

Abstract of Doctoral Dissertation

Supply Response of Sugarcane in Andhra Pradesh*

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Agriculture plays an important role in economic development of any economy and India is no exceptions in this regard. In the Indian economy, the most important source of livelihood is the agricultural sector. It contributes approximately 37 per cent to the country's gross value added and the sector has been growing at about 3 per cent per annum. What is important from industrialisation point of view is the generation of marketable surplus. According to Maurice Dobb "there is a reason to suppose that it will be the marketed surplus of agriculture, which plays the crucial role in under-developed countries in setting the limits to the possible rate of industrialisation". It is to be noted that "industrial progress cannot be achieved, without agricultural advancement and progress, unless we are self-sufficient in agriculture, we cannot have the where-withal to advance in industries".

Price play an important role in the selection of crops and generation of marketed surplus. Generally higher prices are expected to result in a larger output. Prices are therefore, among the most important determinants of the area under different crops. In economic analysis of the farm supply response, price is considered to be the critical economic factor that determines farmers production decisions.

Dalton and some others argue that farmers in underdeveloped countries need only a little amount of cash and therefore, the price has no impact on agricultural output.

According to response group of economists like Rajkrishna, Dharm Narain and others found that farmers have responded favourably to changes in prices. They argued that the response of acreage to changes in relative price is a good indicator of the price responsiveness.

For this purpose there is a need to identify the factors which influence the farmers decision to allocate more land to sugar-cane. Therefore, in this part of our analysis, we have made a modest and humble efforts to identify the factors which will enable to achieve the planned targets of the sugar-cane.

In this study an attempt is made to analyse the factors responsible for the cultivation of sugar-cane crop in Andhra Pradesh.

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Importance of Sugar-cane

Sugar is an important item of consumption even to a common man. Thanks to the ever growing habit of tea and age old consumption of a variety of sweets. The jaggary is known to Indians for a long time even before the most Sugar-cane producing countries of the world today. There are ups and down in the sugar production in the country along the Northern States such as Bihar and Uttar Pradesh, Andhra Pradesh is one of the major sugar-cane growing states in India. During the period 1973-74 to 1989-90, there was a sea-change in the cropped area under the sugar crop in Andhra Pradesh.

A striking development in Andhra Pradesh is that, the area and production of sugar-cane has been gradually declining in recent years, on account of unremunerative cane prices, although very good varieties of sugar-cane suitable for various agro-climatic situations with high percentage of recovery are available. Research on sugar-cane supply response is relevant in the present context of its crisis, because sugar-cane is one of the important commercial crops.

The supply of sugar-cane to a factory depends upon the area under Sugar-cane crop in the region. Sugar-cane area data sowing climatic conditions of the region, the changing acreage under sugar-cane. The area under sugar-cane should be augmented or the cane production should be increased by increasing the yield and secondly ensuring that cane produced is supplied to the factories regularly.

The sugar-cane crops faced with number of problems, viz., irrigation, facilities available, fertilizers, labour. Generally, higher prices are expected to result in a larger cultivation of area under sugar-cane. If this were to be true, why have agricultural prices in India and other less developed countries too failed to enthuse the production sufficiently? Have agricultural prices no impact on agricultural growth which is the essential pre-requisite for economic development of less developed countries.

To formulate and analyse our problem, we have referred to the studies on supply response in Andhra Pradesh as well as to other regions on Sugar-cane crop and other crops. Unfortunately, with regard to the supply response of sugar-cane in Andhra Pradesh only a few studies are undertaken for different time periods. In this state the establishment of sugar factories is increasing. Therefore, the study of supply response (to price-non-price variables) would be of great importance in formulating a suitable price policy for sugar-cane crop.

Objectives

1. To estimate the acreage response of sugar-cane in Andhra Pradesh to price changes.
2. To examine the relative importance of price, yield, rainfall and irrigation on the area sown with Sugar-cane.
3. To examine whether there are differences in the supply elasticities among the three regions of Andhra Pradesh, viz., Telangana, Rayalaseema and Coastal Andhra.

Hypothesis

The following hypothesis are proposed to be tested in the study:

1. Positive relation exists between area cultivated with sugar-cane and relative prices of sugar-cane. This means that increase in relative price of Sugar-cane in t-1 year leads to an increase in the area cultivated with Sugar-cane in 't' years;
2. Positive relationship exists between area cultivated under sugar-cane and irrigated area. This means that, increase in the area irrigated results in an increase in the area cultivated under Sugar-cane;
3. Positive relationship exists between Sugar-cane cultivation and rain fall. This means that higher the rainfall in a year higher will be the area allocated for Sugar-cane cultivation.

Time Period and Data Base

It is a time series analysis and is intended to cover the period 1973-74 to 1989-90. The year 1973-74 is taken as base period of study because it is the year in which Fifth Five Year Plan was launched. In this plan agriculture and rural development were given importance. Further, it is this year by which the gains of Green Revolution were consolidated the farmers were encouraged to cultivate cash crops such as Sugar-cane due to prevalence of high prices. More importance of this year, the Fifth Plan was started, this plan given importance to poverty.

