ARECANUT SUBSECTOR IN MEGHALAYA: A REVIEW

Institute of Livelihood Research and Training

IBDLP MEGHALAYA

SFAC लघु कृषक कृषि व्यापार संघ

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Introduction:

Areca nut (Areca catechu), commonly known as betel nut is believed to have originated in Philippines or from Malaysia and has been widely cultivated in China, India, Bangladesh, Sri Lanka etc. Meghalaya holds 5th position in the production of Areca nuts, producing 3.3% of total production of Areca nuts in India. Areca nut is grown in East Khasi hills, Jaintia hills, West Garo hills and East Garo hills of Meghalaya. Areca nut is consumed in fresh, cured and dry forms along with betel leaves and lime. The red boiled areca nuts are commercially used for the preparation of sweet supari, pan masala and Gutkha, while fresh and fermented areca nuts are consumed locally.

Production stage:

Kahikuchi is the most important variety of Areca nut grown in Meghalaya and DawkiKwai is extensively grown in East Khasi hills and Jaintia hills. Planting material is prepared through a two stage nursery. Seeds are first sprouted in the primary nursery and then transplanted into a secondary nursery for further growth. Farmers do not access any machinery for taking up any pre cultivation or inter-cultivation activities. Also, farmers do not use any pesticides or insecticides at any stage of the crop and hence are not dependent on any agricultural input providers. Areca nut plants are affected with yellow leaf disease and bud rot disease causing great damage to the crop. Farmers in the state are losing 20% of the plants every year owing to senility, wind and diseases. Areca nuts are completely rain fed and no protective irrigation is provided in summer months. Even harvesting is taken up manually and hence except sickles and crow bars, no other instruments/machinery is used. Farmers do not take any crop loans from banks.

Post production stage:

Arecanuts that are harvested are graded by farmers of Khasi hills and Jaintia hills before marketing and soaking. In Garo hills in particular, owing to pressing financial needs, farmers sell off their produce that has not fully matured to traders without any grading or soaking. Value addition of Areca nuts takes place in two different ways. The first method involves soaking of fresh areca nuts to fermented Areca nuts and the second involves conversion of fresh areca nuts to Supari. Value addition of Areca leaf sheaths is taken up by pressing the leaf sheaths in to leaf plates.

Channels for marketing of Arecanuts:

Farmers, bulk traders, retail traders, retail pan traders, owners of soaking pits/fermentation tanks, owners of supari processing units, owners of Pan masala and gutkha manufacturing units and owners of Areca leaf plate manufacturing units are the various players in the economics of Arecanut. Except for Pan Masala and Gutkha manufacturers who operate on a larger scale, rest of the units are small scale units mostly established at the homes of the owners. Four different channels are seen in marketing of Arecanuts:

- **Soaked Arecanuts –domestic/commercial consumption channel:**

  This channel was seen in Khasi hills and Jaintia hills, wherein 50% to 20% of the fresh Areca nuts are soaked in pits/fermentation tanks and are fermented for 3-5 months, graded and sold in the market from May onwards. Similarly, for domestic consumption the process is taken up at the homes of farmers from Khasi hills, Jaintia hills and Garo hills.

- **Fresh Areca nut – Farmer channel:**

  Fresh Areca nuts are sold by the women farmers from Jaintia hills and Khasi hills in the local weekly markets. Here, farmers harvest fully ripened fruits every week and sell the produce in the weekly markets.

- **Fresh Areca nut. trader channel:**

  Farmers in Garo hills sell their produce to traders or agents of traders who work on a commission basis for the traders either through advance contracting or contracting after ripening. The traders in turn sell fresh Arecanuts in weekly markets and also sell them to red supari manufactures in places such as Tura and Phulbari. Red Supari is in turn sold to traders at Silchar which is in turn sold to supari to Gutkha and Pan Masala manufactures

- **White supari channel:**

  This channel was seen only in Khasi hills and Jaintia hills, where in kwaisupari (Last grade of supari which contains green arecanuts that are damaged) is sun dried at home and sold to the traders who inturn sell to traders at Silchar and Kalian in Assam. Traders then sell the supari to Gutkha and Pan Masala manufactures

- **Areca leaf plate channel:**

  This channel utilizes fallen leaf sheaths of Areca nut and processes them in to Areca leaf plates that have demand internationally.

Economics:

The benefit cost ratio for farmers in Khasi and Jaintia hills is 58%, whereas that for farmers in Garo hills 1.3%. The benefit cost ratio of owners of soaking pits is 3.2%, where as that of arecanut grading and sorting unit and supari manufacturing unit is 1.2 and 1.4 respectively.

Recommendations:

Farmers in Meghalaya do not use any inputs such as manures or fertilizers or pesticides and other than intercultural operations no other crop husbandry practices are followed. Areca plantation is rain fed and extreme rainfall coupled with dry spells is leading to moisture stress. Also, extreme rains are leading to soil erosion thereby depleting soil nutrients leading to decline in the production of arecanuts. Trading scenario in Khasi and Jaintia hills seems to be supportive to farmers, whereas in Garo hills, traders dominate the market leading to losses to farmers. Particularly in Garo hills region, both farmers and processors of supari require credit support, which shall provide them a boost so that distress sales of farmers and credit based system of processors could be avoided. Meghalaya is a fertile ground to take up interventions in improvement of areca plants in the organic way as pesticides and fertilizers are still alien to this land. Bringing farmers together both for collective bargaining and cross learning is essential for their development. A project based approach for improving the production of Areca nuts with specific outputs would support the farmers and processors in big way.

Role of horticulture department is to be redefined to include supply of material, knowledge and skills not to the farmers directly, but instead to a cadre of entrepreneurs who are either part of a producer's organization or a local private enterprise who is contracted to multiply and distribute planting material and advisories in a transparent manner. Membership based producers' organization is to be promoted that not only represents the producers' interests, but also mobilises some equity from the producers and leverage larger capital to invest in improved inputs and/or higher order value additions.

In terms of post-harvest intervention, significant improvement in price realization can be achieved by aggregation, sorting and grading raw and soaked/fermented nuts and feeding it into the existing value chain players. Common facilities for de-husking, soaking/fermenting nuts and collective marketing can be provided by the producer organization. Collection routes can be created so that marketing costs (both logistics and waste reduction) are reduced. Currently the retail traders procure directly from producers to either onward sell to bulk traders or supari processors or to stalls and shops that sell directly to consumers along with beetle leaves and other ingredients that make up feed the customary chewing practice. The aggregation and

organized sale cater to these retail sellers through a door-step delivery service. A larger share of the retail customer level price can thus be realized for the producers.

It is recommended to invest in training and infrastructure for making arecaleaf to encash the economic value of the sheath attached to the arecanut leaves.

Objectives and Methodology

Institute for Livelihood Research and Training (ILRT) is partnering with the Meghalaya Basin Development Authority (MBDA) in providing capacity building support to the project staff in 8 identified blocks out of 39 blocks of the state in enterprise promotion. As part of the project, ILRT undertook livelihood mapping in the seven blocks and identified potential sub-sectors. A further in depth study of these subsectors will be undertaken to understand the livelihood gaps, identify potential for opportunities to improve the sub-sectors and provide recommendation to the state Govt. The core idea of undertaking these sub-sector studies is to assess the opportunities to bring local communities in to the fold of sub-sector, so that the sub-sector gets strengthened at one hand and the livelihood choices are enhanced.

The specific objectives of the study are to:

- understand existing players and their practices/ contribution for improvement of the sub-sector activities
- assess the gaps which are preventing to perform effectively with specific reference to the primary producer
- recommend implementable solutions to enhance the stake of primary producers in the sub-sector

Scope of the Study

To study poultry sub-sector in the state of Meghalaya covering the following parameters.

- Document existing practices of the sub-sector covering the pre-production, production and post-production stages
- Assess the current status of the sector which will include the number of people engaged in the activity, estimated annual income from the activity, contribution of the activity to the overall income portfolio of the household, current market structure and key players
- Understand the existing market situation and nature of relationship between different market players in the study area (relationships, attitudes and behaviors).
- Understand the capacity of producers and their organizations (POs) to access services, credit, information and resources.
- Suggest improvements in the value chain system to ensure direct linkages of the farmers with the major markets and increased incomes from their produce
- Relevance and capacity analysis of support structure

Methodology

The following methodology was employed (but not limited to) during the assessment.

- Literature Review

Review the existing markets in the state and market regulatory and price control policies and/or laws and mechanisms, any documents on market trends in the target area and any other relevant literature where possible.

- Developing the sub-sector map and map different players in each stage beginning from input supplier to consumer.

- Analysis of subsector dynamics

The analysis focuses on eliciting the information (i) existing practices by different players at each level, (ii) Gaps (iii) opportunities for interventions. Map potential local and regional markets in terms of type, size and volume of market, goods sold and bought, supply chain, type of producers, suppliers and vendors, women led businesses/trades, distance of the market from the target project villages, mode of transportation, market associations/trade organizations, security arrangement/situation especially for women and competitiveness (number of producers/suppliers /vendors versus items in demand).

Study Tools

- Producer interview/ interaction
- Focus Group Discussions (FGDs) with producer groups/ producers
- Semi-structured interviews with Key informants and stakeholders

Table 1: Sampling locations

TIME SCHEDULE FOR ARECANUT SUBSECTOR STUDY IN GARO HILLS

Total No. of Blocks: 3

Sl.No	Name of Blocks
1	Betasing
2	Selsella
3	Gasuapara

1. Overview of the subsector:

Figure 1: Areca nut plantation in Meghalaya

Areca nut (Areca catechu), commonly known as betel nut is believed to have originated in Philippines or from Malaysia and has been widely cultivated in China, India, Bangladesh, Sri Lanka etc.According to Dr. T.N. Prakash Kammardri (Kammardi) India is the traditional areca- growing country in the world. At the time of partition, during 1947, nearly half of the area under arecanut was lost to Pakistan. As a result, the country faced a shortage in the supply of arecanut during the early fifties. The increasing internal demand was fulfilled by import of arecanut from Sri Lanka and Malaysia in the beginning. Government had encouraged the expansion of area under arecanut cultivation on a large scale and provided liberal financial assistance, through co-operatives and scheduled banks, for its cultivation. Consequently, the production of arecanut increased steadily and the country achieved self-sufficiency by early 60's (Kammardi).

1.1 National production: India is the largest producer of Areca nuts followed by China and Myanmar. India also happens to be the largest consumer of areca nuts too. According to National horticultural Board, Karnataka is the highest producer of Areca nuts (58.9%) followed by Kerala (15.8%). Meghalaya holds 5th position in the production of Areca nuts producing 3.3% of total production of Areca nuts in India.

