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# **Estimation of the Resource Use Efficiency and Constraints Faced by the Farmers in Sugarcane Cultivation in Balrampur District of Uttar Pradesh**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

To study the resource use efficiency and constraints faced by the farmers in Balrampur district of Uttar Pradesh was conducted in agriculture year 2020-21. Multistage sampling technique was used. The study pertains and data gathered was analyzed and it was found that the return to scale in marginal farm was 0.93, in small size farm it was about 0.92 and in medium size farm the return to scale was found to be 0.96. The major constraints faced by the farmers in production of Sugarcane are High cost of Input, High Interest on Loans, High Labor Cost, High Incidence of Disease, Lack of Irrigation water supply, Inadequate Credit, Delay in Sanction of crop loan, Uncertain Weather, Lack of knowledge and important Technology and Poor Soil Fertility and the constraint faced by the farmers in Marketing of Sugarcane are Delay in Cash Payment, High Commission Charges, Malpractices in weighing, Price Fluctuation, High cost of transportation, Lack of storage facility, Market is far from production, Lack of information about government schemes and subsidies, Illegal deduction and Lack of skilled labor.

**Keywords:** Constraint; ranking; efficiency; return to scale.

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## 1. INTRODUCTION

The Gramineae family includes sugarcane (*Saccharum officinarum* L.), which has its origins in tropical south and southeast Asia. Because it offers sugar along with biofuel, fiber, fertilizer, and a variety of other byproducts with ecological sustainability, sugarcane is a renewable, natural agricultural resource. White sugar, brown sugar (Khand sari), jaggery (Gur), and ethanol are all made from sugarcane juice [1-4].

In India, sugarcane is a significant cash crop. The planting of sugarcane and the ensuing growth of the sugar business predates agriculture and has accompanied the rise of human civilisation. Sugar is used extensively and has a profound impact on the socioeconomic climate of the nation. In the modern rural economy, sugarcane farming and the sugar industry have served as the main drivers of socioeconomic development in rural regions by utilising local resources to create jobs, higher incomes, and transportation and communication infrastructure. The cultivation of sugarcane and related operations include around 7 million sugarcane farmers as well as numerous agricultural labourers. More than 4 Lakh skilled and semi-skilled employees in rural areas are employed by the sugar business in addition to this [5-7].

## 2. RESEARCH METHODOLOGY

This chapter deals with methodology of the study which has been used at various stages. It has been applied particularly for selection of area, block, villages, sample size, collection of information farmers, traders and method of analysis the detailed methodological framework is presented below:

### 2.1 Sampling Technique

Multi stage sampling was followed for the selection of respondents for the present study.

### 2.2 Selection of District

Balrampur District was selected purposively for the research work since it is one of the major districts in the State where Sugarcane Production is very high.

### 2.3 Selection of Block

There are 9 blocks in Balrampur District out of which Balrampur block was selected purposively.

### 2.4 Selection of Villages

A list of all the villages falling in selected block will be prepared and five villages will be selected randomly.

### 2.5 Selection of Farmers

A separate list of sugarcane farmers in the chosen villages will be created, along with information about their holdings. 60 respondents will be chosen at random from this list using a proportionate distribution to the population.

1. Marginal size farm group- having area of cultivation less than 1 ha
2. Small size farm group- having area of cultivation between 1-2 ha
3. Medium size farm group- having area of cultivation between 2-10 ha
4. Large size farm group- having area of cultivation more than 10 ha

### 2.6 Mode of Data Collection

1. **Primary Data:** Primary data regarding Socio- economic conditions, factors influencing in adoption of Sugarcane cultivation, resources use efficiency, Cost return per hectare and per quintal, marketing costs, margins, efficiency, price spread, and constraints were collected from the sample respondents. Alternatively, the data on intermediaries were collected from various marketing intermediaries associated with marketing of Sugarcane through pre structured schedules. Similarly, the constraints faced by Sugarcane growers in marketing of Sugarcane were collected through opinion survey.
2. **Secondary Data:** All the necessary secondary data related to the topic were collected from various published sources like journals, bulletins, books, magazines and particular websites etc. and other sources of secondary data includes various Government offices like Block office, Market office and District Agricultural office .

### 2.7 Method of Analysis

**Descriptive Analysis:** Tabulation method is used for the analysis of data along with the required statistical tool for the interpretation of the result.

## 2.8 Analytical Tools Used

- 1. Production function:** To study the resource use efficiency in sugarcane production, Cobb-Douglas production function will be used. The mathematical form of Cobb Douglas production function is:

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4} \dots \dots \dots X_n^{b_n} e^{\mu}$$

where,

Y = per hectare output ( ₹/ha)

X<sub>1</sub> = seed ( ₹/ha)

X<sub>2</sub> = Irrigation charge ( ₹/ha)

X<sub>3</sub> = Plant protection charges ( ₹/ha)

X<sub>4</sub> = Manure and fertilizers ( ₹/ha)

b<sub>i</sub> = Elasticity coefficient of the respective input variables

e = Error term or disturbance term

μ = Random variables

- 2. Garret Ranking:** It is used to rank the preference indicated by the respondents on different factors.

