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IMPACT OF MAJOR FARM INPUTS ON PRODUCTIVITY OF SUGARCANE: A CASE STUDY IN TEHSIL KOT ADDU, PUNJAB, PAKISTAN

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ABSTRACT:- The study is based on primary data collected from sugarcane growers to find out the affect of major farm inputs on the productivity of sugarcane in Tehsil Kot Addu (Punjab). The data was collected from 70 sugarcane growers during 2013 harvesting. The costs of land preparation, DAP, urea, irrigation, FYM, seed and labor for harvesting were the significant factors which affect on the proceeds of sugarcane growers. The results revealed that costs of land preparation, DAP and urea were highly significant at 1% level with positive coefficients 0.94, 0.23 and 0.76, respectively. The cost of FYM was significant at 1% level with negative impact on sugarcane productivity (-0.07). The coefficient of multiple determinations R^2 was 0.72, which designated that 72% deviation in the productivity of sugarcane was elucidated by all instructive variables and the adjusted R^2 was 0.71. To increase the output of sugarcane in the country, government may resolve the identified hurdles by providing subsidy on major inputs to raise the returns of sugarcane farmers.

Key Words: Sugarcane; Farm Inputs: Productivity; Land Preparation, Fertilizers; Irrigation; Seed; Labour: Pakistan.

INTRODUCTION

In Indo-Pak subcontinent, agriculture is the most imperative and rewarding economic activity since ancient times. Agriculture as the key sector is the main driving force for the growth and development and the basic source of livelihood for the population of Pakistan. This part gives almost 21% to the GDP and occupies about 45% of the total work strength. It has an imperative role in making sure food security, economic enlargement and sinking poverty. The quality of life of the people of Pakistan can be improved by making agriculture a proficient, productive and profitable sector (GoP, 2013).

Sugarcane is an imperative foundation of revenue and service for the agricultural society and is the second main cash crop of Pakistan. Its share in value added agriculture and GDP is 3.8% and 0.9%, respectively (GoP, 2013).

Sugarcane is one of the major and ranked third largest in terms of area among 13 crops being cultivated in Pakistan (Qureshi, 2004). Pakistan ranks at the fifth position in production of sugarcane with 5.47 m t after Brazil (51.4 m t), India (35.5 m t), China (10.63 m t) and Thailand (6.43 m t) (FAO, 2009).

During 2007-08, the utmost creation was documented in Punjab with an average yield of 61.41 t ha^{-1},

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while the lowest of 51.37 t $ha^{-1}$was recorded in Khyber Pakhtunkhwa. In Punjab sugarcane yield obtained is comparatively higher than Sindh and Khyber Pakhtunkhwa (Khushk, 2008).

Sugarcane production is a multifarious procedure and be able to envisaged as a purpose of numerous factors. The awareness of the comparative significance of the reserve contribution influencing sugarcane production is essential for the sugarcane growers for introducing beneficial alter in their process at the micro level, and for the strategy maker for creating plans to improve agricultural efficiency depended on resonance monetary values at the macro level. Production techniques such as, planting time, soil type, different varieties, use of inputs and ease of use of irrigation water; have significant blow on sugarcane production. Whereas examining the input costs and productivity association of sugarcane, the vital input expenses such as, DAP, urea, irrigation, FYM, cost of seed and labor used for harvesting were measured. It has been squabbled that there are variety of troubles in estimation of output and input association by means of field data set, as the data of diverse factors are not controlled as these variables are controlled in a trial (Upton, 1996). The ecological situations and administrative approach differ from one farm to a new eventually; these aspects influence the crop productivity.

