Economic Analysis of Arecanut (*Areca catechu* L.) Cultivation in Mokokchung District, Nagaland

Ms. Arenkumla and *Dr. Amod Sharma

Research Scholar and Senior Professor & Former Head, Department of Agricultural Economics, School of Agricultural Sciences, Nagaland University

Medziphema Campus, District: Chumoukedima, Nagaland - 797106. Email:

Abstract:

The present study was carried out during 2024-2025 in two blocks, Tuli and Kubulong. A multistage random sampling method was adopted, selecting four villages from each block, covering a total sample size of 120 growers. The objectives were to analyze the socioeconomic characteristics of the growers, estimate cost and returns, evaluate economic viability and examine marketing channels and constraints. The findings revealed that a majority of the growers (60.00 per cent) belonged to the middle age group (36 to 60 years), indicating that arecanut farming is dominated by experienced middle-aged farmers. Male participation was relatively high (70.83 per cent), while the majority of households were medium-sized families (5 to 9 members). Educational attainment was low, with 49.17 per cent of farmers reporting only primary education. Landholding analysis showed that 51.67 per cent of the farmers belonged to the medium landholding category (2.01 to 3.00 ha), while land under arecanut accounted for about 33.84 per cent of the total cultivated land. The per hectare cost of cultivation was estimated at Rs. 44,929.62, while gross and net incomes were Rs. 82,460.55 and Rs. 59,650.57, respectively, yielding a Benefit-Cost (B: C) ratio of 1.83. The B.C. ratio was highest for semi-medium farms (3.08), demonstrating higher efficiency in this group. Human labor, both hired and family, accounted for 58.31 per cent of the total cost of production. Marketing analysis showed that 34.40 per cent of the produce was sold through Channel III , 41.35 per cent through Channel II and 24.35 per cent through Channel I. Marketing efficiency was highest for ripe nut channels due to reduced intermediaries. The major production constraint was declining soil fertility, while the foremost marketing constraint was price fluctuation. Other constraints included limited access to credit, poor storage facilities and lack of extension services. This study highlights the profitability and significance of arecanut cultivation in Nagaland, particularly Mokokchung district, as an important cash crop. Strengthening credit availability, providing training, and establishing stable marketing systems will enhance productivity and economic security for growers in the region.

Keywords*: Arecanut, economic analysis, socio-economic, marketing, gross income, net income*

Introduction:

Arecanut (*Areca catechu* L.) is a monocot crop belonging to the tribe *Arecae* and sub-tribe *Arecinae* of the Arecaceae family. It is a highly valued palm, cultivated mainly for its kernel and widely grown in eastern countries such as India, Bangladesh, Sri Lanka, Malaysia, the Philippines and Japan. The nut is primarily used for chewing and holds significant cultural, religious and economic importance, especially in India. Globally, around 600 million people consume arecanut in some form, often as part of betel quid (pan), accounting for nearly 10.00 to 20.00 per cent of the world's population. Arecanut is the fourth most addictive substance after tobacco, alcohol, and caffeine and is considered the second most common carcinogenic agent in the Indian subcontinent (Mitra and Devi, 2016). Arecanut grows best in temperatures between 14°C and 36°C, with annual rainfall ranging from 750 mm to 4,500 mm. The crop is highly sensitive to frost and extreme heat and performs poorly above 1,000 m elevation. Its utility extends beyond chewing purposes: the kernel provides fat for confectionery, the stem is used as timber and fuelwood, husk for hardboard making, tannins for dyeing, and it also has medicinal applications. Two main commercial varieties are processed in India: Red Boiled Type (RBT) and White Chali Type (WCT). RBT is prepared from immature green nuts that are dehusked, boiled with natural dye (chogaru), and dried for about a week. WCT is produced from fully ripe nuts, dried in the sun for nearly two months. The quality and market price of arecanut depend significantly on post-harvest processing methods (Kumar and Konyak, 2024).

