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Subhash Chandra

Department of Agricultural
Economics & Statistics,
Chaudhary Charan Singh
Snatkottar Mahavidyalaya
Padmapur Pandav Nagar Basti,
Uttar Pradesh, India

Vinay Kumar Rawat

Department of Agricultural
Economics & Statistics,
B.R.D.P.G. College, Deoria,
Uttar Pradesh, India

Satish Chandra Verma

Department of Agricultural
Economics & Statistics,
B.R.D.P.G. College, Deoria,
Uttar Pradesh, India

Corresponding Author

Subhash Chandra

Department of Agricultural
Economics & Statistics,
Chaudhary Charan Singh
Snatkottar Mahavidyalaya
Padmapur Pandav Nagar Basti,
Uttar Pradesh, India

The profitability of sugar cane cultivation on the sample farmers Basti district in Eastern U. P.

Subhash Chandra, Vinay Kumar Rawat and Satish Chandra Verma

Abstract

Sugar cane (*Saccharum spp.*) is an important commercial crop and main source of sugar in the country. It is cultivated entirely almost in all the tropical and subtropical states. Sugarcane cultivation in India dates back to pre-Vedic period and presently the country stands second largest producer of sugarcane (355.0 mt) and sugar (>32.0 mt) in the world after Brazil. Brazil has the highest area (5.34 million hectares) while Australia has the highest productivity (85.1 tonnes per hectare) India ranks second among the sugarcane growing countries of the world in the both area and production after Brazil with an area under sugarcane cultivation of 4.94 million hectares with an average yield is 68.6 tons per hectare. Among different states of the country, Uttar Pradesh occupies first place in area (22.34 lakhs hectare) and production 1623.38 lakhs million tons but in terms of productivity it ranks seventh. (Annual Report 2017-18). The cost of cultivation of sugarcane was more at the field of large farmers followed by medium farmers and small farmers. The cost of cultivation of sugarcane per hectare in the small, medium and large farmers categories were Rs. 53998.40, Rs. 54442.39 and Rs. 57649.61 respectively.

Keywords: sugarcane, farm income, gross income, profitability, sample farm, farmers, cost of cultivation, input output ratio

Introduction

Sugarcane (*Saccharum spp.*) is an important commercial crop of the world and the cultivation of sugarcane, in India dates back to Pre-Vedic period (2000 B.C.). India is one of the principal centers of the origin of the sugarcane. Sugarcane is grown in diversified climatic condition i.e. tropical and sub-tropical. Sugarcane is an important commercial crop of the world and more than 100 Countries produce sugar, at present Brazil, Cuba, Mexico, India and Thailand are the leading producers of sugarcane. Currently 69 per cent of the world's sugar is consumed in the country of region. Globally, sugarcane is cultivated over an area of 20.10 million hectares with a production of 1,318.10 million tones and productivity of 65.5 tonnes per hectare. Sugarcane area and productivity differ widely from country to country. Brazil has the highest area (5.34 million hectares) while Australia has the highest productivity (85.1 tonnes per hectare) India ranks second among the sugarcane growing countries of the world in the both area and production after Brazil with an area under sugarcane cultivation of 4.94 million hectares with an average yield is 68.6 tons per hectare. Among different states of the country, Uttar Pradesh occupies first place in area (22.34 lakhs hectare) and production 1623.38 lakhs million tons but in terms of productivity it ranks seventh (Annual Report 2017-18).

Beside a cash crop, it occupies an important place in the national economy and also provides fodder for animals, food for human being and casual employment to more than 5 lakh persons in sugar factories. A part from a large number of agricultural labour nearly 35 million farmers and their families are involved in Sugar cane cultivation. Uttar Pradesh, Maharashtra, Tamilnadu, Karnataka, Andhra Pradesh, Gujarat, Haryana and Uttaranchal are major sugar cane cultivating states in India

Majority of technologies developed for improving sugarcane production in the country certainly enhanced the productivity of sugarcane irrespective of reduction in cost of cultivation. The maximum cost of production (Rs 278 /q) of sugarcane is found in Haryana followed by Uttar Pradesh as Rs234/q while the minimum cost of production has been recorded in Maharashtra (Rs 183/q) in the country during 2016-17. Hence, the cost of production of sugarcane has been aggravated in the subtropical region of India which jeopardized the profit due to narrowing the additional margin in the form of net return. The high cost of production is also beyond the limit of majority of sugarcane growers in the country like India where more than 85% farmers having small size land holding.

