# Technological Interventions:
## Increase in area, productivity and income of coconut farmers in Assam

**J.C. Nath, S. Saikia and H.P. Maheswarappa***

All India Coordinated Research Project on Palms, Horticultural Research Station, Assam Agricultural University, Kahikuchi, Guwahati-781 017, Assam

*Project Coordinator, AICRP on Palms, ICAR-CPCRI, Kasaragod-671 124

### Introduction

Coconut palm (Cocos nucifera L.) is a unique plantation crop which provides all required amenities for human life which include food, drink, beverage, medicine, fibre, and a variety of raw materials for production of an array of products of commercial importance. The state of Assam particularly lower and central Brahmaputra valley is endowed with favourable soil and climatic conditions for growing coconut. In Assam, coconut is mainly a crop of homestead land with small and marginal land holdings. In recent years, coconut is gaining unprecedented popularity all over the states as well as neighbouring states due to its easy adaptability, wide range of uses and higher economic return. The palm is gradually gaining the status of major plantation crop in the state with an annual production of 132.59 million nuts from an area of 19.73 thousand ha and productivity of 6720 nuts/ha (2015-16).

Research work on fruit crops on regional basis was emphasized during second five year plan, which lead to the opening of the eight regional fruit research stations in different states of the country including Kahikuchi as one of the stations in Assam. Thus, the research on fruit crops at Kahikuchi was initiated in the year 1957 with a scheme on pineapple. The establishment was named as Regional Fruit Research Station in the year 1960-61 after inclusion of research schemes on banana, citrus and temperate fruits. The station was run by the Department of Agriculture, Govt. of Assam till 1973 after which it was handed over to the Assam Agricultural University and was named as Horticultural Research Station (HRS). Prior to handing over to AAU, the research works on coconut were carried out under the state scheme run by the Dept. of Agriculture, Govt. of Assam and during that period research works were mainly concentrated on standardization of spacing, method and time of planting, pit size, method of sowing seed nuts in the nursery, fertilizer requirement for the tall cultivar of coconut etc. Many recommendations as an outcome of the above research works were made for the region and the most notable achievements were the fertilizer requirement for the tall palms and controlling of crown choking disorder of coconut by the application of borax. However, with the establishment of All India Coordinated Research Project (AICRP) on Palms during October 1985, paved the way for conducting more extensive research works on coconut for the benefit of farmers of the region. The Centre is located near Lakapriyo Gopinath Bordoloi Airport (Borjhar) and about 17 km away from Guwahati city. Geographically, Kahikuchi is situated on the 26.30 N latitude, 91.70E longitude and 64 m above the mean

sea level. The area received an annual rainfall of about 1200-1500 mm and hot-humid during summer. Periodic dry spell generally occurs from November to March. The maximum and minimum temperature ranges from 190-350°C and 50-260°C, respectively. The soil of the centre is mainly alluvial clay-loam with the pH ranges from 4.4 to 5.5. Under this project, research works have been conducted primarily on crop improvement and natural resource management in coconut with the following mandates.

- To identify, conserve and utilize elite genetic resources for useful traits in palms from different agro-climatic regions and to evaluate performance of varieties/hybrids under different locations and to facilitate release of varieties/hybrids.
- To standardize suitable agro-techniques for optimizing nut yield and quality in coconut.
- To improve input use efficiency and develop location-specific palm based integrated cropping system to enhance the productivity per unit area.

## Research Achievements

### Crop improvement: Coconut variety/hybrid released

***Kamrupa:***

A high yielding tall coconut variety was released in the year 2001, which was selection from Assam Green Tall. It is having green colour oblong shaped nuts and an average yield of 100-110 nuts/palm/year and tolerant to stem bleeding, red palm weevil, crown choking and grey leaf spot with copra yield: 2.86 tonnes/ha, oil content: 65.0 %. The variety is recommended for commercial cultivation in Assam state.

*Kamrupa*

***Kalpa Samrudhi (MYD x WCT):***

The hybrid was released in the year 2009, with an average yield of 110-130 nuts/palm/year and copra content of 172 g/nut (3.1 t/ha) with 68.0 % oil content. Nuts are yellow-green coloured, oval shaped with tender nut water content of 345 ml/nut. The hybrid is moderately tolerant to stem bleeding, crown choking and moisture stress. It is suitable for copra and tender nut purpose. It is recommended for cultivation in Assam and Kerala.

*Kalpa Samrudhi*

## Crop Production

### Nutritional Studies

***a) Fertilizer requirement for hybrid coconut***

For the hybrid COD x WCT, a fertilizer dose of 500 g N: 500 g P2O5: 2000g K2O per palm in two splits (April and September) has been proved to be the best for recording highest yield of 115 nuts/palm/year and benefit cost ratio of 3.45. This nutritional dose for the hybrid COD x WCT has been recommended for the state of Assam.

