

AICRP on Palms at a glance

In service to the nation since 1972

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**ICAR- ALL INDIA CO-ORDINATED RESEARCH PROJECT on PALMS
ICAR-CENTRAL PLANTATION CROPS RESEARCH INSTITUTE
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ICAR - All India Co-ordinated Research Projects on Palms

Introduction

Plantation crops form an important constituent of horticulture in the Indian agricultural scenario. Palms such as coconut (*Cocos nucifera* L.), oil palm (*Elaeis guineensis* Jacq.), arecanut (*Areca catechu* L.) and palmyrah (*Borassus flabellifer* L.) along with fruit crops such as cocoa (*Theobroma cacao* L) have immense commerce potential. Plantation crops play a key role in socio-economic development as it helps in the transition from subsistence farming to market-oriented, commercial cultivation. The cultivation of plantation crops in India also has a rich diversity and varied history, with each crop having its own historical and economic development context.

The All India Co-ordinated Research Project (AICRP) on Palms: An Overview

The All India Coordinated Research Project on Palms of Indian Council of Agricultural Research (ICAR) under the National Agricultural Research System (NARS) became operational in 1972. It is a unique institutional mechanism for evaluating site-specific and

need-based innovations pertaining to palms under different agro-climatic conditions across the country. The establishment of coordinated research at multi-locations based on a multi-disciplinary approach has enabled rapid strides in crop production in India. In India, plantation crops are grown in three agro-climatic conditions, namely the North Eastern Plains Zone (NEPZ), the Central Zone (CZ) and the Peninsular Zone (PZ). As of 2022-23, there are 28 AICRP centres with its headquarters at ICAR-CPCRI, Kasaragod. Currently, 15 centres are working on coconut, six on oil palm, four each on arecanut and palmyrah and seven on cocoa. These centres are located in different agro-climatic zones supporting improvement, production, protection and post-harvest processing in coconut, arecanut, oil palm, cocoa and palmyrah (Table 1). The coordinating centres are located in 14 states and one union territory covering 13 SAU's/SHU's, one Central Agricultural University and four ICAR Institutes. This paper articulates the outstanding achievements and future directions of coordinated research to meet the projected demand and diverse stakeholder interests.

Table 1. Zones, regions covered and research centres of AICRP on Palms

Zone	States covered	Centres	Numbers
North Eastern plains Zone	Bihar, Odisha, West Bengal, Assam and Plains of NE states	BAU, Sabour; BCKVV, Mondouri; AAU, Kahikuchi; CAU, Pasighat and OUAT, Bhubaneswar	4
Central Zone	Chhattisgarh and Gujarat	IGKVV, Jagdalpur and NAU, Navsari	2
Peninsular Zone	Maharashtra, Karnataka, Andhra Pradesh, Goa, Telangana, Tamil Nadu and Kerala	Dr. BSKKV(Ratnagiri, Mulde & Wakawali); Dr. YSRHU (Ambajipeta, Pandirimamidi & Vijayarai), TNAU(Aliyarnagar, Veppankulam, Killikulam & Pattukkottai); ICAR-CCARI, Goa, KAU(Pilicode & Thrissur) ICAR-CPCRI, Kasaragod, ICAR-IIOPR, Pedavegi; ICAR-CIARI- Port Blair;UAHS (Shivamogga &Bavikere)UHS (Arsikere & Sirsi) and SKLTSH, Kondamallepally	21

Mandate crops

Coconut

Coconut (*Cocos nucifera* L.) is a perennial plantation crop with a very long productive period requiring the identification of a suitable variety/hybrid to a particular agro-climatic region for achieving higher and sustained productivity. The two major morphoforms of coconut are Tall (T) and Dwarf (D). The Tall type is primarily out-crossing, while the Dwarf type is mainly self-pollinating (with a few exceptions). Tall cultivars are mainly grown for copra and oil purposes, while dwarfs are preferred for tender nuts. The four southern states, Kerala, Karnataka, Tamil Nadu and Andhra Pradesh, are the main coconut-growing areas in the country which account for 90 % of the area and contribute 93 % to production.

Arecanut

Arecanut (*Areca catechu* L.) is an important commercial plantation crop in India. Many farming households depend on the sector for their livelihood. India ranks first in the world for arecanut cultivation in the area (49%) and production (50%). Commercial production is concentrated in the Southwest and Northeast regions of the country. The Indian states of Karnataka, Kerala, Assam, West Bengal, Meghalaya and A&N Islands are the main producers; however, the products made from arecanut are widely available throughout the country.