Year	Area (ha)	Production (M tons)	Productivity (MT/ha)
2010-2011	400100	478000	1.2
2011-2012	464000	681000	1.5
2012-2013	446000	609000	1.4

Table 2: Area, production and productivity of areca nuts in India. (Source: National horticulture board)

1.2 Meghalaya Production Scenario: Areca nut has been traditionally cultivated by the tribes of Meghalaya since time immemorial. Areca nut is grown in East Khasi hills, Jaintia hills, West Garo hills and East Garo hills of Meghalaya. Areca nut is planted on the hill slopes in Meghalaya and the climate of the state is congenial for the growth of areca nuts which requires 14 degrees to 36 degrees temperature and well distributed rainfall. In the year 2012-2013, areca nuts were produced in 14600 hectares of area with a production of 19800 Metric tons. However, data pertaining to area and production remained unchanged during 2011-12 and 2012-13, which shows that the data is not accurate. Also, according to Dr. Kammardi, unlike in the Southern

Year	Area (ha)	Production (Metric tons)	Productivity (MT/ha)
2010-2011	12,400	17100	1.4
2011-2012	14600	19800	1.4
2012-2013	14600	19800	1.4

Table 3: Area, production and productivity of areca nut in Meghalaya(Source: National horticulture board)

states, arecanut cultivation in Assam and North Eastern regions, is unsystematic and carried out as a 'forest crop', which imposes a severe constraint in getting accurate estimates of area and production of arecanut in the country. However, in these states number of plants and spacing could be collected to come up with number of hectares of areca nut plantation. Otherwise, data for taking up planning exercises would be irrelevant, thereby rendering the exercises futile.

1.3 .Products:

Areca nut is not a nut, but is a drupe[1] and the palm is often called as betel tree as areca nut is chewed along with betel leaf which is a vine of Piperaceae family. Though Areca nut plants are mostly grown for seeds which contain alkaloids that are intoxicating, the plant is used for interior landscaping too. Areca nut is consumed in fresh, cured and dry forms along with betel leaves and lime. The red boiled areca nuts are commercially used for the preparation of sweet supari, pan masala and Gutkha, while fresh and fermented areca nuts are consumed locally. Areca nut is known for its carcinogenic[2] properties. There is a white variety of areca nut which is prepared after sun drying of fresh areca nuts. Other than Areca nuts, leaf sheath, stem and husk of Areca nuts are used commercially in making areca leaf plates, wooden items, construction material, fabric etc. Areca nut is also used in treating leucoderma, cough, fits, worms, anemia and obesity (Ministry of Agriculture, 2013). There are four products that are traded by the farmer in the market and each of the products follows different trade channels. Soaked Areca nut, Fresh Areca nut, home dried Arecanut and Areca leaf sheaths are traded by the farmer. Fresh and fermented Areca nut is consumed by the locals and most of the boiled and dried Areca nut (supari) leaves the state and lands in the gutkha, sweet Supari and pan masala manufacturing units.

1.4 .Arecanut sub sector map:

Arecanuts are grown by all the three tribes of Meghalaya– Khasis, Jaintias and Garos. The subsector of areca nut has been categorized in to preproduction, production and post-harvest stages. Preproduction stage involves all the activities taken up by the farmer from preparation of nursery to transplantation stage. All the inputs used during land preparation stage are covered under this head. Also, problems related to input availability have been discussed. Production stage involves all the package of practices taken up by the farmer from transplantation stage till the harvesting stage. The post-harvest stage includes processing and trading of areca nut both for domestic and commercial purposes. Activities such as methods in harvesting areca nuts, soaking pits, traders involved in marketing of areca nuts, retailersselling areca nuts in local markets, supari processors has been discussed in the post-harvest stage.In addition, support provided by department of horticulture, department of forestry etc. which arethe prime players in the areca nut economy of Meghalayais also discussed.

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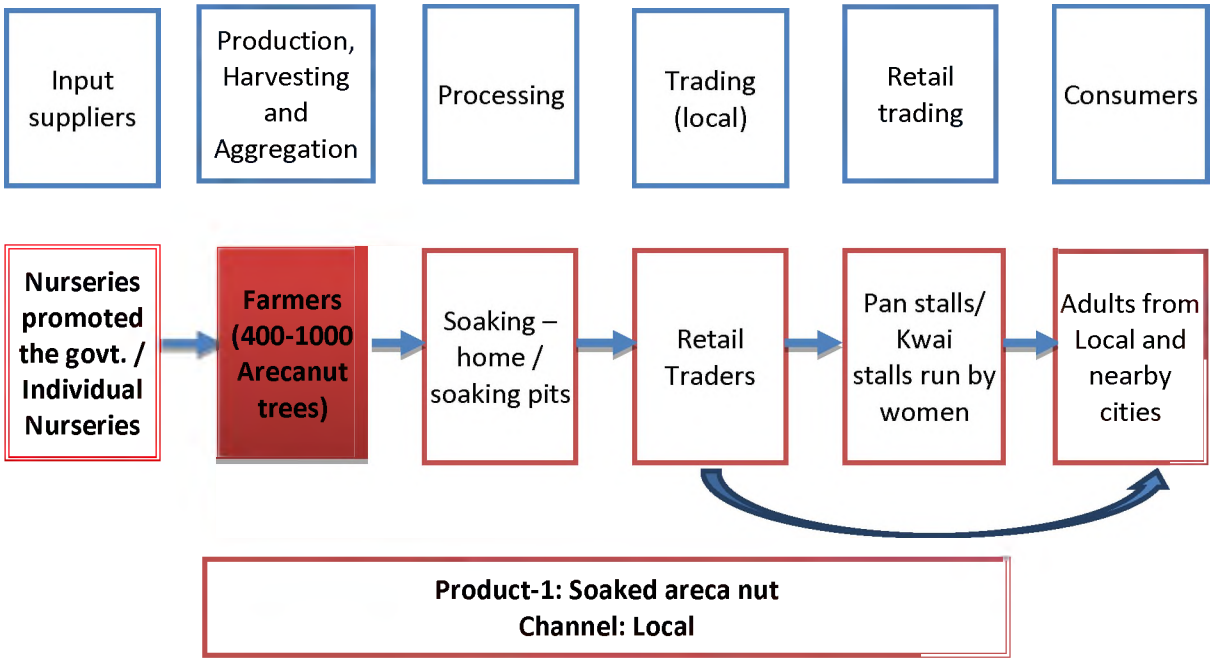
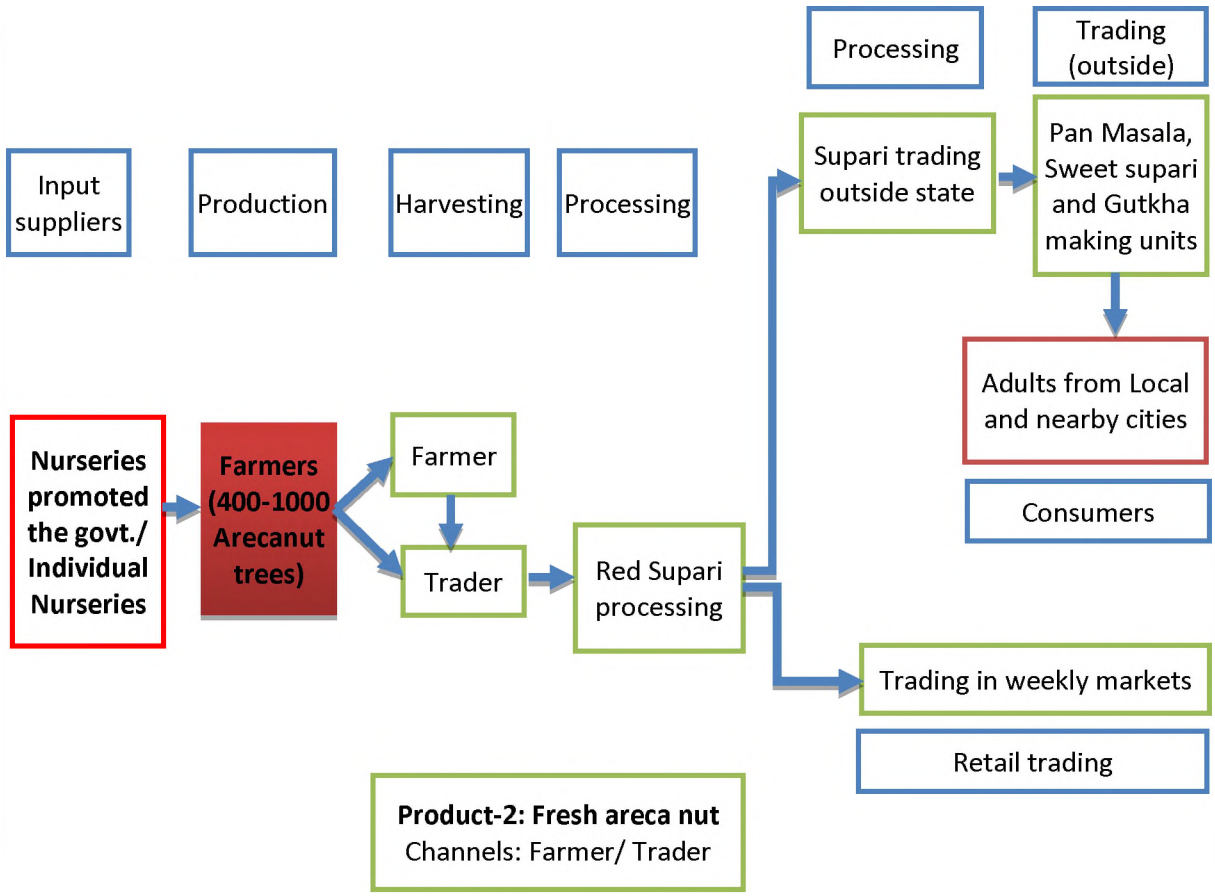
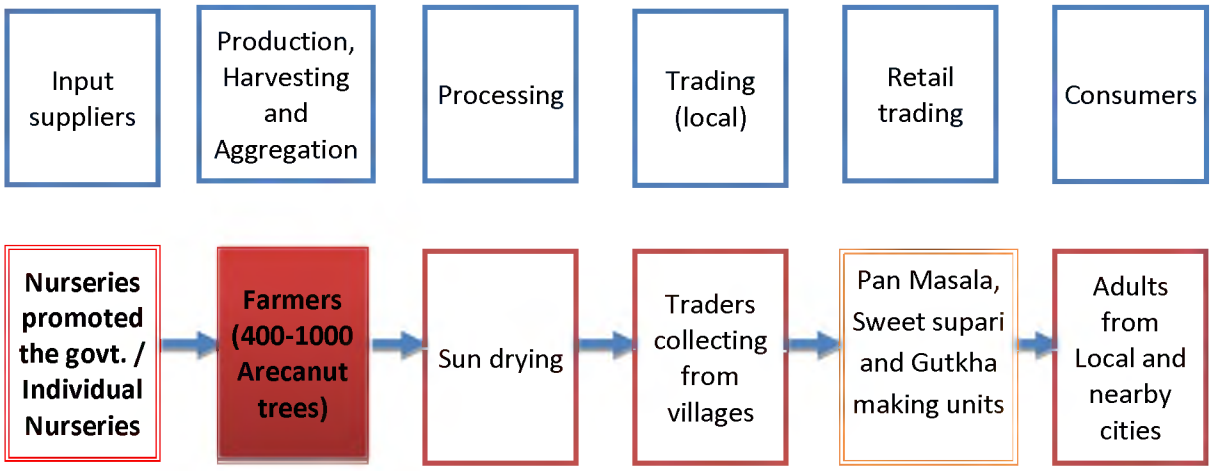
[1] A drupe is a fruit with a hard stony covering enclosing the seed

