Synopsis of the thesis entitled

ECONOMICS OF SUGARCANE CULTIVATION IN ANDHRA PRADESH
(A Case Study of Visakhapatnam District)

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INTRODUCTION:

Sugarcane is important cash crop grown in India. Sugarcane cultivation and development of sugar industry runs parallel to the growth of human civilization and is as old as agriculture. The importance and use of sugarcane and sugar in the country’s socio-economic milieu is deep rooted and immense. In the current day rural economy set up sugarcane cultivation and sugar industry has been focal point for socio-economic development in rural areas by mobilizing rural resources, generating employment and higher income, transport and communication facilities. About 7 million sugarcane farmers and large number of agricultural labourers are involved in sugar cane cultivation and ancillary activities. Apart from this, the sugar industry provides employment to 5 lakh skilled and semi skilled workers in rural areas.

India is one of largest sugarcane producers in the world, producing around 300 million tonnes of cane per annum. Production of the sugar is the second largest agro processing industry in the country after cotton and textiles. India is the only country that produces plantation while sugar unlike other countries that produce raw or refined sugar or both.

In India, sugarcane the key raw material for production of Sugar and Gur, planted once a year during January to March. It is the major cost driver for the production of sugar. It being an agricultural crop is subject to the unpredictable vagaries of nature, yielding either a bumper crop or a massive shortfall in its cultivation from year to year.

The sugarcane growing may be broadly classified into two agro climatic regions – subtropical and tropical. The subtropical zone includes four States: 1) Uttar Pradesh (UP) 2) Bihar 3) Punjab 4) Haryana. The tropical zones include five States. These are: 1) Maharashtra 2) Andhra Pradesh 3) Tamil Nadu 4) Gujarat 5) Karnataka.

As far marketing of sugarcane is concerned there is difference. Sugarcane is directly sold to sugar factories or mills that produce sugar. The second way of cane marketing is processing the cane into Jaggery (Gur) and marketing. The processing of sugarcane into Jaggery depended on the cane price offered by the sugar mills operating in the area and prices of Jaggery. The processors preferred to crush cane into Jaggery at times of attractive Jaggery prices coupled with low prices offered by
sugar mills. Thus, in India, two important marketing channels for sugarcane have been identified. They are:

Channel 1: Producer → Sugar factory → Wholesaler → Retailer → consumer
Channel 2: Producer → Processor (Gur) → Wholesaler → Retailer → consumer

**Need for the Study:**

Micro level case studies focusing on input-output relationship in crop cultivation, specific to one individual crop help us to understand the ways with which it is able to increase yield and production. At the same time these studies through light on cost and return of farmers for proper policy fixation that takes into account both the common farmer as well as consumer. This highlights the need and importance of study of economics of sugarcane cultivation to understand the effectiveness of Price Policy in determining the area under sugarcane, the cost and returns of sugarcane production at farm level. For proper evaluation, of the economy of sugarcane farmer’s fundamental micro level studies are necessary from time to time. It is worth to mention that proper investigation into cost and returns of sugarcane farmers would through light on the economics of sugarcane cultivation that helps to judge the profitability of farming.

In fact case studies have been most commonly used method of research on farm economics. The important objective case studies are to compare the results characteristic of different classes or conditions eg: cost of production of a crop of farms in different size groups.

In view of the need and importance of micro level case studies, this research study is attempted with the following specific objectives.

**Objectives:**

1. To examine the growth of Sugarcane cultivation in India
2. To examine the Socio Economic background of sample sugarcane farmers
3. To examine the Input – Output relationship in sugarcane cultivation
4. To examine the Cost and returns of sugarcane growers – who are selling sugarcane directly to sugar mills and
5. To examine cost and returns of sugarcane cultivation of Jaggery farmers.
6. To highlight the important problems of sugarcane cultivation at micro level.
Hypothesis:
- The area and output of sugarcane will be responsive to price, if a little time is allowed for adjustment.
- There is efficiency in the use of inputs on an average farm of sugarcane production.
- There is no difference in efficiency in use of inputs among different size groups also, and also between ratoon and plant.

Methodology:
(a) Sample Selection:

The discussion on methodology includes selection of the study area, sample households, tools of analysis. Multistage sampling technique is use in the sample selection process. The levels are (i) Selection of district (ii) Selection of sample villages and (iii) Selection of sample farmers.

