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An economic analysis of sugarcane cultivation in Sultanpur district of Uttar Pradesh

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Abstract

Keeping in view the importance of Sugarcane crop as food, feed and fodder as well as income and employment generation in its cultivation, disposal and industrial uses, a study on "An Economic analysis of Sugarcane cultivation in Sultanpur district of Uttar Pradesh" was conducted. Main objectives were to analyse the cost and income measures, resource use efficiency and constraints in its cultivation. One hundred respondents were selected from Kurebhar block of dist. Sultanpur through purposive cum random sampling. Data were collected through personal interview on structured schedule. Tabular and functional analyses were done for presentation of the result. Selected respondents were distributed as 60, 25, and 15 per cent from marginal, small and medium category. Overall holding size was found 1.71 hectare varying from 0.65 to 2.97 hectare. Technical, irrigation, labour availability and finance problems were found as major constraints against Sugarcane cultivation which were suggested to overcome with the constructive support of the Government agencies and financial institution. Lastly it is conclude that sugarcane is most suitable crop from all points of view for the farmers of Sultanpur district.

Keywords: sugarcane cultivation, irrigation, size of farm, Sultanpur district

Introduction

Sugarcane (*Saccharum officinarum* L.) belongs to family gramineae and originated to tropical south Asia and south east- Asia. Sugarcane is a renewable, natural agriculture resource because it provides sugar besides biofuel, fibre, fertilizer and myriad of by-products with ecological sustainability. Sugarcane juice is used for making white sugar, brown sugar (Khandhasari), jaggery (Gur) and ethanol. Sugarcane is an important cash crop grown in India. Sugarcane cultivation and development of sugar industry runs parallel to the growth of human civilization and is as old as agriculture. The importance and use of sugarcane and sugar in the country's socio- economic milieu is deep rooted and immense. In the current day rural economy set up sugarcane cultivation and sugar industry has been focal point for socio-economic development in rural areas by mobilizing rural resources generating employment and higher income, transport and communication facilities. About 7 million sugarcane farmers and large number of agricultural labourers are involved in sugarcane cultivation and ancillary activities. Apart from this the sugar industry provides employment to 5 Lakh skilled and semiskilled workers in rural area. "Statistical yearbook"; Food and Agricultural Organization, 2015. Sugarcane is grown in diversified climatic conditions. India is one of the largest sugarcane producers in the world, producing around 300 million tonnes of cane per annum. Production of sugar is the second largest agro processing industry in the country after cotton and textiles. In India, about more than 50 million farmers, their dependent and a large number of agricultural labourers are involved in sugarcane cultivation, harvesting and ancillary activities constituting 7.5 per cent of the rural population and many workers are employed indirectly in processing. Molasses is the chief by-product of sugar industry and is the main raw material for alcohol production and alcohol-based industries in India. Nearly 1877.10 million tonnes of sugarcane was produced in the harvesting year 2017-18 worldwide. With the production of over 739.27 million tonnes in 2017-18, Brazil was the leader in Sugarcane production followed by India (341.20 million tonnes) and China (125.54 million tonnes). Production of sugarcane was 341.20 million tonnes in the year 2017-2018 with Uttar Pradesh being the highest producer (162.34 million tonnes) followed by Maharashtra (72.64 million tonnes) and Karnataka (29.92 million tonnes). The area under sugarcane cultivation is around 5.06 million hectare with an average yield of 67.43 tonnes/ha. Uttar Pradesh had the highest area under sugarcane cultivation in 2017-2018 (2.24 million hectare). Kerala has the highest productivity of 116.2 tonnes/ha.

Devi and Chahal (2013) ^[2] revealed that unaware of new technology, unavailability of labour and high rate of wages, insufficient source of irrigation and higher interest rate along with inadequate credit availability were major technological, socio economics, infrastructure, financial and marketing problems constraints faced by the farmers. Krishnkant *et al.* (2015) ^[4] revealed that the cost of sugarcane cultivation planted was ₹172679, in which share of operational cost, land rent and material cost was 38, 22 and 26 per cent respectively. Thereafter, sugarcane was to be ₹129752.65 with share of operational cost and marginal cost 41.29 and 14 per cent, respectively. Karpagam *et al.* (2019) ^[3] revealed that majority (91.7%) of the respondent have more than 5 years of experience. Major constraints faced by cent- percent of the respondents were – non availability of labour, high cost of labour, yield reduction due to continuous cultivation, prolonged drought, water scarcity, low procuring cost given by sugar factories. Deshmukh *et al.* (2021) ^[1] conducted study on cost and return of sugarcane in the Kabirdham district of Chhattisgarh state. The major constraint in the production of sugarcane were labour shortage during peak period (76.79) followed by increasing wage rate of human labours (64.04). Delayed payment of sugarcane and bonus was a major marketing constraint faced by the growers (71.67), followed by Delayed in weighting and purchasing by factory (56.96) in the study area.