Therefore, keeping the technological cost of production in the mind, an attempt has been made to find out an appropriate technologies referred to low cost technologies having comparatively higher additional margin in profit through net return in sugarcane agriculture.

Materials and Methods

The present study pertains to Basti district of Eastern Uttar Pradesh. Out of 14 community developmental blocks in the district Basti, only one block, namely Basti was selected purposively, where two sugar factories are situated in the block. They are already functioning. Therefore, the Basti block was taken as the sample block.

A list of all villages of Basti block was prepared, having more than five percent of the net cultivated under sugarcane cultivation were prepared with the help of record available with revenue officials. Out of which five villages namely Katahapur, Badhaya, Dayalpur, Bakhshai and Rajaya were selected randomly.

A list of all cultivators along with their cultivated area for each of the selected village was prepared. Farmers having ten percent of the net cultivated area under sugarcane were considered as sugarcane cultivators. These cultivators were stratified under the marginal, small, medium and large size group of operational holdings for selected villages. The equal number of 15 sugarcane farmers from each stratum in each selected villages were taken randomly in the sample. Thus in totality there were 75 farmers in each stratum comprising 225 cultivators in the total sample.

Statistical Tools

For comparison and interpretation of the data following statistical tools were used:

1. Tabular Analysis

The tabular analysis was used to compare the production and productivity, loss and returns, income and employment level and other differential input level and their impact on farm economy.

2. Function Analysis

The production function analysis was carried out to examine the resource use efficiency of sugarcane on the sample farm. To study the effect of various independent variable on the dependent variable (yield) multiple regression analysis was used with a view to determine the simultaneous relationship between total farm return from sugarcane production and their various input variable on the basis of lard per ha.

However, Cobb-Douglas type production function for resource use efficiency have been found with the functional analysis applying the model as under.

$$y = a + \sum_{i=1}^n B_i X_i$$

Where,

Y= The dependent Variable (yield)

X_i= Independent variable (Casual factors)

B_i= Elasticities of production with respect of X_i (Regression coefficient)

a = Intercept (constant)

The value of intercept (constant) and coefficient (B₁) in

respect of independent variable (casual factor) in the function have been estimated by using the least square method.

To measuring the return of farm size as a institutional variable, all the variable except land are transferred into per hectare basis. After standardizing it this will take the functional formulae-

$$Y = a.e^{bx}$$

When expressed in logarithmic terms into linear function of the following type;

$$\log y = \log a + b (\log e.x.)$$

$$\text{suppose } b \log e = B$$

$$\text{so, } \log y = \log a + B.x$$

where

$$B = \frac{\sum \log y}{\sum x^2}$$

Then

$$b = \frac{B}{2.71828}$$

where,

y = Area/Production/Yield

x = Number of years/time variable in years

e = napionion base i.e. 2.71828

a = Intercept

b = Regression co-efficient

The compound growth rate (r) was worked out as follows:

$$r = (e^b - 1) \times 100$$

where

r = Compound growth rate

e = napionion base

b = Regression coefficient

Cost concepts

For policy matter, the Estimation Committee on Cost of Cultivation, 1981, Directorate of Economics and Statistics, Govt. of India, has recommended the following classification of costs to be adopted:

Cost. A1 all actual expenses and kind incurred in production by owner

Cost A2 = Cost A1 + Rent paid for leased-in land, if any

Cost B1 = Cost A1 + Interest on value of owned fixed capital (excluding land)

Cost B2 = Cost B1 + Rental value of owned land (net of the land revenue) and rent paid for leased in-land.

Cost C1 = Cost B1 +Imputed value of family labour

Cost C2 = Cost B2 +Imputed value of family labour

Cost C3 = Cost C2 + 10 per cent of Cost C2 to account for managerial input of the farmers

Gross Income

It includes:

Cash received on account of the sale of farm produce.

Value of the produce, main or by-product used for home consumption and for cattle feed are given over as wages in kind.

Value of the seed for sowing purposes.

