

Socio – Economic Evaluation using the Cultivation Cost Burden and Household Livelihood Security among Sugarcane Farmers in Erode District

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Abstract

The paper evaluated estimation of the cultivation cost burden's impact on the livelihood security of sugarcane farmers in Erode District. The growing of sugarcane is an expensive endeavor because the farmers incur costs in the form of seed cane, fertilisers, employees, the cost and availability of water, harvesting costs, transport and credit facilities before any income can be generated at the end of the crop cycle. The research was conducted as empirical study with primary data collected from a fixed size sample of 391 sugarcane producers through intervention of the interview method. The four quantitative techniques are used: Percentage Analysis (with Descriptive Statistics); Cultivation Cost Burden Index; Household Livelihood Security Index and Robust Multiple Regression. The results revealed that the labour cost and harvesting-transport cost constitute the biggest cost pressure. The higher cost burden farmers indicate an inferior level of livelihood security in terms of both savings and ability to repay debt and risk-coping aspects. It is revealed from regression that cost burden of cultivation

has negative and statistically significant relationship with household livelihood security and net income per acre has positive relationship. The paper examined an analytical perspective based on the farmers to be used on the evaluation of the sugarcane cultivation for household security considerations after taking costs pressure.

Keywords: Sugarcane Farmers, Cultivation Cost Burden, Household Livelihood Security, Farm Income and Erode District.

1. Research Locale

The sugarcane is a unique crop in the context of agricultural income in that it has guaranteed industrial demand along with a high working capital need. The evaluating sugarcane by gross return is not enough because the investment of money in the crop through seed cane, fertiliser, labour, irrigation, harvesting and transport happens in a period of up to five years. The Erode District is used as a typical context with regard to field settings because as per the district agriculture

information, the net area cultivated is 1,56,641 ha with the majority area in the field cultivated with sugarcane and a huge share of irrigated agriculture through canals and wells (Erode District Administration, 2026). It was attempted to do an objective evaluation of the impact of a commercial crop on household security in an irrigated western Tamil Nadu context.

It is an empirically important question since it is relevant to the policy setting of sugarcane. As per the report issued by the Government of Tamil Nadu (GoTN) around the special support provided for the Fair and Remunerable Price (FRP) during the 2024-25 crushing season, the state has observed a movement in the price toward the FRP. For farmers whose cane is supplied to mills, it is 3,500 per metric tonne (Government of Tamil Nadu, 2025). The Union Government gave the go-ahead for a Fair and Remunerative Price of Rs. For sugar season of 2025-26, the price stands at Rs. 355/ quintal (at basic recovery rate of 10.25 per cent as per Press Information Bureau, 2025). The approved Fair and Remunerative Price is Rs. 365 per quintal (for the next season) highlights the key role of the administered price of cane for farmers income and cane procurement by mills (Press Information Bureau, 2026). The importance of these policy prices for the farmer is only if the net returns after deductions and costs can support the family.

The study views cost burden as a household pressure rather than being merely an item of household campaign accounts. The cane farmers can feel stressed even if they are making a positive gross income especially when they see sharp hikes in labour charges and transport deductions and when irrigation could not be counted on and when repayment of credit comes at a time when realisation is delayed. The Commission for Agricultural Costs and Prices considers the cost of production, alternative returns of the sugarcane, recovery rate, realisation of by-products and risk margin as crucial parameters to recommend the sugarcane price policy (Commission for Agricultural Costs and Prices, 2024). This policy logic must be evaluated at a household level since the officially accepted cost of production cannot necessarily inform decisions regarding how well a family can cover food, education, health, savings and debt after paying for cultivation costs.

The situation is worse in the case of sugarcane since the crop has an intimate linkage with the mills as well as harvesting-transport systems. The Directorate of Economics and Statistics reported that deduction may be taken out in the final settlement of farmer's contracts during harvesting and transport in Tamil Nadu based on the contractual agendas (Directorate of Economics and Statistics, 2024). The delayed payment by sugar Mills was identified as one of the major problems of the sugar sector and was

associated with the sugar price and viability of the sugar mills (NITI Aayog, 2020). This study goes beyond just a farm-level cost and return analysis and measures household livelihood security as the focus. The paper utilized household livelihood security as a multi-dimensional outcome. It incorporates the ability to ensure the consumption of food, send children to school, cover medical costs, pay off debts, save and protect productive assets and production risk. The Committee on Doubling Farmers' Income stressed that it is important for the farm income policy to break free from focusing on crop output and consider all aspects related to the livelihood security of farmers (Committee on Doubling Farmers' Income, 2018). The study upholds on that basis and poses a question if cost burden in sugar production lowers down the capacity of the household to sustain their security once the crop is harvested.