The State of Andhra Pradesh is one of the major sugarcane growing States in India. In this State there are farmers whose sells the harvested sugarcane to the sugar factories and at the same time there are farmers who process the sugarcane manufacture Gur and sell to wholesalers.

(i) Selection of District:

In Andhra Pradesh State, Visakhapatnam district is one of the major sugarcane growing district in Andhra Pradesh. Further, in Visakhapatnam district there are three sugar factories and one huge famous Gur marketing yard at Anakapalli. In view of these two facts the Visakhapatnam district is selected for the study.

(ii) Selection of Villages:

For the purpose of selection of villages the command area of each sugar factory is the base. From the command area of each sugar factory two villages are selected. A total of six villages are selected. Further, for Gur farmers selection, the command area of the major Gur wholesale market is considered. A total of six villages under Gur cultivation are selected. The details of selected villages are given below.
Sugarcane Sugar Villages:
1. Pisinikada
2. Dibbapalem
3. Munagapaka
4. Chuchukonda
5. Kasimkota
6. Veduruparthi

Sugarcane Gur Villages:
1. Kapsa Jagannadhapuram
2. Veeravalli Agraharam
3. Kothapally
4. Etikoppaka
5. Kodavatipudi
6. China Boddupalli

(iii) Selection of Farmers:

For the purpose of selection of farmers the total sugarcane cultivators list is ascertained from village records possessed by the village secretary-a government official. This data is the base for the selection of farmers.

The population of sugarcane cultivators is stratified based on the size of the holding and from this sample farmer’s are selected. There are few sugarcane cultivators who have large operational holding. Therefore they are purposively eliminated. For purpose of selection of the sample farmer’s marginal farmers, small farmers and medium farmers are considered.

To know the difference in cost and returns of owner cultivator and tenant cultivator, proper care is taken to have representation of tenant farmers in the sample. In Visakhapatnam district sugarcane cultivation is of two types viz., plant and ratoon. Therefore while selecting the sample proper care is taken to have representation of both these groups in the sample.

(b) Data Base:

This study is based on both secondary data and primary data. To analyse trends in growth of area, output and yield published data is collected from (a) Statistical abstract of Andhra Pradesh and (b) Center for Monitering Indian Economy. Data relating Visakhapatnam district is collected from district Hand Book of statistics.
(c) Period of Enquiry:

The secondary data relates to the years from 1970-71 to 2010-11. The primary data collected relates to the 2010-11. Primary data is collected with the help of the pre designed and pre tested questionnaire.

Tools of Analysis:

(a) The collected data is analyzed using different statistical techniques. Apart from averages and percentages appropriate statistical techniques are used wherever necessary. **Compound Growth Rate** is used to analyze temporal changes in area, production and yield of sugarcane, the formula is given below. The opening of the economy with different economic reforms is expected to have an impact on internationally traded agriculture goods which include sugarcane. To capture the impact reforms on sugarcane cultivation. The total period is divided into two sub periods, i.e. 1970-71 to 1989-90 and 1990-91 to 2010-11.

\[ Y = ae^{bx} \]

The growth rate is calculated for total period and also for two sub periods.

(b) The instability in the growth is measured by eliminating the trend component from the series. To measure the instability in the growth of area, production and yield of sugarcane **Cuddy’s Measure of Instability** is used. It is defined as

\[ \text{Instability Indices} = C.V. \sqrt{(1 - R)^2} \]

(c) **Coefficient of Variation** is calculated by using the formula

\[ \text{C.V.} = \frac{\text{Standard Deviation (S.D)}}{\text{Mean}} \times 100 \]

\[ \text{Standard Deviation (S.D)} = \sqrt{\frac{1}{n} \sum (x_i - \bar{x})^2} \]

Where \( \bar{x} = \frac{1}{n} \sum x_i \)

(d) **Correlation Technique** is used to know the relationship between (a) Minimum Support Price and Output of sugarcane (b) Minimum Support Price and Area under sugarcane.

\[ r = \frac{\text{Cov (xy)}}{\sqrt{\text{\sum (x - \bar{x})^2} \times \sqrt{\text{\sum (y - \bar{y})^2}}} \]
(e) To analyze **Input Output Relationship Cob-Douglas Production Function** has been estimated by the Ordinary Least Square (OLS) one equation for plant crop and another for ratoon crop is used. The specification function as follows,

\[ Y = ax_1^{b_1} \cdot ax_2^{b_2} \cdot ax_3^{b_3} \ldots \ldots \cdot ax_n^{b_n} \]

Where \( Y = \) Output
- \( x_1 = \) Input variable
- \( b_1 = \) Production elasticity in respect to \( x_1 \)
- \( a = \) Constant

The Cob-Douglas Production Function was transformed into linear form by taking the log on both sides.