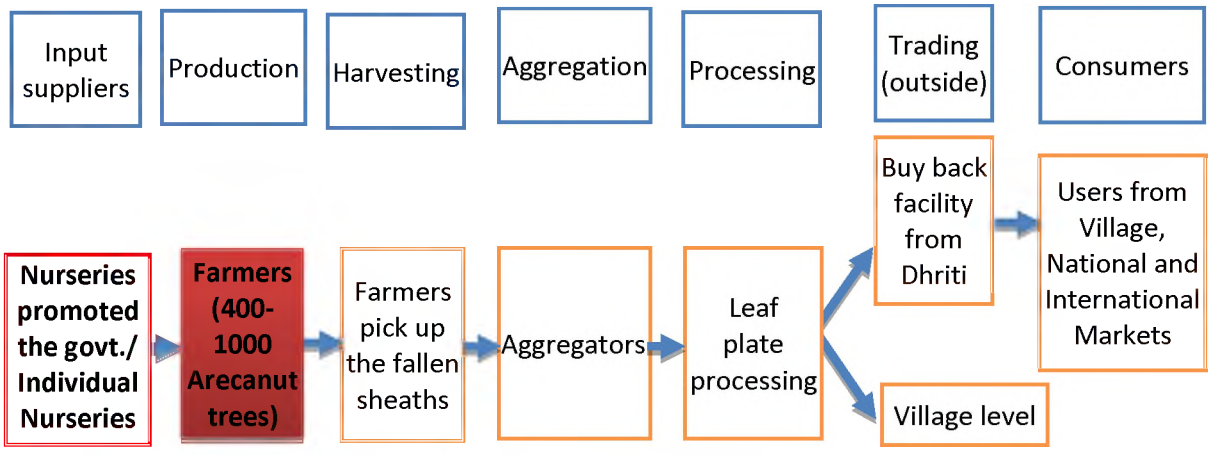
[2] The International Agency for Research on Cancer (IARC) considers betel nut as human carcinogen. Chewing of betel nut is linked to oral and esophageal cancer.


Input suppliers
Production, Harvesting and Aggregation
Processing
Trading (local)
Retail trading
Consumers
Nurseries promoted the govt. / Individual Nurseries
Farmers (400-1000 Arecanut trees)
Soaking – home / soaking pits
Retail Traders
Pan stalls/ Kwai stalls run by women
Adults from Local and nearby cities
Product-1: Soaked areca nut
Channel: Local


Processing
Trading (outside)
Input suppliers
Production
Harvesting
Processing
Supari trading outside state
Pan Masala, Sweet supari and Gutkha making units
Adults from Local and nearby cities
Consumers
Nurseries promoted the govt./ Individual Nurseries
Farmers (400-1000 Arecanut trees)
Farmer
Trader
Red Supari processing
Trading in weekly markets
Retail trading
Product-2: Fresh areca nut
Channels: Farmer/ Trader



Product-3: Home dried Arecanut or White Supari
Channel: Farmer



Product-4: Arecaleaf Sheath Plates
Channel: Farmer

2. Pre-Production Stage-Inputs and Process:

Varieties grown:Farmers are not aware of the variety of Areca nut that they grow. They only know that it is Kwai/Guiwhich is the local name for Arecanut. According to North Eastern Region Community Resource Management Project for upland areas (NERCORMP) Kahikuchi is the most important variety (also recommended variety) of Areca nut grown in Meghalaya and DawkiKwai is extensively grown in East Khasi hills and Jaintia hills. Other than Kahikuchi, varieties recommended by National horticulture board areMangala, Sumangala, Sreemangala, Mohitnagar, SwarnaMangala, VTLAH-1(hybrid) and VTLAH-2 (hybrid).

Figure 2: Areca nut nursery taken up by farmers in their backyard

Nursery management: Planting material is prepared through a two stage nursery. Seeds are first sprouted in the primary nursery and then transplanted into a secondary nursery for further growth.

Primary nursery:Farmers grow plants in their own nursery and orange colored fruits from healthy, early bearing andgood yielding plants are selected and placed in a moist place in the months of June/July for sprouting. Porosity of soil is maintained adequately by mixing sand with the soil. The sprouted Areca nuts are shifted to a secondary nursery, sown in soil. Primary nursery is kept moist in order to support the sprouting process. Though no manure is added to the nursery bed in East Khasi and Jaintia hills, farmers in Garo hills add dried Farm Yard Manure (FYM) to enhance fertility.

Secondary nursery:Saplings from the secondary nursery are shifted to the main field at an age of 4-5 years.No irrigation is provided to the plants in secondary nursery. Plants in the nurseries are not grown in plastic bags. At times, plants from the nursery are sold to farmers from other villagers and these bare rooted plants travel to other villages too, thus leading to plant mortality or increased time in recovery.

Access to technical infrastructure: Farmers do not access any machinery for taking up any pre cultivation or inter-cultivation activities. Also, farmers do not use any pesticides or insecticides at any stage of the crop and hence are not dependent on any agricultural input providers. Even harvesting is taken up manually and hence except sickles and crow bars, no other instruments/machinery is used.

Constraints at preproduction stage:

- Growing of secondary nurseries in polythene bags filled with potting mixture (seven parts of top soil and three parts of dried Farm Yard Manure) is recommended not only to provide adequate nutrition but also to protect plant from trauma during transplantation/transportation to other areas. However, such practice is not followed. Similarly, adequate irrigation is not provided to the nursery plants during summer months.

3. Productionstage –Activities and technology:

***Transplantation*:** Plants are transplanted to the main field during monsoon and the young plants are planted in 1ft* 1ft pits. Saplings are placed in the pits and covered with soil and no manure whatsoever is used to fill the pits.

Nutrient Management:Farmers do not use any manures or fertilizers to replenish the nutrients that are being leached out owing to soil erosion. Some of the farmers however apply dried fallen leaves to the plant, which fulfills the nutrition requirement of the plants partially.

Irrigation: Areca nuts are completely rain fed and no protective irrigation is provided in summer months. Even in young plants, basins are not dug around the plant owing to which water does not accumulate at the base of the plant and hence does not moisturize entire root zone leading to moisture stress.

Intercultural operations:Intercultural operations such as weeding takes place twice in a year – once in June/July and the second in October. Laborers are hired for taking up intercultural operations.

Pest Management:*According to farmers, f*ollowing are the diseases affecting Areca plants:

Yellow leaf disease: Owing to the moisture stress and improper management practices, Areca nut plants in Meghalaya face severe problem of yellow leaf disease caused by Mycoplasma which affects the youngest leaf of the plant and spreads to the outer whorls as well, leading to gradual shriveling and death of the plant.

Bud rot: Similarly, bud rot disease caused by *Phytophthorapalmivora* is also rampant wherein the disease starts at the leaves and gradually spreads to the inner portion and rots the bud, thereby killing the plant.

Farmers are unaware of the causes of the disease and are taking wild guesses including "internet waves" in the atmosphere causing the damage.

Wind damage and senility: Slender trunk of Areca nut plant is susceptible to winds as farmers do not deflect plants on the north-south line at an angle of 350 towards the west as per recommendations by North Eastern Region Community Resource Management Project (NERCORMP). Farmers in the state are losing 20% of the plants every year owing to senility, wind and diseases.

Fruit yield and harvesting: Areca nuts that are transplanted to the main field produce fruits between 5-10 years of transplantation and bear fruits for 30 years. However, farmers do not practice removal of senile trees and new plants are planted based on availability of adequate place. The period of harvest of Arecanut is from November to April and a healthy plant produces three bunches and each bunch bears around 200 Areca nuts. However, an average tree bears two bunches and each bunch has around 100-150 Arecanuts.

Areca nuts are harvested in three pickings within a span of 50-60 days, harvesting takes place at one instance in Garo hills as Traders take a contract for the entire Areca farm. In East Khasi and Jaintia hills, harvesting takes place with the help of a sickle attached to a long bamboo stick and skilled labour is required to harvest Arecanuts. The harvested fruits are lowered to the ground by a skilled laborer and two other unskilled laborers collect the same using gunny bags. In Garo hills however, one skilled laborer swings from one tree to the other and harvests the mature

palms. It was interesting to note that the laborer does not come to the ground until all the mature areca nuts from one field are fully harvested. Though life threatening incidences have not been reported during the study, there are incidences where the skilled laborer fell to the ground and gets hurt. Owing to the sturdy nature of the Areca nut, no serious damage of Areca nuts has been reported during harvesting.

Market requirement: Farmers growing Areca nut are doing so at subsistence level and are hardly investing anything on the farm other than labor (own/hired) for inter-cultivation and harvesting. In Garo hills it has been observed that traders take care of harvesting as well. Hence farmers do not approach banks for loans. However, in Garo hills in particular, it has been observed that owing to pressing financial needs, farmers are selling off their produce that has not fully matured to traders. Farmers are fully aware that the price of Areca nut improves post December, but are selling their produce to traders owing to requirement of money particularly in the month of December, which happens to be a festival month. Hence consumption loans are required by farmers in the month of December and if such loans are provided to farmers, they would be able to reap good returns from Arecanut.

Constraints in production stage:

- Cropping practices taken up by the farmer are inadequate and except for intercultural practices and harvesting no other crop management practice is taken up by farmers. In spite of incidence of diseases like yellow leaf and bud rot, farmers are unable to do anything owing to lack of knowledge of disease management practices. Almost 20% of the areca plants in the plantation are being replaced every year owing to mortality due to wind, insects, pests and senility
- Tender Areca nut plants are susceptible to scorching due to exposure to sunlight and the older ones that are tall are susceptible to heavy winds.
- Lack of proper guidance from department of horticulture owing to lack of availability of personnel at the village level.