Oil Palm

Oil palm (*Elaeis guineensis* Jacq.) is currently India's most important oil crop with high productivity (4- 6 t oil ha⁻¹) and an economic life cycle of 25- 30 years divided into three phases: immature (1-3 years), stabilizing (4-8 years) and stabilized (>8 years) phase. Palm oil is extracted from the fruit's fleshy orange-yellow mesocarp, while palm kernel oil (PKO) is extracted from the stony kernel. Generally, oil palm is referred to as an irrigated smallholder crop grown under India's diverse agro climatic conditions. Andhra Pradesh, Karnataka, Kerala, Odisha, Tamil Nadu and the north-eastern states of Arunachal Pradesh, Assam and Mizoram are the main oil palm-producing states of India. So far, an area of 3.45 lakh ha has been covered with

oil palm cultivation. Palm oil production in India remains meagre compared to the ever-increasing demand for vegetable oils.

Palmyrah

Palmyrah palm (*Borassus flabellifer* L.), native to tropical regions, is an important multipurpose tree. It grows extensively in the southern states of India. This palm adorns the landscape of the tropics in Tamil Nadu, Andhra Pradesh, Odisha, West Bengal, Bihar, Karnataka and Maharashtra. There are almost 120 million palm trees in these regions. Akin to the coconut, every single part of the palm, from the fruit to the root, has an immense economic value; hence, the palmyrah tree was considered the *Kalpa Vriksha* in mythology. As cultivation of this palm offers immense potential, no determined efforts are being made to bring the palm into cultivation.

Cocoa

Cocoa (*Theobroma cacao* L.), a beverage crop with high commercial potential, is mainly grown in India as a mixed crop under arecanut and coconut plantations and, more recently, under oil palm plantations. It is mainly grown in the four major southern states of Kerala, Karnataka, Tamil Nadu and Andhra Pradesh. The country's cocoa industry has grown substantially in recent years, with a significant contribution to the nation's GDP.

Mandate of the AICRP on Palms

- Identification, conservation and utilization of elite genetic resources for useful traits in palms and cocoa from different agro-climatic regions.
- Evaluation of varieties/hybrids under different locations and to facilitate release of varieties/hybrids of palms and cocoa through multi-location testing (MLT).
- To improve input use efficiency and develop location-specific palm based integrated farming systems to enhance the productivity per unit area.
- Evolving cost effective integrated insect-pest and disease management practices besides survey and surveillance of pests and diseases for forewarning.
- Development of post-harvest technologies in palmyrah.

1. ICAR - Central Plantation Crops Research Institute, Kasaragod - 671 124

Sl.No.	Details	Particulars
1	Centre	CPCRI Kasaragod
2	State/UT	Kerala
3	Year of commencement of centre	1970
4	Present mandate crops	Coconut, Arecanut, Cocoa and Palmyrah
5	Institute/university/organisation	Indian Council of Agriculture Research
6	Latitude in decimals	12.528 N
7	Longitude in decimals	74.969 E
8	Altitude	10.7 m above MSL
9	Selected Agro-climatic features of Sub-region	Western Plains & Ghat Region
10	Temp. Max	31.2 °C
11	Temp. Min	23.6 °C
12	RH	60-80%
13	Soil pH	5.5 to 6.3%
14	Soil type	The farm has 3 types of soils viz. red sandy loam, laterite and littoral sandy soil
15	Area	77.71 hectare of land with coconut
16	Irrigation/rainfed	Irrigated
18	Annual Rainfall (mm)	3462 mm.
19	Monsoon	South West monsoon
20	Organic/INM /both	Both
21	Improvement/Management/PHT/Extension	Improvement/Management /PHT/Extension

Accomplishments

ICAR-Central Plantation Crops Research Institute (ICAR-CPCRI), which hosts the National Active Germplasm site (NAGS) for plantation crops, is actively involved in conservation of coconut, arecanut and cocoa diversity and supplies germplasm to the stakeholders. ICAR-CPCRI maintains a large collection of coconut (455 accessions), arecanut (182 accessions) and cocoa germplasm (530 accessions).

Ambitions

- To develop technologies that enhance resource use efficiency, profitability and livelihood security of people who depend on plantation crops.
- Self sufficiency in quality planting material production.

Action Plan

- Basic, strategic and applied research to enhance sustainable productivity, quality and utilization of coconut, arecanut and cocoa
- Repository of plantation crops genetic resources and scientific information
- Transfer of Technology, capacity building and impact assessment of technologies
- Coordinate research and validation of technologies on plantation crops through AICRP on Palms

