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Dr. Anuj Kumar
Associate Professor,
Department of Economics,
Govt. College, Dholpur,
Rajasthan, India

Sonal Meena
Assistant Professor,
Department of Geography,
Govt. College, Dholpur,
Rajasthan, India

Dr. Sunil Kumar
Department of Economics,
Govt. College, Dholpur,
Rajasthan, India

Correspondence Author:
Dr. Anuj Kumar
Associate Professor,
Department of Economics,
Govt. College, Dholpur,
Rajasthan, India

A study of sugarcane farming under different irrigation situations in Western Uttar Pradesh: A case study

Dr. Anuj Kumar, Sonal Meena and Dr. Sunil Kumar

Abstract

Sugarcane as a commercial crop is a major cash crop in India which is responsible for the overall socio-economic development of the farming community. Sugarcane juice makes jaggery, sugar and khandsari etc. The production of the crop is mainly located in the states of Uttar Pradesh, Maharashtra, Tamil Nadu, Karnataka and Gujarat. Contribution of sugarcane to the national GDP is 1.1% which is significant considering that the crop is grown only in 2.57% of the gross cropped area. In India sugar is an essential item of mass consumption, and the domestic demand is around 25 million tonnes per annum. It has been observed that area expansion has significantly contributed towards increased production of sugarcane but productivity has remained stagnant. Cost of cultivation of sugarcane also witnessed increasing trend and due to much higher use of inputs, it was found to be higher for Western Uttar Pradesh. However growth of value of output has outpaced the growth of cost of cultivation and thus rising trend of profitability was observed. This study demonstrates that two cropping systems in Western Uttar Pradesh mainly rice -wheat and sugarcane -wheat cover a large area under different irrigation systems. In this study, an effort has been made in this study to examine the trends in area, production, productivity, costs, returns and profitability of sugarcane and to determine the factors which are contributing toward productivity of sugarcane in Western Uttar Pradesh. The average cost of cultivation of sugarcane crop has been obtained from Rs.195.19 to Rs.208.84 per quintal. Total cost of sugarcane in Western Uttar Pradesh on different means of irrigation like canal irrigated farms, electric tubewell irrigated farms, diesel tubewell irrigated farms, canal plus electric tubewell irrigated farms and canal plus diesel tubewell irrigated farms was received as Rs.195061, Rs. 208542, Rs.219085, Rs.212983 and Rs.216658. Gross income and net income from sugarcane crop in the study area were also obtained in the same order. The study indicated that the cost of production per quintal of sugarcane was lower than other major crops of the region, wheat and paddy, on the other hand, the net income per hectare from sugarcane was higher than the other two crops. In western Uttar Pradesh, the percentage profit and agribusiness was getting more from sugarcane as compared to the major crops.

Keywords: Sugarcane, area, production, productivity, cost of cultivation, profitability, gross income, farm business income

Introduction

Agriculture is an important contributor to the Indian economy Agriculture is the backbone of the Indian economy plays an important role in improving the overall welfare of the rural society. As the largest private enterprise in India, agriculture contributes about a quarter of the GDP and sustains a livelihood. Despite its small contribution to the country's GDP, agriculture is the mainstay of the Indian economy because of its share in employment and also in livelihood. Some analysts also raise questions on this by citing the contribution of agriculture and allied sectors in the country's GDP, according to them, about 50 percent of the country's population is in the human resource in the agriculture sector, yet this sector contributes only 15-16 percent to the GDP. Despite the above logic, it is also necessary to see that the last two years have been badly affected by the Covid-19 global epidemic, due to the effect of the global disaster Corona, like all the affected countries of the world, the economic activities of India were almost stalled. Due to which the GDP declined by 14.9% in the first half of the financial year 2020 21, only a marginal growth of 0.3 percent is expected in the second half. On the other hand, if we talk about the rate of agricultural growth during this period, there was an increase of 3.6%, while in the financial year 2021-22, the rate of agricultural growth was recorded at 3.9%.

These figures prove that there is a stability in agricultural development even in adverse conditions, and this strength is like a backbone. According to this year's Economic Survey report, the share of agriculture in the country's GDP was 20.2 percent in 2021-22, which was recorded at 19.9% in 2020-21. India is home to 16.87% of the world's population, while India has only 2.4 percent of the world's area. Rice and wheat are the important food crops of the country. India produces about 96.5 million tonnes of wheat every year, which is about 16% of the world's total production.