4. Post Production Stage:

i. Value addition process of Arecanut:

Arecanut grading:Arecanuts that are harvested are graded by farmers and first grade and second grade arecanuts (Kwaisoh and Kwaileh) are sold directly in the market. Kwailuti and Kwairit are used for soaking.

Value addition of Areca nuts takes place at two stages – The first stage involves soaking of fresh areca nuts to fermented Areca nuts and the second is conversion of fresh areca nuts to Supari. Value addition of Areca leaf sheaths is taken up by pressing the leaf sheaths in to leaf plates.

Soaking pits:Soaking of areca nuts is taken up in order to improve their flavor. Soaking operation requires daily change of water and hence requires a perennial water source. Also, owing to the smell that is emanated out of the soaking pit, these pits are constructed outside the village. A pit of 6ft to 8ft depth constructed and water is filled till the brim of the tank and one Lathi (6400 pieces) of Good quality Areca nuts are filled in a bamboo baskets that has 6 ft depth. These bamboo baskets are immersed in water till the brim and are covered with heavy stones so that the bamboo basket is submerged in water. The tank has a drainage

Figure 3: Soaking pit in Jaintia hills

system and water is emptied and filled on a daily basis for three to five months. Each bamboo basket is rented to the farmer who pays Rs.1000 per basket for the period of 3-5 months. Name of the farmer is written on the basket and it is the responsibility of the farmer to keep an eye on the fermentation process. The responsibility of owner of the fermentation tank is to replace water on a daily basis. Depending on the farmer, 20% to 50% of Areca nuts produced are soaked in the fermentation tank.

Supari processing: Processing units which produce supari from Areca nuts are operational in areas such as Tura and Phulbari. Husk of Areca nut is removed by women and Areca nuts is cut in to two halves and are boiled with a red colored liquid that oozes out of the Areca nut from previous boiling. Boiled Areca nut is dried in Sun and later graded in the same processing unit or in nearby units. Sorting and grading is another major activity which takes place in separate units (In Phulbari, usually sorting and grading takes place in Cashew nut processing units). Processing, sorting and grading of Areca nuts takes place from December to April.

Figure 4: Boiling of fresh areca nut pieces for making supari

Areca leaf plates:Fallen leaf sheaths of Areca nuts are collected and are sun dried in addition to heat drying of leaf sheaths. These sheaths are then cleaned and are pressend using hydraulic pressing machines to form areca leaft plates, cups and so on.

ii. Channels for marketing of Arecanut:

Channel-1: Soaked Areca nut-Domestic consumption channel:

This channel was seen in Khasi hills and Jaintia hills, wherein 50% to 20% of the fresh Areca nuts are soaked in pits/fermentation tanks and are fermented for 3-5 months, graded and sold in the market from May onwards. Also, in these places, some of the fresh areca nuts are soaked at home for domestic use. The soaked Areca nuts are traded in weekly markets by the farmers and from these weekly markets, retail traders either buy the produce from the farmers directly or bulk traders buy the produce from farmers, aggregate the produce and supply the produce at the door step of retail traders. From these retails traders (small pan stalls and women putting up Kwai stalls) buy soaked arecanut and sell the same in retail marketalong with betel leaf, lime along coconut, ginger etc. Consumers either buy the soaked areca nuts directly from retail traders in weekly markets or as Pan from the pan stalls/women run kwai stalls.

Figure 5: Soaked Areca nut in market

The price of fresh and fermented Areca nuts fluctuates and at times and fermented Areca nuts realize lower price when compared to fresh ones. In spite of the price fluctuation, farmers prefer to ferment the areca nuts and sell them in the market as they also consider this process as a storage process, where in Areca nuts can not only be stored for 3-5 months more, but their flavor is also enhanced. They prefer this process as they can get some income in the month of May as well, instead of selling all their produce in the months of December to February.

Similarly, in Garo hills, a part of the produce is soaked in underground pits and used for domestic purpose, but not traded in the market.

Channel-2: Fresh Areca nut – Farmer channel:

Fresh Areca nuts are sold by the women farmers from Jaintia hills and Khasi hills in the local weekly markets. Here, farmers harvest fully ripened fruits every week and sell the produce in the weekly markets. From the weekly markets, traders purchase the areca nuts and aggregate the produce. Generally, traders supply areca nuts to retail traders who have stalls in daily markets as regular supply is required. However, those retail traders who have stalls in one or two weekly markets prefer to buy fresh Areca nuts directly from the traders at the local markets.

Mostly, traders (wholesale) trade in both fresh and fermented areca nuts. Retailers buy various grades of fresh and fermented Areca nuts from farmers and sell in retail in the weekly markets to the customers directly. These retailers buy betel leaves from the farmers as well and sell betel leaves, Areca nuts and lime to the customers. Among the customers are pan shop owners along with women selling areca nut pieces, betel leaf and lime in small packets that are ready for consumption. Women selling arecanut packets for ready Consumption also adds small pieces of ginger or coconut along with betel leaf and lime at some places.

These traders either supply fresh areca nuts to retail areca nut traders (who are generally women) or supply the produce directly to supari processing units. These units are located both within Meghalaya and outside Meghalaya in Assam, West Bengal, Uttar Pradesh and Bangladesh. Government promoted cooperative supari processing unit is located in Phulbari. Red supari that is processed in the units within Meghalaya is traded at weekly markets in retail and in markets of Guwahati in bulk. Supari from Guwahati market is sold to Gutkha and Pan Masala manufacturing units.

Channel-3: Fresh Areca nut. trader channel: Farmers in Garo hills prefer to sell their produce to traders or agents of traders who work on a commission basis for the traders. The traders/ agents visit the plantation during the onset of fruiting and enter in to an advance contract with the farmer by paying an advance. In addition to advance contracting, contracting during the ripening phase of areca nuts is also practiced mostly during December. Though areca nuts are not fully ripened by December and though farmers are fully aware that the price of areca nuts would improve after December, farmers are forced to sell the produce to traders owing to need of liquid cash during December which happens to be a festival month. Total produce available in the plantation is sold to the trader/agent at a pre agreed amount. The agents receive lump sum amount from the traders to enter in to advance contract, take up harvesting operations, transportation and related expenses. A fixed amount per bag is given to the agent as commission and the agent is expected to meet prefixed target. Similar to channel-2, fresh areca nuts are either sold to the supari manufacturing units or to the retail traders at the local markets.

Channel-4: White supari channel: This channel was seen only in Khasi hills and Jaintia hills, where in Areca nuts are graded and sold in the market unlike Garo hills where no grading is done. However, grading is done at the retail trader level in Garo hills. Areca nuts of the best grade weigh around 35 grams and are bright Orange in Color. Areca nuts belonging to grades from Kwaisoh to kwairit are sold in

the weekly market. However, kwaisupari grade which contain green arecanuts that are damaged are sun dried at home and are later cut in to halves. Supari thus obtained is sold to the traders who go to the village to collect the white supari. This supari is aggregated and sold to traders at Silchar and Kalian in Assam. Traders then sell the supari to Gutkha and Pan Masala manufactures

Channel-5: Areca leaf plate channel: This channel utilizes fallen leaf sheaths of Areca nut and processes them in to Areca leaf plates that have demand internationally. Government of Meghalaya, with the support of Tamul plates marketing private limited has provided machinery for manufacturing areca leaf plates to six of the individuals/Self Help Groups in Meghalaya. Leaf sheaths that fall from the areca plants are collected either by the owners of the areca plate unit or are collected by village level aggregators (for bigger units). Areca leaf plates are manufactures with the help of machinery and are sold in local markets or are sold to Tamul plates marketing company limited, which provides buy back facility and sells them in whole sale market and also in the international market. However, this channel has just taken roots in Meghalaya and hence Areca leaf sheaths in the villages are either used for packing rice or are not considered as an economically important bye product of Areca plant.

Most of the farmers in the villages visited own 400 to 1000 Areca nut trees and a negligible portion of farmers own 4000-5000 plants. At the farmers end, four products are sold in the markets – Soaked Areca nuts, Fresh Areca nuts, Sun dried Areca nuts and Areca leaf sheath. Production of Areca nut is discussed first, followed by channels followed by various products and the channels that these products follow after they leave the farm. Production of Areca nut is divided in to pre-production and production stages.

iii. Economics of various agro products and channels of Arecanut:

Farmers, bulk traders, retail traders, retail pan traders, owners of soaking pits/fermentation tanks, owners of supari processing units, owners of Pan masala and gutkha manufacturing units and owners of Areca leaf plate manufacturing units are the various players in the economics of Arecanut. Except for Pan Masala and Gutkha manufacturers who operate on a larger scale, rest of the units are small scale units mostly established at the homes of the owners. Following are the details of cultivation costs and costs incurred by owners of various value addition units of Areca nuts. Cost of cultivation and working capital costs of value addition units provided here under have been provided as per thousand areca nut plants and average produce obtained from them.

Cultivation cost:Farmers in Meghalaya mostly spend on farm labor and transportation expenses and do not spend on manures, fertilizers, pesticides, mulches, cover crops etc. Cost of cultivation for thousand Areca nut plants is provided as follows:

S. No	Expenditure item	Unit	Cost/ unit	No of units	Total cost/ year	Remarks
1	**Intercultural operations**	Person day	300	60	18000	Taken up twice a year –once in June/July and once in October*

S. No	Expenditure item	Unit	Cost/ unit	No of units	Total cost/ year	Remarks
		s				
2	**Harvesting**					
2.1	Skilled labor	Person days	500	5	2500	One skilled person for five days for 1000 plants
2.2	Unskilled labor	Person days	300	45	13500	Three unskilled labor for five days for 1000 plants* 3 times in 60 days
3	**Market transportation cost**	Bag **	80	50	4000	
4	**Loading/unloading charges**	Bag **	20	50	1000	
Total cost of cultivation					**39000**	
Cost per plant					**39**	

*Includes family labor

**Bags are non-standardized, common measure is a bag containing 2400 to 3600 nuts (with husk) weighing approximately 60kgs

In terms of returns, farmers from Khasi and Jaintia hills are getting better returns when compared to those from Garo hills.