Net Income

Gross income - Gross expenses

C ₂	50.87
C ₃	55.69

Family labour income

Net income + Family labour wages

Farm business income

Family labour income + Interest on working capital + Rental Value of own land.

Results and Discussion**Profitability of Sugar cane cultivation on Sample Farmers**

In this part of the chapter profitability of Sugar cane cultivation by sample farmers of Basti district has been examined. The profitability has been examined on the basis of cost-return analysis of sugar cane cultivation by the growers. Income from sugar cane cultivation in this study has been analyzed using procedure adopted in farm management analysis. The study envisages estimation of income from cultivation of sugar cane in different holding groups in Basti district.

Marginal Holdings

Estimates of the cost of cultivation/production per hectare of sugar cane pertaining to <0.5 to 1.0 hectare holdings are presented in Table 1.

Table 1: Estimation of the cost of cultivation production per Hectare of sugar cane with reference to various cost concepts on Marginal farms in Basti district. (Value in rupees)

Cost of cultivation / hect.	Marginal
Cost of cultivation / hect.	
A ₁	21605
A ₂	21605
B ₁	24724
B ₂	33908
C ₁	28231
C ₂	37415
C ₃	41157
Yield of main product / hect. (Qtl.)	672
Yield of by- product / hect. (Qtl.)	140
Cost of production / Qtl	
A ₁	29.26
A ₂	29.26
B ₁	33.50
B ₂	46.10
C ₁	38.28

It reveals that the cost of cultivation under cost A₁ was Rs. 21605/- per hectare under cost A₂ it was same as farmers did not pay rent for the leased in land. The cost B₁ and B₂ were estimated as Rs. 24724/- and Rs. 33908/- per hectare. Cost C₁ comprises cost B₁ plus imputed value of family labour is Rs. 28231/- where as cost C₂ which comprises cost B₂ plus imputed value of family labour is Rs. 37415/- cost C₃ which is cost C₂ plus 10 percent of Cost C₂ added is Rs. 41157/- per hectare.

Table 2: Breakup of the Gross Income and Net Income per hectare of sugar cane on marginal farms in Basti district (Value in rupees)

Gross Income	Marginal
Gross Income	
Main Product	45002
By-Product	4491
Total Output	49493
Net Output	
Over Cost A ₁	27888
Over cost A ₂	27888
Over cost B ₁	24769
Over cost B ₂	15585
Over cost C ₁	21262
Over cost C ₂	12078
Over cost C ₃	8336

The cost of production per quintal has been estimated on proportionate allocation of different costs in main and by products. The cost of production per quintal against cost A₁ and cost A₂ is Rs. 29.26, against B₁ 33.50, against B₂ Rs. 46.10, against C₁ Rs. 38.28, against Rs. C₂ Rs. 50.87 and against C₃ Rs. 55.69 per quintal. The allocation of cost was done against main product 672 quintal and by product 140 quintals. The value of main product Rs. 45002/- and by product Rs. 4491/- the total output accounts to Rs. 49493/- The net income per hectare over cost A₁ and cost A₂ is Rs. 27888/- per hectare. The net income over Cost B₁ is Rs. 24769/- per hectare. The net income over cost B₂ is Rs. 15585/- per hectare. The net income over cost C₁ is Rs. 21262/- per hectare. The net income over cost C₂ is Rs. 12078/- per hectare. The net income over cost C₃ has been estimated to be Rs. 8336/- hectare.

Table 3: Financial Test Ratio of the sugar cane cultivation (Value in rupees)

Financial	Marginal
Gross Cost ratio	0.76
Fixed ratio	0.32
Operation Ratio	0.45
Rate of return on capital	0.32
Output-Input ratio with	
Cost A ₁	2.29
Cost A ₂	2.29
Cost B ₁	2.00
Cost B ₂	1.46
Cost C ₁	1.75
Cost C ₂	1.32
Cost C ₃	1.20

The estimate of income over different cost concepts is of the sugar cane grow-belonging to marginal holding group in Basti district of Eastern Uttar Pradesh.

Financial test ratio as the term indicates is parameter of financial management and cost concept based returns. The gross cost ratio is 0.76 while the fixed cost ratio is 0.32. The operating ratio is 0.45 while the rate of return on capital 0.32. The output-input ratio with cost A1 and cost A2 is 2.29, with B1 2.00 with B2 1.46. The output-input ratio over cost C1 is 1.75, cost C2 1.32 and Cost C3 1.20. These ratio present financial management and farming efficiency estimates as such they serve as parameter. These reports the income cost and financial derivatives related to sugar growers pertaining to marginal group of Basti district.

