Original Article

Cost of Coconut Cultivation –Farmer Groups wise in East Godavari District

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Abstract - *The present study was undertaken in the East Godavari district of Andhra Pradesh during the year 2015-2016 with the objective of studying the economics and feasibility of coconut cultivation. A multistage sampling method was used for the study. The cost of Cultivation of coconut in the Ainavilli Mandal is presented in table 1.1. The average total cost of coconut production per acre worked out to Rs.23608, Rs.23117, and Rs.20,858.64 respectively for marginal, small, and large coconut growers. The total cost of coconut cultivation was highest in the case of marginal growers followed by small and large coconuts growers. The cost of Cultivation of Coconut in Ambajipeta Mandal is presented in table 1.2. The average total cost of coconut cultivation worked out to Rs. 22,408.50 Rs. 21,987.48 and Rs.19,632.19 for marginal, small, and large coconut growers respectively. The total variable costs were Rs.15,447.50, Rs. 14,807.7, and Rs.12,136.29 respectively for marginal, small, and large coconut growers. The total variable cost as a proportion to the total cost was 68.94, 67.35, and 61.82 percent of respectively for marginal, small, and large coconut growers. The contribution of fixed cost to the total cost of cultivation accounted for Rs.7,495.9(38.18 percent) for large coconut growers followed by Rs. 7,179.78, (32.65 percent) for small coconut growers and Rs. 6,961 (31.06 percent) for marginal coconut growers. The cost of Cultivation of Coconut in Ambajipeta Mandal is presented in table 1.2. The average total cost of coconut cultivation worked out to Rs. 22,408.50 Rs. 21,987.48 and Rs.19,632.19 for marginal, small, and large coconut growers respectively. The total variable costs were Rs.15,447.50, Rs. 14,807.7, and Rs.12,136.29 respectively for marginal, small, and large coconut growers. The total variable cost as a proportion to the total cost was 68.94, 67.35, and 61.82 percent of respectively for marginal, small, and large coconut growers. The contribution of fixed cost to the total cost of cultivation accounted for Rs.7,495.9(38.18 percent) for large coconut growers followed by Rs. 7,179.78, (32.65 percent) for small coconut growers and Rs. 6,961 (31.06 percent) for marginal coconut growers.*

Keywords - *Coconut, maintenance cost, cost of cultivation, feasibility, copra, the net present value of the return.*

I. INTRODUCTION

The Coconut Palm (*Cocos nucifera* Linn.) is supposed to be one of the five legendary Devavriksh as and is eulogized as Kalpavriksha - the all-giving tree - in Indian classics. All parts of the palm are used in some way or another in the daily life of the people of the west coast, the traditional coconut growing area. Its fruit is called Lakshmi Phai and is used in social and religious functions in India irrespective of whether palm is locally grown or not. Each and every part of the coconut tree is useful to mankind. The coconut products like the wet kernel, desiccated copra, coconut water, cream flour, oil, cake, toddy, husk, fiber, shell, coir, wood, and leaves are used for one purpose or the other.

Coconut is grown in more than 93 countries worldwide, with a total production of 54 billion nuts per annum. India occupies the premier position in the world with an annual production of 13 billion nuts, overtaking Indonesia and the Philippines, the other two prominent coconut-growing countries in the world. In India, the coconut tree is grown on the entire coastal belt of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, West Bengal, Pondicherry, and Maharashtra and in the islands of Lakshadweep, Andaman, and Nicobar. Of late, coconut cultivation was introduced to suitable locations in non-traditional states including Assam, Gujarat, Madhya Pradesh, Rajasthan, Bihar, Tripura, Manipur, and Arunachal Pradesh and in the hinterland regions of the coconut growing states.

A. Importance of Cost of Coconut Cultivation in Andhra Pradesh

An Attempt was made to analyze the cost and returns of coconut in the study area of East Godavari District of Andhra Pradesh. An economic analysis of cost returns and resource-use efficiency of coconut production assumes great significance as it determines the overall profitability of coconuts for growers in the study area. For the purpose of analysis, the present chapter has been divided into three sections. The first section deals with the cost and returns of coconuts. The productivity and resource-use efficiency are discussed in the second section. The last section deals with the production problems faced by the coconut growers in the study area.