Worldwide arecanut production was about 14.15 lakh tonnes in 2017, increasing slightly to 14.29 lakh tonnes in 2018. The global productivity is around 1.287 t/ha. India dominates global production and consumption, contributing 58.00 per cent of the world's cultivated area and 53.00 per cent of total output. Annual domestic consumption stands at nearly 330,000 MT, with over 10 million livelihoods linked to arecanut farming (Jamir, 2020). Karnataka is India's leading producer, contributing nearly 47.00 per cent of national production, followed by Kerala and Assam. Together, Karnataka and Kerala account for about 70.00 per cent of the country's area and production. Other producing states include Tamil Nadu, West Bengal, Maharashtra, Andhra Pradesh, Goa, Meghalaya, Nagaland, and Tripura. Arecanut is marketed through major centers such as Bangalore, Mangalore, Mumbai, Ahmedabad, Delhi and Chennai. A portion of India's produce is exported, mostly as ingredients in *pan masala* and *gutkha*. (Narendra *et al.*, 2020).

In the North-Eastern region, arecanut is cultivated in Assam, Meghalaya, Mizoram, Tripura, Arunachal Pradesh and parts of Nagaland. In 2010, the region accounted for 93.60 thousand ha producing 97.70 thousand MT of chali (NHB, 2025). Assam leads in both area and production, followed by Meghalaya, Mizoram, and Tripura. Locally, arecanut is called *kwai* or *gue* in Meghalaya, *tamul* in Assam and Nagaland, and *kua/kuhva* in Manipur and Mizoram. Traditional preparations include *Neetadaka* and *Chali*. The area under arecanut in the North-East has been steadily increasing, from 93.6 thousand ha in 2011 to 118.62 thousand ha in 2020. Production rose marginally between 2019-20 and 2021-22, from 1,196.6 MT to 1,226.8 MT, with productivity stable at 5.40 to 5.53 MT / ha. Small and medium farmers dominate cultivation, with more than 85.00 per cent of holdings under 1 ha (Kumar *et al.*, 2021). Nagaland, located in the extreme northeast of India, has a land area of 16,579 sq. km and a population of 1.98 million. Agriculture forms the backbone of the state's economy, engaging over 60 .00 per cent of its population. Rice is the staple crop, occupying about 70.00 per cent of the cultivated land. The state practices both terrace and *jhum* (slash-and-burn) cultivation, with about 90,900 ha under jhum and 77,670 ha under terraces (Kumar and Sharma, 2023).

Arecanut is cultivated across Nagaland as a significant cash crop. In 2020–21, the area under arecanut was 0.22 thousand ha, with production of about 1.22 thousand MT (Anon., 2022). Mokokchung district, located between 26.20°N to 26.77°N latitude and 94.29°E to 94.76°E longitude, is one of the key growing regions. The district, lying in the Eastern Himalayan region, experiences a subtropical to temperate climate, with acidic soils (pH 4.10 to 5.30) and annual rainfall of 2,000 to 2,500 mm. Nearly 80.00 per cent of its rural population depends on agriculture (Anon., 2023).

Materials and Methods:

Mokokchung district of Nagaland, India was intentionally chosen for undertaking the study owing to its relevance in arecanut production and marketing. The district covered an area of 1,695 sq km, with a population of over 2,20,052 and comprised of 114 villages, grouped under six Rural Development Blocks (Anon., 2022). Mokokchung district was purposively selected from the 16 districts in Nagaland due to its highest number of arecanut growers. Out of the 9 blocks in Mokokchung district, Tuli and Kubolong blocks were selected due to having highest plantation area under Arecanut cultivation for the current study. For the selection of villages first-off all the villages was cluster in both blocks; then keeping in mind the specific objectives it was stratified into the cluster and then 4 villages from Tuli block and 4 villages from Kubolong block was chosen randomly; so total selected villages were 8 (eight) for the present study considering of the availability of arecanut growers. A total of 15 (fifteen) respondents from each of the 8 (eight) villages involved in arecanut cultivation was selected for the study through the use of a simple random sampling technique, with an overall count of 120 (one hundred twenty) respondents respectively. This study relied on both primary and secondary data sources. Primary data was obtained directly from respondents through personal interviews schedule specifically designed for the research. The secondary data and related information was collected from textbooks, handbooks, reports, journals, horticultural department, internet, websites, etc; A combination of purposive and random sampling

techniques was employed to select a suitable sample size for this study. Finally the collected data were processed, classified, tabulated and systematically analyzed using suitable tools according to the objectives of the study.

