in the post reform period they take 4 years and 4 months for full adjustment.

REFERENCES

1) *Walsh, R.M., Response to Price in Production of Cotton and Cotton – Seed, Journal of Farm Economics, Vol. 26, 1944, pp.359 – 372.*
2) *William Oliver Barnes, Jr., Acreage Response of South Eastern Upland Cotton to Federal Policy in the Freedom to Farm Era, A Research Paper Submitted to the Faculty of The University of Tennessee at Martin Fulfilling Requirements for the Degree of Master of Science, Systems Science in Agriculture, December 2012.*
3) *Director of Statistics, Government of Tamil Nadu, Season and Crop Reports of Tamil Nadu – Various Issues*