Cost of cultivation helps the farm management experts to make practical recommendations for farm planning objectives at the better allocation of resources to increase the efficiency and productivity of the crop. It also helps in the utilization of resources or factors of productions in such a manual that they yield/produce the highest returns.

The estimation for the cost of cultivation for a perennial crop like coconut is more complex fake coconut trees are having a very long life. Different cost Items like fixed and variable costs are presented Mandal-wise in this chapter.

B. Review of Literature

This section briefly reviews the number of theoretical and empirical concepts used in previous studies on coconut production and marketing. In this part, the most relevant literature is presented keeping in view the objectives and methodology of the present study. Highlights the studies on cost and returns of coconut.

Aravindakshan. M (1977) [1] in his study emphasized that India occupies the premier position in the world production of coconut. More than 90 percent of the production is contributed by the four Southern States namely, Kerala, Tamil Nadu, Karnataka, and Andhra Pradesh. The world production of coconut at 5,400 crore nuts of which more than 25 percent is the contribution of India.

Godoy& Bennett (1991) [2] made a comparison of the profits of cultivating modem and traditional varieties of coconuts as a mono-crop and intercrop, in ideal land in average growing conditions, under good and with average management. They carried out the analysis from a private (financial) and from a national (economic) perspective. The results revealed that in Indonesia, intercropping generates more income than monocropping.

Srinivasan N (2002) [3] emphasized the productivity of the coconut crop is constrained by various stresses. Among them, the root (wilt) disease is the major problem in the southern districts of Kerala, Tamil Nadu, and Goa. The study also emphasized the root (wilt) affected palms are also affected by leaf rot. The incidence of leaf rot increases the incidence of root disease (wilt).

ChowdryD (2006) [4] in his study entitled "Problems and Prospects of Coconut Cultivation in Assam" focused on the problems of coconut cultivation in Assam. First, there is a lack of awareness of the farmers on recent developments related to crop improvement, crop protection, production, and cropping system; Secondly, there is a lack of quality planting materials for the farmers.

Dash, D.K, Kar M.R, and Subudhi G. (2007) [5] highlight the coconut Hybrid is ideal for tender nuts. The volume of water was found to increase till the seventh month of nut development in all the cultivators and it declined thereafter. The decrease in nut water may be due to absorption by developing endosperm from the eighth month onwards.

Elias G. (2015) [6] focused on "Trends in the area of coconut cultivation in India". Coconut is cultivated in more than ninety countries in Asia and the Pacific regions. In India, coconut is grown in 17 states and 3 union territories under varying soil and climatic conditions. Production of coconut in the country is concentrated mainly in the four southern states, namely Kerala, Tamil Nadu, Karnataka, and Andhra Pradesh. In the Post–Liberalisation period, Kerala has been showing negative development in the area under cultivation but the neighboring states of Karnataka and Tamil Nadu have been performing well in the area under coconut cultivation.

C. Statement of the Problem

The coconut palm is one of the most beautiful and useful trees in the world, it is one of the traditional, prominent perennial crops related to the heritage, culture, and economy of the country for the last 3000 years. In addition, coconut is closely coupled with the daily foodstuff of millions of people around the world.

Amidst huge production and demand, coconut suffers from the bottlenecks of low level of production technology, high degree of pest and disease, land fragmentation, obsolete irrigation system conventional arrangements in marketing, fluctuating price; lack of proper institutional financing, etc. The cost of production and net returns obtained per thousand nuts would determine the profitability of the crop.

Therefore, a fresh survey on cost and return, marketing of coconuts in East Godavari district of

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Andhra Pradesh was undertaken. East Godavari District is one of the rich coconut-producing regions in Andhra Pradesh. Problems faced by the producers and traders involved in the marketing process of coconut and to focus on the inadequacies prevailing in the marketing system of coconut and coconut products in the district.   Hence, the present study is an attempt to analyze the production and marketing of coconut in the district.

D. Objectives of the Study
➤ To analyze the cost and returns of coconut cultivation in the East Godavari district.
➤ To study the efficiency of resource use and returns to scale
➤ To analyze the problems encountered in the cultivation and marketing of coconut by the farmers.
➤ To suggest policy measures for improving coconut cultivation in the study area.