2. Literature Review

The TNAU's cost of cultivation information for irrigated sugarcane provides a practical classification of land preparation, seed, manure, irrigation, plant protection, harvesting and other costs (Tamil Nadu Agricultural University, n.d.). Govindarajan (2023) showed that operational cost dominated sugarcane cultivation in Tamil Nadu and that human labour alone accounted for a substantial share of operational expenditure. Saravanan (2016a) examined cost and

returns of sugarcane production in Erode District and gave early district-level evidence that net return is closely shaped by seed, labour and harvesting expenditure. Saravanan (2016b) further linked resource-use efficiency in Gobichettipalayam Taluk with the economic performance of sugarcane production. These studies establish the cost base of the present paper but they do not directly measure household livelihood security.

Verma and Solanki (2020) estimated cost and returns for sugarcane farmers in Baghpat District and confirmed that sugarcane profitability must be read through the structure of paid-out cost. Malarkodi, Bharathi and Janakirani (2013) studied sugarcane production in the western zone of Tamil Nadu and connected productivity with water availability and cost of cultivation. Shanthi, Gunasridharan and Saravanan (2019) showed that socio-economic conditions and adoption constraints influence sugarcane technology adoption in Tamil Nadu. Bey et al. (2022) compared resource use in sugarcane under tenant and owner farms and showed that tenancy status influences profitability. These findings support the need to include farm size, land tenure, irrigation and credit source in a district-level primary study.

Kshirsagar (2008) demonstrated that organic sugarcane farming can improve income stability where input dependence is reduced. Aravind and

Jeyapriya (2021) estimated sugarcane water requirement in Coimbatore and showed that irrigation planning remains central to sugarcane performance. Voora, Larrea and Bermudez (2023) stressed the need for sustainable sugarcane production practices and procurement systems that support farmer financial sustainability. Hess et al. (2016) reviewed sugarcane development and found that water, soil, employment and food security effects must be assessed together. These contributions justify a livelihood framing because household security is affected by technical resource use and market-linked payment conditions.

Kaahwa et al. (2023) examined sugarcane production and smallholder livelihoods in Uganda and connected cane growing with food security and nutrition outcomes. Saqib et al. (2023) assessed livelihood effects arising from crop transition toward sugarcane and showed that income gains can coexist with food security concerns. Dubey, Deka and Nain (2023) used a composite livelihood security approach and found that income, social participation, livestock possession and household assets influence livelihood security. Patidar (2019) argued that livelihood security in rural India should be examined through linked indicators instead of a single income measure. These studies provide the conceptual basis for constructing a Household Livelihood Security Index in the present paper.

The reviewed literature indicates two clear limitations. The cost of cultivation studies generally explain profitability through paid-out cost, imputed family labour and returns but they rarely test whether the cost pressure weakens household-level security. The Livelihood security studies often use multidimensional indicators but they are not usually linked to a crop-specific cost burden in sugarcane. The present paper addresses this gap by combining a Cultivation Cost Burden Index with a Household Livelihood Security Index and by estimating the influence of cost burden on livelihood security through robust regression.

3. Objectives of the Study

- ✧ To study the overall demographic and farm details of sugarcane farmers of Erode District.
- ✧ To calculate the cost burden facing by the sugarcane farmers using composite cost burden index.
- ✧ To evaluate household livelihood security in the food, education, health, debt repayment, saving, assets maintenance and risk coping aspects.
- ✧ To analyse the effect of cultivation cost burden on the livelihood security of the sugar cane farmers in the households.
- ✧ To suggest policy-component proposals to alleviate cost burden

and enhance household's livelihood security.



4. Hypotheses of the Study

- ✧ H₀₁: There is no significant difference in household livelihood security across low, moderate and high cultivation cost burden categories.
- ✧ H₀₂: Cultivation cost burden has no significant influence on household livelihood security among sugarcane farmers.
- ✧ H₀₃: Net income per acre has no significant influence on household livelihood security after controlling farm and household characteristics.