The year 1989-90 was chosen as the end period of the study because it is the last year of Seventh Five Year Plan and the published data on which this study is based is available upto 1989-90 when this problem was taken up for study. The study is based on the secondary data collected from the reports published by the Bureau of Economics and Statistics, Centre for Monitoring Indian Economy, Reports of the Government of India. Season and Crop Reports for various years. Sugar-cane price data are obtained from the office of the Directorate of Sugar input price index, Fertilizer Price Index, NPE for the period 1973-74 to 1989-90.

Methodology

Five districts have been chosen in Andhra Pradesh for the study. The basis for the selection of these districts is the highest average acreage under sugar-cane during the period of the study. The districts thus selected are Nizamabad, Medak, West Godavari, Vishakhapatnam and Chittoor. These districts represent the three regions of the State of Andhra Pradesh. Nizamabad and Medak are from Telangana (2 out of 10 districts), West Godavari and Vishakhapatnam are from Coastal Andhra (2 out of 9 districts) and Chittoor from Rayalaseema (1 out of 4 districts). These five districts account for 65 per cent of the Sugar-cane cultivated area in Andhra Pradesh. The district-wise data is presented in the equation, i.e., the response of area cultivated under sugar cane (dependent variable) has been worked out in response to independent variables viz., relative price, relative yield, annual rainfall in milli metres (mm), total irrigated area, fertilizer price.

Techniques used

The present study adopts multiple regression technique of Nerlovian⁹ type of lagged adjustment model. The form of which is as under

$$\begin{aligned}
 X_t &= a + b_1 P_{t-1} + b_2 Y_{t-1} + b_3 R_t + b_4 I_{t-1} + b_5 T \\
 &\quad + b_6 P_{t-1} Y_{t-1} + b_7 R_{pi} + u_t \quad (1)
 \end{aligned}$$

the final equation of the model can be obtained as follows

$$\begin{aligned}
 X_t - X_{t-1} &= B(X_t - X_{t-1}) \\
 X_t &= B(X_t - X_{t-1}) + X_{t-1} \\
 X_t &= BX_t - BX_{t-1} + X_{t-1} \\
 X_t &= BX_t - X_{t-1} (1-B) \quad (2)
 \end{aligned}$$

By substituting equation 1 in place of X_t in equation 2, we can get the final equation of the Model. This is as follows:

$$\begin{aligned}
 X_t &= B(a + b_1 P_{t-1} + b_2 Y_{t-1} + b_3 R_t + b_4 I_{t-1} + b_5 T \\
 &\quad + b_6 P_{t-1} Y_{t-1} + b_7 R_{pi} + X_{t-1} (1-B) + BU_t \quad (3)
 \end{aligned}$$

where

X_t = desired standard irrigated area under the crop studied in time 't'

X_t = Actual standard irrigated area under the crop studied in time 't'

X_{t-1} = standard irrigated area under the crop studied, in time 't-1'

a = constant

P_{t-1} = Relative farm harvest price of sugar-cane lagged one year.

P_s/P_p ,

P_s = sugar-cane price,

P_p = paddy price

Y_{t-1} = Relative yield of sugar-cane with one year lag

Y_s/Y_p ,

Y_s = Yield of Sugar-cane

Y_p = Yield of paddy

R_t = Rain fall

I_{t-1} = total irrigated area under crop with one year lag.

T = Trend variable

$P_{t-1} Y_{t-1}$ = lagged relative income per hectare

R_{pi} = relative price of Fertilizer price

U_t = the error term

B = Nerlovian adjustment factor. The Nerlovian coefficient of adjustment "B" is one minus the coefficient of lagged dependent variable. Its value usually lies between zero and one ($0 < B < 1$). Implicit meaning of ($0 < B < 1$) is that, farmers are able to change the acreage of a crop in any year only to the extent of fraction "B" i.e., difference between the acreage they

would like to plant and the acreage actually planted in the preceding year 'B' therefore is an indication of how fast the farmers are adjusting to their expectations. The value of 'B' close to unity indicates that the adjustment process is very fast. When the value of 'B' is close to zero the implication is that the adjustment process is very slow to the changing prices and other non-prices factors. If the value of 'B' is greater than one it would mean that the farmers over adjust to the planned acreage.

Economic Development of Andhra Pradesh

The pace of agricultural development in Andhra Pradesh has been explained from 1973-74 to 1989-90 - plan-wise and also for the 17 year period as a whole. Compound growth rates and indices have been made use of for the purpose for each of the following variables, Viz., total irrigated area under all crops, net irrigated area, irrigated area under sugar-cane, area under food and non-food crops and yield per hectare of sugar-cane. These have been taken indicators of agricultural development for the 17 years period.