Methods and Techniques of analysis or Analytical tools

Both tabular and functional techniques were used for analysis of data. Percentage, simple and weighted average were used for tabular analysis. Cobb Douglas production function was used for functional analysis of data. Tabular and functional analysis was helped in presentation of the results. To fulfill

the objectives of the study, the data collected were subjected to statistical analysis. For this purpose the following statistical techniques were adopted.

Tabular Analysis

Tabular analysis was done to analyse the general economic characteristics of the sample farmers, determine the resource structure, cost structure, returns, profits and opinions of the farmers regarding the problems in production of sugarcane. In tabular analysis the percentages, arithmetic mean & weighted mean were applied.

Significance tests of the sample regression coefficients

In estimation of elasticity coefficients, it was desired to ascertain the reliability of these estimates. The most commonly used „t“ test was used to a certain whether the sample production elasticity coefficients, b_j is significantly different from zero or not at some specified probability level.

$$„t“ \text{ cal.} = b_j / \text{standard error of } b_j$$

If calculated „t“ value is greater than the tabulated value of „t“ at specified probability level and „n-k-1“ degree of freedom, b_j is said to be statistically significantly different from zero (k is number of independent factors and n is sample size).

1. Average holding size on sample farms

The details of land holding area under different size group of sample farms are given in Table 1. The average size of holding of marginal, small, and medium, farms were found 0.64, 1.41, and 3.06 hectares, respectively with an overall average size of land holding was estimated as 1.39 hectare.

Table 1: Average size of holding on different size group of sample farms (ha)

S No.	Size groups of	No. of farmers	Net cultivated	Average size of
1.	Marginal	45	28.81	0.64
2.	Small	35	49.38	1.41
3.	Medium	20	61.13	3.06
Grand Total		100	139.31	1.39

Distribution of cultivated land owned by different size group of sample farms revealed that 20.68 per cent of cultivated land was owned by 45.00 per cent of marginal size of farms. Whereas 35.44 and 43.88 per cent of area were owned by 35.00 and 20.00 per cent of small and medium size group of farms. It show that land and human labor combination on samples.

2. Cropping pattern

Cropping pattern presents the area devoted to the various crop during the given period, conventionally in a single year. It indicates the yearly sequence and arrangement of crops grown by farmer in a particular area. The cropping patterns followed by the sample farms are presented in Table 2 It is depicted from the Table 2 that on an average the highest area was covered under sugarcane 23.73 per cent followed by wheat

18.64 per cent, paddy 18.22 per cent, maize 11.84 per cent, onion 5.08 per cent mustard 4.46 per cent chickpea 3.81 per cent, potato 3.39 per cent, moong/urad 2.54 per cent barley 2.11 per cent, pigeon pea 1.69 per cent, chari 1.27 per cent and ber seem 0.85 per cent of total cropped area on sample farm. Sugarcane crop was allotted a considerable area by the sample farmer. The gross cultivated area was higher (58.90.60%) in the Kharif followed by Rabi season (33.47%) and less in the Zaid season (7.62%) on all farm situations. It is also clear from the Table 2 that sugarcane 23.73 per cent in the kharif season of total cropped area. Sugarcane as popular crop have occupied table 23.73 per cent of gross cropped area which was distributed as 35.74 per cent on medium farms followed by small 15.95 per cent, and marginal 13.76 per cent, respectively of their total cultivated area.

Table 2: Cropping pattern under different size group of sample farms (hectare)