5. Research Methodology

The study follows an empirical study that adopts Interview method as data gathering technique. The interview was considered as suitable method since sugarcane farmers do not necessarily keep a formal record of all expenditure items and direct contact in the field facilitates elaboration of the expense parts, their indebtedness, deductions due to harvest and their livelihoods. The interview schedule is divided into four which consists of household profile, farm characteristics, cost burden indicators and livelihood security indicators. The measurement design relies on a farmer-centred approach with the cost factors measured in Rs. per acre and perception-

based burden/ livelihood indicators measured on a five point response scale. The research area of the study is Erode District, Tamilnadu. The district has been chosen because of sugarcane being an important commercial crop under irrigation in the district. There were 391 sugarcane farmers sampled for the study and up to date list of active sugarcane growers was not assumed to be available at the design of the sugar cane fields stage hence Cochran's formula is applied.

The formula is given by,

$$n = Z^2pq / e^2$$

At 95 per cent confidence, Z is 1.96, p = 0.50, value of q = 0.50 and error is 0.05. The calculation is returned as 384.16 and the sample is boosted to 391 to complete field coverage and factor in complete usable responses.

The snowball sampling method was adopted due to the infinite number of population size. The study used the primary set of sugarcane farmers to accumulate on the further set of respondents. The study used this non-random sampling size to follow avoid randomization error. This sampling method is justified as it is not a study of a general farming population. That necessitates the farmer having firsthand experience with the cost burden, harvesting arrangements, irrigation expenses and realisation of cane income. The study used four of the quantitative techniques which described a farmer profile, a farm profile, cost components

and livelihood indicators by means of percentage analysis and descriptive statistics. The Cultivation Cost Burden Index consists of 6 different indicators proposed as follows: Input cost pressure, Labour cost pressure, Irrigation cost pressure, Harvesting and transport pressure, Repayment pressure on credit obtained and Payment delay pressure. The Household Livelihood Security Index is based on seven dimensions which

involved food security, education security, health security, debt repayment security, savings security, asset maintenance security and risk-coping security. The robust multiple regression was used to evaluate the impact of cost burden on household livelihood security is estimated and accounted for farm size, net income per acre, debt-income ratio, access to reliable irrigation and payment delay and farming experience.

6. Analysis and Interpretation

Table 1
Demographic and Household Profile of Sugarcane Farmers

Variable	Category	Frequency	Percent
Gender	Male	340	86.96
	Female	51	13.04
Age group	Up to 35	53	13.55
	36-45	130	33.25
	46-55	140	35.81
	Above 55	68	17.39
Education	No formal schooling	35	8.95
	Primary	75	19.18
	Middle	75	19.18
	Secondary	103	26.34
	Higher secondary	74	18.93
	Graduate and above	29	7.42
Family size	Up to 4	134	34.27
	5-6	186	47.57
	Above 6	71	18.16

The table reveals that sample is larger of males but there are farmers represented as females in the interviews. The highest age group is in 36-55 years and this indicates that sugarcane growing is highly under the management of middle-aged farm households and still has experience in the fields. While the sample size of secondary and higher secondary education groups are considerable, the other two groups, no formal schooling and graduate-level are smaller in size. The size of the family-size pattern reveals that most families have 5-

6 members, a factor that affects the family livelihood security and thus the family size needs to be assessed alongside the farm income.

Table 2
Farm Characteristics and Institutional Profile

Variable	Category	Frequency	Percent
Farm size class	Marginal	33	8.44
	Small	184	47.06
	Medium	143	36.57
	Large	31	7.93
Land tenure	Owned	259	66.24
	Leased	55	14.07
	Owned and leased	77	19.69
Irrigation source	Canal	112	28.64
	Borewell	107	27.37
	Canal and borewell	103	26.34
	Open well	53	13.55
	Purchased water	16	4.09
Main credit source	Cooperative bank	107	27.37
	Commercial bank	99	25.32
	SHG/MFI	44	11.25
	Moneylender	63	16.11
	Friends/relatives	34	8.7
	No crop loan	44	11.25

The results indicated small farmers are the majority group as far as farm size is concerned followed by the medium farmers. The profile examined the move toward considering cost burden as a household issue where the smaller farm is less able to absorb increases in costs. The owned land is the predominant tenure type and leased and mixed type farmers can be found. These are mainly canal and borewell irrigation sources and combined canal-borewell irrigation sources which are predominately found in the region. The cooperative banks and commercial banks are the prominent sources of credit however moneylenders and microfinance channels are also given in the data. The impact on costs involved input-price problem, irrigation source, credit route and land usage arrangement.

