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## Size-class wise study on economics of sugarcane cultivation under contract farming in Vizianagaram District of Andhra Pradesh

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### Abstract

The study has been conducted in Vizianagaram district of Andhra Pradesh state with an objective of identifying economic status of sugar cane farmers under contract farming. Multi-stage simple random sampling without replacement was employed to select sample farmers from the study area. The sample farmers were divided into four categories according to the farm size from marginal farmers to medium farmers. The primary data was collected by personally interviewing each respondent. The cost concepts were used as a methodology for the study. The results state that a cost-saving trend with increasing farm size, indicative of potential economies of scale. Moreover, the crop yield and pricing information provide a comprehensive picture of the revenue generated from sugarcane cultivation. The calculated benefit-cost ratio of 1.28 suggests that this farming practice is economically favourable and has the potential to yield profits for the farmers involved.

**Keywords:** Contract farming, size-class, costs, returns, sugarcane

### Introduction

Contract farming is a system of production and supply of farm produce by farmers through forward contracts (Eaton and Shepherd, 2001) <sup>[5]</sup>. A contract firm can either obtain the produce from the contract farmers or engage in corporate production through corporate farming by leasing in land. The contract is between the 'company' and the 'contract farmer' generally signed at the time of planting and specifies how much produce the firm will buy and at what price (Asokan, 2005) <sup>[3]</sup>. The former chooses the 'effective' farmer who can grow and assure the contract crop production according to the quality specification of the contracting firm (Rahuri, 2008) <sup>[9]</sup>. While choosing the contract farmer, the contract firm usually tries to impose conditions such as availability of assured irrigation facility and labour, which are crucial for contract crop production. Thus, in this process the contract farmer is indirectly offered 'partial crop insurance' by a company through insuring the contract crop. However, the contract farmer is still exposed to vagaries of weather and other natural hazards beyond his control. Often the firm provides credit, inputs, technical advice and retains right to reject the substandard produce (Glover and Kusterer, 1990) <sup>[6]</sup>.

Sugarcane (*Saccharum officinarum* L.) is the main source of sugar and energy in India, which is one of the most significant economic crops for Indian farmers (Jha & Singh, 2018) <sup>[7]</sup>. It belongs to genus *Saccharum* and family Poaceae. Around 327 B.C., sugarcane was first produced in South East Asia and Western India. Around 647 AD it was introduced in Egypt, and approximately a century later, in 755 AD, it reached Spain. Since then, practically all tropical and subtropical countries have adopted sugarcane production. Early in the 16th century, Portuguese and Spaniards brought it to the New World. Around 1741, it was first brought to Louisiana in the United States of America.

India is considered as homeland of sugarcane and has been cultivated from the Vedic period over the years. It is a major commercial crop next to cotton since Indian agro-climatic conditions are favourable for the cultivation of sugarcane. It is the most important source of sugar and also plays a pivotal role in the agro-industrial economy of India. The study will give an insight into the plight of the contract farmers of sugarcane with respect to their economic

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condition in the district. The results of the study will be helpful to find the economic status of contract farmers in the area under study with the following objective.

**Objectives**

To study the costs and returns of sugarcane contract farmers

**Study Location**

The study was conducted in the state of Andhra Pradesh, which is recognized as the 8th largest sugarcane-producing state in India, constituting about 0.86 lakh ha of cultivated area with an overall production of 6.71 million tonnes and yield of 78.15 tonnes ha<sup>-1</sup> during the year 2019-20 (Agricultural Statistics at glance 2019-20). Multi stage sampling techniques have been used for selection of the respondents at different levels in this present study. Vizianagaram district is selected for the study as it ranks third in terms of area (0.12 lakh ha.) for sugarcane production in Andhra Pradesh in the year 2020 (Agricultural Statistics at a Glance 2019-20). From each district 54 sample farmers were selected purposively. From the district, two mandals are selected based on majority of the farmers practicing contract farming from which 26 sample farmers were selected purposively from each mandal. From each mandal, two villages having sufficient contract farmers were selected purposively for the study from which 13 sample farmers were selected from each village with the help of Simple Random Sampling Without Replacement Method (SRSWRM). The study is mainly based on primary data collected from sample sugarcane contract farmers in the district. Secondary data from different sources was used as and when necessary.

