



ANALYSIS OF FACTORS AFFECTING SUGARCANE FARMERS' INCOME IN BAGALKOT DISTRICT, KARNATAKA: A PRIMARY SURVEY STUDY

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ABSTRACT

Sugarcane is one of the important agricultural commodities in the district of Bagalkot in Karnataka. Sugarcane is one of the important sources of income and employment for rural farming communities. However, sugarcane production requires large investment, manpower and land resources and income of farmers depends on the optimal utilization of these resources. The present study is to study the factors affecting income of sugarcane growers in Bagalkot District, Karnataka. The special reference is made to capital, labor and land area. The research uses a quantitative method and a simulated dataset representing 120 sugarcane cultivators. The dataset has been constructed using a well-structured questionnaire framework that includes socioeconomic characteristics, land holding, sugarcane area, capital expenditure, labor deployment, production parameters, yield, revenue earned, cultivation costs and agricultural income. Descriptive statistics, correlation analysis and multiple linear regressions were applied to examine the correlations of selected factors with agricultural revenue. The results show that the average area used for growing sugarcane was 2.21 hectares with an average production of 87.66 tons per hectare. The mean gross return per farm was ₹5.81 lakh, while the mean net return was at ₹3.21 lakh, giving a benefit-cost ratio of 2.23. The correlation investigation revealed that there were positive relationships between capital, labor, land area and farmers' incomes. The outcomes of multiple regression analysis reveal that capital, labor and land area have positive and substantial statistical effect on the income of sugarcane growers. Labor had the highest standardized regression coefficient ($\beta = 0.479$) followed by land size ($\beta = 0.462$) and capital ($\beta = 0.156$). The model explained 82.4 percent of variability in farmers income ($R^2 = 0.824$). The study shows that the income of sugarcane growers can be raised by gaining access to more productive capital, by using the labor efficiently and by better management of land resources. Because the data set is created artificially, the results are for the progress of research models and methodological illustration, and need to be validated by a real-world field survey.

KEYWORDS: Sugarcane, Farmers' Income, Capital, Labor, Land Size, Bagalkot District, Karnataka, Multiple Regressions.

1. INTRODUCTION

Sugarcane is a major farm product in the Bagalkot district of Karnataka. Sugarcane is one of the major sources of revenue and employment of rural farming communities. However, sugarcane production demands huge investment, man power and land resources and income of farmers depends on optimal utilization of these resources. The present study intends to investigate the factors impacting income of sugarcane growers in Bagalkot District, Karnataka. Special attention is made to capital, manpower and area of land. The research was conducted by using quantitative methods using simulated data of sugar cane growers as many as 120. A fully structured questionnaire framework has been developed for the dataset, which covers the aspects of socioeconomic factors, land holding, sugarcane area, capital expenditure, labor deployment, production parameters, yield, revenue earned, cultivation costs and agricultural income. The relationships of chosen parameters with agricultural revenue were analyzed using descriptive statistics, correlation analysis and multiple linear regressions. The results revealed that the mean area for sugarcane cultivation was 2.21 ha with an average yield of 87.66 tones/ha. The mean gross return per farm was Rs 5.81 lakh and the mean net return was Rs 3.21 lakh with a benefit-cost

ratio of 2.23. The correlation analysis showed that there were favorable correlations between capital, labor, land area and farmers' incomes. The results of multiple regression analysis indicated that capital, labor and land area had positive and significant statistical effect on revenue of sugarcane growers. The greatest standardized regression coefficient ($\beta = 0.479$) was obtained for labor followed by land size ($\beta = 0.462$) and capital ($\beta = 0.156$). The model accounted for 82.4 percent of variability in farmers income ($R^2=0.824$). The study reveals that the revenue of the sugarcane growers can be increased with the help of availability of more productive capital, efficient utilization of labor and improved management of land resources. The results are for the progress of research models and methodological illustration, and need to be validated by a real-world field survey because of the artificial generation of the data set.

Objectives of the Study

1. To examine the socio-economic characteristics of sugarcane farmers in Bagalkot District.
2. To estimate the cost and returns of sugarcane cultivation.



3. To analyze the relationship between capital, land size, labor and farmers' income.

2. REVIEW OF LITERATURE

The income from agriculture is influenced by the interplay of physical, economic and technical factors. Land, capital and manpower are the main productive assets in agriculture and their efficient usage has substantial impact on farm output and profitability. The availability and timely use of these resources are very important in the development of commercial crops like sugarcane, where huge investments are involved in planting supplies, fertilizers, irrigation, personnel, pest management and harvesting.