No. of trees	**1000**
Avg. no. of fruits per tree	150
Avg. no of Flowering trees	800
Avg. no of fruits	120000
No. of soaked fruits	60000
Income received per kani (400 pieces) (Rs.)	9000
No. of kanis	150
Income received for soaked fruits (Rs.)	13,50,000
expense on transportation and soaking process	11250
Profit	13,38,750
No. of fresh fruits	60000
Income received per kani (400 pieces)	7000
No. of kanis	150
Income received for fresh fruits (Rs.)	10,50,000
expense on transportation (Rs.)	1250

Profit (Rs.)	10,48,750
Net Profit (Rs.)	23,87,500

- On an average, farmers from Khasi hills and Jaintia hills get Rs. 7000 per kani (400 pieces) for fresh Arecanuts and Rs.9000 per kani for fermented/soaked ones. Considering average production of 150 fruits per plant with 80% of plants giving fruits, average production per 1000 plants is 1,20,000 fruits.
    - Assuming 50% of these fruits are soaked, which is 10 baskets, farmer incurs Rs.10,000 as expenditure which is to be paid to fermentation tank owner. Additionally, Rs.50 per bag is paid as transportation expenses, which comes to Rs.1250. Hence the gross income earned is Rs.1, 3,50,000 and net profit is Rs.13,38,750
- Fresh areca nuts get an income of 10, 50,000 and after deduction of transportation expenses, net profit is Rs.10, 48,750. Total profit earned by the farmer is Rs.23, 87,500.
- In Garo hills however, traders buy entire produce of farmers and pay them meager amounts. For a plantation of thousand plants, which produces 50 bags (60 kg each) of Areca nuts, traders pay them Rs.50,000.

Value addition cost –Establishment of fermentation tanks:

The process of conversion of fresh Areca nuts to fermented areca nuts takes place at the level of the farmers who spend Rs.1000 per 6400 pieces of Areca nuts and wait for a period of 3-5 months. Fermentation tanks are established outside the village as per the decision taken by village councils, owing to the foul smells emanated by the tanks. The land on which tanks are constructed is owned by the pit owner. The cost incurred by owner of soaking pit (with a capacity to ferment 50 baskets/season (produce from 3*1000 areca plants) is provided in the annexure. The owner of fermentation tank earns Rs.50000 for 50 baskets during five month period. Hence profit earned per season is Rs.34167.

Value addition cost –Supari processing units:

In the process of conversion of fresh areca nuts to supari, the processor mostly invests in working capital as no capital expenditure is required. Usually, the process is taken up at a household level by hiring labor. Peeling, boiling and drying of Areca nut takes place in one unit (boiling unit) and later on, the dried nuts are sent to separate unit for grading (sorting and grading unit). In practice, these units are established in their own houses and hence other than the cost of machinery, no other costs are usually incurred. Usually, sorting and grading units are located in the Cashew nut processing units during off season. The detailed computations are in the Annexure

The owner of boiling and drying unit sells supari at Rs.7000 for a bag of 60 kilograms. Conversion rate from Areca nut to supari after drying is 26% and hence 420000 kilograms of fresh areca nut is converted to 109200 kilograms of supari, which comes to 1820 bags with a capacity of 60 kilograms. The owner sells each bag of dried Areca nut at Rs.7000 and hence total income is Rs. 12,740,000.

Sorting and grading is a separate activity that is taken up by different players. In case of Phulbari, where the team visited, the activity was taken up in a Cashew nut processing unit

during off season. Owner of sorting and grading unit purchases boiled and dried Areca nut from boiling and drying unit. Other than the cost of raw material, labor costs in terms of sorting and grading and transportation costs for selling the graded and sorted produce in Guwahati are to be taken up by this player. Following are the costs incurred by the owner of grading unit for grading 4200 quintals of dried supari:

A	Working Capital (seasonal for five months)				
S. No	Particulars	Unit	No of units	Price per unit	Total cost
1	Cost of boiled and dried areca nuts	bag (60kg)	1820	7000	1,27,40,000
2	Grading of Supari	person days	500	160	80000
3	Transportation	bags (50kg*)	1260	200	252000
Total working capital					1,30,72000

*Drop of weight due to processing loss

Sorted and graded Areca nuts are sold in Guwahati market and following are the grades of Areca nuts along with prices realized in Guwahati market. It is to be noted that unlike all other transaction that happen on weight, graded supari is sold in 50 kilogram bags and not 60 kilogram bags.

S. No	Grade	Price realized Rs/50Kg	Number of units	Total price*
1	CK (Chikun)	8000-10000	1092	9828000
2	RK (Rutha)	6000-7000	683	4436250
3	HRK	4000-5000	273	1228500
4	Chaluwa	3000-4000	137	477750
Total price realized in Guwahati market				**15970500**

* Considering average of the price realized per fifty kilogram bag

Processors of Areca nut send the graded suparito markets in Guwahati and trade the supari based on the price prevalent in the market. Price realized in the market fluctuates based on supari that enters in to Guwahati market either legally or illegally from neighboring countries.

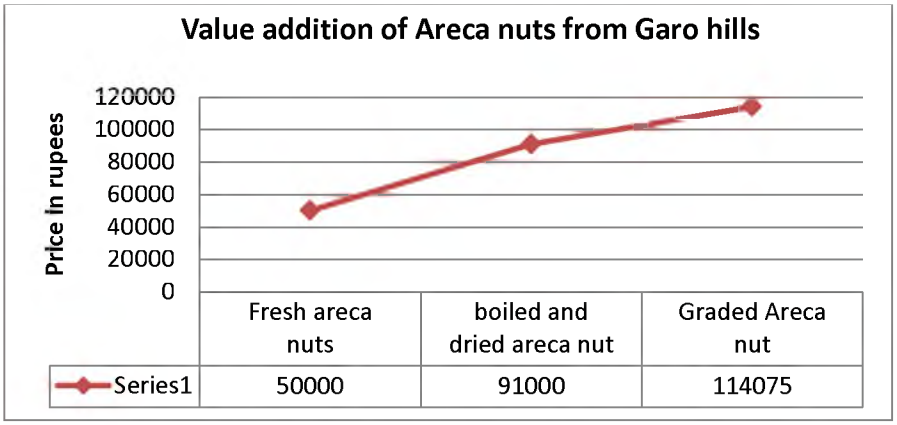
Value added to Areca nuts:

Stakeholder	Cost incurred (A)	Income generated	Profit earned	Benefit cost ratio
		(B)	(B-A)	(B/A)
Farmer (Khasi hills and Jaintia hills)	39000	227500	188500	5.8
Farmer (Garo hills)	39000	50000	11000	1.3
Soaking pit owner(Khasi hills and Jaintia hills)	15833	50000	34167	3.2
Owner of Arecanut boiling unit (Phulbari)	66464	91000	24536	1.4

Owner of Arecanut sorting and grading unit (Phulbari)	93371	114075	20704	1.2

*Either 1000 areca nut plants or produce from 1000 areca nut plants

Soaking fresh Areca nuts from Khasi and Jaintia hills region, improves the market value of Areca nuts by 18%. In case of fresh Arecanut from Garo hills, following graph represents value addition of Arecanut, processed to form supari.



iv. Traders:

Garo hills: Three types of traders have been identified in the value chain of Areca nuts in Garo hills.

Bulk traders:The first one is a bulk trader who procures arecanuts from the farmers. The traders directly come to villages and negotiate with the farmers after visiting their gardens in the months of November/December. Farmers call their friends and acquaintances in Guwahati to enquire about the price prevalent in Guwahati, based on which price is negotiated with the traders. Mostly, traders are acquainted to each other and quote similar price, which is aligned with that prevailing in Guwahati market. Traders pay cash to the farmers, take care of the harvesting and transport the produce in their vehicles. The bulk traders invest in harvesting and transportation of Areca nuts. Harvesting expenses amount to Rs.16000 for thousand arecanut plants and transportation expenses on an average amount to Rs.5000 (@Rs.100/bag). Hence the trader spends Rs.21000 per 50 bags of Arecanuts. Hence for plantation of 1000 Arecanut plants, bulk trader spends Rs. 76000. Arecanuts are graded by the trader and then the graded Arecanuts take different routes.

Areca nuts are measured on the basis of pieces at the farmer, trader and retailer level in East Khasi and Jaintia hills. However, traders procure areca nuts on kilogram basis from the farmer, and sell to which is in turn sold by the retailer according to pieces. Standardized measurement for sale of areca nuts is not seen in the state, thereby giving an opportunity for the traders to take advantage.

- **Route-1: Supply directly to retail trader at daily markets**

Around 2-3 bags of Arecanuts are supplied to retail traders who sit in daily markets such as those in Tura. First grade arecanuts are sold at Rs.1800 and second grade ones are sold at

Rs.1700 and third grade arecanuts are sold at Rs.1200 per 60 kilogram bags. Cash is collected from the retail traders and credit system is not to be seen.

Assuming 20 bags of the produce from 1000 areca nut belong to first grade, 20 bags to second grade and 10 bags to C grade, following would be the profit generated by the bulk trader:

Grade	**Bags**	**Average price**	**Price** realized
First	20	1800	36000
Second	20	1700	34000
Third	10	1200	12000
Total price realized **by bulk trader**			**82000**
Investment			**76000**
Profit			**6000**

- **Route-2: Supply directly to Supari boiling units at Tura/Mankachar/Phulbari**

Mostly, Arecanuts belonging to the last grade are sent to Supari processing units and rate for a 60 kilogram bag fluctuates between Rs.1000 to Rs.1500. Mostly, rate improves during March to May, when the season for arecanuts begins to decline. Here credit based trading is seen as loans are unavailable from banks. Right from traders till the sorting and grading units, credit system works. Once graded produce sells in the markets of Guwahati, credit is repaid.

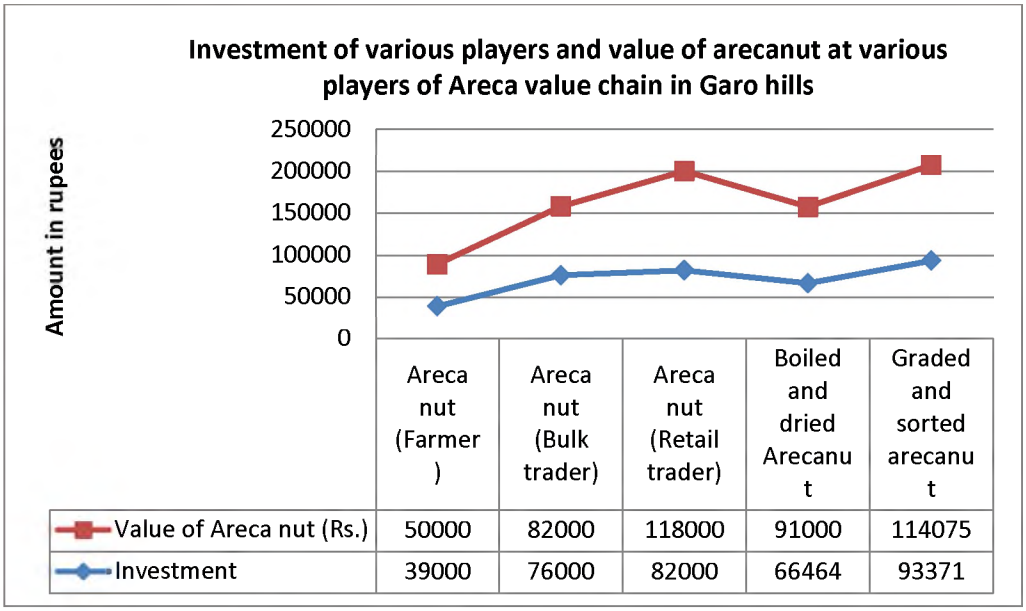
Retail traders:The second types of traders are the retail traders sitting in daily and weekly markets. Retail traders usually sell betel leaves along with Arecanuts.