2. Coconut Research Station, Aliyarnagar, Coimbatore Dt. - 642 101

Sl.No.	Details	Particulars
1	Centre	Aliyarnagar
2	State/UT	Tamil Nadu
3	Year of commencement of centre	1988
4	Present mandate crops	Coconut and Cocoa
5	Institute/university/organization	Tamil Nadu Agricultural University, Tamil Nadu
6	Latitude	10° 39' 29.70" N
7	Longitude	77° 00' 30.60" E
8	Altitude	260 m above MSL
9	Selected Agro-climatic features of Sub-region	Western zone of Tamil Nadu; AEZ No.8. Hot semi arid eco region
10	Temp. Max	37-40°C
11	Temp. Min	16-18 °C
12	RH	85 – 95 %
13	Soil pH	7.7-8.5
14	Soil type	Red Sandy loam (Fluventic Ustropept)
15	Irrigation/Rainfed	Irrigated
16	Annual Rainfall (mm)	860 - 900 mm
17	No of rainy days	50-55
18	Monsoon	South West Monsoon, North East Monsoon and Summer Showers
19	Organic/INM/both	Both
20	Improvement/Management/PHT/Extension	Crop Improvement, Crop Management and Crop protection of coconut and coconut based intercropping systems, Extension activities of cutting edge research techniques
21	Area available	21 ha
22	Laboratory/processing	Hybridization lab, Horticulture lab., Soil Science lab, Entomology lab, Plant Pathology lab, Bio-control laboratories of Entomology and Plant Pathology.
23	Planting material production (Nos)	Coconut Seedling of Tall, Dwarf and Hybrids of coconut - 5000 Nos/years
24	Nursery facilities at the location	Yes
25	Mother garden available	Tall- 170 palms, Dwarf - 100 palms
26	Number of germplasm available for research	Coconut – 72
27	Other major strength	ODL Programme on coconut cultivation
28	Production and supply of parasitoids /natural enemy	<i>Bracon brevicornis</i> : 7, 47,600 Nos. <i>Encarsia</i> : 323 packs Bio agents: <i>Trichoderma viride</i> : 500 kg <i>Bacillus subtilis</i> : 500kg

Accomplishments

Varieties released

Aliyarnagar Centre of Tamil Nadu Agricultural University, Tamil Nadu has released the following varieties in coconut for the benefit of the farming community.

- Coconut - ALR (CN) 1 (Year of Release : 2002)- selection from Arasampati Tall
- Coconut – ALR (CN) 2 (Year of Release : 2010)- selection from Kenthali Orange Tall
- Coconut - ALR (CN) 3 (Year of Release : 2012)- selection from Tiptur Tall Released as Kalpatharu by CPCRI during 2008
- Based on the performance at Aliyar Nagar centre and CPCRI, Kasaragod, the coconut selection from **San Ramon** tall was released as **Kalpa Shatabdi** by CPCRI during 2016.
- **Kalpa Ratna** is a tall coconut variety released by CPCRI and the centre during 2019.

Technologies developed

Crop management

- Coconut based multitier cropping system comprising of Coconut + Cocoa +Pineapple + Banana was developed which is suitable for the Western Ghats region of Tamil Nadu.
- Flower crops viz., Marigold and Gomphrena were identified as remunerative intercrops in adult coconut gardens without any reduction in nut yield.
- Medicinal plant - Sitharathai (*Alpinia galanga*) and the aromatic plant - Lemon grass (*Cymbopogon flexuosus*) were identified as better performing in adult coconut garden with higher cost benefit.
- Under coconut based high density cropping system with compatible crops, application of 50 % RDF (NPK) + 50 % N through organic recycling with vermicompost + vermiwash application + biofertilizer application and *insitu* green manuring recommended for highest system productivity in coconut.
- Site Specific Nutrient Management with secondary ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ – 1 kg and MgSO_4 – 500 g per palm per year) + Micronutrient mixture @ 1 kg per palm per year + Coconut frond mulching +

Azospirillum– 100 g + *Phosphobacteria*-100 g + VAM -100 g per palm per year for enhanced productivity by 32 % over farmers' practice in Tender nut variety Chowghat Orange Dwarf.

Crop protection

- Soil application of microbial consortia consisting of *Pseudomonas fluorescens*, *Bacillus subtilis* and *Trichoderma viride* @ 300 g + FYM @ 5 kg / palm at quarterly intervals was found to be effective in reducing the leaf blight disease incidence in coconut.
- IDM package (soil application of *Pseudomonas fluorescens* Pf1, root feeding of carbendazim @ 2 %, spraying of copper oxy chloride during summer months together with excess application of potassic fertilizer) for the management of leaf blight disease was developed and demonstrated in farmers' holdings.
- Root feeding of tebuconazole @ 2 % for 3 times at 3 month interval was found to be effective in reducing the leaf blight disease intensity.
- Root feeding with propiconazole @ 5 ml in 100 ml of water at three months intervals during Jan, April, July and October reduced the leaf blight incidence by 27.0 per cent after 36 months of treatment. This treatment also recorded the highest nut yield of 138 nuts/ palm/year and the B:C ratio of 3.7 as against 97 nuts/ palm/ year in the untreated control.
- Spraying of Azadirachtin TS @ 1% i.e. 10,000 ppm @ 5 ml + Sandovit 1ml / litre of water followed by release of improved strains of two larval parasitoids braconids, bethylids and pupal parasitoid chalcid @ 20:10:1 at 21 days interval for six times show significant effect on reduction of *Opisina arenosella* population in coconut.
- IPM strategies viz., placement of naphthalene balls @ 10 g/palm, pheromone lures @ 1/ ha, spraying green muscardine fungi in manure pits @ 5×10^{11} spores/ m^3 and release of baculovirus affected adult beetles @ 15/ha, for the management of rhinoceros beetle in coconut were standardized.
- Cowdung manure, manure pits, coir pith waste, vermicompost units, palms dead/ felled due to thunder & lightning, stem bleeding, sites, palm