Wali, Kadam, Mohapatra and Mishra (2019) have studied financial aspects of sugarcane cultivation with the use of primary and secondary data in Bagalkot belt of Karnataka. The research employed trend analysis, regression analysis and budgeting methods. Authors reported that the area and production of sugarcane increased and found that the net returns from the sugarcane farming were beneficial. The research emphasized the need for efficiency in the utilization of resources and found that sugarcane had high production costs. These results highlight the economic importance of sugarcane production in Bagalkot and provide a basis for examining the causes of farmers' profits.

Shivanaikar, Guledagudda and Mokashi (2014) did a comparative study on the economic features of organic and inorganic sugarcane production in Bagalkot district. Their analysis showed that both methods had good net returns, but the organic sugarcane growing system had a better benefit-cost ratio. The study also showed that considerable investment was made in human labor and diverse production resources. Hence the cost and effective use of production resources are important factors affecting profitability in sugarcane growing.

There are several empirical studies on the function of resource allocation in sugarcane growing. Wali et al. (2019) used regression analysis to study the efficiency of resource use in sugarcane farming in Bagalkot district. Their research demonstrates that agricultural profitability can be increased by production resources and their optimal distribution. Building on this, the present study extends the scope of this perspective by considering capital, labor and land area as factors of farmers' income.

Work is an important input in sugarcane agriculture, as numerous operations like planting, weeding, irrigation management; harvesting and transportation require timely work. Wali et al. (2019) reported that human work accounted for a large share of the costs incurred in sugarcane growing in Bagalkot, thereby confirming the labor-intensive nature of the crop. Thus, variations in the availability of people and labor costs can greatly affect the profitability of agriculture.

The area of land is positively correlated to the volume of sugarcane cultivation. In their study, Kamatar, Bose and Iliger (2021) found that significant number of farmers were belong to medium landholding category and the extent of sugarcane cultivation was associated with the socio-economic characteristics of farmers in Bagalkot district for progressive and

non-progressive sugarcane growers. Their research shows that farm size and the proportion of land allocated to sugarcane are important elements to consider in trying understanding differences between sugarcane farmers.

Availability of capital is a key determinant in agricultural production. Sugar cane farmers need money to purchase planting materials, fertilizers, pest control products, irrigation services and labor. The agriculturalists with enough operating capital are strategically better positioned to commence the production activities on time. According to the financial analysis by Wali et al. (2019) a lot of financial investment is needed for sugarcane production in Bagalkot.

Technology adoption can also influence productivity and income from agriculture. Lavanya Raj and Aski (2019) studied the knowledge and adoption of improved sugarcane cultivation practices among the agriculturists in Belagavi and Bagalkot districts in Karnataka. Their study points up the importance of farmers' knowledge and use of recommended agricultural methods in sugarcane production.

Kamatar, Bose and Tamagond (2020) conducted a study on adoption of improved agricultural technologies by progressive and non-progressive sugarcane farmers in Bagalkot district. The study showed variations in the adoption rates among the two groups and that education, annual income, extension communication and mass media participation were positively associated with adoption among innovative farmers. Late payments were also a major challenge for sugarcane farmers, according to the study. These data suggest that farmers' earnings are affected by production assets, institutional, technological and marketing factors.

In recent extension studies, the importance of knowledge and access to improved production information for sugarcane growers has been emphasized. Pawar, Devendrappa, and Nithya Shree (2023) found that agricultural experience, land ownership, success drive, risk propensity, scientific orientation and cosmopolitanism were positively connected with knowledge acquisition on sugarcane producing techniques. The study suggested the use of information and communication technologies like films to boost farmers' awareness of scientific approaches of agriculture.

3. RESEARCH METHOD

3.1 Research Locale

The research centers on the Bagalkot District in Karnataka, where sugarcane serves as a significant commercial crop and a vital source of agricultural revenue. Sugarcane farming is predominantly found in regions with irrigation resources. The region offers an appropriate environment for analyzing the economic elements affecting the earnings of sugarcane cultivators due to differences in farm dimensions, resource application, workforce deployment, and capital investment.

3.2 Study Framework

The study was quantitative in nature to study the parameters influencing the profitability of sugarcane growers in Bagalkot District. To develop and illustrate the proposed statistical model, a simulated data set of 120 sugarcane growers



was constructed.

The simulated observations were designed to reflect real variations in farm size, capital investment, labor employment, production output, and income for sugarcane farmers. Later the dataset was analyzed with descriptive statistics, correlation analysis and multiple linear regressions.

Note that the data set is produced and not collected from a real field study. Hence, the statistical data are meant for the construction of research models and methodological demonstration only and not to be interpreted as accurate estimates of the sugarcane-farming demographic of Bagalkot District.

3.3 Sample Collection

For statistical evaluation, a theoretical cohort of 120 sugar cane growers was studied. The simulated sample was constructed to represent farmers with small, medium, and fairly large farms.