**Table:** Sampling frame of respondents

S. No.	Districts	Mandals	Villages	Population size	Sample size
1.	Vizianagaram	Jami	Bheemasingi	CF=50	CF=13
			Alamanda	CF=54	CF=13
		Korukonda	Koti	CF=47	CF=13
			Kanupuru	CF=48	CF=13

The age of the respondents ranges from 19 to 65 years overall the sample farmers. Majority of contract farmers are aged between 41-60 years while very few sample farmers are aged less than 20 years in the district. The average size of the family of sample farmers is 6.5 and the average members of the family engaged in agriculture are 3.2. Regarding education of the sample farmers states, it is noted that there are no illiterates and graduates among sample farmers and majority of the sample farmers are in category of primary education followed by secondary and higher secondary education in the district. As regards, years of experience majority of the sample farmers are in between the range of 11-20 years in the district. While very few are there in between the range of 31-40 years. The distance of the sugarcane land to the market data is a range of less than <25 and 25-75 kms distance in case of majority of the contract farmers. The size-class wise cropping pattern followed by sample farmers in the district shows that majority of the area is operated under paddy followed by sugarcane in kharif season. During zaid, vegetables are grown and during rabi, the crops grown mainly in are maize and groundnut.

**Methodology**

**Cost Concepts**

Costs concepts were used to calculate costs per unit energy equivalent.

**Operational Cost:** The variable cost components include value of family labour, value of hired labour, value of owned and hired bullock labour, value of owned and hired machine labour, value of seeds purchased, value of manures and fertilizers, value of plant protection chemicals, interest on working capital, interest on fixed capital

**Fixed cost:** The fixed cost components include depreciation, repairs and maintenance, land revenue, cess and taxes + Imputed rental value of owned land, interest on owned fixed capital, etc.,

**Cost A<sub>1</sub>:** Cost of hired human labour and owned labour  
 + Cost of hired and owned bullock labour  
 + Cost of hired and owned machine charges  
 + Cost of pesticides, seeds, manures & fertilizers  
 + Depreciation, repair and maintenance of implements and farm building  
 + Irrigation charges  
 + Land revenue, cesses and other taxes + Interest on working capital  
 + Transportation charges

**Cost A<sub>2</sub>:** Cost A<sub>1</sub> + Rent paid for the leased- in land.

**Cost B<sub>1</sub>:** Cost A<sub>2</sub>+ Interest on fixed assets (excluding land)

**Cost B<sub>2</sub>:** Cost B<sub>1</sub> + Imputed Rental value of the owned land (or) rent paid for leased in land

**Cost C<sub>1</sub>:** Cost B<sub>1</sub> + Imputed value of family labour.

**Cost C<sub>2</sub>:** Cost B<sub>2</sub> + Imputed value of family labour

**Cost C<sub>3</sub>:** Cost C<sub>2</sub>+ 10 per cent of Cost C<sub>2</sub>

**Total cost=** Operational cost + Fixed cost

$$\frac{\text{Benefit-Cost Ratio (Financial Analysis)}}{\text{Gross Returns}} = \frac{\text{Total Cost of Cultivation}}{\text{Total Cost of Cultivation}}$$

**Results and Discussion**

The Table 1 shows the size-class wise labour use pattern of sugarcane under contract farming. It is noted that hours of usage of machine labour per hectare is the highest for medium farmers followed by small, semi-medium and marginal farmers respectively and charges per one-hour usage of machine is between Rs.800 to Rs.900 and the total value is the highest for small farmers followed by marginal, semi-medium and medium farmers respectively. The hours of usage of bullock labour per hectare is the highest for small farmers followed by medium, semi-medium and marginal farmers respectively and price per hour usage of bullock labour is between Rs.135 to Rs.155 per hour and the total value is the highest for small farmers followed by marginal, semi- medium and medium farmers respectively. The total quantity of human labour used is the highest for small farmers followed by medium, marginal and semi-medium farmers respectively and wage rate per man-day is between Rs.288.35 to 360.02 per man-day and the total value is the highest for marginal farmers followed by small, semi-medium and medium farmers respectively.

From overall data, it is noted that the wage rate varies according to the farm size i.e., it decreases with an increasing farm size. So, the total value also varies according to wage rate but quantity of usage of inputs is more or less the same in all four categories of size class.

