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UNVEILING THE FARMING DYNAMICS: A COMPARATIVE ANALYSIS OF ARECANUT AND TEA CULTIVATION DONE BY SMALL FARMERS IN UDALGURI DISTRICT OF ASSAM

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INTRODUCTION:

Agriculture plays an important role in the Indian economy. Cultivating cash crops has become an increasingly important aspect of livelihood for the indigenous people in the Indian Eastern Himalayan region (Boruah, Pant, & Choudhury, 2023).

The present study is based on the comparative analysis of arecanut and tea cultivation done by small farmers in the Udalguri district of Assam, which is known for its rich agricultural heritage and diverse cropping patterns. Both are major economic crops for Assam, contributing to agricultural production and rural development. Arecanut, also known as betel nut, is a tropical crop cultivated for its nut, which is chewed with betel leaf and other ingredients to make a popular stimulant and mouth freshener (Udayana, Naorem, & Singh, 2017). On the other hand, tea, the pride of Assam, is known all over the world for its strong flavor and significant contribution to the export economy of India (Mittal, 2023).

The study area, i.e., Suklai, is a village in Bhergaon Tehsil in Udalguri District of Assam State, India. It is located 30 km to the east ofthe district headquarters in Udalguri and 103 km from the state capital, Dispur. Suklai village provides a unique site for the study of these two crops due to the agro-climatic conditions and soil diversity. Moreover, tea plantations have been traditionally important in the Suklai village; on the contrary, arecanut has attained momentum in the recent past in the alternative cropping pattern of the district.

The study on arecanut and tea cultivation dynamics is essential for policymakers, agricultural planners, and other stakeholders at the local level in making informed decisions that may enhance the livelihoods of the farmers and contribute to the overall development of the district. It will therefore provide valuable insight into the comparative benefits and constraints of these crops to guide future agricultural policies and practices in Udalguri and similar agro-ecological zones.

This research focuses on a comparative analysis of arecanut and tea cultivation in the Udalguri district with a specific focus on cultivation practices, economic contributions,

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and social implications.

REVIEW OF LITERATURE:

Areca nut (Areca catechu) is an important cash crop grown in several Indian regions. This literature review aims to provide an overview of existing research and studies related to the comparative analysis of areca nut cultivation and other cash crops.

Various studies have examined the significance of areca nut cultivation in India. For instance, Hegde & Deal (2014) conducted a study in Karnataka and found that the Areca crop accounts for roughly 1% of the state's GDP and employs about half of the labour force in the state of Karnataka; nevertheless, the profitability of the business is hampered by a mix of unpredictable yields, volatile pricing, and import competition. The findings indicated that areca nut cultivation contributed significantly to the state's GDP and the livelihood of the workers. Very few studies have been found by researcher which focused on comparing areca nut cultivation with other cash crops. Ghimire & Dhungana (2021) analysed rice growing and arecanut production in Jhapa, Nepal. The study compared the profitability, market demand, and sustainability of paddy and found that areca nut cultivation was more profitable and less risky than rice production. Socio-economic impacts also play a vital role in comparative analysis. Tigari& Rajamma (2019) conducted a study in Karnataka to know the farming system and income security. The study concentrated on socio-cultural and economic issues as well as employment chances. According to the study, areca nut cultivation provided greater revenue potential and job options, which helped to enhance rural people's standard of living. Hazarika & Borah (2013) conducted a study titled "Small Tea Cultivation in the Process of Self Employment: A Study on the Indigenous People of Assam (India)" and found that the cultivation of tea on smallholding has gained considerable momentum amongst the youth. Being a labour-intensive industry, it is the source of employment for Assam's Indigenous people.

METHODOLOGY:

The study was conducted in Suklai village in the district of Udalguri, which lies in the lower Brahmaputra Valley zone of Assam. This zone is characterized by diversified agriculture sector and is, therefore, an apt region for comparative agricultural study. The small farmers chosen for the study are those who have farming land varying from 1 acre to 5 acre. Data were collected from

a) Field surveys and interviews of 400 farmers (200 each for arecanut and tea) chosen purposively using Cochran's Formula as the researcher could not find any sampling frame.

$$n = \frac{Z^2 pq}{e^2}$$

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$$n = \frac{1.96^2 \times 0.5(1 \quad 0.5)}{0.05^2}$$

$$n = 384.16$$

Where,

n= Sample size

z= Value based on confidence level,i.e, 1.96 at 95% level of confidence

p= sample proportion i.e 50% or 0.5

e= Accepted sample error (95% level of confidence)

q=1-p

It is rounded off to 400. Therefore, sample size is 400.

b) Interviews with 100 local labours (50 each for arecanut and tea) to know the social issues regarding production

COMPARATIVE ANALYSIS FRAMEWORK:

The research will use a comparative framework to analyse the following aspects of arecanut and tea cultivation:

Cultivation Practices: This will involve studying the planting techniques, fertilizer application, water needs, and harvesting practices.