E. Scope of the Study
Coconut is a major crop cultivated in the East Godavari District of Andhra Pradesh. It contributes to the district's economic, social and other development in various ways. Coconut is also a primary source of food and income generation to the people of the study area. Coconut provides the basic raw materials to the coir and oil industries. The present study mainly focused on the production and marketing of coconuts and does not cover the industrial activities involving coconuts. The study has been carried out from the point of view of the farmers, and marketing activities in the study area.

F. Methodology
a) Collection of Data:
The study is based on the primary as well as secondary data that have been used to achieve the objectives of this study. For the present study, two well-designed and pre-tested questionnaires were used. One questionnaire was used to collect information from the Coconut growers/farmers, while the other from intermediaries i.e., pre-harvest contractor /wholesalers/ retailers.

b) Analysis of Data.
The collected primary data were analyzed with the help of appropriate statistical tools in order to fulfill the objectives of the study. The collected data were carefully classified and tabulated. For the present study the researcher used percentile analysis, Mean, Standard Deviation Compound Annual Growth rate, Co-efficient of variance, Instability Index, Semi log Function, Cobb- Douglas production function, ANOVA Test, Garrett Ranking Technique, Marketing efficiency of Acharya & Agarwal method, Shepherd's method, and hypotheses analyses.

c) Tools and analysis
1) Mean:
Arithmetic average is also called mean. It is the most common type and widely used measure of central tendency or an average. Mean is defined as the quantity (figure) obtained by the number of observations Kothari, C. R. (2004)[7]. The formula of Mean:

$$\text{Mean (or } \overline{X})^* = \frac{\sum X_i}{n} = \frac{X_1 + X_2 + ... + X_n}{n}$$

Where,
X   = value of the variable
n   = total number of items
Σ   = sum of the observations
of the variable

2) Standard deviation: Standard Deviation of a set of scores is defined as the square root of the average of the squares of the deviation of each from the mean. Symbolically we can say that (Singh, 2006)[8].

$$SD = \sqrt{\frac{\Sigma (X - M)^2 N}{}} = \sqrt{\frac{\Sigma x^2}{N}},$$

3) Coefficient of variation:
The coefficient of variation, CV, indicates the relative magnitude of the standard deviation as compared with the mean of the distribution of measurements, as a percentage. Thus, the formulas are:

$$\text{Population: } CV = \frac{\sigma}{\mu} \times 100$$

$$\text{Sample: } CV = \frac{s}{\overline{X}} \times 100$$

The coefficient of variation is useful when we wish to compare the variability of two data sets relative to the general level of values (and thus relative to themean)ineach set (Daniel L. Fulks and Michael K. Staton, 2003)[9].

4) Compound Annual Growth Rate:

It works out change for a given period on the basis of the base year to end year values i.e.

$$g = [\{\frac{k_1}{k_o}\}^{1/t} - 1] \, X \, 100$$

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Where

g	=	compound growth rate
K_1	=	value of k in the end year
K_0	=	value of k in the base year
t	=	Time Period

(Gujarati N. D., 2004)[10]

5) Instability Index: Instability is one of the important decision parameters in development dynamics, more so in the context of agricultural production.

$$IX = CV\sqrt{1 - \text{R squared}}$$

Where;

IX = Instability Index
CV = Coefficient of variation (in percent)
R squared = Coefficient of determination from a time-trend regression adjusted by the number of degrees of freedom.

Krishan & Chanchal (2014)[11]

(Gujarati N. D., 2004)[12]

6) Coefficient of Variation

The coefficient of variation (CV) is the most commonly used technique particularly in studies like this. This is another method to compare the variability of two or more two series of their relative variation. The series for which the coefficient of variation is greater is said to be more variable or conversely less consistent, less uniform, less stable, or less homogeneous. Coefficient of Variation is employed in coconut production, coir production, consumption, and coir products export The formula for calculating correlation coefficient is
C.V. = Standard deviation*100 Mean

7) Chi-square Test:

A chi-squared test, also written as a test, is any statistical hypothesis test wherein the sampling distribution of the test statistic is chi-squared distribution when the null hypothesis is true. The following formula analyses the different variables and different farmers in the study area:

$$X^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(O_{i,j} - E_{i,j})^2}{E_{i,j}}.$$

Where

X^2 = Chi-square O = Observed numbers
E= Expected numbers

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ANALYSIS AND DISCUSSION

G. Mandal Wise Cost of Cultivation:
The cost of cultivation of coconut refers to the total cost incurred in the cultivation of nuts, where total cost consists of variable cost and fixed cost. The variable costs include i.e., cost of seedling, cost of labor, cost of manure, cost of fertilizers, and cost of pesticides and other costs i.e., the fixed cost consists of, land tax, the rental value of land, interest on fixed cost and share of net establishment cost.

a) Cost of Cultivation of Coconut- Ainavilli Mandal

The cost of Cultivation of coconut in the Ainavilli Mandal is presented in table 5.1. The average total cost of coconut production per acre worked out to Rs.23608, Rs.23117, and Rs.20,858.64 respectively for marginal, small, and large coconut growers. The total cost of coconut cultivation was highest in the case of marginal growers followed by small and large coconuts growers.

The total variable cost stood at Rs.16,314.32, Rs.15,606.86, and 13,191.42 respectively for marginal, small, and large coconut growers. The total variable cost constituted 69.11, 67.52per cent, and 63.25 percent of total cost respectively for marginal, small, and large coconut growers. The contribution of fixed cost to the total cost of cultivation accounted for Rs.7,617.22 which is .36.75 percent of the total cost for large coconut growers followed by Rs. 7,510.88 which is 32.48 percent of the total cost for small coconut growers and Rs. 7,294.19 which is 30.89 percent of the total cost for marginal growers.

The highest proportion of the variable cost components is Labour, watch and ward, Manure, Irrigation, seedlings, and fertilizers in descending order for all the three groups of the coconut growers. However, the order of descent is not actually uniform among these groups. When it comes to labor, the Small farmer has the highest proportion of more than 23%, while the large farmer has the lowest at 19.83%. The total fixed cost per acre accounted for Rs.7,294.19, Rs.7,510.88, and 7,667.22 respectively for marginal, small, and large coconut growers. On the other hand, the total fixed cost was estimated for 30.89per cent, 32.48 percent, and 36.75 percent of respectively for marginal, small, and large coconut growers.

- In case of marginal coconut grower total
- fixed costs, the rental value of land- accounted for the highest share of Rs 3,500 (14.83 percent) followed by an annual share of the net establishment cost of Rs. 2,456 (10.40 per cent). and the annual interest on the fixed cost of Rs. 961.75 (4.07 percent). On the other hand, land revenue tax accounted for about Rs. 376.43 which is only 1.59 percent of total fixed costs.

Table 1. Cost of Coconut Cultivation –Farmer Groups wise in Ainavilli Mandal

- *(Rs. per acre & per year)*
- *Source: Field Survey.*

Sl. No	Cost on	Marginal Farmers		Small Farmers		Large Farmers	
		Amount	Percentage	Amount	Percentage	Amount	Percentage
	Fixed Cost						
1	Land tax	376.43	1.59	387.47	1.67	358.73	1.73
2	Rental value of land	3500.00	14.83	3500.00	15.13	3500.00	16.77
3	Interest on fixed cost	961.75	4.07	1215.18	5.25	800.93	3.83
4	Share of net establishment cost	2456.00	10.40	2408.23	10.43	3007.55	14.42
	Sub Total	7294.19	30.89	7510.88	32.48	7667.22	36.75
	Variable Cost						
1	Labour	5135.54	21.75	5435.40	23.52	4135.78	19.83
2	Manures	1994.35	8.44	1636.41	7.07	1459.15	6.99
3	Pesticides	1230.40	5.22	1290.87	5.59	1162.84	5.57
4	Irrigation	1808.89	7.66	2070.42	8.95	1731.84	8.30
5	Fertilizers	1451.14	6.14	1310.98	5.67	1192.83	5.73
6	Seedling	1523.31	6.46	1339.60	5.79	1171.80	5.63
7	Watch & Ward	3170.70	13.44	2523.19	10.93	2337.18	11.20
	Sub Total	16,314.32	69.11	15,606.86	67.52	13,191.42	63.25
	Total Cost	**23608.51**	100	**23117.74**	100	**20858.64**	100