**Table 1:** Size-Class Wise Estimation of Labour Use Pattern of Contract Farmers of Sugarcane Production in Vizianagaram District. (per hectare) (2020-21)

Particulars Input	Marginal CF (N=13) <1 ha	Small CF (N=13) 1-2 ha	Semi-medium CF (N=13) 2-4 ha	Medium CF (N=13) >4 ha	Pooled Average (N=52)
<b>Labour Utilization</b>					
<b>1. Machine Labour</b>					
Quantity (Hours)	26.98	28.17	27.55	28.32	<b>27.76</b>
Rate (Rs./hr)	900.00	900.00	850.00	800.00	<b>862.50</b>
Total Value (Rs./ha)	24,282.00	25,353.00	23,417.50	22,656.00	<b>23,927.13</b>
<b>2. Bullock Labour</b>					
Quantity (hours)	8.15	8.78	8.65	8.75	<b>8.58</b>
Rate (Rs./hr.)	155	150	140	135	<b>145.00</b>
Total Value (Rs./ha)	1,263.25	1,316.55	1,211.00	1,181.25	<b>1,243.01</b>
<b>3. Human Labour (both hired and family labour)</b>					
Total man-days	219.25	223.08	218.63	222.41	<b>220.84</b>
Rate (Rs./man-day)	360.02	332.24	309.85	288.35	<b>322.61</b>
Grand Total Value (Rs./ha)	78,933.30	74,115.60	67,742.00	64,133.00	<b>71,230.98</b>

Table 2 reveals that the pooled average value of hired human labour is the highest among all inputs used and it is highest for semi-medium farmers followed by medium, small and marginal farmers respectively. Pushpa *et al.*, (2017) [8] findings stated that marginal farmers have used less hired human labour than other categories of farmers in cultivation of major crops like paddy, wheat and sugarcane. The value of fertilizers and manures is the highest for marginal farmers

followed by small, semi-medium and medium farmers respectively. The operational cost, Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2, and Cost C3 is the highest for marginal farmers followed by small, semi-medium and medium farmers respectively. It shows the negative correspondence as the value decreases with an increasing farm size.

**Table 2:** Estimation of Costs of Sugarcane Production Under Contract Farming in Vizianagaram District (Rs. per ha) (2020-21)

SI. No.	Particulars	Marginal CF (N=13) <1 ha	Small CF (N=13) 1-2 ha	Semi-medium CF (N=13) 2-4 ha	Medium CF (N=13) >4 ha	Pooled Average (N=52)
1	Value of hired human labour	39,483.05	40,693.16	46,476.77	44,856.75	42,877.43
2	Value of hired bullock labour	1,263.25	1,316.55	1,211.00	1,181.25	1,243.01
3	Hired machine labour	24,282.00	25,353.00	23,417.50	22,656.00	23,927.13
4	Value of manures (owned and purchased)	11,787.13	11,628.06	10,076.40	9,531.12	10,755.68
5	Value of fertilizers	14,546.87	12,354.76	10,876.76	9,493.66	11,818.01
6	Value of seed (both farm produced and purchased)	7,200.00	7,000.00	6,830.00	6,200.00	6,807.50
7	Value of insecticides and pesticides	1,944.00	1,641.54	1,170.00	1,392.00	1,536.88
8	Irrigation charges (both owned and hired machines)	6,992.31	5,384.62	4,292.31	3,196.15	4,966.35
9	Land revenue, cesses and other taxes	80.00	80.00	80.00	80.00	80.00
10	Miscellaneous expenses (artisans, ropes, repairs to small farm implements)	178.54	154.65	143.45	134.23	152.72
	Total operational costs	1,07,757.15	1,05,606.33	1,04,574.19	98,721.16	1,04,164.71
11	Interest on working capital	4,310.29	4,224.25	4,182.97	3,948.85	4,166.59
12	Depreciation on farm buildings, farms machinery and irrigation structure	209.00	195.00	184.00	140.00	182.00
	Cost A <sub>1</sub>	1,12,276.43	1,10,025.59	1,08,941.16	1,02,810.01	1,08,513.30
13	Rent paid for leased-in land	0.00	0.00	0.00	0.00	0.00
	Cost A <sub>2</sub> = Cost A <sub>1</sub> + Rent paid for leased-in land	1,12,276.43	1,10,025.59	1,08,941.16	1,02,810.01	1,08,513.30
14	Imputed interest of fixed capital excluding land	28.90	27.50	26.40	22.00	26.20
	Cost B <sub>1</sub> = Cost A <sub>1</sub> + Imputed interest of fixed capital excluding land	1,12,305.33	1,10,053.09	1,08,967.56	1,02,832.01	1,08,539.50
15	Imputed rental value of owned land	20,000.00	20,000.00	20,000.00	20,000.00	20,000.00
	Cost B <sub>2</sub> = Cost B <sub>1</sub> + Imputed Rental Value of Owned Land	1,32,305.33	1,30,053.09	1,28,967.56	1,22,832.01	1,28,539.50
16	Imputed Value of Family Labour	39,450.25	33,422.44	21,265.23	19,276.25	28,353.54
	Cost C <sub>1</sub> = Cost B <sub>1</sub> + imputed value of family labour	1,51,755.58	1,43,475.53	1,30,232.79	1,22,108.26	1,36,893.04
	Cost C <sub>2</sub> = Cost B <sub>2</sub> + imputed value of family labour	1,71,755.58	1,63,475.53	1,50,232.79	1,42,108.26	1,56,893.04
	Cost C <sub>3</sub> = Cost C <sub>2</sub> + 10% of Cost C <sub>2</sub> as management cost	1,88,931.14	1,79,823.08	1,65,256.06	1,56,319.09	1,72,582.34