***b) Integrated nutrient management in COD x WCT hybrid coconut***

An integrated nutrient dose for the hybrid coconut COD x WCT has been found to be suitable which gave higher yield of 110.5 nuts/palm/year and benefit cost ratio of 2.02. The dose consisted of N=500 g/palm/year (50% N by urea + 50% N by vermicompost), P2O5= 500 g/palm/year and K2O=2000 g/palm/year and is to be applied in two splits in April and September. This integrated nutrient dose for the hybrid COD x WCT has been recommended for Assam condition.

***c) Fertilizer application through micro-irrigation technique***

Application of 75% recommended NPK through drip irrigation in coconut during October to April in 10 equal splits at 20- day intervals was recommended which resulted significantly higher growth, yield and benefit cost ratio (2.27) compared to other treatments.

## Coconut based cropping system

***a. First generation coconut based high density multispecies cropping system***

A high density multispecies cropping system model (1024 m2/ model) comprised of Coconut + Black pepper (Var. Panniyur-1) + Ginger (Var. Nadia) + Assam lemon + Banana (Var. Chenichampa) + Pineapple (Var. Kew) was established and recommended which gave a net return of Rs. 67,375/ha with a benefit cost ratio of 1.67. Soil microbial population (bacteria, fungi and actinomycetes) was also recorded higher in the aforesaid model compared to monocropping.

***b) Second generation coconut based high density multispecies cropping system***

A profitable coconut based cropping system comprising of Coconut + Black pepper + Turmeric was recommended for the region which gave a net return of Rs.79,038/ha with benefit cost ratio of 1.56.

***c) Development of coconut based integrated cropping system***

The coconut based integrated cropping system model covering of 0.4 ha with crop components such as Turmeric (var. Megha), Pineapple (var. Kew), Assam lemon, Banana (Chenichampa) and Black pepper (Var Panniyur-1) along with coconut as monocrop were evaluated. Yield of coconut was increased from 55 nuts/palm/year to 66.0 nuts/palm/year with a per cent on nut increase of 20.0 % over a period of three years under CBCS. Soil and leaf nutrient (NPK) as well as earthworm and soil microbial population (Bacteria, fungi and actinomycetes) were increased compared to monocropping system. This model has a potential to earn more profit of Rs. 239,075/ha with a benefit cost ratio of 1.75.

***d) Medicinal and aromatic plants in coconut garden***

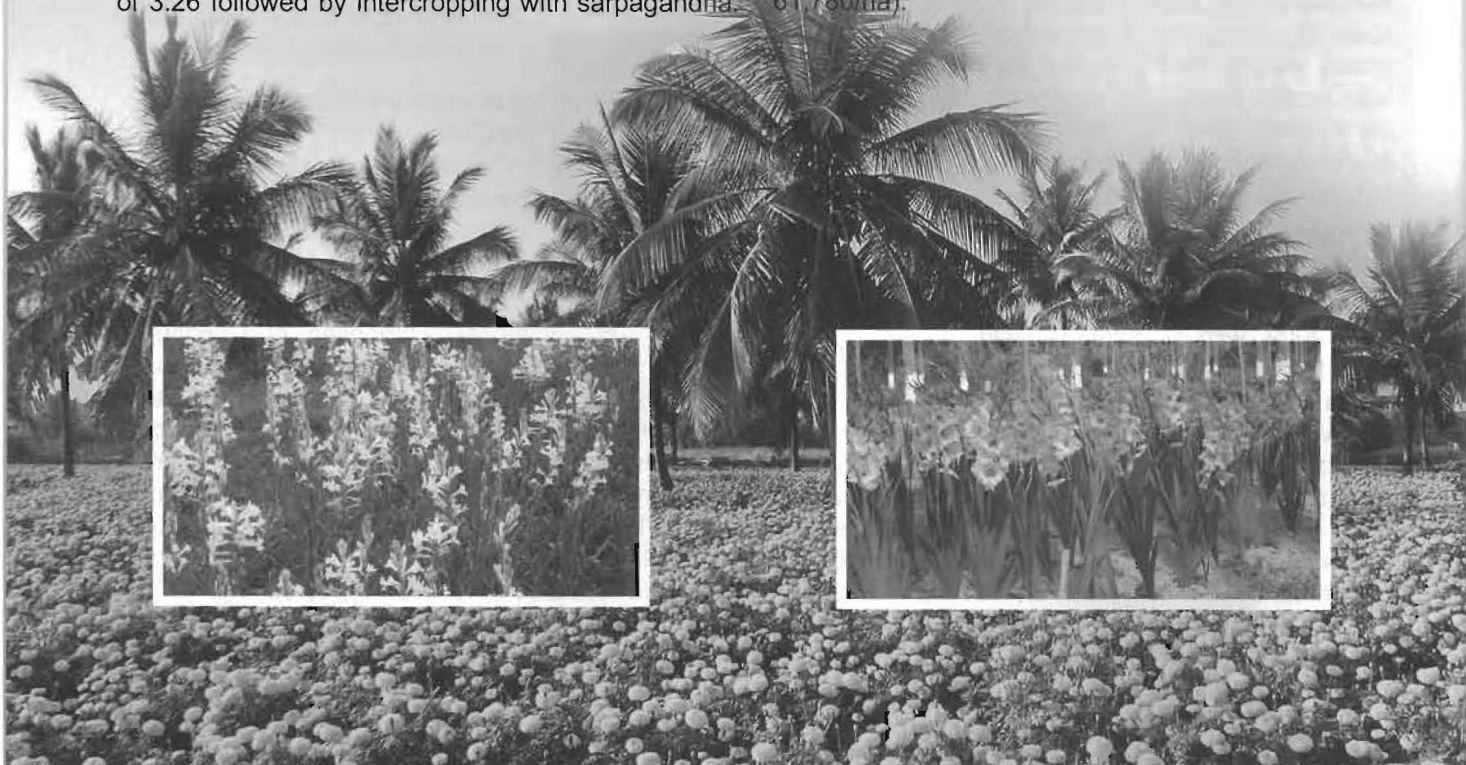
Three medicinal plants viz., Sarpagandha (Rauvolfia serpentina), Pipali (Piper longum) and Vedailota (Paederia foetida) and two aromatic plants viz., Citronella (Cymbopogon winterianus) and Patchouli (Pogostemon cablin) were evaluated. Intercropping system of growing patchouli under coconut was recommended which recorded the highest net income of Rs. 178.089/ha with B:C ratio of 3.26 followed by intercropping with sarpagandha.

