An Application of Distributed Lag Models to Major Crops in Anantapur District of Andhra Pradesh

A.V.S. Raghavaiah[1], Dr. K. Balaji[2]

[1]Associate Professor, Department of Statistics, S.K.S.C. Degree College, Proddatur, Kadapa (Dist), AP, INDIA.

[2]Associate Professor, Anantalakshmi Institute of Technology and Sciences, Anantapur, Anantapur (Dist), AP, INDIA.

Introduction:

Agriculture as a basic industry has been playing a predominant role in Indian economic development and its contribution occupies one third share of national dividend. It also provides major part of the employment to the people, through industrial and territory sectors which are growing significantly after economic reforms. There had been considerable fluctuations in area of crops were caused by variations in prices, weather conditions, availability of irrigation and marketing facilities and other inputs.

Farmers were motivated by number of economic, technological and sociological factors in land allocation decision. A high price may not tempt a farmer to allocate his land under a particular crop nor a low price act as a deterrent. A subsistence farmer may not shift a larger portion of his land under one crop which was more profitable and thereby run a risk and face uncertainty. Among the risk factors price risk, ad yield risk are the two main factors which influence the area allocation among different crops. In recent periods the farmers objected has been not only to maximize profits but also to minimize losses and risk.

Out of many crops cultivated in Anantapur district ground nut is one of the important commercial and food crops grown in both khariff and rabi seasons mainly under irrigation and partially under rain fed in black soil areas in different parts of Anantapur district.

In this paper an attempt was made to study supply response of major commercial and food crops like groundnut and paddy respectively I Anantapur district of Andhra Pradesh.

Objectives:

- To determine the supply response of some selected crops paddy, groundnut in Anantapur district of Andhra Pradesh.
- To calculate the short run and long run elasticity's of prices of the above crops.

Methodology:

To fulfill our objectives, the hectareage supply equations have been estimated with the help of Nerlovian partial adjustment, Adaptive expectation model. The farmer desires the hectareage to be planted under different crops on the basis of expected feature price. The farmer partially adjusts the current planted area to the desired area in the current production year due to techno- economic and institutional constraints. Nerlove

introduced the element of dynamism by incorporating the concept of distributed lags in the analysis of the hectareage of the agricultural commodities. He defined the long run supply response function as follows:

$A_t^{\Theta} = a_0 + a_1 p_{t-1} + v_t$ ----------1

A_t^{Θ} = Desired long run hectareage

p_{t-1} = Lagged price of the crop

v_t = Error term

a_0, a_1 are the constants and the price co efficient respectively.

The actual area under the crop was adjusted in proportion to the difference between the long run desired level area and actual area under the crop.

$A_t - A_{t-1} = B(A_t^{\Theta} - A_{t-1}) 0<B\leq$ ----------2

B is the Co efficient of adjustment

Substituting (1) in (2) we get

$A_t = C_0 + C_1 P_{t-1} + C_2 A_{t-1} + U_t$ ----------3

Where

$C_0 = a_0 B$, $C_1 = a_1 B$, $C_2 = (1-B)$

$U_t = BV_t$

The equation (3) is helpful in the estimation of short run and long run price elasticity's and they can be obtained by using relations:

$SRE = C_1 (\bar{P}_{(t-1)}/\bar{A}_t)$ ---------- 4

$LRE = (C_2/(1-C_2)) (\bar{P}_{(t-1)}/\bar{A}_t)$ ---------- 5

Where $P_{(t-1)}$ and $\bar{A}_t$ are the means of $P_{(t-1)}$ and A_t respectively

Along with the above model, we have used another model by using some other variables like risk which also have some effect on area under the particular crop under the study.

The model is as follows:

$A_t^{\Theta} = a_0 + a_1 P_t^{\Theta} + a_2 Y_{t-1} + a_3 CVp + a_4 CV_r + a_5 R_t + a_6 I_t + a_7 D + U_t$ ---------- 6

Substituting $P_t^{\Theta} = P_{(t-1)}$ in equation (6)

$A_t = C_0 + C_1 P_{t-1} + C_2 Y_{t-1} + C_3 CVr + C_5 R_t + C_6 I_t + C_7 D + C_8 A_{t-1} + U_t$ ---------- 7

Where

A_t = the actual area planted in 1000 hectares under the crop

T = t^{th} production period

P_{t-1} = Lagged farm harvest price of the crop (Rs./Q)

Y_{t-1} = yield of the crop lagged by the year (Kg/hct)

CVp = Co efficient of variations of the prices of the crop concerned for the year t-1, t-2 and t-3 used as the measure of price risk.