**Sugarcane Plant Farming:**

\[ \log y = \log A + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + b_7 \log x_7 \]

Where \( y = \) Value of output per hectare
- \( x_1 = \) Expenditure on labor
- \( x_2 = \) Expenditure on seed
- \( x_3 = \) Expenditure on manure and fertilizer
- \( x_4 = \) Ploughing charges
- \( x_5 = \) Irrigation charges
- \( x_6 = \) Fixed capital (Depreciation)
- \( x_7 = \) Land rent

**Sugarcane Ratoon Farming:**

\[ \log y = \log A + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 \]

Where \( y = \) Value of output per hectare
- \( x_1 = \) Expenditure on labor
- \( x_2 = \) Expenditure on manure and fertilizer
- \( x_3 = \) Ploughing charges
- \( x_4 = \) Irrigation charges
- \( x_5 = \) Fixed capital (Depreciation)
- \( x_6 = \) Land rent
(f) **Cost Concepts:**

The cost of cultivation is analyzed from cost concepts. They are 1) Total Cost 2) Total Variable Cost and 3) Total Fixed Cost.

In Farm Management Studies (FMS) there are four important concepts of cost. As far as income is considered two important concepts are generally used. These are,

**Cost \( A_1 \)** = This cost approximated actual expenditure incurred in cash and kind and included the following cost items: (a) Hired human labour (b) Owned and hired bullock labour (c) Seed (d) Manures and fertilizers (e) Implements charges (f) Land revenue and other taxes (g) Irrigation charges and transport (h) Interest paid on working capital.

**Cost \( A_2 \)** = Cost \( A_1 \) plus Actual rent paid (tenant farmers)

**Cost \( B \)** = Cost \( A_2 \) plus (a) rent paid or (b) evaluated on owned land and (c) interest on fixed capital (excluding land only)

**Cost \( C \)** = Cost \( B \) plus the value of family labour used (both paid out cost plus imputed cost).

(g) **The Farm Business Income (FBI):** The surplus obtained by deducting Cost \( A_2 \) from value of total output is known as Farm Business Income (FBI). This is the real measure of earnings of the farmer and his family for management of risk, labour, use of land and capital.

(h) **Farm Income:** Farm Income is the surplus earned over cost \( C \) is another measure of earning of the farmer.

(i) **Marginal Physical Productivity (MPP):**

The Marginal Physical Product (MPP) of an input variable may be defined as the additional physical output of a crop from the need of additional variable input when the level of other input variables kept constant.

The MPP of a particular factor used in the production of sugarcane is worked out by taking the 1st order partial derivative of the output \( y \) with respect to each input variable concerned as given in the production function. As an illustration to workout MPP of \( x_1 \) the following step is involved.

\[ Y = a x_1^{b_1} \cdot x_2^{b_2} \cdot x_3^{b_3} \cdot \ldots \cdot x_n^{b_n} \]
Where

\[ Y \text{ is the output and } x_1, x_2, x_3, \ldots, x_n \text{ are the input variables used for production of } (y). \]

The first order partial derivative of output with respect to input variable \( x \) is obtained by the following equation.

\[ \frac{\partial Y}{\partial x} = \frac{\partial}{\partial x} \left( \alpha x_1^{b_1-1} x_2^{b_2} \cdots x_n^{b_n} \right) \]

\( Y \) is output, \( x_1, x_2 \) and \( x_3 \) are input variables. The 1\textsuperscript{st} order partial derivative of output with respect to \( x_1 \) is obtained by

\[ \frac{\partial Y}{\partial x_1} = b_1 \frac{y}{x_2} b \]

The MPP substituting the geometric mean value in place of \( x \) in the above expression the MPP of \( x \) at its geometric mean level is obtained. A similar estimation is to be repeated to find out the MPP of other inputs \( x_2, x_3, x_4 \) etc.

(j) **Marginal Value Product (MVP):**

The Marginal Value Product (MVP) is the additional return in monetary term obtained from an additional unit of an input variable. The MVP of each input variable has been computed by multiplying the MPP of input by the price of the output taken as independent variable (factor) in the equation.