Total irrigated area has shown a positive trend over various plans in the State of Andhra Pradesh for the 17 year period. Net irrigated area also has shown positive growth rate. Total cropped area has shown a simple negative growth rate for the 17 year period as a whole, but has shown positive growth rate in the Sixth and Seventh Five Year Plans. Irrigated area under sugar-cane has shown a simple negative growth overall but plan-wise, it has recorded positive rates for the Fifth and Sixth Plans. If one considers that irrigation is the major determinant of agricultural development, one can say that the process of agricultural development in Andhra Pradesh is moving forward at a slower rate.

The area under food crops has shown a positive trend during the Sixth Five Year Plan. For the 17 year period it is slightly negative. For non-food crops, the overall growth rate for the 17 years period has shown a positive trend. This shows that the emphasis, over the past two decades, has moved from food-crops to non-food crops.

The area sown more than once has recorded significant improvement in the 17 year period. This means that the farmers have resorted to intensive cultivation in preference to extensive cultivation. The net sown area has shown a nominal negative trend.

In the present study, the relative importance of price and non-price factors has been estimated by using regression coefficients and elasticities of price, yield, rainfall and irrigation, for each of the five sample districts and for Andhra Pradesh as a whole. Different sets of equations have been used for this purpose.

Findings

1. The results show that the influence of relative price is significant in affecting acreage in all the sample districts as well as for the State of Andhra Pradesh as a whole except in West Godavari (At 10 per cent level of significance). Thus, price-acreage relationship is positive.

This means that if the price is enhanced, the production of sugar-cane might improve considerably. The price elasticity does not indicate any regional pattern as such.

2. Our results suggest that Andhra Pradesh as a whole yield sensitivity is insignificant. However, in the “sugar-cane” districts, the yield sensitivity is positive and significant. (‘Sugar-cane’ districts are the districts which account for 65 percent of the cane acreage in Andhra Pradesh). This difference in the estimates suggests that the yield sensitivity is more certain and likely in districts where sugar-cane is an important crop.
3. It is found that the influence of rainfall on sugar-cane acreage is not significant for A P as a whole and in Medak and Chittoor districts. As regards the other districts, the influence of rainfall is significant and positive. The short-run elasticity of cane acreage with respect to rainfall is highest in Nizamabad followed by Vishakhapatnam.
4. The effects of irrigation are much more certain and positive for A P as whole, and in all districts except in the Coastal districts. This might be owing to the fact that irrigated area is high and more stable in the Coastal belt. In the sugar-cane districts of Telangana, the farmer’s responsiveness to irrigation is very high. Thus, our result shows that the acreage under sugar-cane in these districts is likely to grow at a fast pace if irrigational facilities improve in these districts.
5. On the whole, with the possible exception of irrigation, there does not appear to be any clear regional pattern in the variation of supply elasticities. In the case of irrigation, the Telangana farmers more responsive than the farmers in Coastal region. It appears that the dominance of rice in West Godavari district has its impact in affecting the acreage under sugar-cane. That might be the reason for the price acreage relationship is not being significant in West Godavari.

Hypothesis I

The study reveals significant and positive influence of relative price on sugarcane acreage in Andhra Pradesh as well as sample districts, except West Godavari. Here (West Godavari) the influence of price on acreage is insignificant.

Hypothesis II

The effects of rainfall are not significant in Andhra Pradesh as a whole as well as Medak and Chittoor. In Nizamabad and Vishakhapatnam however, rainfall exerts positive and significant influence. The influence of rainfall in West Godavari is less certain. It is significant and positive only at 10 per cent level.

Irrigation exerts positive and significant influence for Andhra Pradesh as a whole as well as Nizamabad, Medak and Chittoor. Its influence is not

significant in West Godavari and Vishakhapatnam.

Suggestions

1. Incentives by way of enhanced prices for sugar-cane crop will go a long way in increasing sugar production. The farmers will get adequate remuneration for their toil.
2. Irrigation facilities need to be improved in the rain-fed areas where it is essential in affecting sugar-cane acreage. The increased facilities might induce the farmers to increase acreage.
3. Improved technological innovations will boost the sugar-cane production. Hence, the Government should explore ways to make available the same to the farmers.
4. A holistic approach is needed to understand the problems of farmers growing sugar-cane. Other factors than price like, high yielding variety seeds pesticides, fertilizers, are equally important in attaining the targeted level of sugar-cane production.
5. While framing the agricultural policy, the government needs to keep in mind that the food crop, non-food crop differentiation should not be allowed to be left to the fate of the farmers. The Government should follow a balanced course.

Chapter Scheme

The study is divided into five chapter as detailed below :

Chapter I deals with the relevance of the study, statement of the problem, the hypothesis directing the course of the study, sample design and methodology, etc.

Chapter II takes up the responsibility to review of the various past studies related to the present study of supply response.

Chapter III reveals agricultural development in Andhra Pradesh, growth structure and trends in brief, describes the importance of sugarcane in particular.

Chapter IV is devoted to an analysis of the supply response of sugarcane and also compared with other studies.

Chapter V deals with the presentation of findings, conclusions and suggestions for policy formulations.