Fig 1.1 Cost of Coconut Cultivation in Ainavilli Mandal

Cost of Coconut Cultivation in Ainavilli Mandal
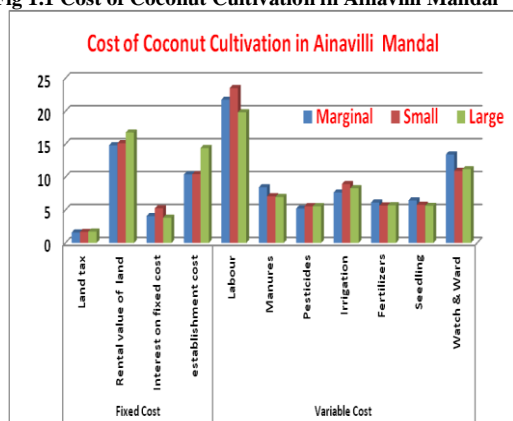
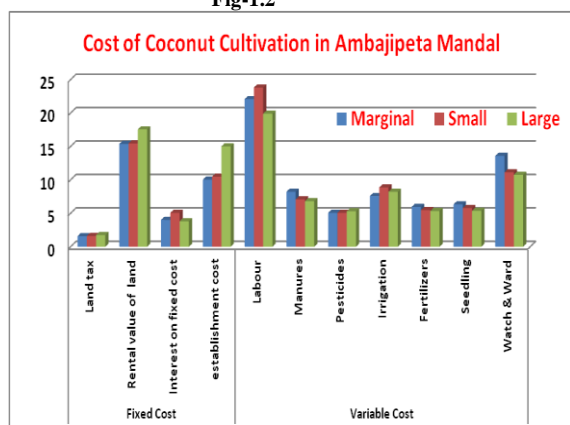**b) Cost of Cultivation of Coconut in Ambajipeta Mandal**

- The cost of Cultivation of Coconut in Ambajipeta Mandal is presented in table 1.2. The average total cost of coconut cultivation worked out to Rs. 22,408.50 Rs. 21,987.48 and Rs.19,632.19 for marginal, small, and large coconut growers respectively. The total variable costs were Rs.15,447.50, Rs. 14,807.7, and Rs.12,136.29 respectively for marginal, small, and large coconut growers. The total variable cost as a proportion to the total cost was 68.94, 67.35, and 61.82 percent of respectively for marginal, small, and large coconut growers. The contribution of fixed cost to the total cost of cultivation accounted for Rs.7,495.9(38.18 percent) for large coconut growers followed by Rs. 7,179.78, (32.65 percent) for small coconut growers and Rs. 6,961 (31.06 percent) for marginal coconut growers.

- In the case of marginal coconut grower total variable labor cost constituted the highest share Rs.4,950.50 (22.09 percent) followed by the cost of watch and ward at 13.60 percent, cost of manure was estimated to be Rs.1,844 (8.22 percent), cost of irrigation accounted for 7.6 percent.

- In the case of small coconut grower, the total variable cost components were as follows: cost of labor 23.83 percent followed by the cost of watch and ward at 11.15per cent, cost of irrigation at 8.87 percent, cost of manure was found to be 7.09 percent followed by the cost of seedling at5.79 percent, cost

of fertilizer at 5.50 percent and cost of pesticides at 5.09 percent. in the case of large farmers, the components of variable costs were found to be at the following proportions in the descending order: cost of labor (19.92 percent), Watch and ward (10.77per cent), cost of irrigation (8.32 percent), cost of manure (8.22 percent), cost of fertilizers (5.36 percent), cost of seedlings (5.39 percent) and cost of pesticides (5.31 percent).To conclude labor cost accounted for the highest share of variable cost in all three types of coconut growers. It shows clearly that the total cost of cultivation per acre of coconut was low at Rs.19632/- per acre for the large coconut farmers in Ambajipeta Mandal.