Literature exists on sugarcane crop focusing mainly on their agronomic aspects. Tayyab (1972) analyzed the price movements of eight agricultural commodities during 1961-1970. The study estimated the average seasonal wholesale prices, retail prices and seasonal variation index of eight commodities namely wheat, maize, milk, eggs, potatoes, masoor, chilies and *gurr*. Singh (1979) reported an enhancement in sugarcane yield due to intercropping of sugarcane with onions. They reported that cane yield increases due to intercropping of sugarcane with onions which depicts an increase in total income over sugarcane planted alone. Iqbal (1979) analyzed the production of sugarcane, *gurr* and the percentage contribution of sugarcane to sugar and gurr making and found that high prices of *gurr* would transfer sugarcane to *gurr* making and would directly affect the production of sugar in Khyber Pakhtunkhwa Province. Asif et al. (2005) found that sugarcane production is encouraged by the policy incentives as export promotion for sugar while it is discouraged as import substitution sugar. The analysis further revealed that land rent was the major cost item of cane production, indicating its scarcity and high opportunity cost. Hussain et al. (2006) concluded that Pakistan has no relative benefit in producing sugar at export equivalence prices (price risk scenario); though, crop is grown as an import replacement crop to provide the requirements of sugar manufacturing.

The main objectives of the present study is to find out the impact of major inputs on productivity of sugarcane crop in Tehsil Kot Addu of Punjab, Pakistan and to make some appropriate suggestions in the light of the findings of the study to promote sugarcane crop there.

MATERIALS AND METHOD

The research study was carried out with primary data composed by taking interviews. Questionnaires were used to collect primarily data from sugarcane growers of the Tehsil Kot Addu of Punjab, main sugarcane cultivating province of Pakistan. A field survey method was chosen because it is convenient and can collect wide range of information required for this study. Many issues can be examined by means of this method (Gall et al., 1996). The field survey technique gives the map for the research study and in general structure for gathering data. The method comprises source of data, area of study, sampling procedure, collection of data and analysis of data.

Procedure of Data Collection

The basic primary data were gathered from the sugarcane growing farmers on socioeconomic factors and major farm inputs for sugarcane of the respondents on a well structured questionnaire during the crop year 2013. This research was conducted in Tehsil Kot Addu of district Muzaffar Garh. The questioning with farmers was conceded out by confronting each other dialogues, which permitted incredibly comprehensive insights for growing sugarcane in the study area. The interviews of 30, 20 and 20 sugarcane growers in villages Sheikh Umer, Bangla Machi and Manhan Sharif, respectively were carried out from November to December, 2013.

Analysis of the Data

After finishing the field survey for data, the collected data were edited and shifted from the questionnaires into spreadsheet as a database folder. The factors within the database file pass on to the particulars of every question in the questionnaire. To measure the productivity returns is depend on the analysis of production expenditure for sugarcane.

Production Function Analysis

One way to establish which variables are vital in the producing sugarcane output is to compute elasticities of sugarcane output with reverence to these input variables. These elasticities are originating by estimating a production function with a suitable efficient form. For this rationale, the present study computes a Cobb-Douglas prod-uction function. This condition has the benefit that it produces straight estimates of production elasticities with esteem to a range of inputs. Therefore a Cobb-Douglas kind production function was applied to compute the production function from a data set of sugarcane producers survey carried out during, 2013.

This method was usually applied to review input and output associations (Chennareddy, 1967). This technique has simple to interpret results also gives an adequate degree of freedom for numerical testing (Heady and Dillon, 1961; Griliches, 1963).The research study suggests the subsequent arrangement of the production function as described in following equation.

$$\ln Yt = \beta_1 + \beta_2 \ln Lt + \beta_3 \ln Dt + \beta_4 \ln Ut + \beta_5 \ln IRRIt + \beta_6 \ln FYMt + \beta_7 \ln SRt + \beta_8 \ln Lht + ui$$

where,

Yt = Sugarcane productivity
Lt = Cost of land preparation per acre
Dt = Cost of DAP per acre

Ut = Cost of urea per acre
IRRIt = Cost of irrigation per acre
FYMt = Cost for FYM per acre
Srt = Cost of seed per acre
Lht = Cost of labor for harvesting per acre
ui = Error term

RESULTS AND DISCUSSION

Socio-economic Factors

Age Group of the Farmers

Age plays a vital role in the rejection or selection of new practices and modern technology. Person's age is accepted to have great contribution towards personal learning, perso-nality development, attitude and such properties adapted to a person's skills and experience over his life time and help out in correct judgement. It was observed that majority (53%) of the respondents belong to the age group of 41-50 years who were the middle aged persons of the society and showed more interest in sugar-cane cultivation. Age group of 20-40 years was 23% respondents and above 51 years of age were 24% respondents.