India is the second largest producer of sugarcane after Brazil, which shows that sugarcane is an important commercial crop in India. Sugarcane is the only raw material for all major sweeteners in the country. Sugarcane is an important crop which is a major and rich source of food, fibre, chemicals and fodder for livestock. Sugarcane products are also playing an important role in the national economy. Sugarcane production and its processing is a major source of employment and livelihood in India. About 50 million farmers and 3 to 5 lakh skilled unskilled workers are employed in the sugarcane and sugar industries and its associated industries. Sugarcane is an important cash crop in western Uttar Pradesh and this area is considered to be the count heart land of the state. The social- financial condition of western Uttar Pradesh is essentially completely dependent on sugarcane production. There is a great need to understand sugarcane based cropping systems and their economics to explore the possibilities of increasing agricultural production and farm income in western Uttar Pradesh. In the present paper an attempt has been made to study the cost and return structure of sugarcane crop in different irrigated fields. The aim of the study is to study the cost and return structure of sugarcane crop based on various cost and concepts. The objective of this study was also to examine the profitability of farmers by cultivating sugarcane in western Uttar Pradesh.

Materials and Methods

Objectives of the Study

1. To calculate the cost and return value of sugarcane crop on various types of farms.
2. To analyze the farm business income of sugarcane crop.
3. To comparing the cost and return value of sugarcane crop on different irrigated farms.

Sampling Structure

Since the study was confined to the Buland Shahr, Hapur and Ghaziabad District of Western Uttar Pradesh, the data were collected for the year of 2020-21. The primary data were collected from the selected farmers relating physical input-output of the sugarcane crop and the prices for the agriculture year 2020-21 by interviewing the farmers personally with the help of a set of schedules specially prepared for this purpose. Besides, secondary data, the data related to the canal water, tubewell water, land resource, human labour, farm power, agro-chemicals, working capital etc. were also collected. A four stage sampling technique is used for selecting the sample farms. Ghaziabad, Hapur and Buland Shahr district were selected from Western Uttar Pradesh. From the above three district 6 tehsils (two from each) were selected on the basis of highest operation holdings. Out of these 6 tehsils, 24 villages (4 from each tehsils) and 5 farmers from each village were randomly selected (120 farmers). In all 120 (randomly selected)

farmers were interviewed with 24 farmers in each irrigation system situation.

1. Canal Irrigated Farms
2. Electric Tubewell Irrigated Farms
3. Diesel Tubewell Irrigated Farms
4. Canal + Electric Tubewell Irrigated Farms
5. Canal + Diesel Tubewell Irrigated Farms

The farms were also classified under different categories i.e. small, medium and large sized farms according to their operational holdings in the study area. Under this classification, small farmers are those who are farming on land less than 2.0 hectares, medium farmers are farming on land between 2.1 to 4.0 hectares and farmers farming on land more than 4.0 hectares are considered large farmers. The farmers were selected randomly within each category. The number of farmers selected from various categories was 14 small, 7 medium and 3 large.

The data were subjected to tabular analysis to examine the resource endowment and their use, productivity, employment generation and fertilizer consumption in growing sugarcane crop on the various farms under different irrigation systems. Various cost and income concepts were also employed to examine cost and returns on farms due to change in irrigation potential. To fulfill the objectives of the study, the cost of production and returns were worked out on per hectare basis for sugarcane crop in each category for the farmers. Return from the crop was estimated by calculating the gross return from each selected crop.

Estimation of Cost and Returns Cost Concepts

Cost A1 = Value of hired human labour + value of farm power + value of seed (both farm seed and purchased) + value of agro-chemicals + depreciation + irrigation cost + land revenue + interest on working capital

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

Cost B = Cost A2 + Interest on value of owned fixed capital assets (excluding land) + rental value of owned land

Cost C = Cost B + Imputed value of family labour

Income Concepts

Gross Income = (Main Product X Price per unit) + (By Product X Price)

Net Income = Gross income - Cost C3

Family Labour Income = Gross Income – Cost B

Farm Business Income = Gross Income – Cost A1

Farm Investment Income = Net Income + Rental value of owned land + Interest on fixed cost

Capital Benefit Cost Ratio = Gross Income/ Cost C3

$$\frac{\text{Gross Income} - \text{Total Cost}}{\text{Total Cost}} \times 100$$

Percent Profit =

Result and Discussion

A. Cost of Cultivation

The study is based on the primary data which is based on the data obtained from the representative districts of Ghaziabad, Hapur and Bulandshahr of Western Uttar Pradesh. On the basis of the data obtained, about 23% of the gross cropped area was included in the sugarcane crop. Sugarcane is an annual crop and once this crop is sown, it can be produced for 2 years by applying other inputs, so the average data has been obtained keeping in mind the above