Economic Contributions: This study will provide a comparison of the economic profitability of both crops, taking into consideration market prices, yield variations, and input costs among other factors.

Social Impacts: The study will analyse the human labour requirement in each crop, the gender involved in cultivation, and other social issues regarding their production.

RESULTS AND DISCUSSION:

Cultivation Practices

The researcher Interviewed with local farmers which provided valuable insights into the cultivation practices of tea and arecanut. The discussions emphasized crucial aspects of planting techniques, fertilizer usage, irrigation necessities, and harvesting procedures, as summarized below.

Planting Methods:

Arecanut is suitable for cultivation in fertile soils, temperatures ranging from 15°C to 40° C, altitudes up to 1000 meters, and precipitation levels between 750 and 4500 mm. Seedlings are produced from selected mother palms and then placed in sand beds before being transported to nursery beds made of polythene bags. To ensure the protection of plants from the direct sun light, shade trees are grown between two plants. Proper spacing of 2.75 meters between each plant is maintained for healthy growth. The provision of

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adequate water is essential for growth. Conversely Tea thrives in high altitudes with acidic soils (pH 4.5-5.5) that are well-drained and receive ample precipitation. Spaced 1.2-1.5 meters between rows and 0.75-1 meter within rows is used to plant high-yielding, disease-resistant clones or seedlings. The use of shade trees is also employed, and terraces are constructed to mitigate soil erosion.

Fertilizer Use:

Both organic and inorganic fertilizers, such as nitrogen (100 g), phosphorus (40 g), and potassium (140 g), are necessary for arecanutcultivation per plant . The application of fertilizers is divided into two phases: pre-monsoon (May-June) and post-Monsoon (September-October). Until they reach maturity, the doses are adjusted for younger plants. For tea potential nitrogen (ammonium sulfate or urea), phosphorus (rock phosphate), and potassium are used, with dosage varying according to plant age and stage of growth. For example, nitrogen is applied in 2:3 ratios for the first three years and then becomes 1:2 after four years. Prior to the monsoon season, fertilizers are aired in the drip circle.

Irrigation Requirements:

Arecanut requires weekly irrigation from November to February and every four days from March to May. Flooding and drip irrigation methods are commonly used, with flooding requiring 175 liters of water per tree per day and drip irrigation using 16-20 liters per tree per day. Regular irrigation during dry months is essential to maintain palm health and productivity. Tea requires annual rainfall of 2000-3000 mm, with supplementary irrigation during dry periods and post-harvest. Sprinkler and drip irrigation are the preferred methods, ensuring uniform water application and maintaining soil moisture. Mulching is often employed to conserve moisture, and routine monitoring helps prevent over-irrigation or under-irrigation, avoiding waterlogging and root diseases.

Harvesting Methods:

Arecanut is harvested when it rips, typically from May to July in India. Traditional harvesting involves skilled climbers using ladders, ropes, or harnesses with sickles or machetes, while mechanical harvesting is increasingly adopted for efficiency. The ripe stage is identified by a yellow or red outer husk with minor splits, and the cropping period starts after 6-7 years of planting of saplings. Tea is harvested in multiple flushes, including the first flush (spring), second flush (summer), monsoon flush, and autumn flush. Hand plucking, which involves selecting two leaves and a bud, ensures high-quality tea, while mechanical plucking is suited for larger plantations but may compromise quality. Plucking frequency varies, with fine plucking every 7-10 days for premium quality, medium plucking every 10-14 days for balanced quality and quantity, and coarse plucking focusing on higher yields at the expense of quality.

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Economic Contributions:

Economic contributions are crucial aspects of this study. The data collected from the cultivators are analyzed and explained in detail below.

Establishment costs for arecanut cultivation

Establishment costs are the initial costs. In the case of areca nut cultivation, the establishment costs include all costs from the beginning up to the time of getting returns, that is, 6 years.