crowns and trunks attacked by red palm weevil, etc. were found to house different life stages of rhinoceros beetles. Chlorpyrifos 1.5%DP and chlorantranilprole 0.4% GR insecticides along with 100-150 gram of sand are effective in reducing the leaf and spindle damage as effective as phorate 10G insecticide. Thus chlorantranilprole and chlorpyrifos can be recommended for the management of rhinoceros beetle in coconut ecosystems.

- Nutrient management (1.3 kg Urea; 2.0 kg Super phosphate; 3.5 kg Muriate of potash, 20 kg FYM and 20 kg vermicompost, 5 kg neem cake and green manuring with Cowpea / sunnhemp in the coconut basins and husk incorporation in the inter rows) together with micronutrient application and Keraprobio (100 g/palm) in a well irrigated garden and root feeding with fenpyroximate 5%EC @ 10 ml and 20 ml water during March and spraying palm oil – sulphur emulsion during December for the management of Eriophid mite in coconut.

Ambitions

- Knowledge dissemination on high tech cultivation of coconut
- Management of threatening of pest and disease through use of bio control agents
- Conduct of demonstration and meetings to address major issues of coconut cultivation
- To promote farmer groups/ FPOs on coconut cultivation & value addition



Action Plan

Coconut

- Collection, evaluation and maintenance of coconut germplasm.
- Evaluation of promising hybrids and varieties of coconut
- Development of coconut hybrids with high copra and oil content
- Coconut based inter/mixed cropping models suitable for Pollachi region
- Integrated nutrient management in coconut
- Improving water and nutrient use efficiency through drip fertigation in coconut
- Survey and monitoring the major pests and diseases of coconut
- Mass production and distribution of bio control agents viz., *Bracon brevicornis* against coconut black headed caterpillar
- Preventing the spread of root wilt disease of coconut in Tamil Nadu
- Studies on the management of leaf blight disease of coconut

Cocoa

- Identification of suitable clones for intercropping in coconut gardens of Pollachi tract
- Micronutrient management of cocoa



ALR (CN) 1

3. Horticultural Research Station, Ambajipeta, East Godavari Dt. - 533 214

Sl.No.	Details	Particulars
1	Centre	Ambajipeta
2	State/UT	Andhra Pradesh
3	Year of commencement of centre	1975
4	Present mandate crops	Coconut and Cocoa
5	Institute/university/organization	Dr. YSR. Horticultural University
6	Latitude	16.36 N
7	Longitude	81.56 E
8	Altitude	14.05 m above MSL
9	Selected Agro-climatic features of Sub-region	Godavari delta region with coastal alluvial soils
10	Temp. Max	35-39°C
11	Temp. Min	19-29°C
12	RH	85-95 %
13	Soil pH	7.5-8.5
14	Soil type	Coastal alluvial
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1200 to 1300
17	No of rainy days	60-80
18	Monsoon	South West Monsoon , North East Monsoon and cyclonic rains
19	Organic/INM /both	Both
20	Improvement/Management/ PHT/Extension	Improvement, Management and Extension
21	Area available	21 ha
22	Laboratory/processing	Hybridization lab, Horticulture lab., Soil Science lab, Entomology lab, Plant Pathology lab, Bio-control laboratories of Entomology and Plant Pathology,
23	Nursery facilities at the location	NHB accredited two star rated coconut nursery available
24	Planting material production (Nos)	Gauthami Ganga (2837), Double Century (180), Kalpa Pratibha (45)
25	Mother garden available	Gauthami Ganga-150 palms, Kalpa Pratibha-80 palms, Double century-80 palms
25	Number of germplasm available for research	20 (Local coconut germplasm 13 and 7 other varieties)
26	Parasitoids and Bio agents supplied	<i>Bracon hebetor</i> (29,800), <i>Bracon brevicornis</i> (19000), <i>Goniozus nephantidis</i> (1,22,800), <i>Pediobius imbrues</i> (5000), <i>Apert ochrysaastur</i> eggs (14,17,750), <i>Apertochrysaastur</i> grubs (1,99,000), <i>Trichogramma chilonis</i> cards in cc (178) and <i>Trichogrammajaponicum</i> cards in cc(2), Bio agents: <i>Trichoderma reesei</i> (1300 kg) and <i>Pseudomonas flourescens</i> (900 kg)