Retail traders at daily markets usually sell less than 2 bags of Arecanuts and hence in a month they sell around 50 bags of Arecanuts. Following is the economics at the retail trader level (for a month):

Grade	**bags**	**Average price**	**Total cost**	**pieces per bag**	**Customer price (Rs.per 80 pieces)**	**Price realized by retail trader**	**profit**
First	20	1800	36000	1280	150	48000	12000
Second	20	1700	34000	1600	120	48000	14000
Third	10	1200	12000	1760	100	22000	10000
Total	**50**		**82000**	**4640**		**118000**	**36000**

Panstalls/Kwai stalls: Panstalls/Kwaistalls run by women sell pieces of Arecanut (usually one packet contains 1.5 pieces of Arecanut), along with a betel leaf and lime for Rs.10. Here, along with betel leaf and lime, Arecanut (assuming first grade) which costs around Rs.3 for 1.5 pieces is sold at Rs.10.

Subsector players and Arecanut price: Following graph indicates price of arecanut from Garo hills, as it moves towards consumers both in raw and processed forms:



Grade	Price per Kani (400 pieces)
Kwaisoh	1200-1300
Kwaiheh	1100
Kwailuti	700
Kwairit	400
kwaisupari	Notavailable

It is to be noted that when a farmer from Garo hills sold his produce in the local weekly market in the month of March, he received Rs.1800 per 60 kg bag, whereas, he would have received Rs.1000 per 60 kg bag from the trader. Even if transportation expenses to nearest market and harvesting expenses are considered, he had incurred around Rs.480 per bag harvested. However, it is not only the place in which the produce is marketed, but also the month in which it is marketed.

Khasi and Jaintia hills:There are four types of traders in Khasi and Jaintia hills as well. However, price, profit margins are different and additionally, there is lot of importance to fermented arecanuts.

Weekly market traders: These traders buy graded arecanuts from farmers in the weekly markets. The prices at which these traders procured Areca nuts from farmers have been provided in the table. A part of the arecanuts procured by these traders (mostly those from lower grades) are sent for soaking either in their own pits or pits owned by others.

v. Transportation

In Khasi hills and Jaintia hills, farmers either have their own transport or transport Areca nuts in rented vehicles. Commonly, Tata sumo, Tata Ace, Mahindra Bolero etc. are used for transportation. Markets are at a distance of 7km to 20 km and farmers spend around Rs.50 to Rs.80 per a sac from the market place. In Garo hills, mostly harvesting and transportation is taken care of by the traders. In case of selling the produce directly to the weekly market by the farmer, rented vehicles are readily available and problems do not face any problem in terms of transportation.

vi. Women in Arecanut sub sector

In Khasi and Jaintia hills, women take lead in selling arecanuts in the market and also women take up the role of traders buying arecanuts from women farmers in the weekly markets. In

addition, women sell arecanuts in retail at various weekly markets. However, in case of Garo hills, men dominate the market and mostly men farmers sell the produce in market and traders sitting in weekly markets and those taking up bulk trading are all men. When it comes to employment in supari boiling and drying unit, women are employed as laborers and they do the peeling/cutting activity of Areca nut. Men are involved in boiling and safeguarding of dried arecanut. Similar is the case with grading unit, where women are employed as laborers.

Constraints in post-production stage

- Farmers from Garo hills are dependent on middle men and hence are reaping lesser benefits than their counterparts in Khasi and Jaintia hills.
- Shelf life of Arecanuts is very less and except for fermentation process taken up by farmers, no other method of preservation of Arecanuts is available with the farmers.
- System of measurement of arecanuts is not standardized and hence uniform measurement standards are not seen. Owing to this, traders, particularly those in Garo hills are gaining at the cost of farmers.
- Farmers are not too keen to take credit from banks and hence are selling their produce even before maturity, particularly before December which happens to be a festival month.
- Unavailability of working capital and dependence on credit based system by supari processors.
- Problem of increased supply of supari in Guwahati markets from other countries such as Burma through legal and illegal routes
- Other than Arecanut, mostly no other bye product is brought to economic use by farmers.

5. Institutional support mechanism

a. Department of Agriculture/Horticulture

There are 28 Farms and Nurseries under the directorate of Agriculture across various districts of Meghalaya, it has been observed that in case of East Khasi hills and Jaintia hills, farmers usually grow their own saplings and are not dependent on any nurseries for procuring plants. In case of new plantation when large numbers of plants are required, in addition to using plants from their own nurseries, farmers buy plants from other farmers in the village or procure them from neighboring villages. In one of the nursery in Garo hills, promoted by directorate of Agriculture, it was observed that seeds from the local varieties from neighboring villages have been used for growing nurseries. The plants grown in these nurseries were provided to farmers at subsidized prices. However, plants from the nurseries are inadequate to meet the requirement of large number of farmers who are losing around 20% of the plants every year either to senility, wind or pests and diseases. Also, it has been observed that mostly, farmers from Garo hills are procuring few plants from nurseries, where as those in Jaintia hills and Khasi hills are mostly dependent on plants from their own nurseries. As the nurseries have been providing plants to the farmers only since two years, the performance of the plants cannot be ascertained as of now. However, it has been observed that farmers do not follow appropriate package of practices and hence it is more likely that the plants might not perform as per expectations.

Small Farmers Agri Business Consortium has been implementing the Centrally Sponsored Scheme **"Technology Mission for Integrated Development of Horticulture in North Eastern States",** using the end to end approach.

b. Central Plantation Crops Research Institute

The Central Plantation Crops Research Institute, Research Centre, Kahikuchi came into force in 1959 as Regional Arecanut Research Station under Central Arecanut Research Station (CARS). The institute has been established to produce quality planting materials of major plantation and spice crops, to develop Arecanut based cropping system models suitable for North Eastern region, To evolve effective control measures against major diseases and pests of important plantation and spices crops, and to standardise and transfer proven technologies to the farming community.Similarly, horticulture mission is being implemented by Meghalaya Basin Development Authority (MBDA) to expand the area under horticulture by about 36,000 hectares in five years covering nearly 90,000 farmers. The mission adopts a holistic approach for the development of horticulture by providing support for irrigation, technology transfer and post-harvest management.

c. Policy and advocacy

Though union government has issueddirections to the sale, manufacture and distribution of gutka (tobacco-laced areca nut pieces) and pan masala (a chewing mixture), Meghalaya has not yet implemented the ban. However, owing to carcinogenic properties of Arecanut, the state is not offering support to Arecanut farmers on par with farmers growing other horticultural crops such as cashew nuts and oranges. Though the union Ministry of Health & Family Welfare earlier had plans to classify areca nut as an injurious substance, according to KonkodiPadmanabha, president, Central Arecanut and Cococa Marketing and Processing Cooperative (CAMPCO) Ltd.,

the union ministry is not planning to ban arecanut at the current juncture. CAMPCO is taking up efforts to ensure that there is no ban on arecanut in order to protect the interests of Arecanut farmers.

6. Recommendations

Inputs and Preproduction stage

Improved varieties – VTLAH-1 and VTLAH-2

The Central Plantation Crops Research Institute (CPCRI), Kasaragod has come up with VTLAH-1 and VTLAH-2 that are dwarf varieties which could be easily managed. Suitability of these varieties to the weather conditions of Meghalaya could be taken up in the nurseries and farms established by department of horticulture. Similarly, early yielding varieties that are disease resistant are to be introduced in the state.

Community nurseries

Locally, nurseries could be promoted by providing training and technical support to women and unemployed youth from the villages. It is also essential to update them on latest developments in nursery management through periodic trainings and follow ups. Also, demonstration units for promoting the importance of good quality planting material are essential at the village level.

Selection of planting material using simple germination test

Good planting material is not accessible to farmers. Moreover, farmers are dependent on their own nurseries, due to lack of information on importance of planting good material from nurseries and unavailability of nurseries at their vicinity. Though selection of fruits for germination is done as per recommendation, it would be good if farmers take up a germination test before selecting the fruits. Selected nuts, when floated in water should float vertically with calyx-end pointing upwards and these nuts produce the seedlings of greater vigor. The selected fruits are to be dipped in cattle dung to enhance germination. Also, well decomposed Farm Yard Manure is to be added to the seed bed as done by the farmers in Garo hills to enhance fertility of the seed bed.

Project approach for expansion

Cropping practices taken up by the farmer are inadequate and except for intercultural practices and harvesting no other crop management practice is taken up by farmers. In spite of incidence of diseases like yellow leaf and bud rot, farmers are unable to do anything owing to lack of knowledge of disease management practices. Almost 20% of the areca plants in the plantation are being replaced every year owing to mortality due to wind, insects, pests and senility. A project based approach for improving the production of Areca nuts with specific outputs in particular time frame is essential. An integrated approach in farming including improved planting material, land management, soil and water management, Integrated Nutrient Management, Integrated Pest Management, mechanization etc. is required.

Production Stage

Plant management measures

Tender Areca nut plants are susceptible to scorching due to exposure to sunlight and the older ones that are tall are susceptible to heavy winds. It is recommended to grow cover crops such as Stylosanthusgracilus, Prurariagavanica, Calapogoniummuconoides etc. These cover crops acts as mulch, prevent soil erosion and when cut and applied to the soil, improve its nutrient availability. In addition, cattle manure is also recommended to be applied in basin that are to be dug around the Areca plant. Also, application of dried leaves directly to the plant takes a lot of time for the nutrients to become available. Hence, it is recommended that it is composted either with the help of earth worms or through biodynamic composting. Areca husk can also be composted and provided as manure to the plantation. Testing of soil and using manures as per recommendation is to be encouraged.

During transplantation, pits are to be filled with mixture of top soil, powdered Cow dung and sand to provide appropriate nutrition and also to provide appropriate soil porosity to retain moisture and also to aid in root growth.