Diversity was incorporated in the information on landholding dimensions, sugarcane cultivation area, financial investment, personnel deployment, output, and agricultural revenue. We used this strategy to mimic the variability often seen in a farmer level survey.

3.4 Data Acquisition and Dataset Creation

Important production and socio-economic characteristics of sugarcane growers in Bagalkot District were collected through

a well-structured questionnaire schedule. The dataset was prepared to capture data that would have been collected through a major field survey of sugarcane cultivators. These included demographic characteristics, age, educational level, experience in agriculture, size of household, total land area, area under sugarcane cultivation, financial investment, labor utilization, sugarcane output, yield per hectare, income realized, cost of cultivation, gross income and net profit. The simulations considered realistic differences between farmers with different farm sizes, investment levels and manpower use. The information was compiled to maintain logical relationships among the variables mainly in terms of cultivated area, productivity, yield, cost of cultivation and farm revenue. The data obtained were 120 observations and were used for descriptive, correlation and multiple regression analysis to find out the factors affecting the income of sugarcane growers in Bagalkot District.

3.5 Statistical Methods

The statistical methods used for the study of the simulated data were as follows: Descriptive statistics were used to explain the characteristics of the farmers and the main economic variables. The type and magnitude of relationships between capital, labor, area and income were analyzed using correlation analysis.

RESULTS

Table 1. Descriptive Characteristics of Sugarcane Farmers (n = 120)

Particulars	Mean	Standard Deviation
Age (years)	46.3	9.8
Farming experience (years)	21.7	8.6
Family size (persons)	5.1	1.6
Total landholding (ha)	2.72	1.03
Area under sugarcane (ha)	2.21	0.91
Sugarcane yield (tones/ha)	87.66	9.83
Capital investment (₹)	1,72,622	69,925
Labor use (man-days)	131.42	53.66

The results showed that the average age of the farmers was 46.3 years with an average agricultural experience of 21.7 years. The average working landholding was 2.72 hectares of which about 2.21 hectares were under sugarcane cultivation. Thus, sugarcane formed a key part of the agricultural economy for the households studied.

5.2 Cost of Sugarcane Cultivation

Table 2. Estimated Cost of Sugarcane Cultivation per Hectare

Particulars	Cost (₹/ha)	Percentage
Seed/sets	18,500	15.68
Farmyard manure	8,200	6.95
Fertilizers	12,750	10.81
Plant protection	7,150	6.06
Human labor	35,600	30.17
Machinery/bullock labor	12,400	10.51
Irrigation	8,600	7.29
Transportation and other costs	6,800	5.76
Interest and miscellaneous costs	7,900	6.7
Total cost	1,17,900	100

The average labor utilization was 131.42 man-days per farm. This shows that the cultivation of sugarcane is labor intensive. The capital investment was ₹1.73 lakh on average which indicates that sugarcane cultivation demands a lot of financial resources.



The chief part of the expenses of agriculture was labor of human beings, which was about 30.17 per cent of the total cost. This finding is consistent with the labor-intensive nature of sugarcane production.

The next important items of expenditure were fertilizers and seeds/sets. The size of investment in these resources means that enough working capital is essential to maintain productivity.

5.3 Production and Returns

Table 3. Production and Returns from Sugarcane Cultivation

Particulars	Average
Area under sugarcane (ha)	2.21
Yield (tones/ha)	87.66
Production (tones/farm)	193.7
Average price (₹/tone)	3,000
Gross return (₹/farm)	5,81,100
Total cultivation cost (₹/farm)	2,60,559
Net return (₹/farm)	3,20,541
B ratio	2.23

Results indicate the profitable returns from sugarcane cultivation under simulated conditions of Bagalkot farm. The average gross return was about ₹5.81 lakh per farm and the average net return was about ₹3.21 lakh.

The benefit-cost ratio of 2.23 indicates that for every rupee invested in the farming of sugarcanes, the farmers earned a gross profit of about ₹2.23.

5.4 Correlation Analysis

Table 4. Correlation between Major Variables and Sugarcane Income

Variable	Correlation with Income (r)	Significance
Capital	0.58	Significant
Labor	0.64	Significant
Land size	0.79	Significant

The results of the correlation analysis showed that all the three explanatory factors had a positive link with the revenue of sugarcane producers. Land size is most strongly associated with income, followed by capital and labor.

This shows that farmers with larger sugarcane farms tend to earn more overall. In the same way, higher income is associated with an increase in the labor supply and capital investment.

DISCUSSION

The current research found that capital, labor and land area have positive and statistically significant impacts on the revenue of sugarcane farmers in the dataset simulated. These results are in line with earlier research which have emphasized the role of resource management, production costs and farm size in sugarcane growing.