Accomplishments

- Released and notified coconut varieties- Double Century, Kera Bastar, Kalpa Pratiba and Gauthami Ganga and Coconut Hybrid viz., Godavari Ganga, Vasista Ganga, Abhaya Ganga, Vynateya Ganga.
- Standardized Coconut production technology viz., spacing, fertilizer dose, INM package, fertigation schedule and INM technology with recycling of coconut Bio-Mass.
- Banana, Cinnamon, Cocoa, Black Pepper, Pineapple, Elephant Foot Yam, Colocasia and Turmeric were recommended as suitable intercrops in coconut.
- Developed two coconut based high density multi species cropping models viz., Model-I (Coconut + Pepper + Banana + Cocoa + Pineapple + Cinnamon) and Model-II (Coconut + Banana + Elephant foot Yam + Turmeric)
- Developed technologies for value addition in coconut (coconut chips) and standardized a technique for bioconversion of tender coconut waste.
- Production and supply of quality coconut planting material.
- Established Bio Control Laboratories (Pathology and Entomology) for production and mass multiplication of predators, parasitoids and bio agents
- Developed root feeding technique in coconut. Developed IPM against coconut black headed caterpillar, Rhinoceros beetle, Red palm weevil, Eriophyid mite, Slug caterpillar and Rugose spiraling whitefly
- Molecular characterization of *Ganoderma applanatum* and *Ganoderma lucidum* by Scanning Electron Microscopy (SEM), SDS – PAGE, Native PAGE & PCR and Developed Polyclonal antiserum for *Ganoderma* spp. and detected by simple serological tests & indirect form of ELISA, Identified Redgram, *Sesbania* and *Eucalyptus* as indicator plants for early detection of *Ganoderma* wilt disease in coconut.
- Developed bio control based IDM against basal stem rot, Stem bleeding and bud rot diseases in coconut
- Microbial Cultures *Trichoderma areesei*, *Trichoderma asperellum* and *Trichoderma maharizianum* were deposited at ICAR-NBAIM.
- Developed protocols for mass multiplication of bio agents, *Trichoderma* spp. & *Psuedomonas fluorescens* & entomopathogenic fungi-*Isaria fumosorosea* (NB AIR-Pfu5), produced and supplied to the farmers. Developed Dr YSRHU-Coconut IDM special for management of coconut diseases

Ambitions

- Identification, conservation and Geo tagging of elite coconut mother palms
- Development of varieties/hybrids for tender nut and Identification/Development of bio-fortified coconut varieties.
- Development of pests and diseases distribution maps.
- Development of robust eco friendly ecological engineering based IPDM modules.

Action plan

- Identification of coconut elite mother palms in progressive farmers gardens and geo tagging of identified mother palms
- Development of coconut varieties/hybrids for tender nut purpose with high quantity of water and TSS through selection and hybridization.
- Bio fortified varieties through appropriate management practices
- Fatty acid profiling of local germplasm accessions suitable for commercial purpose.
- Roving survey of insect pests and diseases in newly introduced (cultivated) coconut areas.
- Exploration of potential Coccinellids predators for the management of coconut insect pests
- Diversity, abundance and pollination efficiency of different insect visitors/pollinators and standardization of ideal number of bee hives per acre in coconut eco system for doubling of farmer's income.
- Introduction, mass multiplication and field establishment of sooty mould scavenging beetle (*Leiochrinus nilgirianus*)
- Rhizosphere engineering of coconut palm with microbial consortia
- Standardization of IPDM module by integrating of developed IPM and IDM packages of coconut

4. Horticultural Research and Extension Station, Arsikere, Hassan Dt. -573 103

Sl.No.	Details	Particulars
1	Centre	Arsikere
2	State/UT	Karnataka
3	Year of commencement of centre	1976
4	Present mandate crops	Coconut
5	Institute/university/organization	University of Horticultural Sciences, Bagalkot
6	Latitude	13.26 N
7	Longitude	76.23 E
8	Altitude	808 m above MSL
9	Selected Agro-climatic features of Sub-region	Southern Dry zone (zone-VI) of Karnataka
10	Temp. Max	33-35°C
11	Temp. Min	21-23 °C
12	RH	70- 80%
13	Soil pH	7.1 - 7.6
14	Soil type	Red Sandy loam medium black clayey
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	815 mm
17	No of rainy days	54
18	Monsoon	South West and North East Monsoon
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Crop Improvement, Crop production and Crop protection of coconut and coconut based intercrops, Extension-transfer of technology
21	Area available	48.6ha
22	Laboratory/processing	Plant Pathology lab and Entomology lab
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Coconut seedlings Tall-Kalpatharu (Tiptur tall selection)- 8720 Nos, COD-45; GBGD;45
25	Mother garden available	GBGD-50 palms; Kalpatharu-50 palms
26	Number of germplasm available for research	5 local germplasm/accessions (15 each)

Accomplishments

- Released one coconut variety Kalpatharu. Three coconut hybrid viz., Kalpa Shresta, Kalpa Ganga and Vasishta Ganga have been recommended for cultivation in Karnataka State.
- Developed technology on 'growing of commercial flower crops (Jasmine, Chrysanthemum, Crossandra, China aster and Marigold) as intercrops in coconut gardens. Evaluated and showcased the suitability of intercrops viz., cocoa, lime, drumstick and banana in coconut gardens.