Yellow Leaf disease management

Provision of adequate irrigation during summer months, appropriate drainage, mulching, and removal of diseased plants. Appropriate soil tilth by digging and addition of sand is to be followed. Bud rot can be controlled by removing the diseased portions of plants and spraying Bordeux mixture.

Post Production Stage

Collectivization of produce and processing

It is essential to collectivize farmers in order to take up collective procurement of inputs and marketing of agricultural produce including Areca nuts. The collective strength shall also empower farmers in accessing technology for the betterment of their farms. Forming farmers collective could support the farmers in a big way by increasing their bargaining power and also in pooling up their available resources for the well-being of all farmers. Farmer's collectives could go for collective marketing of areca nuts directly to bigger markets like Shillong instead of selling in local markets. Instead of selling fresh arecanuts, farmers collective can go for processing of Areca nuts in to Supari which has good shelf

Adoption of preservation techniques

Farmers could be educated on preservation techniques of Arecanut developed by Kerala Agricultural University. By adopting the procedure, and hence sell off their produce immediately. According to the e- learning portal of Kerala Agricultural University, Arecanut nut could be preserved in fresh condition for 10-12 months with fresh bright color and firmness of the skin without any foul smell and without any significant changes in the constituents by adopting the procedure.

Market Information System

Voice based SMS system providing information on weather, crop management practices that needs to be adopted, market prices etc. could be established that would link farmers to department of horticulture should be provided. A pilot project of linking extension provider with the SMS based system and establishment of village information kiosk could be taken up. Meghalaya state agriculture market portal provides free SMS service for market price of one particular commodity for three markets. However, this is not popular with the farmers.

Standardized weights and measures

Efforts are required to standardize measurement system of Arecanuts not only in Meghalaya, but also in neighboring states of Assam and West Bengal, which are the major markets for arecanut from Meghalaya.

Value addition opportunities- Leaf plate

- Each Areca nut plant produces ten leaf sheaths in a year, which is the raw material for manufacture of biodegradable leaf plates which have excellent demand both in national and international markets. Dhritii is an NGO working in Barpeta in Assam and has promoted an Areca leaf plate manufacturing unit and procures leaf sheaths from the adjacent Bodo land. In addition, the NGO has promoted Tamul plates manufacturing company private limited which not only manufactures areca leaf plates but also provides consultancy support to those who would like to set up such units. The company also provides required skill training and buys back facility for the finished areca leaf plates. With the support of Tamul plates manufacturing company, similar companies could be established in each of the districts of Meghalaya by farm laborers, who could collect/buy leaf sheaths from farmers and manufacture areca leaf plates with the help of a three machine unit which costs around Rs.50000. The company promoted at the district level could buy the areca leaf plates from the manufacturers and sell the same in the mainstream market with the consultancy support of Tamul plates manufacturing company initially and gradually take up the activity on its own.

Areca nut fiber could be used for making value added items like thick boards, fluffy cushions and non-woven fabrics, thermal insulators and non-woven fabrics. Extensive studies on bio softening of areca nut fibers concluded that the bio softened areca nut fibers can be exploited commercially for the production of furnishing fabrics, textiles etc. By blending with cotton and polyester (C.V. Srinivasa, 2011). Government could further explore this aspect so that husk of Areca nut which is either used as a cooking fuel or left unused could be brought to commercial use and the farm laborers could establish processing units and gain from the same.

2	• Lack of proper guidance from department of horticulture owing to lack of availability of personnel at the village level.	• During transplantation, pits are to be filled with mixture of top soil, powdered Cow dung and sand to provide appropriate nutrition and also to provide appropriate soil porosity to retain moisture and also to aid in root growth. • According to e- learning portal3 of Kerala Agriculture University, owing to the perennial nature of Areca plant, once affected by moisture

[3] http://www.celkau.in/Crops/Plantation%20Crops/Arecanut.aspx#2

		stress, the plant takes two to three years to recover. In spite of availability of large quantities of Areca nut husk, it is not used for mulching purposes, there by exposing the plantation to severe moisture stress. Hence providing irrigation to the plants during dry periods is essential. • At present no manures or fertilizers or pesticides are not used on Areca plantation. Hence instead of advising farmers to use fertilizers and pesticides, if the farmers could be advised to take up organic cultivation of Areca nuts by using manures, biological pest control, cover crops for enhancing nutrition, then the yield of areca nuts could be improved without causing any damage to the nature. • • Dedicated personnel selected from the villages and trained as paraprofessionals in plantation crops is essential for developing local resources. •
	• Farmers from Garo hills are dependent on middle men and hence are reaping lesser benefits than their counterparts in Khasi and Jaintia hills. • Shelf life of Arecanuts is very less and except for fermentation process taken up by farmers, no other method of preservation of Arecanuts is available with the farmers. • System of measurement of arecanuts is not standardized and hence uniform measurement standards are not seen. Owing to this, traders, particularly those in Garo hills are gaining at the cost of farmers. • Farmers are not too keen to take credit from banks and hence are selling their produce even before maturity, particularly before December which happens to be a festival month.	• . • Efforts are to be taken to sensitize bankers need for credit to farmers taking up plantation and other crops. Farmers also need to be educated on importance of credit to avoid distress sales. •

	• Unavailability of working capital and dependence on credit based system by supari processors. • Problem of increased supply of supari in Guwahati markets from other countries such as Burma through legal and illegal routes.	• Bankers are to be encouraged to provide credit to small scale industries providing seasonal employment to women. Visits of bankers to these units needs to be encouraged so that farmers are sensitized about the credit based system in vogue in supari processing. • Stringent steps are to be taken by the government to regulate imports in to the country and take every step to seal illegal entry of supari in to Guwahati market in order to protect the interests of small scale processors. Also, import duty on supari from Burma and other neighboring countries has to be increased to protect the interests of local producers and processors.
	• Other than Arecanut, mostly no other bye product is brought to economic use by farmers.	•

7. Conclusions and way forward

Despite its rather serious adverse health impact, arecanut is and will continue to be a major agriculture produce in Meghalaya for the near foreseeable future. Not only is this an efficient[4] income generating activity for many farmers, but it also feeds into an entrenched and inexorable custom of nut chewing among the Meghalayan population. Currently, there are no data on local consumption, but from other proxy indicators it appears to be a surplus production state. Given this backdrop, any state-sponsored initiative to improve the income from arecanut production must have a high marginal benefit to serve as an incentive to the farmers to adopt improved practices.

This section will provide a set of some insights into the institutional dimensions, particularly the role of economic policy towards private enterprise that can catalyse investments in increasing the gross production and in the process increase returns to the producers. And then, the section will look at some of the techno-economic interventions that are likely to yield notable dividends in terms of increasing crop productivity as well as other value-addition and value realization to the producers.

Decentralization of knowledge and other resources

As the report above describes, among the most significant cause for sub-optimal production of Arecanut in the state is the poor planting material used by the farmers. To address this problem, the Government of Meghalaya has a scheme for providing planting materials through district level nurseries that improve the stock of trees. However, from the sampled farmers who provided primary data for this study, it is evident that the nurseries cannot meet the demand of the farmers when they need saplings either for replacement of senile trees or plan a new plantation. The second weak link between state horticulture department and farmers is seen in

[4] Efficient from an economic input output viewpoint. With minimal material and labor inputs, the production, even if sub-optimal, gives the farmer sufficient net income as described in the earlier sections.

the extension and advisories provided on critical stages of crop husbandry. For the same reason cited for planting material, the outreach of the department is quite limited due to weak budgetary provision. This problem is further aggravated in districts where communities are remote and logistics pose a serious challenge. The third key stage where farmer income is impacted significantly is the post production value chain. This is almost entirely in the hands of semi-regulated or completely unregulated private industries. While there are some processing units in Meghalaya, bulk of the surplus production finds its way to processors north of the border with Assam.

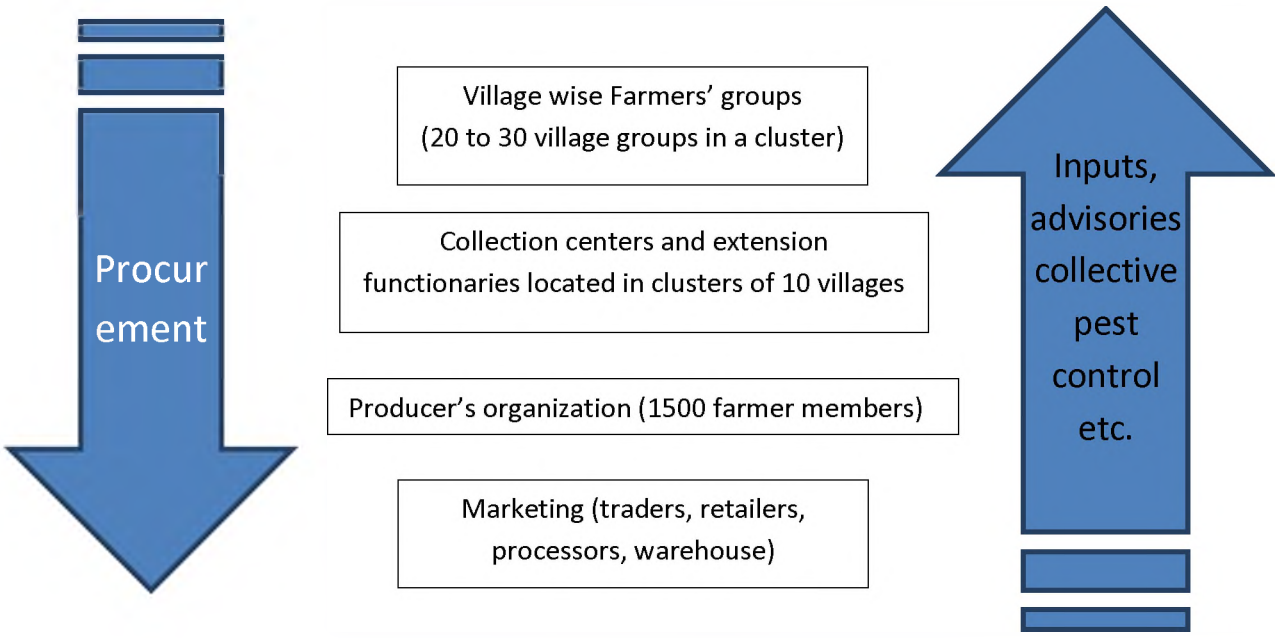
The overarching inference from the above narrative is that state apparatus of horticulture department is not proficient, for many reasons, to increase the outreach in any significant way in near future. Fortunately, that may neither be necessary nor best option for achieving sustainable support services. Like most departments in the state and indeed the country, state horticulture establishments in Meghalaya is not only constrained financially but also in its accountability structure. Given very little downward accountability to the farmers, even the meagre budgetary support that comes to them are cornered by very few farmers.