The Table 3 reveals that the yield and gross returns per hectare sugarcane production showing positive correspondence as there is increase in returns with an

increasing farm-size. Pushpa *et al.* (2017) [8] findings reveals that the per hectare productivity of sugarcane crop was higher on larger farms compared to marginal farms in sugarcane.

**Table 3:** Estimation of Returns of Sugarcane Production under Contract Farming in Vizianagaram District (Rs. /ha) (2020-21)

Size-class	Yield (tonne)	Price (Rs./tonne)	Gross Returns (yield*price)
Marginal CF <1ha N=13	71.79	2,900	2,08,188.97
Small CF 1-2ha N=13	72.99	2,900	2,11,662.02
Semi-Medium CF 2-4ha N=13	76.98	2,900	2,23,242.00
Medium CF >4ha N=13	80.69	2,900	2,34,001.00
Pooled Average (N=52)	75.61	2900	2,19,273.50

The Table 4 depicts the net returns over operational cost, Cost A<sub>1</sub>, Cost A<sub>2</sub>, Cost B<sub>1</sub>, Cost B<sub>2</sub>, Cost C<sub>1</sub>, Cost C<sub>2</sub>, and Cost C<sub>3</sub> is the highest for medium farmers followed by semi-medium, small and marginal farmers respectively. It shows the pattern of positive correspondence as there is increase in net returns with the land-size. The pooled average value of net

returns over operational cost is Rs. 1,15,108.79 per hectare, Cost A<sub>1</sub> is Rs. 1,10,760.20 per hectare, Cost A<sub>2</sub> is Rs. 1,10,760.20 per hectare, Cost B<sub>1</sub> is Rs. 1,10,734.00 per hectare, Cost B<sub>2</sub> is Rs. 90,734.00 per hectare, Cost C<sub>1</sub> is Rs. 82,380.46 per hectare, Cost C<sub>2</sub> is Rs. 62,380.46 per hectare and Cost C<sub>3</sub> is Rs. 46,691.16 per hectare.

**Table 4:** Estimation of Net returns over costs of Sugarcane Production under Contract Farming in Vizianagaram District (Rs. /ha) (2020-21)

Size-class	Net returns Over							
	Operational Cost	Cost A <sub>1</sub>	Cost A <sub>2</sub>	Cost B <sub>1</sub>	Cost B <sub>2</sub>	Cost C <sub>1</sub>	Cost C <sub>2</sub>	Cost C <sub>3</sub>
Marginal CF <1ha N=13	1,00,431.82	95,912.54	95,912.54	95,883.64	75,883.64	56,433.39	36,433.39	19,257.83
Small CF 1-2ha N=13	1,06,055.69	1,01,636.43	1,01,636.43	1,01,608.93	81,608.93	68,186.49	48,186.49	31,838.94
Semi-medium CF 2-4ha N=13	1,18,667.81	1,14,300.84	1,14,300.84	1,14,274.44	94,274.44	93,009.21	73,009.21	57,985.94
Medium CF >4ha N=13	1,35,279.84	1,31,190.99	1,31,190.99	1,31,168.99	1,11,168.99	1,11,892.74	91,892.74	77,681.91
Pooled Average (N=52)	1,15,108.79	1,10,760.20	1,10,760.20	1,10,734.00	90,734.00	82,380.46	62,380.46	46,691.16

