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## A study on resource use efficiency of sugarcane production in Ghazipur district of eastern Uttar Pradesh

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**Abstract**

Sample sizes of hundred farmers (Marginal- 55, Small- 30, and Medium- 15) were interviewed from five villages of Mardah block of Ghazipur district. Data was analyzed and found that average holding size was 1.18 hectares and cropping intensity was 239.90 per cent. On an average cost of cultivation was Rs. 95124.68 per hectare. The gross and net incomes on overall farms were found to be Rs. 146587 and Rs. 63156.54 per hectare, respectively. The input and output ratio was found to be 1:1.67 on cost C. Sugarcane cultivation in the study was characterized by decreasing returns to scale.

**Keywords:** Cost and return, resource use efficiency

**1. Introduction**

Agriculture being the most important sector in Indian economy provides livelihood to more than 2/3<sup>rd</sup> of the population. In India agriculture occupies 43% of the total geographical area and contributes about 14% to India G.D.P (FAO, Stat, 2015). Among the many crops grown sugarcane is grown even before the Vedic period. In the present time, sugarcane is properly grown in various parts of Indonesia, Hawaii, Philippines, Indo-China, Thailand, Egypt, Africa and Australia etc.

Sugarcane is one of the world's largest cultivated crops as 2014, it was cultivated on about 26.2 million hectare area in more than 90 countries, with a world -wide harvest 175.1 million metric tonnes. Brazil topped the list as the world's largest producer of sugarcane followed by India, China, Thailand, Pakistan and Mexico.

Sugarcane has commercial importance and is a main source of sugar in Asia and Europe. It is the raw material for the production of Jaggery (Gur) and Khandsari. It is also consumed raw and juice is also extracted for beverage purpose. In India the sugarcane cultivation and sugar industry plays a vital role towards socio-economic development in rural areas. Depending on the suitability of agro-climatic conditions sugarcane is grown in almost 9 states of the country. The world's demand for sugar is the primary driver for sugarcane cultivation as it accounts for 80% of the sugar produce.

Talking about the statistics, In Uttar Pradesh sugarcane occupied an area of 2.23 million hectares giving a produce of 135.16 million tonnes in the year 2014-15. District Ghazipur has best suited agro-climatic condition for sugarcane cultivation and thus in 2014-15 sugarcane occupied an area of 7037 hectare giving a produce of 341829 million tonnes with the productivity of 485.76quintals/hectare.

Keeping this in the view the present study entitled "A study on Resource Use Efficiency of Sugarcane Production in Ghazipur District of Eastern Uttar Pradesh" assumes special significance.

**1.1 The main objectives of the study were**

1. To work out cost and return of sugarcane production on different size of sample farms.
2. To work out resource use efficiency in sugarcane production in different size of sample farms.

**2. Materials and Methods****2.1 Selection of Sample Farmers**

A separate list of sugarcane growers of five selected villages were prepared along with their size holding and classified into three categories i.e. (1) Marginal farmer (below 1 hectare), (2) Small farmer (1-2 hectare) and (3) Medium farmer (2-4 hectare).

Multistage stratified cum random sampling technique was used to select the district, block, village and farmers. Ghazipur district was selected purposively. A list of all the blocks was prepared and Mardah block was selected purposively.

## 2.2 Method of enquiry

The primary data was collected by survey method through personal interview on well-structured and pre tested schedule, while secondary data were collected from books, journals, report and records of the district and block headquarters.

## 2.3 Analytical tools

Both the tabular and functional analysis was used. Weighted average was worked out for interpretation of data with the help of following formula.

$$WA = \frac{\sum W_i X_i}{\sum W_i}$$

### Where

WA = Weighted Average  $X_i$  = Variable

$W_i$  = Weights of variable

## 2.4 Production function

To study the resource use efficiency in sugarcane production, Cobb-Douglas production function was used. The mathematical form of Cobb Douglas production function is:

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

### Where

Y = per hectare output (Rs./ha)  $X_1$  = seed (Rs./ha)

$X_2$  = Irrigation charge (Rs./ha)

$X_3$  = Plant protection charges (Rs./ha)  $X_4$  = Manure and fertilizers (Rs./ha)

$b_i$  = Elasticity coefficient of the respective input variables  $e$  = Error term or disturbance term

$\mu$  = Random variables

## 3. Result and Discussion

### 3.1 Cost and Returns

The different cost concepts viz. Cost  $A_1/A_2$ ,  $B_1$ ,  $B_2$ ,  $C_1$ ,  $C_2$  and  $C_3$  were considered for analysis of the data. The cost of production of this sugarcane Rs./qt. and input output relationships were analyzed on the basis of different costs. It was found that the overall average total cost of cultivation on the basis of  $C_3$  came to Rs.93290.38/ha which was maximum i.e. Rs. 95124.68 on medium farms followed by small farms and marginal farms corresponding to Rs. 94820.23 and Rs.1956.74, respectively. It was also observed that cost of cultivation showed positive relationship with desired size farms.