Table 3
Cost and Income Profile per Acre

Cost or income item	Mean	Standard deviation	Share of total cost
Land Preparation Cost	6865.13	978.3	5.0
Seed Cost	14865.69	2063.85	10.82
Fertiliser Manure Cost	18868.62	3209.43	13.73
Plant Protection Cost	5885.35	1266.49	4.28
Irrigation Cost	11693.07	3156.39	8.51
Labour Cost	44580.49	8219.65	32.44
Harvest Transport Cost	25241.73	6169.64	18.37
Interest Lease Cost	9346.95	5055.41	6.8
Total Cost Per Acre	137404.16	13361.44	
Gross Income Per Acre	186113.71	24550.65	
Net Income Per Acre	48709.55	27737.51	
Yield Tonnes Per Acre	53.11	6.78	

The study revealed labour cost as the largest cost component with an average of Rs. 44,580 per acre and a share of 32.44 per cent in total cultivation cost. The harvesting and transport form the second largest component with an average of Rs. 25,242 per acre and a share of 18.37 per cent. The fertiliser and manure cost contributes 13.73 per cent while seed cost contributes 10.82 per cent. The average total cost per acre is Rs. 1,37,404 and the average gross income per acre is Rs. 1,86,114. The average net income per acre is Rs. 48,710. The cost profile therefore shows that sugarcane can produce a positive margin but the margin depends heavily on labour availability, harvesting charges and input discipline.

Table 4
Cultivation Cost Burden Index

Component	Mean	Standard deviation
Input Cost Pressure	3.05	0.8
Labour Cost Pressure	3.62	0.87
Irrigation Cost Pressure	1.97	0.74
Harvest Transport Pressure	2.59	0.83
Credit Repayment Pressure	3.54	1.23
Payment Delay Pressure	3.56	1.21
CCBI	61.08	7.96

Table 4A
Cultivation Cost Burden Index Classification

Category	Frequency	Percent
Low	21	5.37
Moderate	295	75.45
High	75	19.18

The study revealed the Cultivation Cost Burden Index which explains Labour cost pressure is the highest component score and this is in line with the cost evidence reported. The pressure for delay of payment and pressure to harvest and transport continues to be important. The mean of the index is 61.08 on a 0-100 scale which puts the average farmer in the 'moderate' cost burden category. In the classification, 75 farmers are in the top category of high cost burden category and 21 farmers are in the low cost burden category. The results indicated that there are not only a small number of extreme cases which is an accepted mode of operation of the many sugarcane families.

Table 5
Household Livelihood Security Index

Domain	Mean	Standard deviation
Food Security	3.43	0.78
Education Security	3.33	0.76
Health Security	3.17	0.83
Debt Repayment Security	2.97	0.91
Savings Security	2.68	0.85
Asset Maintenance Security	2.88	0.84
Risk Coping Security	2.85	0.83
HLSI	60.91	9.81

Table 5A
Household Livelihood Security Index Classification

Category	Frequency	Percent
Low	54	13.81
Moderate	265	67.77
High	72	18.41

The Household Livelihood Security Index is presented in table 5. Both food security and education security score higher than savings security and debt repayment security. The mean of all the indexes is 60.91. This puts the average family in the moderate livelihood security band. There are 54 farmers in low group, 265 farmers in moderate group and 72 farmers in high livelihood security group. The low levels of savings and commitment to

repaying debt suggests that farm households may have limited surplus over basic consumption following cultivation costs to cushion themselves against unforeseen circumstances.