Small Holding Group

Estimates of the cost of cultivation's/production per hectare of sugar cane pertaining to small farms are presented in table – 4. It shows that the per hectare cost of cultivation of sugar cane under cost-A is Rs. 22265/-. As the farmers did not pay rent for the leased in land the cost of cultivation per hectare under cost A2 is same as under A1. The cost of cultivation under cost B1 is Rs. 25423/- per hectare while it is Rs. 34723/- under B2. The cost of cultivation per hectare estimated under C1 is Rs. 29153/- and under C2 Rs. 38453/- per hectare. The yield of sugar cane aggregated 691 quit and the yield of by products 143 quintals.

Table 4: Estimation of the cost of cultivation production per Hectare of sugar cane with reference to various cost concepts on Small farms in Basti district (Value in rupees)

Cost of cultivation / hect.	Small
Cost of cultivation / hect.	
A ₁	22265
A ₂	22265
B ₁	25423
B ₂	34723
C ₁	29153
C ₂	38453
C ₃	42298
Yield of main product / hect. (Qtl.)	691
Yield of by- product / hect. (Qtl.)	143
Cost of production / Qtl	
A ₁	29.32
A ₂	29.32
B ₁	33.48
B ₂	45.73
C ₁	38.39
C ₂	50.64
C ₃	55.71

Table 5: Breakup of the Gross Income and Net Income per Hectare of sugar cane in on Small farms in Basti district. (Value in rupees)

Gross Income	Small
Gross Income	
Main Product	46297
By-Product	4576
Total Output	50873
Net Output	
Over Cost A ₁	28608
Over cost A ₂	28608
Over cost B ₁	25450
Over cost B ₂	16150
Over cost C ₁	21720
Over cost C ₂	12420
Over cost C ₃	8575

After proportionate allocation of the costs under different concepts between main and by-products the cost of production per quintal main product has been estimated. The cost of production under Cost A1 is Rs. 29.32, under A2 also Rs. 29.32. The per quintal cost of production under cost B1 is Rs. 33.48 and under B2 Rs. 45.73. The estimate of cost of production per quintal under cost C1 is Rs. 38.39, under cost C2 Rs. 50.64 and under cost C3 Rs. 55.71.

The cost concept based incomes are presented in table 5. it shows that the estimated Gross income from main product is Rs. 46297/- per hectare, from by product Rs. 4576/- per hectare there by the total output of farms between 1.0 to 2.0 hectares in small farms in Basti district under command area is estimated as Rs. 50873/- per hectare. Net income per hectare over cost A1 is Rs. 28608/- and over cost A2 also Rs. 28608/-. The per hectare net income over cost B1 is Rs. 25450/-. The net income over cost B2 has been estimated to be Rs. 16150/- per hectare. The per hectare net income over Cost C1 has been estimated to be Rs. 21720/-. The net income over cost C2 is Rs. 12420/- per hectare and the net income over cost C3 Rs. 8575/- per hectare. These estimates of net income per hectare over different cost concepts refer to the sugar cane growers belonging to small holding group in the at Basti district Uttar Pradesh.

Table 6: Financial Test Ratio of the sugar cane cultivation (Value in rupees)

Financial	Small
Gross Cost ratio	0.76
Fixed ratio	0.31
Operation Ratio	0.44
Rate of return on capital	0.32
Output-Input ratio with	
Cost A ₁	2.28
Cost A ₂	2.28
Cost B ₁	2.00
Cost B ₂	1.47
Cost C ₁	1.75
Cost C ₂	1.32
Cost C ₃	1.20

The financial test ratio is presented in Table-6. (b) refer to the small holding group in Basti. Table presents gross cost ratio to be 0.76 where as fixed ration is 0.3%. The operating ration is 0.44 and the rate of return on capital 0.32. The output-input ratio with Cost A1 and A2 is 2.28, with cost B1 2.00, with Cost B2 1.47, with Cost C1 1.75, with cost C2 1.32 and with cost C3 1.20. These represent the performance of sugar cane growers belonging to small holding in Basti district.