Cost concept: In the farm management studies of arecanut, the cost of cultivation was estimated using various cost ideas; both variable and fixed. These cost concepts are as follows:

Cost A_1 = Hired human labour + value of machine labour + value of plant material + value of manures and fertilizers + irrigation charge + marketing transportation cost + depreciation of implements and farm buildings + land revenue, cess and other taxes + interest on working capital + miscellaneous expenses.

Cost A_2 = Cost A_1 + rent for leased in-land

Cost B_1 = Cost A_2 + interest on value of owned capital assets (excluding land)

Cost B_2 = Cost B_1 + rental value of owned land

Cost C_1 = Cost B1+ imputed value of family labour

Cost C_2 = Cost B_2 + imputed value of family labour

Cost C_3 = Cost C_2 x 1.10, (10 per cent of cost C_2 is added to cost C_2).

The cost of production will be worked out by using the formula:

Cost of production = (Cost C_3 - Value of by-product) / Yield

The cost of cultivation of arecanut was estimated using various cost ideas-both variable and fixed (Bey and Shartma, 2024a).

Marketing cost and price spread

Marketing cost was determined by evaluating all expenses associated with moving arecanut from the farm to the final consumer. This includes all post-harvest costs such as transportation, handling, storage, market fees, weighing charges and labor costs for packing, loading and unloading. The marketing expenses incurred at different stages of the supply chain were estimated to arrive at the total marketing cost. Marketing margin at any stages of marketing were determined using the calculated following method:

$$MM = SP - (PP + MC)$$

Whereas: MM = Marketing margin,

SP = Seller's price,

PP = Purchase Price,

MC = Marketing cost.

Marketing margins may vary based on product perishability and the number of participants involved in the marketing channel (Sharma, 2018).

Price spread measures the difference between what consumers pay and the net amount received by the producer for the same quantity of agricultural produce. It is expressed as percentage of consumer's price.

$$\text{Price spread} = \frac{Consumerprice - Netpriceofproducer}{consumerprice} \times 100$$

Result & Discussion:

The sample growers were categorized into four distinct groups based on their total land holdings, which were classified as semi-small (1.01 to 2.00 ha), small (2.01 to 3.0 ha) and semi-

medium (above 3.01 ha). A closer examination of the data, reveals that there were no grower sunder marginal category in the study area, (20.00 per cent) fell under the semi-small category, while a significant proportion (51.67 per cent) were classified as small land holders. In contrast, a mere (34.00 per cent) of the growers were categorized as semi-medium land holders. The average land holding was calculated to be 2.59 ha.

Table 1 reveals that the distribution of 120 Arecanut grower units exhibited considerable diversity, with 32 units (26.66 per cent) having < 499 trees, 51 units (42.50 per cent) having between 500 trees to 999 trees and 37 units (30.83 per cent) having > 1,000 trees. The majority of units (42.50 per cent) fall under category II which includes growers with 500 trees to 999 trees, respectively. (Similar studies were carried out by Sengma and Kalita, 2024).

Table 1. Sample size of Arecanut growers

Sl. No	Grower Category	No. of Arecanut growers	Per cent
1.	Category I (<499 Trees)	32	26.66
2.	Category II (500 to 999 Trees)	51	42.50
3.	Category III (>1000 Trees)	37	30.83
Total		**120**	**100.00**