CVr = Co efficient of variations of the prices of the crop concerned for the year t-1, t-2 and t-3 used as the measure of yield risk.

R_t = Rain fall of the current year (millimeters)

D = Dummy variable to pick up the effect of left out variables of mew technology. Thus the dummy will specify the constant terms for the two period i.e., 1958-1997, and 1997-2010.

U_t = stochastic disturbance term.

C_is = Regression co efficient

Both the linear and log linear models for the equation (3) and (7) were fitted to the data and the results discussed to evolve a better model. To test the serial correlation, Durbin- Watson test statistic was not appropriate in this model because it includes a lagged dependent variable. Durbin proposed a test statistic known as 'h' statistic correlation in lagged models.

$$h= (1-\frac{1}{2}d)\sqrt{\frac{n}{(1-n)V(\acute{C})}} \quad \text{---------- 8}$$

where

d= Durbin Watson test statistic

n= size of the sample

$V(\acute{C}_8)$= estimate of variance of C_8

DATA

The time series data from the year 1985-2010 have been used in our study. Data related to area, yield, farm harvest price and rain fall were collected from various issues of the "season and crop reports of Andhra Pradesh" and " Statistical Abstract of Andhra Pradesh" (issued by the director, bureau of economics and statistic, Government of Andhra Pradesh).

Calculation of short run and long run Elasticities:

We calculated the supply of short run and long run elasticity for the above data and the results were enumerated in the following table:

Short- run and long- run elasticity			
Crop	Elasticity of supply SRE	Elasticity of supply LRE	Co efficient of adjustment
Paddy	0.05794	0.06353	1.059
Ground nut	0.13316	0.31177	0.728

From the above table we have observed that the short run and long run price elasticity is more in the case of ground nut followed by paddy. The co efficient of adjustment is more in the case of paddy followed by ground nut.

Conclusion

The decisions by the farmers relating to the cropping pattern are influenced by the prices they get for various farm products. Rationality is one of the basic underlying assumptions of economic behaviours of the farmers. In addition to the prices, the farmers are also influenced by their own consumptive requirements of commercial and food crops. Since monsoon dependent agriculture is a gamble, the farmers in backward region which are affected by frequent fluctuations in rainfall have to be extremely cautions in their farming

operation. For Anantapur district the coefficient of lagged yield is positive for both paddy and ground nut crops. The risk factor of the price is negative and risk factor of ground nut is positive. So we conclude that the lagged area is positive for ground nut crop except paddy but significant in the case of groundnut.

References:

1. Cummings, John Thomas, "the Supply Responsiveness of Indian Farmers in the Post Independent Period: Major cereal and cash crops", Indian Journal of Agricultureal Economics, Vol-30 Issue-1, January-march 1975.
2. Dayanatha Jha, "Aceage Response of Sugarcane in Factory Areas of North Bihar", Indian Journal of Agriculture Economics, Vol-25, Iissue-2, January-March 1970.
3. Kaul, J.l. Sindhu, D.S. "Acerage Response to prices for major Crops in Punjab- An Econometric Study", Indian Journal of Agricultural Economics, Vol-22, Issue-4, October-December 1997.
4. Raj Krishna, "Farm Supply Response in India- Pakisthan: A Case Study of the Punjab Region". The Economic Journal, Vol-24 Issue-1, January-March 1968.
5. Subba Rao.K. " Farm Supply Response- A case Study of Sugarcane in Andhra Pradesh". Indian Journal of Agricultural Economics, Vol24, Issue-1, January-March 1969.
6. Satyanaraya Reddy.k and Bathaiah.D, "An Econometric Analysis of Hectareage Response of Major Crops: A Case sStudy of Telangana Regionof Andhra Pradesh", Decision Vol-14, Issue-1 January-March 1987.