Crop Grown	Average size of Farm Groups			All Farm Average
	Marginal	Small	Medium	
A. Kharif	0.64(52.46)	1.41(54.86)	3.06(65.24)	1.39(58.90)
Paddy	0.26(15.57)	0.58(22.57)	0.53(11.30)	0.43(18.22)
Sugarcane	0.19(13.76)	0.41(15.95)	1.63(34.75)	0.56(23.73)
Maize	0.13(10.66)	0.28(10.89)	0.61(13.00)	0.28(11.86)
Pigeon Pea	0.02(1.64)	0.05(1.95)	0.08(1.71)	0.04(1.69)
Chari	0.03(2.46)	0.02(0.78)	0.08(1.71)	0.03(1.27)
Moong/Urd	0.02(1.64)	0.07(2.72)	0.13(2.77)	0.06(2.54)
B. Rabi	0.43(21.31)	0.95(36.96)	1.35(28.78)	0.79(33.47)
Wheat	0.26(21.31)	0.51(19.84)	0.76(16.20)	0.44(18.64)
Mustard/Pea	0.04(3.28)	0.17(6.61)	0.20(4.26)	0.11(4.66)
Potato	0.02(1.64)	0.08(3.11)	0.15(3.20)	0.08(3.39)
Barsheam	0.03(2.46)	0.03(1.17)	0.01(0.21)	0.02(0.85)
Barley	0.02(1.64)	0.06(2.33)	0.08(1.71)	0.05(2.11)
Chickpea	0.06(4.92)	0.10(3.89)	0.12(2.13)	0.09(3.81)
C. Zaid	0.12(9.84)	0.21(8.17)	0.28(3.97)	0.18(7.62)
Chari	0.03(2.46)	0.08(3.11)	0.10(2.13)	0.06(2.54)
Onion	0.09(7.38)	0.13(5.06)	0.18(3.84)	0.12(5.08)
Total(A+B+C)	1.22(100%)	2.57(100%)	4.69(100%)	2.36(100%)

3. Cropping intensity

The details of cropping intensity are given in the Table 3.

Table 3: Cropping intensity of different size group of sample farms

S. No.	Size group of farms	No. of farms	Net Cultivated area (ha)	Gross Cropped area (ha)	Cropping intensity (%)
1.	Marginal (below 1 ha)	45	0.64	1.22	190.63
2.	Small (1-2 ha)	35	1.41	2.57	182.27
3.	Medium (2-4 ha)	20	3.06	4.69	153.27
4.	Overall Average	100	1.39	2.36	169.78*

Intensity of cropping refers to the number of crops raised on a field during an agriculture year 2020-21. This can be computed by dividing gross sown area by the net cultivated area. It is expressed in per cent.

$$\text{Cropping intensity} = \frac{\text{Gross sown area}}{\text{Net cultivated area}} \times 100$$

Table 3 reveals that the overall average cropping intensity on sample farms having 169.78 per cent which was found highest on marginal farms 190.63 per cent followed by small 182.27 per cent, and medium 153.27 per cent respectively. Cropping intensity was inversely related to size of farms.

4. Farm asset structure on sample farms

(a.) Per farm investment on sample farms

Table 4. Presents the per- farm asset structure on sample

Table 4: Per farm investment on different size group of sample farms (₹)

S. No.	Particulars	Size of farms			
		Marginal	Small	Medium	Overall average
1.	Buildings	100577.74(61.07)	138595.70(61.87)	178165(60.11)	129401.48(61.09)
I.	Residential	87444.43(53.09)	123681.43(55.21)	159800.00(53.91)	114598.49(54.11)
	a. Kachcha	11766.66(7.14)	11824.27(5.28)	14550.00(4.91)	12343.49(5.83)
	b. Pucca	75677.77(45.95)	111857.16(49.93)	145250.00(49.00)	102255.00(48.28)
II.	Cattle shed	11044.43(6.70)	11100.00(4.95)	11200.00(3.78)	11094.99(5.24)
	a. Kachcha	8655.55(5.25)	7571.44(3.38)	6200.00(2.09)	7785.00(3.68)
	b. Pucca	2388.88(1.45)	3528.56(1.57)	5000.00(1.69)	3309.99(1.56)
III.	Godown	2088.88(1.26)	3814.29(1.70)	7165.00(2.42)	3707.99(1.75)
	a. Kachcha	-	-	440.00(0.15)	88.00(0.04)
	b. Pucca	2088.88(1.26)	3814.29(1.70)	6725.00(2.27)	3619.99(1.71)
2.	Milch Animals	52406.66(31.82)	61037.15(27.25)	69340(23.39)	58814.00(27.78)
a.	Cow	7315.55(4.44)	11371.43(5.08)	8300.00(2.80)	8932.00(4.22)

b.	Buffalo	36111.11(21.93)	43142.86(19.26)	53100.00(17.91)	41970.00(19.82)
c.	Goat	8980.00(5.45)	6522.86(2.91)	7940.00(2.68)	7912.00(3.74)
3.	Machinery and Implements	11707.57(7.11)	24390.49(10.89)	48904.01(16.50)	23585.87(11.14)
I.	Minor Implements	3741.95(2.27)	9758.05(4.36)	22013.95(7.43)	9501.98(4.49)
II.	Major Implements	7965.61(4.84)	14632.43(6.53)	26890.05(9.07)	14083.89(6.65)
	Grand total	164691.97(100)	224023.31(100)	296409.01(100)	211801.36(100)

Table 5: Per hectare investment on different size group of sample farms (Rs.)