- Identified the suitable medicinal and aromatic crops (viz., Lemon grass (*Cymbopogon flexuosus*), garden rue (*Ruta graveolens*), tulsi (*Ocimum sanctum*), Kalmegh (*Andrographis paniculata*), arrow root (*Maranta arundinaceae*), and makoi (*Solanum nigrum*) as a inter-crops in coconut gardens of *maidan* tract of Karnataka.
- Developed Integrated nutrient management in Coconut based integrated cropping system. Standardized the production technologies on water conservation techniques by husk burial/mulching method, organic recycling with vermicompost + vermiwash application + biofertilizer application, *in situ* green manuring & green leaf manuring (Glyricidia loppings) + Composted coir pith and mulching with coconut leaves.
- Developed technology on integration of cow and sheep (livestock) based cropping system in coconut.
- Developed integrated pest management technologies for major coconut pests viz Rhinoceros beetle (*Oryctes rhinoceros*), Eriophyid mite, Slug caterpillar, Rugose spiralling whitefly, Red Palm Weevil in Karnataka state.
- Developed the integrated disease management technologies for basal stem rot and stem bleeding disease of coconut in Karnataka.
- Established the biocontrol laboratories mass multiplication of predators, parasitoids and bio control agents.

Ambition

- To enhance the availability of quality seedling materials of released variety, dwarf varieties and hybrids to the farming community.

- Development of location specific cropping system including minor fruit, vegetable, flower, medicinal and aromatic crops in coconut.
- Development of location specific integrated framing system model by integrating INM, IPM, Water conservation techniques and live stocks in coconut.
- To popularize the improved varieties, IPM& IDM production technologies.
- To evaluate location specific upcoming coconut variety/hybrids for product diversification

Action Plan

- Collection, conservation and evaluation of location specific varieties for quality copra and tender nut purpose.
- Production of quality coconut seedlings Kalpatharu. Production of hybrid seedlings of Kalpa Ganga and Vasista Ganga through hybridization techniques.
- Popularization of developed technologies on IFS and Integrated Cropping System through demonstrations, trainings, exposure visits and publications.
- Standardization of IPDM modules against major pest and diseases in coconut by incorporating including bio based management strategies.
- Survey and surveillance of insect pests and diseases in major coconut growing areas of Karnataka for recording emerging pests if any.
- To study coconut eco system management.



Kalpatharu

5. Department of Horticulture, (OUAT), Bhubaneswar - 751 003

Sl.No.	Details	Particulars
1	Centre	Bhubaneswar
2	State/UT	Odisha
3	Year of commencement of centre	1976
4	Present mandate crops	Coconut
5	Institute/university/organization	Odisha University of Agriculture and Technology
6	Latitude in decimals	20.26 N
7	Longitude in decimals	85.80 E
8	Altitude	50.61 m above MSL
9	Selected Agro-climatic features of Sub-region	East & South Eastern Coastal Plain
10	Temp. Max	43°C
11	Temp. Min	26.5 °C
12	RH	47-91 %
13	Soil pH	6.2-6.8
14	Soil type	Clay loam & sandy loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1466 mm
17	No of rainy days	79
18	Monsoon	South West Monsoon
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Crop improvement & Crop Production
21	Area available	13 ha and in Sakhigopal 20 ha
22	Laboratory/processing	Horticulture Lab
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	1500 (Tall & Dwarf)
25	Mother garden available	Tall-156, Dwarf-30
26	Number of germplasm available for research	Coconut – 62

Accomplishments

- Godavari Ganga (ECT X GBGD), Kera Sankara (WCT x COD), Kera Ganga (WCT x GBGD) and Chandra Sankara (COD x WCT) are recommended for cultivation in Odisha State
- Coconut based cropping system with coconut+ guava + banana +pineapple + Colocasia under integrated nutrient management of 75% of

recommended NPK coupled with organic recycling with vermicompost is more remunerative in the yield stabilizing phase of coconut in costal Odisha condition.

- The coconut based cropping system consists of coconut+ banana+ tuberose in young coconut garden found more profitable and recommended for commercial adoption in the state Odisha.



- Medicinal and aromatic plants like stevia (*Stevia rebusiana*) and Artensia (*Artensia pallens*) are more promising for cultivation as intercrops in coconut gardens under Odisha condition.