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

Where,

R<sub>ij</sub> = Rank given for the i<sup>th</sup> variable by j<sup>th</sup> respondents.

N<sub>j</sub> = Number of variables ranked by j<sup>th</sup> respondents

## 3. RESULTS AND DISCUSSION

**Production elasticity of Sugarcane crop on different size of group farms:** Table 1 shows the production elasticity of Sugarcane crop in different household.

In marginal household the production elasticity of Field preparation, Irrigation, Seed and Sowing,

Labor, Fertilizer and Harvest and other expenses were 0.55, 0.19, 0.25, 0.69, 0.28 and 0.15 respectively. The return to scale in marginal farm was 0.93 which shows decreasing return to scale i.e. marginal farmers were gaining less than what they were spending. The R<sup>2</sup> value of marginal household was 0.90 i.e. the considered variable explains 90.00 percent of the variation in depending variable i.e. return from sugarcane. It can be concluded that cost of fertilizer at 5 percent level of significance had significant influence on the returns.

In small household the production elasticity's of seed, irrigation, plant protection chemicals, fertilizer and labour were 0.88, 0.89, 0.69, 0.24, 0.71 and 0.32 respectively. The return to scale in small farm was 0.92 which shows increasing return to scale i.e., small farmers were gaining more than what they were spending. The small household's R<sup>2</sup> value was 0.91, meaning that the variable under consideration accounts for 91% of the variation in the dependent variable, or return from sugarcane. Both the cost of irrigation and the cost of seed had a significant impact on sugarcane returns at the 5% and 1% levels of significance, respectively.

In medium household the production elasticity's of seed, irrigation, plant protection chemicals, fertilizer and labour were 0.66, 0.32, 0.64, 0.86, 0.87 and 0.61, respectively. The return to scale in medium farm was 0.96 which shows increasing return to scale i.e. medium farmers were gaining more than what they were spending. The value of R<sup>2</sup> medium household was 0.97 i.e. the considered variable explains 97.00 percent of the variation in depending variable i.e. return from sugarcane. It was discovered that the cost of seed at a significance level of 5% and the cost of irrigation at a significance level of 1% both significantly affected the returns from sugarcane.

**Table 1. Production elasticity of sugarcane crop on different size of group of farms**

Size group of sample farms (ha)	Production elasticity						Return to scale	R <sup>2</sup>
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>		
Marginal	0.55**	0.19	0.25	0.69	0.28	0.15	0.93	0.90
Small	0.88**	0.89	0.69	0.24	0.71	0.32*	0.92	0.91
Medium	0.66	0.32*	0.64	0.86**	0.87	0.61	0.96	0.97

\*\* Significant at 5% significance level; \*Significant at 1% significance level

where, X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub>, X<sub>4</sub>, X<sub>5</sub> and X<sub>6</sub> stands for Field Preparation, Irrigation, Seed and sowing, Labor, Fertilizer and Harvest and other expenses

**Table 2. Constraints faced by the farmers in the production of sugarcane**

S.No.	List of Constraints	Garret score (in%)	Rank
1.	High Incidence of disease	54.88	4 <sup>th</sup>
2.	Inadequate credit	51.55	6 <sup>th</sup>
3.	Delay in sanction of crop loan	50.59	7 <sup>th</sup>
4.	High cost of Input	61.33	1 <sup>st</sup>
5.	High Interest on Loans	59.47	2 <sup>nd</sup>
6.	High Labour cost	58.50	3 <sup>rd</sup>
7.	Uncertain weather	42.85	8 <sup>th</sup>
8.	Lack of irrigation water supply	53.20	5 <sup>th</sup>
9.	Poor soil fertility	31.45	10 <sup>th</sup>
10.	Lack of knowledge and important technology	33.50	9 <sup>th</sup>

**Table 3. Constraints faced by the farmers in the marketing of sugarcane**

S.No.	List of Constraints	Garret Score (in%)	Rank
1.	Market is far from production	48.35	7 <sup>th</sup>
2.	High cost of transportation	51.88	5 <sup>th</sup>
3.	Lack of Storage facility	48.50	6 <sup>th</sup>
4.	Price fluctuation	51.88	4 <sup>th</sup>
5.	Lack of skilled labour	42.30	10 <sup>th</sup>
6.	Delay in cash payment	56.41	1 <sup>st</sup>
7.	Malpractices in weighing	52.48	3 <sup>rd</sup>
8.	Illegal deduction	42.75	9 <sup>th</sup>
9.	High commission charges	53.96	2 <sup>nd</sup>
10.	Lack of information about Government schemes and subsidies	43.20	8 <sup>th</sup>