Fig-1.2

c) **Cost of Cultivation of Coconut in Amalapuram Mandal**

- The cost of cultivation of Coconut in the Amalapuram Mandal is presented in table 1.3. The average total cost of coconut cultivation accounted for Rs.24722.09, Rs.24232.21, and Rs.22013.11 respectively for marginal, small, and large coconut growers. The total cost of cultivation was highest in the case of marginal growers followed by small and large coconut growers.
- The total variable cost accounted for Rs.17,182.9 Rs. 16,335.76 and Rs.13,871.38 respectively for marginal, small, and large coconut growers. The total variable cost constituted 69.50, 67.42, and 63.01 percent of the total cost, respectively for marginal, small, and large coconut growers. While the contribution of fixed cost to the total cost of cultivation is 36.98 percent for large coconut growers followed by 32.58 percent for small coconut growers and 30.50per cent for marginal coconut growers.
- Looking at the various components of the variable cost, it is clear that labor is the largest proportion followed by watch and ward for all the three groups of farmers. Irrigation comes in third place in the small and large farmers while manures come at that place in the marginal farmers.
- It is observed from the analysis the variable costs i.e., the cost of manure, seedling, fertilizer, pesticides in Amalapuram Mandal.

Table 1.2 Cost of Coconut Cultivation –Farmer Groups wise in Amalapuram Mandal
(Rs. per acre & per year)

Sl. No	Cost on	Marginal Farmers		Small Farmers		Large Farmers	
		Amount	Percentage	Amount	Percentage	Amount	Percentage
Fixed Cost							
1	Land tax	387.43	1.56	401	1.65	395.45	1.79
2	Rental value of land	3600	14.56	3650	15.06	3650.45	16.58
3	Interest on fixed cost	995.76	4.03	1335	5.50	945.43	4.29
4	Share of net establishment cost	2556	10.33	2510.45	10.35	3150.40	14.31
	Sub Total	7539.19	30.50	7896.45	32.58	8141.73	36.98
Variable Cost							
1	Labour	5350	21.64	5545.40	22.88	4214.19	19.14
2	Manures	2150	8.69	1720.51	7.10	1560.19	7.08
3	Pesticides	1345	5.44	1340.50	5.53	1242	5.64
4	Irrigation	1901.3	7.69	2190.45	9.03	1832	8.32
5	Fertilizers	1541.5	6.23	1415	5.83	1242	5.64
6	Seedling	1620.1	6.55	1448.70	5.97	1241	5.63
7	Watch & Ward	3275	13.24	2675.20	11.04	2540	11.53
	Sub Total	17182.9	69.50	16335.76	67.42	13871.38	63.01

Total Cost	24722.09	100.0	24232.21	100.0	22013.11	100.0

Source: Field Survey.

- **Fig-1.3**

Cost of Coconut Cultivation in Amalapuram Mandal
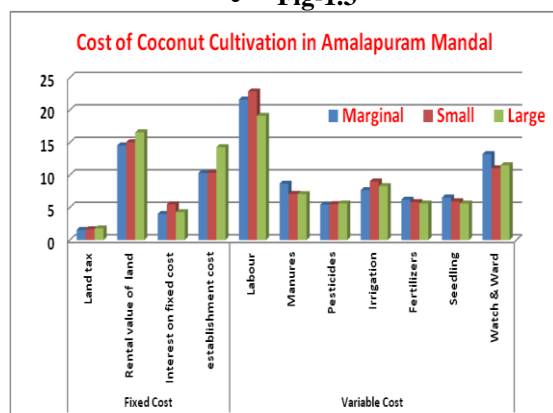
CONCLUSION

The study reveals the comparative advantages of large farmers over marginal and small farmers in terms of production and profitability. On the other hand, overall comparative cost and returns of large farmers are in better economic and institutional conditions comparative to marginal and small farmers in terms of profitability. The degree of returns to scale indicates the increasing return to scale for marginal coconut growers, decreasing returns to scale for both small and large coconut growers. But it was found there are overall decreasing returns to scale for all categories of growers in the study area. Thus it may be concluded from the analysis that among the significant variables, labor, manure, pesticides, fertilizer, and irrigation were more important resource inputs for the marginal, small, large farmers in the study area. The variable "labor" had a greater influence on the productivity of coconuts than all other variables.

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