Education Level

Education performs a vital role in the use of modern technology as educated people are more efficient as compared to the uneducated. Most of the farmers (51%) had primary and middle education, 10% were matriculate and above and 39% were illiterate.

Farming Experience

Farming experience data revealed that 47% sugarcane growers are involved in farming from last 16-30 years, followed by 33% who have more than 30 years farming experience while 1-15 years experience 20 %. This indicated that most of the sugarcane growers had sufficient experience of sugarcane cultivation.

Summary Statistics of Socioeconomic Factors

The mean value of farmer's age was 49 years (range 25-61 years). Similarly the education mean was 4.3 years (ranges 0-14 years). The farming experience was 17 years with range of 7-42 years.

Analysis of Sugarcane Productivity

The effects of all factors studied were investigated through production function analysis. The coefficient of multiple determinations R^2 was 0.7249, which designated that 72% disparity in the cost of input production was clarify by all of the explanatory factors and the adjusted R^2 is 0.71 (Table 1).

Cost of Inputs

Land Preparation

The coefficient of regression for the variable cost of land preparation was positive (0.94) at 1% level of significance, which indicates that land preparation cost should be minimized (Table 1).

DAP

The regression coefficient for DAP cost was positive (0.23), which indicated that 1% raise in the use of DAP fertilizer would raise the sugarcane production by 23% keeping other factors constant. The estimated co-efficient was highly significant at 1% level of significance, representing that the DAP cost extensively inclined the sugarcane production owing to reasonable use of DAP fertilizer (Table 1). On similar lines Khan et al. (2002;

Table 1. Determinants of sugarcane productivity

Variable	Coefficient	Std. Error	t-Value
Land preparation	0.94*	0.28	3.28
DAP	0.23*	0.03	8.46
Urea	0.76*	0.20	3.81
Irrigation	0.02ns	0.02	0.98
FYM	-0.07*	0.02	-3.42
Seed	-0.08ns	0.07	-1.06
Labor for harvesting	-0.06ns	0.06	-1.01
R-squared	-	0.72	-
Adjusted R-squared	-	0.71	-

** = Significant at 1% level; ns = non significance*

2005) found that optimal and balanced use of fertilizers improved sugarcane yield and gave maximum economic benefit to the farmers.

Urea

The coefficient for the variable urea cost was positive (0.76), which indicated that 1% raise in the use of fertilizer would raise the production by 76% keeping other factors constant. This co-efficient was significant indicating that production of sugarcane increased extensively owed to sensible use of urea (Table 1).

Irrigation

The regression coefficient for irrigation cost was positive (0.02) but non significant, which disguised that 1% increase in use of irrigation would be favorable for the production of sugarcane by 0.02%, holding the other aspects constant (Table 1). Khanzada (1992) reported that the use of irrigation cause considerable profit to the sugarcane crop.

FYM

The coefficient of regression for the FYM cost was negative (-0.07) with 1% significance level, which disguised that 1% increase in the FYM cost would reduce the sugarcane production by -0.07%, observing the other factors constant (Table 1). Khanzada (1992) also showed that use of FYM was negligible and irregular giving negative impact on sugarcane production.

Seed

The coefficient of regression for the variable of seed cost was negative (-0.08) and also non-significant, which indicated that 1% addition in the seed cost would diminish the productivity by 0.08% (Table 1). Kamruzzamani and Hasanuzzan (2007) also explained negative relationship among seed cost and sugarcane productivity.

Labor for Harvesting

The coefficient of regression for the variable of labor for harvesting cost was negative (-0.06), with non-significant impact on sugarcane productivity, which indicated that 1% increase in the labor for harvesting cost would decline the profit by 0.06% (Table 1). Kamruzzamani and Hasanuzzan (2007) described that as cost of labour increased the farmer benefit decreased having negative impact on crop benefit for the farmers.

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