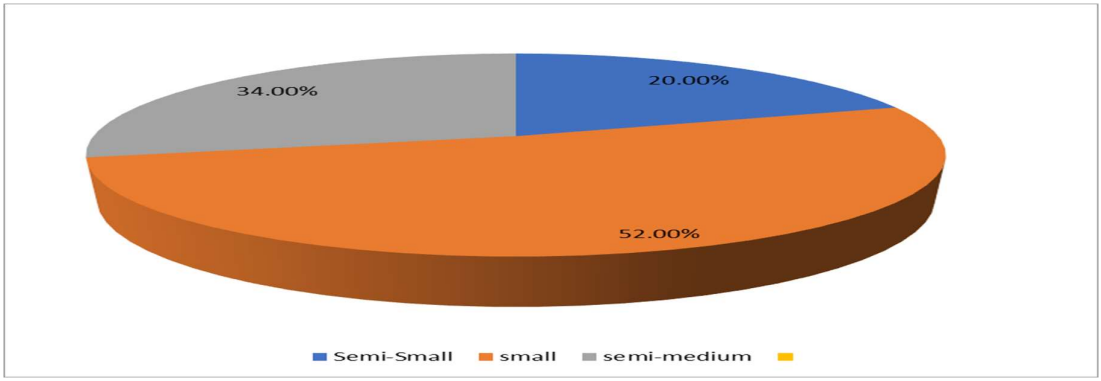

Fig 1. Land holding status of the respondent

Table 2 reveals the average cost of cultivating arecanut was ₹44,929.62/-, comprising variable costs (₹29,070.09/-) and fixed costs (₹15,859.53/-). Variable costs included hired labour (₹10,445.85/-), saplings (₹8,279.36/-), owned labour (₹6,506.76/-), fencing (₹2,337.95/-) and weedicides (₹1,500.18/-). Fixed costs covered rental value of land (₹9,060.16/-), interest on fixed capital (₹5,258.88/-) and depreciation on implements (₹1,540.49/-). The highest cost was hired labour (₹10,445.85), followed by rental value of land (₹9,060.16), saplings (₹8,279.36), owned labour (₹6,506.76), interest on fixed capital (₹5,258.88), fencing (₹2,337.95), depreciation on implements (₹1,540.49), and weedicides (₹1,500.18).

Table 2. Per ha cost of Arecanut cultivation for different categories of growers (₹/ha)

Sl. No	Particulars	Grower Category			Average
		Category I	Category II	Category III	
A.	**Variable cost**				
	1. sapling cost	5431.81 (24.01)	7947.94 (17.60)	11458.33 (17.10)	8279.36 (28.48)
	2. Fencing cost	1490.22 (6.59)	2096.04 (4.64)	3427.58 (5.12)	2337.95 (8.04)
	3.weedicide	658.90	1398.90	2442.73	1500.18

		(2.91)	(3.10)	(3.65)	(5.16)
	4. Human labour charges				
	A) hired	3863.63 (17.08)	11276.71 (24.97)	16197.22 (24.17)	10445.85 (35.93)
	B)owned	1936.36 (8.56)	6356.16 (14.08)	11227.78 (16.75)	6506.76 (22.38)
	Total variable cost	13380.92 (59.15)	29075.75 (64.39)	44753.64 (66.79)	29070.09 (64.70)
B.	**Fixed cost**				
	1.Depreciation farm implements	890.91 (3.94)	1752.78 (3.88)	1977.78 (2.95)	1540.49 (3.43)
	2.Rental value of owned land	4014.77 (17.75)	9446.16 (20.92)	13719.54 (20.48)	9060.157 (20.16)
	3. Interest on fixed capital	4336.36 (19.17)	4879.17 (10.81)	6561.11 (9.79)	5258.88 (11.70)
	Total fixed cost	9242.05 (40.85)	16078.10 (35.61)	22258.43 (33.31)	15859.53 (35.29)
c.	**Total cost (A+B)**	**22622.95 (100.00)**	**45153.85 (100.00)**	**67012.07 (100.00)**	**44929.62 (100.00)**

(The figures in parenthesis indicate percentage to the total)

Table 2 reveals that the cost of cultivating arecanut per ha was different among various categories. The average for Category I was (₹22622.95/-), category II was (₹45153.85/-) and for category III was.₹67012.07, with an average cost of total ₹44929.62/-. Category III was the highest in cultivation cost, indicating that the cost was higher with the increase in the number of arecanut trees. The cost of cultivating arecanut averaged ₹44,929.62/-, consisting of variable costs (₹29,070.09/-) and fixed costs (₹15,859.53/-). Variable costs included hired labour (₹10,445.85/-), saplings (₹8,279.36/-), owned labour (₹6,506.76/-), fencing (₹2,337.95/-) and weedicides (₹1,500.18/-). Fixed costs covered rental value of land (₹9,060.16/-), interest on fixed capital (₹5,258.88/-) and depreciation on implements (₹1,540.49/-). The highest cost was hired labour (₹10,445.85), followed by rental value of land (₹9,060.16), saplings (₹8,279.36), owned labour (₹6,506.76), interest on fixed capital (₹5,258.88), fencing (₹2,337.95), depreciation on implements (₹1,540.49), and weedicides (₹1,500.18). The cultivation cost of arecanut per ha varied by category: ₹22,622.95 (Category I), ₹45,153.85 (Category II), and ₹67,012.07 (Category III), with an overall average of ₹44,929.62. Costs were highest in Category III, rising with the number of trees. (Similar studies were carried out by Sharma and Kalita, 2023).