**Design of the Study:**

The study divided into Eight chapters and is as follows:

Chapter I present the introduction through presenting introduction about the study, sources of data, scope of the study, sample design, methodology followed and Chapterisation. Chapter II presents Review of literature relating to sugarcane cultivation. Chapter III is presents the explanation of the Salient features of the study area. Chapter IV is devoted to discuss the Sugarcane cultivation in India. Chapter V presents the Socio-Economic profile of the sample households. Chapter VI focuses on Resource use and Production function analysis. Chapter VII focuses on costs and returns from the selected sugarcane cultivation and problems of sugarcane farmers and Cost and Returns Ratio of selected sugarcane farmers and Chapter VIII is Summary and conclusions of the study.
Major Findings of the Study:

The following are the salient findings emerged out of the present study:

- The estimated Compound Annual Rate of Growth (CARG) of area under sugarcane crop for the country as a whole is just 1.82 percent which is not impressive considering the 40 years period for which the CARG is estimated.
- Among different major sugarcane growing states in India, U.P State the area is very large compare to other states.
- In State Haryana, Assam, and Bihar the CARG has revealed a deceleration.
- The values of CARG and instability indices shows that there is no clear pattern of association between trend growth rate and instability indices as States with positive and negatives growth rates show higher values of instability indices.
- Among the two periods considered for analysis, comparatively in the post reform period, number of states registering declining rate are more than in pre reform period.
- The CARG of sugarcane output is estimated at 3 percent for the country the estimated instability indices do not revealed much variation.
- Among different States, the performance of Gujarat, Maharashtra and Tamilnadu is impressive. In fact, in Maharashtra and Gujarat the production of sugarcane has phenomenal increase.
- The estimated values of CARG of output suggest that during post reform period, there is less growth.
- As far as yield of sugarcane crop, the analysis shows that, all States show positive trend with less fluctuations. Among different State in Tamilnadu the increase in absolute term is high, while Gujarat has highest CARG value.
- During pre reform period, the CARG values of yield are more than in post reform period.
- The operational holding size wise distribution of sample household revealed predominance of marginal and small farmers.
- 50 percent of the head of sample household are exhaustive cultivators and 25 percent are agriculture labourers.
- The most important agriculture equipment owned by the sample farmers is bore wells followed by sugarcane crushers.
The source wise distribution of irrigated area shows that wells are predominance source of irrigation among wells the bore wells are predominant.

The estimated production elasticities of various farm inputs used revealed that the inter farm variation of farm output is explained by the explanatory variables (independent variables) used in the production function.

The sum of production elasticities indicated constant returns to scale. This is noticed for gur plant crop, ratoon crop and sugar plant crop and ratoon crop.

The explanatory variables used in the production function of different size groups also shows the same result as pointed above with little variation in co-efficient values.

Four important inputs are found to have significant influence on output. They are (a) Expenditure on labour (b) Expenditure on fertilizer and manure (c) Expenditure on irrigation charges (d) Fixed capital expenditure. These four variables have significant co-efficient values observed to influence the output for all size groups of farmers.

The values of MPP and MVP showed that input manure and fertilizer and irrigation charges, machinery important tractor have higher values than other inputs used. Further, these results point out that marginal farmers need to reduce expenditure on labour and investment in fixed capital, small farmers need to reduce expenditure on labour, ploughing charges and no further investment in fixed capital. In case of medium farmers, they have to reduce expenditure on labour and no more further investment on fixed capital.

The ratio of MVP to factor cost indicated that there is efficiency in use of inputs and there is no much difference in the input use efficiency among different size groups and also between ratoon and plant crop. This is noticed in case of both gur and sugar farmers.

The economic analysis of cost of production showed that the Total Cost (TC) of production for Gur plant farmers is estimated at 1.33 lakhs. 1.14 lakhs for ratoon crop.

The TC of production of sugar plant crop is estimated at Rs.1.04 lakhs for Rs. 0.83 lakhs for sugar ratoon crop.
Among different components of Total Variable Cost (TVC) labour charges account for 36 percent followed by cost of machinery and seed.

Cost relating to rent on own land is a predominant cost in Total Fixed Cost (TFC). TC, TVC and TFC are comparatively more for medium farmers.

The Total Cost of production has positive relationship with the size of the farm. This is noticed for sugar and gur farmers in both plant and ratoon crops.

There is no much variation the Total Cost of production among the sample farmers.