Table 2 shows that the constraints faced by the Sugarcane farm families in Production of Sugarcane. Most of the respondents express that the major constraints in production of sugarcane was identified as High cost of input and ranked it (1<sup>st</sup>) followed by High Interest of Loan (2<sup>nd</sup>), High labour cost 3<sup>rd</sup>, High Incidence of disease (4<sup>th</sup>), Lack of irrigation supply (5<sup>th</sup>), Inadequate credit (6<sup>th</sup>), Delay in sanction of crop loan (7<sup>th</sup>), Lack of irrigation Supply(8<sup>th</sup>), Lack of knowledge and important technology(9<sup>th</sup>) and Poor soil fertility awarded as the last rank.

Table 3 shows that the constraints faced by the Sugarcane farm families in Marketing of Sugarcane. Most of the respondents express that the major constraints in production of sugarcane was identified as Delay in Cash Payment (1<sup>st</sup>) followed by High commission of charges (2<sup>nd</sup>), Malpractices in weighing (3<sup>rd</sup>), Price fluctuation (4<sup>th</sup>), High Cost of transportation (5<sup>th</sup>), Lack of storage facility (6<sup>th</sup>), Market is far from production (7<sup>th</sup>), Lack of information and government schemes and subsidies (8<sup>th</sup>), Illegal deduction (9<sup>th</sup>) and Lack of skilled labour awarded as the last rank.

## 4. SUMMARY AND CONCLUSION

### 4.1 Summary

In small household the production elasticity's of seed, irrigation, plant protection chemicals, fertilizer and labour were 0.88, 0.89, 0.69, 0.24, 0.71 and 0.32 respectively. The return to scale in small farm was 0.92 which shows increasing return to scale i.e., small farmers were gaining more than what they were spending. The small household's  $R^2$  value was 0.91, meaning that the variable under consideration accounts for 91% of the variation in the dependent variable, or return from sugarcane. Both the cost of irrigation and the cost of seed had a significant impact on sugarcane returns at the 5% and 1% levels of significance, respectively.

In medium household the production elasticity's of seed, irrigation, plant protection chemicals, fertilizer and labour were 0.66, 0.32, 0.64, 0.86, 0.87 and 0.61, respectively. The return to scale in medium farm was 0.96 which shows increasing return to scale i.e. medium farmers were gaining more than what they were spending. The value of  $R^2$  medium household was 0.97 i.e. the considered variable explains 97.00 percent of the variation in depending

variable i.e. return from sugarcane. It was discovered that the cost of seed at a significance level of 5% and the cost of irrigation at a significance level of 1% both significantly affected the returns from sugarcane.

The production constraint analysis concluded that High Cost of Input was the biggest problem faced by 60 farmers in the study sample followed by High Interest of Loan (2<sup>nd</sup>), High labour cost 3<sup>rd</sup>, High Incidence of disease (4<sup>th</sup>), Lack of irrigation supply (5<sup>th</sup>), Inadequate credit (6<sup>th</sup>), Delay in sanction of crop loan (7<sup>th</sup>), Lack of irrigation Supply (8<sup>th</sup>), Lack of knowledge and important technology (9<sup>th</sup>) and Poor soil fertility awarded as the last rank.

The marketing constraint analysis conclude that the Delay in Cash Payment was the biggest problem in the study sample followed by High commission of charges (2<sup>nd</sup>), Malpractices in weighing (3<sup>rd</sup>), Price fluctuation (4<sup>th</sup>), High Cost of transportation (5<sup>th</sup>), Lack of storage facility (6<sup>th</sup>), Market is far from production (7<sup>th</sup>), Lack of information and government schemes and subsidies (8<sup>th</sup>), Illegal deduction (9<sup>th</sup>) and Lack of skilled labour awarded as the last rank.

### 4.2 Conclusion

The study shows that in resource use efficiency the coefficient of determination ( $R^2$ ) in marginal household was 0.90, in small household farm it was 0.91 and in medium size household farm it was 0.96. The major constraints faced by the farmers in production of sugarcane were High Cost if Input (61.33%), High Interest of loan (59.47%), High labor cost (58.5%), High Incidence of disease (54.88%) and in marketing constraint of sugarcane were Delay in cash payment (56.41%), High commission charges (53.96%), Malpractices in weighing (52.48%), Price fluctuation (51.88%) and this can be resolved by different Government departments like Department of Agriculture, plant protection and irrigation should assure the timely and adequate supply of the inputs and irrigation water and government should also ensure that the quality inputs are supplied to the farmer by different private agencies. Through the Kisan Credit Cards and other financial schemes of the institutional credit have been proved helpful for the farmers. But to make it more efficient these facilities should be easier and liberal. Problem of human labour can be solved with adoption of co-operation among farming community.

## CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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