An alternate approach could be:

i. The department's role can be redefined to include supply of material, knowledge and skills not to the farmers directly, but instead to a cadre of entrepreneurs who are either part of a producer's organization or a local private enterprise who is contracted to multiply and distribute planting material and advisories in a transparent manner
ii. Promote membership based producers' organization either as a coop or company[5] that not only represents the producers' interests, but also mobilise some equity from the producers and leverage larger capital to invest in improved inputs and/or higher order value additions.
iii. Producer organizations will recruit and depute extension workers to receive training on improved package of crop husbandry practices. The workers in turn offer these services to their members for a fee that can be recovered either through a pay-as-you-go basis or from procurement of produce by the organization. On a periodic basis, the organization can also have field demonstration workshops for its members to disseminate spontaneous or pre-scheduled seasonal issues such as planting material, pest control, harvesting and sorting etc.
iv. Given the unregulated nature of trade and value addition processing, one can expect high level of cartelization among the current players. This was borne out when the study team visited processors and bulk suppliers in Goalpara region, north of Garo Hills. It is therefore premature to expand the scope of the producer organizations to include processing in the near future. Instead, in terms of post-harvest intervention, significant improvement in price realization can be achieved by aggregation, sorting and grading raw and soaked/fermented nuts and feeding it into the existing value chain players. Common facilities for de-husking, soaking/fermenting nuts and collective marketing can be provided by the producer organization.
v. Contrary to the responses during the study, distress sale is not as acutely seen among arecanut farmers as in other short duration crops. This is due to the relatively longer

[5] Based on the relative merits of each options in providing autonomy to the producers and prevents elite capture.

spread of harvest season across 5-6 months (Nov to March) and relatively longer shelf life of the produce. This dilutes the glutting syndrome in the market and holding capacity of the producers. This would also mean that the producer organization need not invest in infrastructure for storage and instead offer sorting and grading equipment and organize marketing schedules for spot aggregation and transport.



With a suitable producer's organization at the centre, state resources can be deployed more efficiently to provide support to capacity building process that will bring the producers organization up to speed. Civil society organizations and universities can also be given the mandate to build a cadre of functionaries whose capacity to provide back-stopping support to farmers will be increased and their service delivery made more accountable through incentive based job-tasks. Such extension workers have proven to be more result oriented that when services are delivered by staff of nodal department whose accountability towards farmers cannot be ensured.

Techno-economic advisory services

There is a sound economic rationale for farmers to retain their current low-input-low-risk-low-return model of cultivation. This is seen across the world wherever the marketing costs are very high and price volatility is high too. This is akin to the economic rationale of free-grazing livestock that produces very low milk yield, but requires low investments and low risks. An attempt to increase the productivity through more investments (better planting material, better soil management, fertilizer and plant protection measures and mechanized sorting and grading) will be welcome only if the inputs and advisory services and market are predictable. As mentioned in the earlier section on institutional dimensions, this is best achieved through intervention by a producer organization or by providing space and enabling private parties to invest and operate in a transparent manner. If this is feasible, the following are the technical and financial initiatives that can improve productivity:

vi. More decentralized nurseries for planting material as described above.

vii. Plant protection measures can be stepped up through producer organizations. This will start with an effort to de-mystify the causes of pest attack and its impact. Learning from past experiences elsewhere in the country, it is also necessary to ensure that the plant protection measures are implemented in the right manner and dose. The loss of income due to stunted growth and poor quality nuts can be avoided by these interventions. Ease of purchase and cost assurance through local stocking of recommended pesticides or bio-pest control measures is known to have a positive impact on use rate by farmers.

viii. Collection routes can be created so that marketing costs (both logistics and waste reduction) are reduced. With such organized aggregation, it is easier to sort and grad at the producer level so as to segregate quality of nuts according to the end use (direct consumer, for fermenting and for supari processing). This also helps in collective bargaining with traders.

ix. Supply chain for Retailers: Currently the retail traders procure directly from producers to either onward sell to bulk traders or supari processors or to stalls and shops that sell directly to consumers along with beetle leaves and other ingredients that make up feed the customary chewing practice. The aggregation and organized sale cater to these retail sellers through a door-step delivery service. A larger share of the retail customer level price can thus be realized for the producers.

x. Leaf plate: Invest in training and infrastructure to encash the economic value of the sheath attached to the arecanut leaves. The growth and success of Tamul leaf plate production system indicates that there is demand for natural products in disposable plates and packing material sub-sector. This demand is increasing domestically and internationally. The technology to convert the sheath into usable and hygienic products are also improving rapidly. Currently the recovery rate6 of leaf sheaths is poor due to poor collection methods and rough handling during the transportation. With participation of the farmers, this rate can increase and in the process give additional returns to the producer. Here again, the value addition and market linkages are rapidly evolving and the existing players have distinct edge over the new producer organization. Therefore, it is advisable to tie up with the current players and enter into enforceable contracts that deals a fair share to the producers.

Medium term prospects

The profit margins at higher levels of value-chain are relatively higher, but requires not only higher level of organization and capital investments but also secure an entry into an industry that is closely controlled by informal trade links and even illegal transactions. This includes non-payment of statutory taxes and cess at various purchases and processing, gross under-payment of wages and unhygienic working conditions with high use of child labor in the processing, undeclared cross border trades and illegal hoarding and rigging of whole sale prices. A foray into higher levels of processing by the producers and their institution or even publicly managed enterprise is fraught with high risks of being uncompetitive against the existing players.

The producer led initiative in higher value addition must be commenced only after their institutions are completely adept at improving production level factors and controlling post-

[6] The amount of sheath material used for finished product as a ratio of the total material available. Another indicator is the extent of waste.

harvest aggregation and bulk marketing. During the intervening period, the producer organization can develop business acumen for entering the higher stages value chain by exploring and mastering liaison with key players in the industry and also undertake advocacy to create policies that neutralize the illegitimate benefits availed by current operators that pose unhealthy competition. This can be in the form of stricter enforcement of tax collection and wage payment laws, tax breaks or deferment to people's organizations.

Farmers in Meghalaya do not use any inputs such as manures or fertilizers or pesticides and other than intercultural operations no other crop husbandry practices are followed. Areca plantation is rain fed and extreme rainfall coupled with dry spells is leading to moisture stress. Also, extreme rains are leading to soil erosion thereby depleting soil nutrients leading to decline in the production of arecanuts. Trading scenario in Khasi and Jaintia hills seems to be supportive to farmers, whereas in Garo hills, traders dominate the market leading to losses to farmers. Particularly in Garo hills region, both farmers and processors of supari require credit support, which shall provide them a boost so that distress sales of farmers and credit based system of processors could be avoided. Meghalaya is a fertile ground to take up interventions in improvement of areca plants in the organic way as pesticides and fertilizers are still alien to this land. Bringing farmers together both for collective bargaining and cross learning is essential for their development. A project based approach for improving the production of Areca nuts with specific outputs would support the farmers and processors in big way.

Annexure

Establishment of fermentation tanks- Financial Estimates

1.0 Total Cost

Sl. No	Particulars	Cost (Rs.)
Fixed capital		
1	Construction cost of pit	70000
2	Cost of 50 baskets	5000
3	Water pipeline and stone bricks	40000
Total fixed costs		**1,15,000**
Working capital (5 months)		
4	Labor cost@ 300 per day for six months	45000
5	Replacement costs for baskets	2500
Total working capital		47,500
Total cost		**1,62,500**

2.0 Benefit Cost Analysis

	Current Year (CY)				Cost of 1 Sample year (Rs.)
Fixed Capital	Unit	No of units	Price per unit	Total cost (Rs.)	
Machinery (Cutters, vessels, baskets, tarpaulin etc.)	Lump Sum Cost			50,000	**11000**
Total FC				50,000	
Working Capital					
Fresh Arecanuts	bag (120kg)	3500	2500	8750000	8750000
Labour Costs					
(a) Cutting areca nuts	bag (60kg)	7000	60	420000	420000
(b) Boiling and drying and safeguarding of areca nuts	person months	15	9000	135000	135000
Total WC				**9305000**	**9305000**
TOTAL COST				**93,55,000**	**9316000**
Benefits					
Income from Supari	bag (60kg)	1820	7000	12740000	12740000
TOTAL BENEFIT				**12740000**	**12740000**

Total Perceived Benefits	12740000
Total Perceived Costs	9316000
NET BENEFIT	**3424000**

Total Perceived Benefits	12740000
Total Perceived Costs	9316000
NET BENEFIT	**3424000**

Annexure

Supari Processing unit –Financial Estimates

(Capacity of 4200 quintals (Produce from 140 areca nut plantation, each with 1000 trees) of fresh areca nut)

1.0 Total Cost

Sl. No	Particulars	Unit	No of units	Price per unit	Total cost (Rs.)
A	**Fixed Capital**				
1	Machinery (cutters, vessels, baskets, tarpaulin etc.)	Lump sum			50000
	Total fixed capital				**50000**
B	**Working Capital (seasonal for five months)**				
1	Fresh areca nuts	bag (120kg)	3500	2500	**8750000**
2	Labour costs				
A	Cutting areca nuts	bag (60kg)	7000	60	**420000**
B	Boiling and drying and safeguarding of areca nuts	person months	15	9000	**135000**
Total Working Capital*					**9305000**
Total fund required (Startup)					**9355000**

*Interest cost on capital have not been included

2.0 Cost Benefit Analysis

	Current Year (CY) (Rs.)	Cost of 1 Sample year (Rs.)
Fixed Capital		
Construction cost of pit	70000	15400
Cost of 50 baskets	5000	0
Water pipeline and stone bricks	40000	8800
Total FC	115000	24200
Working Capital		
Labor cost@ 300 per day for six months	0	0
Replacement costs for baskets	2500	2500
Total WC		2500
TOTAL COST		**26700**
Benefits		
Rent received	50000	50000
TOTAL BENEFIT		**50000**

Cost Benefit Analysis	
Total Perceived Benefits (Rs.)	50000
Total Perceived Costs (Rs.)	26700
NET BENEFIT(Rs.)	**23300**

A	Working Capital (seasonal for five months)				
S. No	Particulars	Unit	No of units	Price per unit	Total cost
1	Cost of boiled and dried areca nuts	bag (60kg)	1820	7000	1,27,40,000
2	Grading of Supari	person days	500	160	80000
3	Transportation	bags (50kg*)	1260	200	252000
Total working capital					1,30,72000

*Drop of weight due to processing loss