2-year period while taking the sample of the study. Present table no. 1 describes the cost conditions of sugarcane crop in the land irrigated by different means of irrigation. From the perusal of the table presented above, it is clear that the highest total cost (Rs.219085) for sugarcane production in the study area was received on the farm irrigated by diesel tubewell and lowest total cost (Rs.195061) Received on Canal Irrigated farms. When the share of individual inputs in total cost of sugarcane crop was examined, it was found

that the share of rental value of land on farm irrigated by all sources was the highest. The table also reveals that the highest (32.60 percent) share of rental value was on canal irrigated farms while the lowest (25.25 percent) was received on electric tubewell irrigated farms. The share of human labour and agrochemicals after rental value of land in the total cost was found to increasing manner along with assured and timely irrigation.

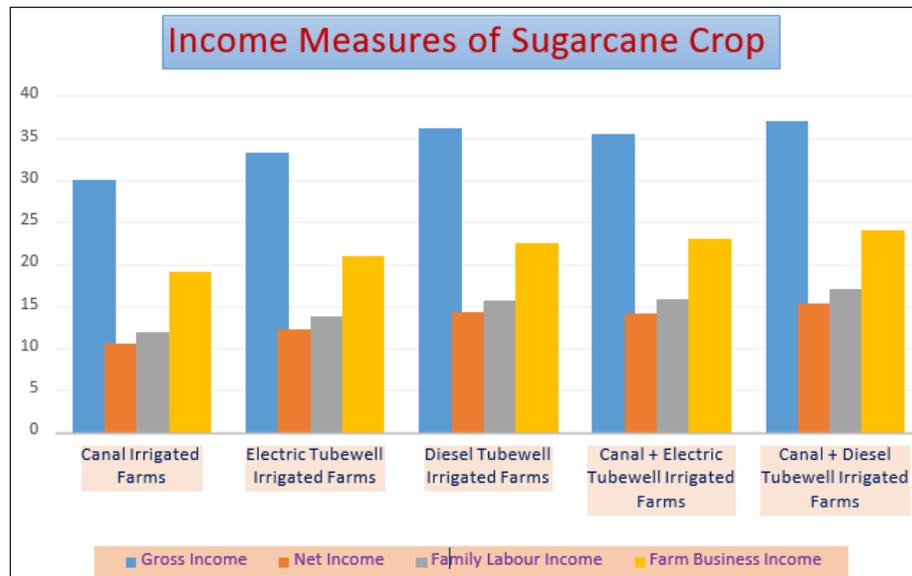
Table 1: Analysis of total cost of cultivation of sugarcane crop under different irrigation systems. (2020-21) (Rs. per Hectare)

Items	Categories of Farms				
	Canal Irrigated Farms	Electric Tubewell Irrigated Farms	Diesel Tubewell Irrigated Farms	Canal + Electric Tubewell Irrigated Farms	Canal+ Diesel Tubewell Irrigated Farms
Rental Value of Land	63600 (32.60)	61000 (25.25)	57775 (26.37)	62260 (29.23)	58290 (26.90)
Interest on Fixed Capital	4700 (2.41)	6127 (2.94)	6380 (2.91)	5850 (2.75)	6306 (2.91)
Depreciation on Fixed Capital	5425 (2.78)	7356 (3.53)	8120 (3.71)	7678 (3.60)	8000 (3.69)
Interest on Working Capital	3850 (1.97)	4600 (2.20)	5176 (2.36)	4776 (2.24)	5588 (2.58)
Human Labour	13800	14600	13925	15700	16560
A- Family					
	(7.07)	(7.00)	(6.35)	(7.37)	(7.64)
B- Hired	26000 (13.33)	30680 (14.71)	33010 (15.07)	33608 (15.78)	36800 (16.98)
Farm Power	26000 (13.33)	27500 (13.19)	29070 (13.27)	27090 (12.72)	27480 (12.68)
Seed	18728 (9.60)	18010 (8.64)	16824 (7.68)	17855 (8.38)	16700 (7.71)
Agro Chemicals	29200 (14.97)	31069 (14.90)	33890 (15.47)	31000 (14.55)	33606 (15.51)
Irrigation	3758 (1.93)	7600 (3.64)	14915 (6.81)	7166 (3.36)	7328 (3.38)
Cost A	109111	122215	135829	124397	129914
Cost B	181261	193942	205160	197283	200098
Cost C	195061	208542	219085	212983	216658
Cost per Quintal	208.84	205.86	200.63	203.42	195.19