Marketing Channels

Three major marketing channels were identified:

1. Channel I (Ripe nut): Producer → Wholesaler → Retailer → Consumer

2. Channel II (Tender nut): Producer → Wholesaler → Retailer → Consumer

3. Channel III (Tender nut): Producer → Wholesaler → Terminal Market.

Table 3. Marketing channels followed by the Sample growers

Sl. No	Channels	Quantity Sold (Kg)	% of Produce sold	Amount (₹)
1.	Channel for tender arecanut	7827	34.40	195675

2.	Channel for ripe arecanut	-	-	-
3	Channel I	5520	24.25	299420
4	Channel II	9407	41.35	517385
Total		**22754**	**100**	**1012420**

Table 3 reveals that 34.40 per cent of the produce was marketed through Type I for tender arecanut. For ripe arecanut, 41.35 per cent was sold through Channel II and 24.25 per cent through Channel I. The total quantity sold was found out to be 22754 kg, with a total amount of ₹1012420.00/-, respectively. (Similar studies were carried out by Dhakre and Sharma, 2009; Sharma, 2013).

Constraints faced by the Arecanut Growers

The challenges encountered by arecanut growers were identified and categorized as constraints in production and constraints in marketing. The constraints were ranked based on the mean score estimated through Garrett's Ranking. The constraint with the highest score was given as Rank 1st and so on. (Similar studies were carried out by Vishandass *et al.*, 2018; Sharma, 2025).

Table 4. Constraints faced by the sample arecanut growers in production

Sl. No	Problem	Garrett Mean Score	Rank
1.	Reduction in soil fertility	56.40	I
2.	Lack of knowledge on improved Cultivation practices	56.18	II
3.	Lack of quality planting material	47.74	III
4.	Incident of pest and diseases	46.68	IV
5.	Lack of funds	44.99	V

Table 4 reveals the most significant production problem was the reduction in soil fertility, which had a Garrett Mean Score of 56.40 and was ranked first. The second most significant issue was the lack of knowledge on improved cultivation practices, with a score of 56.18. Many farmers lacked awareness of the latest techniques, hindering their ability to optimize crop yields and improve productivity. The lack of quality planting material ranked third, with a score of 47.74, indicating farmers' challenges in accessing high-quality seeds, which is crucial for healthy plant growth and maximizing yields. Pest and disease incidence ranked fourth, with a score of 46.68. This posed significant threats to crops, causing damage, reduced yields and increased costs for control measures. Lack of funds ranked fifth with a score of 44.99, limiting farmers' ability to invest and improve productivity. (Similar studies carried out by Sharma and Kalita, 2004; Sharma, 2012; Das and Sharma, 2018).

Table 5 reveals the price fluctuation was the most significant marketing problem, with a score of 77. Unpredictable prices made it difficult for farmers to plan and budget effectively. The absence of market information ranked second with a score of 64. Farmers lacked access to timely and accurate market data, hindering informed decision-making. Even the low marketable surplus ranked third with a score of 55. Farmers produced surplus quantities but not enough quality or quantity to meet market demands. The non-availability of a local market ranked fourth with a score of 46. Farmers struggled to access nearby markets, likely due to inadequate infrastructure. The lack of organization among producers ranked fifth with a score of 37, hindering farmers' ability to negotiate better prices or access larger markets, whereas Inadequate transport facilities ranked sixth with a score of 23, causing challenges in getting produce to market. (Similar studies carried out by Sharma, 2014; Das and Sharma, 2018).

Table 5. Constraints faced by the sample growers during marketing of arecanut cultivation

1.	Price fluctuation	77.00	I
2.	Absence of market information	64.00	II
3.	Low marketable surplus	55.00	III
4.	Non availability of market in the Locality	46.00	IV
5.	Lack of organization among producer	37.00	V
6.	Inadequate transport facility	23.00	VI

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