The positive link between capital and income means that farmers with higher amount of financial assets are better equipped to invest in important inputs for output on a timely basis. Adequate funding enables farmers to purchase quality planting supplies, fertilizers, pest control products, irrigation services and labor as needed. Wali et al. (2019) stated that in sugarcane cultivation the costs of production are very important and that the sugarcane growers in Bagalkot district had high costs of cultivation and good net benefits.

The significant and noticeable coefficient of labor is of particular relevance for sugarcane cultivation. In the present

model, the standardized regression coefficient (Beta = 0.479) of labor was the greatest among the three explanatory variables, implying that relative influence of labor utilization was the strongest. This result is consistent with the cost structure described by Wali et al. (2019) which stated that human labor was a major component of total costs of sugarcane growing. The manpower-intensive nature of sugarcane means that the availability of labor for planting, cultivation duties, irrigation oversight, and harvesting can impact both output and profitability.

The high association between income and land area is consistent with the economic characteristics of commercial agriculture. Large sugarcane fields give farmers more yield and higher possibilities of total farm income. However, large land ownership does not assure higher profitability. Skilled management, efficient use of inputs, irrigation and integration of technology are also important. Kamatar, Bose, and Iliger (2021) pointed out that the Bagalkot farmers had considerable differences in landholdings and sugarcane production. Farm size was important to understand the variability among sugarcane growers.

The results of capital, manpower and land area must also be interpreted in the light of improved agricultural techniques. The importance of awareness and execution of improved sugarcane farming practices among agriculturists of Belagavi and Bagalkot districts was shown by Lavanya Raj and Aski (2019). Similarly, Kamatar et al. (2020) revealed that the adoption rates of innovative sugarcane growers were linked to education, annual



income, extension contacts, and mass media. These results suggest that the impacts of physical resources on income may be strengthened if farmers are given satisfactory technical knowledge and access to agricultural extension services.

The results are also important for the costs and profitability of sugarcane production. Shivanaikar, Guledagudda and Mokashi (2014) revealed favorable net returns of organic and inorganic sugarcane production in Bagalkot district and observed variance in cultivation expenses and benefit cost ratios of the two agricultural methods. The results confirm that the efficient use of inputs and the management of production costs are important for increasing farmers' earnings.

The significant overall regression model with R² value of 0.824, indicates that capital, labor and land area explain a significant proportion of the variation in expected income of farmers. However, residual volatility indicates that other components may have an impact on sugarcane revenue. These characteristics include availability of irrigation, crop yield, sugarcane variety, price realization, availability of institutional credit, adoption of technology, agricultural knowledge, participation in extension activities and marketing practices.

Marketing and payment terms may be quite relevant in Bagalkot context. Kamatar, Bose and Tamagond (2020) observe that the problem of delayed payments is a serious impediment for both sophisticated and traditional sugar cane producers. Delays in payments could affect farmers' cash flow and ability to finance future farming activities. Therefore, income-increasing plans must consider production assets, as well as institutional and marketing constraints.

These results, therefore, provide a broader understanding of the measurement of income from sugarcane. To boost agricultural income, productive capital, sufficient manpower and proper land use are essential. These advantages can be augmented by better technology, extension services, irrigation management and good marketing tactics. This approach is consistent with the broader literature on Bagalkot on sugarcane economics, resource management, and adoption of improved agricultural methods.

CONCLUSION

In the present study, the major factors affecting the profits of sugarcane farmers of Bagalkot District of Karnataka were studied with special reference to capital, labor and area under sugarcane. The results show that sugarcane growing can be profitable under the modeled circumstances. The average gross return is ₹5.81 lakh per farm, net return is roughly ₹3.21 lakh and benefit-cost ratio is 2.23.

Correlation study showed that there was a positive relationship between income of farmers and capital, labor and land area. The strongest relationship was with land area ($r = 0.79$) followed by labor ($r = 0.64$) and capital ($r = 0.58$). Regression analysis found that these three elements had a significant effect on the changes in farmers' income. Labor had the highest proportionate effect followed by land area and capital. The model accounted for 82.4% of the variance in income.

The study emphasizes the significance of efficient workforce management, sufficient working capital and optimum

utilization of land resources in boosting income of sugarcane growers. Nevertheless, enhancement of earnings cannot rely entirely on these variables. Need to be considered are irrigation infrastructure, improved technology, extension services, availability of institutional funding, timely payments, market dynamics and effective input management.

Ultimately, a major limitation is that the research is based on a simulated dataset of 120 farmers instead of real field-survey data. Therefore, the results presented here should be seen as a demonstration of technique and research design and need to be validated by an actual primary survey before any policy level conclusions can be drawn.

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