Figures in Parenthesis represent percentage to the Total

Table 4: Gross income, net income, family labour income and farm business income of sugarcane crop under different categories of farms. (2020-21) (Rs. per hectare)

Categories of farms	Gross Income	Net Income	Family Labour Income	Farm Business Income	Output/ Input Ratio
Canal Irrigated Farms	300748	105687	119487	191637	2.52
Electric Tubewell Irrigated Farms	332264	123722	138322	210049	2.45
Diesel Tubewell Irrigated Farms	362056	143171	156896	226227	2.41
Canal + Electric Tubewell Irrigated Farms	355663	142680	158380	231266	2.58
Canal + Diesel Tubewell Irrigated Farms	370412	153754	170314	240498	2.57



Human labour on farms irrigated by various means such as canal irrigated, electric tubewell, diesel tubewell, canal plus electric tubewell and canal plus diesel tubewell farm was observed Rs.39800, Rs.45280, Rs.46935 and Rs.49308 and Rs.53360 respectively. Table-1 related to the cost of sugarcane crop also shows how much cost A and cost B were received on the farms irrigated by different means, as well as the cost per quintal of sugarcane production has also been displayed through this table which is respectively Rs.208.84, Rs.205.86, Rs.200.63, Rs.203.42 and 195.19 rupees have been obtained. Figures in Parenthesis represent percentage to the Total.

B-Income Measures

The main basis for the success of agribusiness income is how much profit the farm has received in the production of the crop. Table No.-2 shows an assessment of the various measures under different categories of farms. It is clear from the perusal of Table-2 that net income per hectare (Gross Income - Cost C) was obtained maximum in canal plus diesel tubewell and lowest on canal irrigated farms. A perusal of the table also shows that along with the assuredness and certainty of irrigation, the farm business income was also getting higher. Gross income derived from sugarcane crop on farms irrigated by various means in the study area which was obtained highest (Rs.-370412) on canal plus diesel tubewell irrigated farms, Rs.-362056 on diesel tubewell irrigated farms canal plus electric tubewell irrigated farms, (Rs.-332264) electric tubewell irrigated farms and lowest (Rs.-300748) was on canal irrigated farms respectively. The table also shows that the output input ratio were also obtained showing the same trend in the following order over all farms- canal plus diesel tubewell irrigated farms,(2.57) on diesel tubewell irrigated farms (2.41), canal plus electric tubewell irrigated farms,(2.58), (2.45) electric tubewell irrigated farms and 2.52 was on canal irrigated farms. In the study area, production, productivity and gross income in terms of operational holdings were highest in the production of sugarcane crop in the study area, whereas it was the lowest in the farms with smaller holdings.

Conclusion

In Western Uttar Pradesh, the main three crops are wheat, paddy and sugarcane. All the three selected crops cover

more than 74% of the gross cropped area of the study area. The present study examines various cost concepts and income measures in the production of sugarcane crop mainly in western Uttar Pradesh. The said study was based on the data available from both primary and secondary sources and the fields irrigated using various means of irrigation have been studied. For this investigation, three districts of western Uttar Pradesh, Bulandshahr, Hapur and Ghaziabad were selected, out of which 6 tehsils were selected and a total of 120 farmers were selected at random and this study was completed on the basis of cross section data. While selecting the agricultural farm for this study, special attention was also paid to the size of the agricultural holding in the study area. The results of the study, which are clearly visible from Table 1 and 2, show that the total cost of sugarcane crop was increasing along with the development of irrigation means of agriculture. It is also clear from Table 1 that the rental value of land constituted the largest share of the total cost and it was decreasing with the timely irrigation and the assured supply of water. Table 2 clearly shows how much gross income, net income, family labour income and farm business income were being received from sugarcane crop on farms irrigated by different means of irrigation. It is clear from the above table that maximum (Rs.153754) net income was being received by sugarcane crop on canal plus diesel tubewell irrigated farms and least (Rs.105687) on canal irrigated farms. Percent profit from sugarcane crop produced under different modes of irrigation also showed similar trend with canal irrigated farm, electric tubewell irrigated farms, diesel tubewell irrigated farms, canal plus electric tubewell irrigated farms and canal plus diesel tubewell irrigated farms with percentage profit of 54.18, 59.33, 65.26, 66.99 and 70.97 percent respectively. It is also clear from the above study of cost and income measures of sugarcane crop that along with timely and certain irrigation the share of other inputs used in sugarcane crop also increases as a result of cost and income receipt conditions change.

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