Table 1: Average establishment cost for arecanut cultivation (in Rs/acre)

Type of cost	Amount of costs (Rs.)	Percentage (%)
Land leveling	42,000	18.00
Fencing	30,000	12.83
Seedling	22,500	9.62
Planting	70,000	29.92
Cleaning	12,000	5.13
Fencing repairing	20,000	8.55
Miscellaneous	20,000	8.55
Interest on establishment cost @ 8%	17,320	7.40
Total	**2,33,820**	**100**

Source; Field Survey, April 2024

Table 1 provides a detailed breakdown of the average establishment costs for arecanut cultivation per acre, amounting to Rs. 2,33,820 in total. The highest expenditure is on planting, which constitutes 29.92% (Rs.70,000), while the lowest is on cleaning costs, which constitutes 5.13% (Rs.12,000). This comprehensive cost distribution highlights the significant financial inputs required for establishing arecanut cultivation.

b) Establishment costs for Tea cultivation

A tea plantation is supposed to take around three years for establishment. The period is also known as the gestation period. Establishment cost is the cost incurred during the first three years of establishment of a tea garden. This cost once incurred remains valid for the entire life of the garden.

Table 2: Average establishment costs for Tea cultivation (in Rs/acre)

Type of cost	Amount of costs (Rs.)	Percentage (%)
Hired human labour	30,657	14.20
Hired machine power	2,956	1.37
Planting material	77,741	36.04
Irrigation pump set	39,700	18.40
Shade plants	3,018	1.40
Weedicide	26,200	12.13
Manure	3,200	1.48

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Fertilizer	1,383	0.64
Insecticide	9,024	4.18
Organic mulching	2,518.	1.16
Fungicide	3,463	1.60
Interest on establishment cost @ 8 %	15,988	7.40
Total	**2,15,848**	**100**

Source; Field Survey, April 2024

Table 2 shows the average costs of establishment for tea growing per acre. The major head of expenditure is planting material, accounting for Rs.77,741 (36.04%), while the minor head of expenditure is fertilizer, accounting for Rs.1,383 (0.64%).The total sum of the establishment cost is Rs.2, 15,848, with every category of costs accounting for 100% of the total.

c) Operation and Maintenance Costs for arecanut cultivation

Operation and maintenance costs cover costs other than the initial establishment costs, which cater to regular and constant expenses to maintain the plantation's productivity after establishment.

Table 3: Average Maintenance Cost of Arecanut cultivation (in Rs/acre)

Type of cost	Amount of costs (Rs.)	Percentage (%)
Hired Human Labour	17,700	45.13
Farmyard manure	6,200	15.80
Chemical Fertilizers	1,600	4.00
Irrigation	3,000	7.64
Depreciation	1,500	3.82
Plant Protection	3,000	7.65
Other Expenses	4,000	10.20
Interest On Working Capital (6%)	2,220	5.76
Total	**39220**	**100**

Source; Field Survey, April 2024

In Table 3, all the breakdowns of the maintenance costs for arecanut cultivation are shown in detail. The highest share of maintenance cost goes toward hired human labour, which is Rs.17,700, indicating 45.13% of total costs. The next is farm yard manure, which costs Rs.6,200 at a share of 15.80%.The depreciation cost share is the lowest, at Rs.1,500 at a share of 3.82%,Thus, all the maintenance costs sum up to Rs.39,220 and are apportioned among the categories to effectively cultivate the arecanut.

d)Operation and Maintenance Costs for tea cultivation

Table 8: Average Maintenance Cost of tea cultivation (in Rs/acre)

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Type of cost	Amount of costs (Rs.)	Percentage (%)
Hired Human Labour	54,700	45.10
Irrigation	1,500	1.23
Manure	6,000	4.94
Fertilizer	15,000	12.36
Weedicide	12,500	10.35
Insecticide	5,000	4.12
Fungicide	4,000	3.29
Infilling (Plant cost)	4,500	3.71
Depreciation	4,200	3.46
Other Expenses	7,000	5.77
Interest On Working Capital (6%)	6,864	5.67
Total	**1,21,264**	**100**

Source; Field Survey, April 2024

Table 4 details various costs involved in the maintenance of tea cultivation, amounting to Rs.121,264. Human labour hired to maintain the tea gardens is the largest component of average maintenance, amounting to Rs.54,700 (45.10%) of the total expenditure. The others in the list include fertilizers, which amount to Rs.15,000 (12.36%); weedicides and other necessary chemicals, such as insecticides and fungicides, amounting to Rs.12,500 (10.35%); and Rs.9,000 (7.41%), respectively. Irrigation shares the lowest among all costs, i.e. Rs.1,500 (1.23%),These details give the lucid picture that major portions of the budget are channeled into the heads of labor and chemical inputs in tea cultivation.