Medium and Large Holdings

Estimates of the cost of cultivation/production per hectare of sugar cane pertaining to >2.0 hectare holdings are presented in table 7. It reveals that the cost of cultivation under Cost A1 was 22435/-. As farmers did not pay rent for the leased in land the cost of cultivation under A2 is Rs. 24435/- per hectare. Cost B1 and Cost B2 were estimated to be Rs. 27723/- and Rs. 36973/- per hectare, cost C1 which comprises cost B1 plus imputed value of the family labour is Rs. 31350/- and cost C2 which is cost B2 plus imputed value of family labour is Rs. 40600/- per hectares.

Table 7: Estimation of the cost of cultivation production per Hectare of sugar cane with reference to various cost concepts in medium and large in Basti district (Value in rupees)

Cost of cultivation / hect.	Medium and Large
Cost of cultivation / hect.	
A ₁	22435
A ₂	224935
B ₁	27723
B ₂	36973
C ₁	31350
C ₂	40600
C ₃	44660
Yield of main product / hect. (Qtl.)	754
Yield of by- product / hect. (Qtl.)	155
Cost of production / Qtl	
A ₁	29.49
A ₂	29.49
B ₁	33.46
B ₂	44.62
C ₁	37.84
C ₂	49.00
C ₃	53.94

Table 8: Breakup of the Gross Income and Net Income per Hectare of sugar cane in Medium and Large Holdings in Basti district. (Value in rupees)

Gross Income	Medium and Large
Gross Income	
Main Product	50518
By-Product	4960
Total Output	55478
Net Output	
Over Cost A ₁	31043
Over cost A ₂	31043
Over cost B ₁	27755
Over cost B ₂	18505
Over cost C ₁	24128
Over cost C ₂	14878
Over cost C ₃	10818

The cost C₃ has been estimated as Rs. 44660/- per hectare. The yield of the main product is 754 quintals per hectare and yield of by product 155 quintals.

Table 9: Financial Test Ratio of the sugar cane cultivation (Value in rupees)

Financial	Medium and Large
Gross Cost ratio	0.73
Fixed ratio	0.29
Operation Ratio	0.49
Rate of return on capital	0.37
Output-Input ratio with	
Cost A ₁	2.27
Cost A ₂	2.27
Cost B ₁	2.00
Cost B ₂	1.50
Cost C ₁	1.77
Cost C ₂	1.37
Cost C ₃	1.24

Allocating cost of cultivation between main and by products on ratio of value of main product and by product the cost of production per quintal has been estimated cost of production per quintal in reference to cost A₁ is Rs. 29.49, Cost A₂ being similar to cost A₁ the cost of per quintal against cost B₁ is Rs. 33.46, against Cost B₂ Rs. 44.62 per quintal, the cost of

production per quintal against cost C₁ is Rs. 37.84 and against cost C₂ Rs. 49.00. The estimated cost of production in reference to cost C₃ is Rs. 53.94 per quintal.

The cost concept based estimates of income are presented in table 5.14. The value of main product has been estimated to Rs. 50518/- by product 4960 and the value of total output Rs. 55478/- per hectare. On the basis of cost concepts the net income over cost A₁ and A₂ is Rs. 31043/- per hectare, the net income over cost B₁ is Rs. 27755/- the net income over cost B₂ is Rs. 18505/-. The net income over cost C₁ has been estimated to be Rs. 24128/- the net income over Cost C₂ Rs. 14878 and the net income over cost C₃ Rs. 10818/- per hectare. The presented net incomes pertain to medium and Large holding group sugar cane cultivators Basti district in Uttar Pradesh.

The financial ratios pertaining to above have also been estimated. The estimated gross cost ratio is 0.73, fixed ratio 0.29, operating ratio 0.48 and rate of return on capital 0.37, output input ratio with coast A₁ has been estimated as 2.27 with Cost A₂ 2.27, with Cost B₁ 2.00 and Cost B₂ 1.50. The estimates of output-input ratio with cost C₁ is 1.77, with cost C₂ 1.37 and with cost c₃ 1.24. These present cost, income and financial test ratios of sugar cane cultivated by growers of Medium and Large Ownership holding group of Basti district Uttar Pradesh.

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