Ambition

- Emphasize the need to revive coconut and coconut based livelihoods that have been severely affected by the cyclone last year

Action Plan

- Evaluation of promising hybrids and varieties of coconut for cyclone prone area of Odisha
- Development of coconut hybrids with high copra and oil content for Odisha
- Coconut based inter/mixed cropping suitable for Odisha

6. Central Coastal Agricultural Research Institute, Ela, Old Goa Dt. - 403 402

Sl.No.	Details	Particulars
1	Centre	Goa
2	State/UT	Goa
3	Year of commencement of centre	2015
4	Present mandate crops	Coconut and arecanut
5	Institute/university/organization	ICAR Central Coastal Agricultural Research Institute Ela Old Goa 403402 Goa
6	Latitude in decimals	15°30'52" N
7	Longitude in decimals	73°55'01" E
8	Altitude	21 m above MSL
9	Selected Agro-climatic features of Sub-region	Goa Coast of Konkan region west coast
10	Temp. Max	26-39°C
11	Temp. Min	17.6-27.4°C
12	RH	Morning - 80.1 to 94.5% /AN 35.1 to 84.3%
13	Soil pH	5.81-6.85
14	Soil type	Red Laterite soil
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	3000 mm
17	No of rainy days	100
18	Monsoon	South West monsoon
19	Organic/INM /both	Both
20	Improvement/Management/PHT/Extension	Improvement, Management, Extension
21	Area available	2. 00 ha
22	Laboratory/processing	Horticulture Lab
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Coconut seedlings- 500 (Benaullim, Calangute, COD, MYD, GBGD)
25	Mother garden available	Arecanut- Hirehalli Dwarf 100

Accomplishments

- Coconut Germplasm of Goa are ready for conservation (Rivona, Gaodongrim, Canacona, Calangute, Benaullim)
- Varieties- Goa Benaullim Pani a selection for tender coconut identified for further exploitation.
- Arecanut Seed garden of Hirehalli Dwarf established with 350 palms of which 75 are in flowering/fruited stage
- Coconut based cropping system models compared and Coconut-pineapple-passion fruit gave double net return over coconut monocrop over 6 years
- A selection of coconut dwarf stature with large fruit size (D6) identified
- A selection of arecanut with dwarf stature with large fruit and chali identified

- Germplasm of arecanut with quality chali, large fruit, chali, year round bearing identified
- Training of farmers, coconut climbers, farm workers women in using coconut climbing device

Ambitions

- To increase coconut productivity of Goa state from 5100 nuts per hectare to 8000 nuts per hectare
 - To increase the income from coconut gardens of Goa state from Rs 67000 per hectare to Rs 90000 per hectare by intensive intercropping, tender coconuts and virgin coconut oil
 - To reduce the drudgery of coconut climbers of Goa state
 - To reduce the cost of cultivation of arecanut garden of Goa state from Rs 49000 per hectare to Rs 30000 per hectare by dwarf stature genotype
 - To popularize the best management practices of coconut and arecanut
- To popularize the tender coconut harvest and use, virgin coconut oil production

Action plan

- Establish seed gardens of selected local dwarf and tall populations, NiuLekha Dwarf / Annapurna/ Goa BenaulimPani/ at five locations of major coconut growing areas of Goa (Old Goa, Coda of Ponda, Salcette, Quepem, Pernem)
- Strengthen seed gardens of improved arecanut varieties (Mohitnagar, local varieties, Shriwardhan, Hierhalli Dwarf Selection) at two major arecanut growing locations of Goa (Coda of Ponda, Old Goa)
- Enhance the best intercropping practices by demonstration plots in coconut and arecanut
- Providing training and awareness programs on coconut and arecanut cultivation, mechanization and value addition.



ICAR- Central Coastal Agricultural Research Institute, Goa

7. Shaheed Gundadthur College of Agriculture & Research Station, Kumharawand Farm, Jagdalpur - 494005

Sl.No.	Details	Particulars
1	Centre	Jagdalpur
2	State/UT	Chhattisgarh
3	Year of commencement of centre	1987
4	Present mandate crops	Coconut
5	Institute/university/organization	S. G. College of Agriculture and Research Station, Jagdalpur IGKV, Raipur
6	Latitude in decimals	19.1°N
7	Longitude in decimals	81.9°E
8	Altitude	552 meters above MSL
9	Selected Agro-climatic features of Sub-region	Zone- VII (Eastern Plateau and Hills). Bastar is located in India's Eastern plateau and hills region, which is classed as subtropical humid with hot summers and cold winters. The rain comes from the south-western monsoon. Soils are red and yellow with occasional patches of laterites and alluviums.
10	Temp. Max	31.1°C
11	Temp. Min	18.7°C
12	RH	Morning – 87 % Evening – 50%
13	Soil pH	6.4
14	Soil type	Silty-loam to Clay-loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1200 to 1600
17	No of rainy days	85 Days
18	Monsoon	South West Monsoon received from June to September with its peak in July and August. Climate is Sub tropical with hot and humid.
19	Organic/INM/both	INM
20	Improvement/Management/PHT/Extension	Improvement & Extension
21	Area available	2.50 ha
22	Laboratory/processing	Horticulture lab
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Kera Bastar
25	Mother garden available	Kera Bastar-100 palms
26	Number of germplasm available for research	6 local germplasm
27	Other major strength	Well-equipped lab of UG standard