Table 6
Welch ANOVA of Livelihood Security across Cost Burden Categories

Cost burden category	N	Mean HLSI	Standard deviation
Low	21	71.02	9.53
Moderate	295	62.26	8.56
High	75	52.76	9.36
Welch F	43.205	df = 2, 48.394	p < 0.001

The Welch ANOVA results which revealed farmers with low cost-burden, the mean HLSI is 71.02, for farmers with moderate cost burden, the mean HLSI is 62.26 and for farmers with high cost burden, the mean HLSI value is 52.76. The damage difference is statistically significant by Welch F=43.205 and p<0.001. This finding reveals the first null hypothesis is rejected and indicated there is a clear declining pattern in livelihood security as cost burden increases. The significance of the result is that it shows that cost burden is not necessarily correlated with reduced profits which alter the homeostasis of the home and household pertaining to security regarding their daily activities.

Table 7
Robust Multiple Regression Predicting Household Livelihood Security

Predictor	B	Robust SE	Standardised beta	t / z	p
Constant	87.311	4.151		21.032	<0.001
CCBI	-0.506	0.069	-0.41	-7.373	<0.001
Farm size acres	0.471	0.283	0.072	1.662	0.096
Net income per acre (Rs. 10,000)	0.932	0.166	0.263	5.615	<0.001
Debt to income ratio	-0.966	1.561	-0.029	-0.619	0.536
Reliable irrigation access	-0.1	0.818	-0.005	-0.122	0.903
Payment delay days	-0.023	0.019	-0.058	-1.237	0.216
Farming experience years	0.011	0.036	0.014	0.318	0.751
Model summary	R-square = 0.362	Adjusted R-square = 0.350	F = 30.620		p < 0.001

The results of the robust multiple regressions revealed coefficient of Cultivation Cost Burden Index is by using -0.506 in addition to statistically

significant with p lower than 0.001. In other words, a one-point increase in the cost burden index is related to a 0.51-point drop in the Household Livelihood Security

Index while all else is equal. The net income per acre is positive with a statistically significant value. The effect of farm size is more positive but low while debt-income ratio, reliable irrigation access, payment delay and farming experience is not significant in this specification. The model accounts for 36.20 per cent of the variance in livelihood security and the second null hypothesis is rejected. The finding provides evidence that cost pressure is a key factor to livelihood insecurity of sugarcane farmers.

7. Findings

- ✧ The constructed sample shows first that cultivation of sugarcane continues to be cost-intensive where the three inputs of labour, harvesting transport and fertiliser and seed make up the big portion of the sugarcane cultivation cost.
- ✧ The typical farmer is in the 'moderate cost burden zone' and a significant number of farmers are in the 'high cost burden zone'.
- ✧ There is a moderate level of household livelihood security on average and the lowest domain scores are for savings and debt repayments.
- ✧ The livelihood security deteriorates significantly as farmers shift from low cost burden category to high cost burden category.
- ✧ The reduction in cost burden has a statistically significant negative effect on household livelihood security and an increase in net income per acre

improves household livelihood security.

8. Suggestions

- ✧ The policy and field interventions should be targeted towards those cost components which directly reduce household security.
- ✧ The key focus is the reduction of labour cost due to the availability of farmer (shared) mechanised operations particularly during time-sensitive field operations and harvesting.
- ✧ The priority is transparency on harvesting and transport settlement which is required by the Sugarcane farmers as they must be aware of deductions prior to the billings.
- ✧ The input cost rationalisation using cooperative seed cane, fertiliser and plant protection material purchasing.
- ✧ The timely institutional credit as utilization of credit from high-cost sources puts pressure on the household's debt load at the cost of agriculture investment.
- ✧ The irrigation-cost support through micro-irrigation, canal scheduling and planning water-use on a local level. The impact of rising costs on the household is more pronounced for the low-income group which is why the cost linked livelihood support

mechanism for small cane farmers.

- ✧ The prompt cane payment and clear communication with mill are important as delay of payment can impact education, health and consumption planning.

9. Conclusion

It was concluded that there is direct and significant relationship between cultivation cost burden and livelihood security of the households among the sugarcane farmers of Erode District. The evidence examined that cost pressure points of labour and harvesting-transport cost are the most powerful cost drivers. The livelihood evidence reveals that households are more vulnerable in savings and in debt repayment and risk coping than basic food consumption. When livelihood and farm size, income and other controls are taken into account cost burden decreases the security of livelihood. The sugarcane policy cannot remain on the level of mere price announcement but also needs to be checked if the net household position of the farmer enriches after the cost factor, deductions, debt factor and delay factor has been taken into consideration.

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