> "In Assam, coconut is mainly a crop of homestead land with small and marginal land holdings. In recent years, coconut is gaining unprecedented popularity all over the states as well as neighbouring states"

The nut yield of coconut improved with intercropping with medicinal and aromatic crops.

***e) Flower crops as intercrops in coconut garden***

When five commercial flowering crops viz., Tuberose (Polianthes tuberosa) var. Single, Gerbera (Gerbera jamesonii) var. Red Monarch, Bird of Paradise (Strelitzia reginae) var. Glauca, Gladiolus (Gladiolus grandiflorus) var. Oscar, Marigold (Tagetes erecta) var. Siracole along with a control (coconut alone) were evaluated as intercrops in coconut garden, coconut equivalent yield was significantly higher in coconut + gerbera followed by coconut + tuberose and coconut +gladiolus with net return of Rs. 511,270/ha, Rs. 346,840/ha and Rs. 336,630/ha respectively, compared to coconut monocrop (Rs. 61,780/ha).



## Biomass recycling through vermicomposting in CBCS

The dried leaves and spathe of coconut, waste materials of the intercrops such as leaves and pseudostem of banana, leaves of turmeric and pineapple were collected, quantified and left for weathering. The weathered materials of coconut and other intercrops were used for vermicomposting. Glyricidia leaves collected from the plants raised in the boundary were also used for vermicomposting. It can be done with the help of earth worm *Eudrilus sp.* and the biomass can be recycled. On an average, 2004.0 kg of dried biomass can be obtained from the CBCS every year and around 2.4 tons of vermicompost can be produced per year. Vermiwash can also be collected during the process of vermicomposting and applied to coconut and intercrops. Recycling of biomass minimized the dose of application of inorganic fertilizer and thereby reduced the cost of production per ha.

## Nursery seedling production

Apart from the research and extension activities, the station has been producing a good number of quality coconut seedlings of the promising types, particularly the 'Kamrupa' every year which are being sold and distributed to the farmers in the states and to the neighbouring states.

## Extension activities

The All India Coordinated Research Project on Palms at Horticultural Research Station, Kahikuchi has been playing a significant role since its inception in various extension activities for transfer of technologies in the farmers' field to promote coconut culture as well as horticulture as a whole in the region. The various suitable technologies developed for coconut cultivation under AICRP on Palms and other schemes have been disseminated to the farming community through training, method demonstrations, awareness programme such as holding World Coconut Day, Coconut Show & Competition, Kesan Mela and Scientist-farmer interaction.

With the above research and extension activities which are being carried out by the station, and developmental activities taken up by the Coconut Development Board, might have an impact for the overall development of coconut industry in the state and as an outcome of R & D, a steady increase in area and production of coconut over the years have been noticed. Coconut production in Assam during 1985 was 57.41 million nuts from an area of 8034ha. The present production of coconut is 132.59 million nuts from an area of 19,730 ha (2015-16). Thus, there was an overall increase of 130.9 % per cent in production and 145.6 per cent in area over a period of 30 years.

*For further technological information contact:*

*Scientist–in-Charge, AICRP on Palms, HRS, Kahikuchi, Guwahati, Assam, Phone: 0ff.: 03612840232, Mob.: 09435197870* ■