The Table 5 shows benefit-cost ratio (financial analysis) per hectare sugarcane production under contract farming. The benefit-cost ratio over operational cost, Cost A<sub>1</sub>, Cost A<sub>2</sub>, Cost B<sub>1</sub>, Cost B<sub>2</sub>, Cost C<sub>1</sub>, Cost C<sub>2</sub>, and Cost C<sub>3</sub> is the highest for medium farmers followed by semi-medium, small and marginal farmers respectively. It presents the positive

correspondence as the ratio increases with land-size. The pooled average value of benefit-cost ratio (financial analysis) over operational cost is 2.11, Cost A<sub>1</sub> is 2.03, Cost A<sub>2</sub> is 2.03, Cost B<sub>1</sub> is 2.03, Cost B<sub>2</sub> is 1.71, Cost C<sub>1</sub> is 1.62, Cost C<sub>2</sub> is 1.41 and Cost C<sub>3</sub> is 1.28.

**Table 5:** Estimation of Benefit-Cost ratio (Financial Analysis) over costs of Sugarcane Production under Contract Farming in Vizianagaram District (Rs. /ha) (2020-21)

Size-class	Benefit-Cost ratio (Financial Analysis) @							
	Operational Cost	Cost A <sub>1</sub>	Cost A <sub>2</sub>	Cost B <sub>1</sub>	Cost B <sub>2</sub>	Cost C <sub>1</sub>	Cost C <sub>2</sub>	Cost C <sub>3</sub>
Marginal CF <1ha N=13	1.93	1.85	1.85	1.85	1.57	1.37	1.21	1.10
Small CF 1-2ha N=13	2.00	1.92	1.92	1.92	1.63	1.48	1.29	1.18
Semi-Medium CF 2-4 ha N=13	2.13	2.05	2.05	2.05	1.73	1.71	1.49	1.35
Medium CF >4ha N=13	2.37	2.28	2.28	2.28	1.91	1.92	1.65	1.50
Pooled Average (N=52)	2.11	2.03	2.03	2.03	1.71	1.62	1.41	1.28

**Conclusion**

- The study provides additional insights into the relationship between farm size and various economic indicators in sugarcane farming under contract farming in Vizianagaram district, Andhra Pradesh:
- **Input Usage Consistency:** The study notes that the units of input usage per hectare remain relatively consistent among different farm size classes. This suggests that farmers across various farm sizes are using similar quantities of inputs, indicating a degree of uniformity in farming practices.
- **Total Input Value and Wage Rate:** While input usage may be similar, the total value of inputs varies with the wage rate. Specifically, as farm size increases, the total value of inputs decreases. This may be due to larger farms achieving cost efficiencies and potentially paying lower wages per unit of labour.
- **Cost Analysis:** The study's cost analysis, including operational costs and various categories (Cost A<sub>1</sub>, Cost A<sub>2</sub>, Cost B<sub>1</sub>, Cost B<sub>2</sub>, Cost C<sub>1</sub>, Cost C<sub>2</sub>, Cost C<sub>3</sub>), reveals a consistent negative pattern. As farm size increases, the costs associated with these categories decrease. This pattern suggests that larger farms are more cost-efficient, possibly benefiting from economies of scale.

- **Yield and Financial Returns:** In contrast to the cost analysis, the study finds a positive pattern for crop yield, gross returns, net returns, and the benefit-cost ratio (financial analysis) as farm size increases. This indicates that larger farms tend to have higher yields and generate more substantial financial returns, which is a favourable outcome for farmers.
- **Benefit-Cost Ratio (BCR):** The BCR, specifically when comparing it to different cost categories, shows a positive trend with increasing farm size. This implies that as farm size grows, the financial returns relative to the various cost categories become more favourable, indicating improved profitability for larger farms.

**Summary**

The study highlights that, despite similar input usage per hectare across different farm size classes, there are significant variations in the total input value, costs, and financial returns. Larger farms exhibit cost efficiencies, leading to lower operational costs, while simultaneously achieving higher yields and better financial returns. The positive benefit-cost ratio trends suggest that larger farms in the study area are generally more economically viable and potentially more profitable.

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