S. No.	Particulars	Size of farms				
		Marginal	Small	Medium	Overall average	
I.	Buildings	157152.72(61.07)	98294.82(61.87)	58223.86(60.11)	116766.68(61.21)	
	Residential	136631.92(53.09)	87717.33(55.21)	52222.22(53.91)	102629.87(53.79)	
	Kachcha	18385.41(7.14)	8386.01(5.28)	4754.90(4.91)	12159.52(6.37)	
	Pucca	118246.51(45.95)	79331.32(49.93)	47467.32(49.00)	90470.35(47.42)	
II	Cattle shed	17256.92(6.70)	7872.34(4.95)	3660.13(3.78)	11252.96(5.90)	
	Kachcha	13524.30(5.25)	5369.82(3.38)	2026.14(2.09)	8370.60(4.39)	
	B. Pucca	3732.62(1.45)	2502.52(1.57)	1633.99(1.69)	2882.36(1.51)	
	Godown	3263.87(6.70)	2705.17(1.70)	2341.50(2.42)	2883.85(1.52)	
	a. Kachcha	-	-	143.79(0.15)	28.76(0.02)	
	b. Pucca	3263.87(6.70)	2705.17(1.70)	2197.71(2.27)	2855.10(1.50)	
	Milch Animals	81885.41(31.82)	43288.76(27.25)	22660.13(23.39)	56531.52(29.63)	
	Cow	11430.55(4.44)	8064.85(5.08)	2712.42(2.80)	8508.93(4.46)	
	Buffalo	56423.61(21.93)	30597.77(19.26)	17352.94(17.91)	39570.43(20.74)	
	Goat	14031.25(5.45)	4626.14(2.91)	2594.77(2.68)	8452.17(4.43)	
	Machinery and Implements	18293.06(7.11)	17298.21(10.89)	15981.70(16.50)	17482.59(9.16)	
	Minor Implement	5846.80(2.27)	6920.60(4.36)	7194.10(7.43)	6492.09(3.40)	
	Major	12446.26(5.25)	10377.61(3.38)	8787.60(2.09)	10990.50(4.39)	
	d. Pucca	3732.62(1.45)	2502.52(1.57)	1633.99(1.69)	2882.36(1.51)	
	III.	Godown	3263.87(6.70)	2705.17(1.70)	2341.50(2.42)	2883.85(1.52)
		a. Kachcha	-	-	143.79(0.15)	28.76(0.02)
		b. Pucca	3263.87(6.70)	2705.17(1.70)	2197.71(2.27)	2855.10(1.50)
	2.	Milch Animals	81885.41(31.82)	43288.76(27.25)	22660.13(23.39)	56531.52(29.63)
		a. Cow	11430.55(4.44)	8064.85(5.08)	2712.42(2.80)	8508.93(4.46)
		b. Buffalo	56423.61(21.93)	30597.77(19.26)	17352.94(17.91)	39570.43(20.74)
c.	Goat	14031.25(5.45)	4626.14(2.91)	2594.77(2.68)	8452.17(4.43)	
3.	Machinery and Implements	18293.06(7.11)	17298.21(10.89)	15981.70(16.50)	17482.59(9.16)	
III.	Minor Implements	5846.80(2.27)	6920.60(4.36)	7194.10(7.43)	6492.09(3.40)	
IV.	Major	12446.26	10377.61	8787.60	10990.50	

Summary and Conclusion

Sugarcane is important cash crop grown in India. Sugarcane cultivation and development of sugar industry runs parallel to the growth of human civilization and is as old as agriculture. The importance and use of sugarcane and sugar in the country's socio-economic milieu is deep rooted and immense. Sugarcane is grown in diversified climatic conditions. India is one of the largest sugarcane producers in the world, producing around 300 million tonnes of cane per annum. Production of sugar is the second largest agro processing industry in the country after cotton and textiles. India is the only country that produces plantation while sugar unlike other countries that produce raw or refined sugar or both. Nearly 1877.10 million tonnes of sugarcane was produced in the harvesting year 2017-18 worldwide. With the production of over 739.27 million tonnes in 2017-18, Brazil was the leader in Sugarcane production followed by India (341.20 million tonnes) and China (125.54 million tonnes).

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Conflict of Interest

As a corresponding author, I Aryan Raj, confirm that none of

others have any conflicts of interest associated with this publication.

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