The per hectare gross income was maximum to be Rs. 158324.00 on medium farms small and marginal farms, corresponding to Rs.157334.40 and Rs.155452.00 respectively. In respect of all farms gross income came to Rs. 156447.50. Per quintal cost of production of sugarcane on the basis of cost  $C_3$  was highest to Rs. 167.98 on small farms followed by medium and marginal farms corresponding values were Rs. 167.96 and Rs. 164.22 respectively, along with Rs. 65.91/quintal on overall average farms.

Input-output analysis was examined on the basis of cost  $A_1$  to  $C_3$ . It varied from 1:3.05 to 1:1.69 in case of marginal size group of farms, 1:2.73 to 1:1.65 on small farms and 1:2.70 to 1:1.66 on medium farms. The overall average of input-output ratio on the basis of various costs varies from 1:2.89 to 1:1.67. Per hectare cost of return from the cultivation of sugarcane crop on different categories of farms have been presented in Table 1.

**Table 1:** Measures of Per Hectare Cost and Return of Sugarcane (Rs.)

S. No.	Particulars	Size Group of Farms			Overall Average	
		Marginal	Small	Medium		
1	Cost $A_1/A_2$	50876.12	57507.05	58503.04	54009.44	
2	Cost $B_1$	55765.65	62408.49	63585.87	58931.54	
3	Cost $B_2$	73765.65	80408.49	81585.87	76931.54	
4	Cost $C_1$	65597.04	68200.21	68476.99	66809.98	
5	Cost $C_2$	83597.04	86200.21	86476.99	84809.98	
6	Cost $C_3$	91956.74	94820.23	95124.68	93290.98	
7	Yield (q/ha.)	a. Main Product	520.90	525.80	528.60	523.53
		b. By-product	120.00	126.38	128.95	123.26
8	Gross Income (Rs.)	a. Main Product	145852.00	147224.00	148008.00	146587.00
		b. By Product	9600.00	10110.40	10316.00	9860.52
		c. Total	155452.00	157334.40	158324.00	156447.50
9	Net Return over Cost $C_3$	63495.26	62514.17	63199.32	63156.54	
10	Family Income	81686.35	76925.91	76738.13	59515.99	
11	Farm Business Income	104575.88	99827.35	99820.96	102438.10	
12	Farm Investment Income	22889.53	22901.44	23082.83	22922.10	
13	Cost of Production (q/ha.)	164.22	167.98	167.96	165.91	
14	Benefit Cost (B:C) Ratio	a. On the Basis of Cost $A_1$	1:3.05	1:2.73	1:2.70	1:2.89
		b. On the Basis of Cost $B_1$	1:2.78	1:2.52	1:2.48	1:2.65
		c. On the Basis of Cost $B_2$	1:2.10	1:1.95	1:1.94	1:2.03
		d. On the Basis of Cost $C_1$	1:2.36	1:2.30	1:2.31	1:2.34
		e. On the Basis of Cost $C_2$	1:1.85	1:1.82	1:1.83	1:1.84
		f. On the Basis of Cost $C_3$	1:1.69	1:1.65	1:1.66	1:1.17

## 5. Resource Use Efficiency

The Cobb- Douglas's production function was applied to find out the efficiency of various resources use in production of sugarcane.

It indicated that four variables *viz.* human labor, manure and fertilizer, irrigation and plant protection jointly explained

92.39, 95.12 and 96.50 percent variation accused in dependent variable on marginal, small and medium farms, respectively. The value of production, standard error, coefficient of multiple determination and returns to scale for sugarcane production on different size groups of farms are presented in Table 2.

**Table 2:** Resource use Efficiency in Sugarcane on Different Size of sample Farms

Size Group	Production Elasticity				Sum of Elasticity (Returns to Scale)	R <sup>2</sup>
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>		
Marginal	0.2341** (0.0745)	0.3867** (0.0349)	0.0662 (0.1549)	0.1218 (0.0830)	0.8089	0.9239
Small	0.1823* (0.0809)	0.3979** (0.0665)	0.1721 (0.7660)	0.0920 (0.1046)	0.8243	0.9282
Medium	0.2745 (0.3104)	0.2531 (0.0641)	0.2723 (0.1192)	0.0670 (0.0762)	0.8389	0.9302

\*\* Significant at 5% probability level

\*Significant at 1% probability level

X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub> and X<sub>4</sub> stands for human labor, Manure & Fertilizer, Irrigation and Plant Protection, respectively.

## 5. Conclusion

Sugarcane is the main source of sugar in India as well as one of the main crops for earning foreign exchange. Sugar industries in India have importance after textile industry and provide gainful employment to large number of people. In the light of aforesaid importance of the crop studying the economics of production of sugarcane is vital.

According to the study conducted in the Ghazipur district the average total cost of cultivation was found to be Rs. 93290.98/hectare. The cost of cultivation was maximum on medium sample farms and minimum on marginal farms. This is due to more expenditure occurred on human labour and seed charges by medium farms as compared to other categories of farms.

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