e) Comparison of return from Arecanut and Tea cultivation

Table 5: Annual return from Arecanut and Tea Cultivation (per acre)

Items	Arecanut	Tea (Rs.)
Yield (in kg per acre)	11,500	30,000
Price (per Kg)	40	15
Gross retrun	4,60,000	4,50,000
Less: Maintenance Costs **Less**: Amortized establishment costs	(39,220) (6,680)	(121264) (7,194)
Net return	**414100**	**321542**

Note: The establishment cost has been amortized based on the lifespan of both crops,i.e., 30 years in the case of tea and 35 years in the case of arecanut

Table 5 compares the annual returns from the cultivation of arecanut and tea per acre. Raw arecanut yields 11,500 kg per acre, selling at the rate of Rs.40 per kg, leading to a gross return of Rs.4,60,000. In contrast, raw tea leaves yield 30,000 kg per acre at the rate

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of Rs.15 per kg, leading to a gross return of Rs.4,50,000. Net returns are then estimated after the deduction of maintenance costs and amortized establishment costs. An acre of arecanut cultivation is thus associated with an annual net return of Rs.4,14,100, while an acre of tea cultivation is associated with a net return of Rs.3,21,542. This comparison shows that even if tea has a higher yield than arecanut, it will not necessarily lead to higher profitability per acre due to the notable differences in the costs of maintenance and establishment.

(iii) Social Impact Assessment of Arecanut and Tea Cultivation

a) Human labour requirement

The respondents reported that arecanut cultivation requires an annual average of about 500 labour hours per acre, with a range of 400 to 600 hours. The labour hour requirement of tea cultivation is much more, with an average of about 1200 hours per acre every year. The average range varies from 1000 to 1400 hours. Arecanut cultivation has a peak demand for labour from April to September. The first peak of labour demand in tea cultivation occurs from March to May, and the second peak is from October to December. The labour requirement for arecanut cultivation is 40% for harvesting, 30% for fertilizing, 20% for pruning, and 10% for watering. In tea cultivation, 50% of the labour-demanding activities are plucking, 30% for pruning, and 20% for processing.

b) Gender participation in cultivation

The male participation in arecanut cultivation is 80%, and the female participation is 20%. Gender participation in Tea cultivation is slightly more balanced compared to Arecanut cultivation, with male and female participation being 60% and 40%, respectively. In arecanut cultivation, the males are actively involved in harvesting and fertilizing, and the females are more involved in the pruning and watering sectors. In Tea cultivation, the males are actively involved in processing and pruning, and the females are actively involved in the plucking and weeding sectors. Gender-based division of labour is visible in both types of cultivation.

c) Social Issues Regarding Production

Labour conditions in arecanut cultivation suffer more problems, as 50% of the respondents experience very long working hours, 30% of them indicated the non-provision of safety measures, and 20% of the respondents experienced problems related to the facilities. In tea cultivation, the important problems faced include bad living conditions (40%), low wages (35%), and health hazards (25%). The mean daily wage for both arecanut and tea cultivation is Rs. 350 and Rs.300, respectively. Problems with proper payment of the wage were faced by 20% of the respondents in arecanut cultivation and 30% of the respondents in tea. Social welfare programs are not seen in both types of crop cultivation. 10% and 20% of respondents admit to child labour in arecanut and tea cultivation,

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respectively. Both these cultivation types have significant social and economic impacts on local communities. Those impacts include employment and economic boosts, while the opposite side of the coin is environmental degradation.

CONCLUSION

Comparative evaluation of Arecanut and Tea cultivation among small farmers in the Udalguri district of Assam brings out the complex dynamics affecting these two important agricultural practices. There was greater labour hours involved in tea with more female participation as compared to arecanut. Issues like work conditions, wage levels, and child labour also differed between the two crops. Nevertheless, both crops played a major role in the socio-economic development of the region. Arecanut has been proven better in terms of its net return per acre, while tea has been proven better in providing employment opportunities. Addressing labour conditions, equitable benefit-sharing, and gender parity is necessary to make these practices sustainable and inclusive. Further, more improved institutional arrangements and specific policy interventions for smallholder farmers in Udalguri could help agricultural development. Such comparative analyses can provide a basis for developing a resilient and more prosperous agricultural system in Assam.

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