However, from the values of Coefficient of Variation (CV) it can be noticed that whatever the variation exists it is comparatively high for marginal farmers than the other categorized.

The gross income per hectare for plant crop is estimated at Rs.1.42 lakhs and for ratoon crop it is Rs.1.23 lakhs for Gur farmers. Among different size groups the gross value of output is for small farmers is highest.

The farm business income is estimated at Rs. 64, 428 for plant crop and Rs.60, 543 for the Gur ratoon crop. The FBI is comparatively more for small farmers.

In case of sugar farmers, the G.I per hectare is Rs. 77,427 for plant crop and Rs.63,323 for ratoon crop. Whereas F.I shows losses to all the three categories of farmers as cost ‘C’ is more than G.I. The FBI also do not reveal encouraging picture.

The FBI for the total sample is Rs. 7,698 and Rs. 13,838 for plant and ratoon crop respectively. The estimated FBI though ositive at it is vsery less indicating that sugarcane farmers are not able earn enough for all the toil of their family. Among Gur and Sugar cultivators it is Gur cultivation the incomes are comparatively high. This is attributable to low cost of production and high Gur prices.

The Cost Returns Ratio (CRR) is estimated. Considering the Gross Income (G.I) and Total Cost (T.C). Table 7.28 gives these details. For Gur farmers, the ratio is comparatively high for ratoon crop. It is estimated at 1.44 for owner and 1.33 for tenant. There is much difference in the CRR among the three categories of farmers.
In sugar farmers, the CRR values show very distressing and discouraging picture. The situation is much worse for tenant farmers. The estimated CRR for tenant farmers, for total sample is 0.76 and 0.98 for plant and ratoon crop respectively. The estimated CRR for sugar owner cultivator is marginally better than tenant cultivator.

This situation is a result of steep hike in the prices of various inputs that goes into production and MSP of sugarcane crop is not adjusted proportionately to changes in cost. This low CRR in sugarcane cultivation is to be viewed seriously by policy makers to avoid, further distress among sugarcane growers. If this problem is not addressed with appropriate policy measures, may lead to crop holiday or shifting to other crops.

Problems of sugarcane in the study area:

The technical analysis on the input output relationship. Input use efficiency and cost and returns throws like on the technical aspect of the sugarcane cultivation. The researcher during his course of visit to different sample villages for collecting data has noted down the problems being faced by the sugarcane farmers as expressed by them. Sum of the important of these problems are given below which help to suggest appropriate policy measures.

- Increase in the cost of production due to increase input cost, especially the cost of labour. There is scarcity of labour due to implementation of Mahatma Gandhi national Rural Employment Guarantee Scheme. This scarcity of labour has increased the wages.
- These farmers are not aware of recent techniques of production and farm management which help to increase output and reduce cost.
- As bore wells are important source of irrigation for sugarcane cultivation in the study area, electricity power failures, lack of adequate power supply are affecting the irrigation which in turn affect the output. In sugarcane affect on weight of crop.
- The MSP fixed by the government is not remunerative to the farmers in view of steep rise in cost of production, transportation and incidental costs.

Unless these problems faced by sugarcane farmers is solved by appropriate policy measures, sugarcane farmers may declare crop holiday (as happened recently
for Paddy crop in Andhra Pradesh) which affect the sugar mills also and eventually on the supply of sugar and gur.

**Suggestions:**

Taking into consideration, the technical analysis of cost and returns, the problems of sugarcane farmers as pointed out sample farmers the following suggestions are given to sustain Sugarcane cultivation and to improve the economic conditions of sugarcane farmers.

- The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has to be grounded strictly during non-agriculture season i.e. from April –June.
- In view of huge labour cost, appropriate capital intensive techniques (machinery to plant sugarcane stems, de-weeding and harvesting machines) are to be supplied by the government on subsidy basis or made available. Farmers who can afford them will purchase. Once they are available in the village, farmers can hire them as they are doing in case of tractors and crushing machines.
- Sugarcane farmers need to be educated on recent techniques of cultivation and Farm Management by government extension department functioning at Mandal level.
- The sugarcane mills are to be strictly instructed to purchase cane immediately after harvest without loss of weight.
- The most important recommendation is proper review of government policy of MSP. Present MSP is Rs.2200 per ton of sugarcane. This need to be increased to Rs.3000 per ton.
- Uninterrupted power supply need be ensured at least 8 hours in a day so that necessary irrigation from wells will be possible which effect the output.