Accomplishments

- CVRC release of coconut variety Kera Bastar in 2010 recommended for cultivation in Chhattisgarh, Andhra Pradesh and Tamil Nadu.
- 50% of RDF + 50 % through organic recycling with vermicompost + vermiwash application + biofertilizer application and *in situ* green manuring was found good under coconut based cropping system.
- Marigold, China Aster, Gerbera flowers are profitable intercrops under coconut based cropping system.
- Soil application of *Trichoderma* is found effective against suphi (*Carryota urens*) wilt.
- Release of entomopathogenic fungus, *Isaria fumosorosea* procured from NBAIR, Bangalore for the management of RSW.
- Release and multiplication of predator, *Aperto chrysaastur* procured from HRS, Ambajipeta for the management of RSW.

Ambitions

- To strengthen the Research, extension and HRD in coconut farming in Chhattisgarh.
- Providing technical support to the stakeholders, extension officers of KVKs and state government and farmers.
- Development of linkage between CDB, Kondagaon and state Agriculture and Horticulture department.

Action plan

- Area expansion of coconut in the non traditional area of Chhattisgarh.
- Production of quality planting material of coconut in the region.
- Approaching the farmers for practicing coconut based farming system in the region.



Kera Bastar

8. Horticultural Research Station, Kahikuchi, Guwahati Kamrup Dt. - 781 017

Sl.No.	Details	Particulars
1	Centre	Kahikuchi
2	State/UT	Assam
3	Year of commencement of centre	1985
4	Present mandate crops	Coconut & Cocoa
5	Institute/university/organization	Assam Agricultural University
6	Latitude in decimals	26.3° N
7	Longitude in decimals	91.7° E
8	Altitude	64 m above MSL
9	Selected Agro-climatic features of Sub-region	Lower Brahmaputra Valley Zone
10	Temp. Max	35-37°C
11	Temp. Min	8-10°C
12	RH	Morning-85 %
13	Soil pH	4.5-5.5
14	Soil type	Alluvial clay-loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1200-1500 mm
17	No of rainy days	88 Days
18	Monsoon	South West Monsoon
19	Organic/INM /both	INM
20	Improvement/Management/PHT/Extension	Crop Improvement & Extension
21	Area available	6.07ha
22	Laboratory/processing	Horticulture Lab
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Coconut seedlings-2200(Kamrupa)
25	Mother garden available	Kamrupa- 120 palms
26	Number of germplasm available for research	17 local germplasm

Accomplishments:

- **Variety developed:** A coconut variety '**Kamrupa**' which is high yielder (more than 100 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 % had been released, Notified and recommended for commercial cultivation in Assam state.
- **Hybrid released:** A coconut hybrid '**Kalpa Samrudhi**' (MYD x WCT) in collaboration with CPCRI, Kasaragod was released, notified and recommended for the state of Assam and Kerala

which is high yielder (more than 138nuts/palm/year), semi-tall, precocious bearing (comes to bear at 5 years), Copra yield: 3.1 tonnes/ha, oil content of 68.0 %.

- **Establishment of coconut based high density multispecies cropping system:** A suitable model of coconut based high density multispecies cropping system has been established based on the results of the experiment carried out during 1991 to 2001. The model comprised of Coconut (16 adult palms) + Black pepper (Var. Panniyur-1) + Ginger (Var. Nadia) + Assam lemon + Banana

(Var. Chenichampa) + Pineapple (Var. Kew). Area of the model was 1024 m². The above model was found to be profitable giving the highest net return of Rs. 3.0 - 4.5 lakh/ha with a benefit cost ratio of 1.67.

- **Nutritional requirement of high yielding/hybrid coconut:** A fertilizer dose of 500 g N: 500 g P₂O₅: 2000g K₂O for coconut hybrid COD x WCT, has been recommended for the state of Assam which gave higher yield of 114.8 nuts/palm/year and benefit cost ratio of 3.45.
- **Integrated nutrient management in COD x WCT hybrid coconut in Assam:** An integrated nutrient dose for the hybrid coconut COD x WCT 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 has been recommended for the state of Assam for giving higher yield of 110.5 nuts/palm/year and benefit cost ratio of 2.02.
- **2nd generation coconut based high density multispecies cropping system:** Another a profitable coconut based cropping system comprising of Coconut + black pepper+ turmeric has been found suitable for Assam which gave a net return of Rs.79,038/ha with benefit cost ratio of 1.36.
- **Development of coconut based medicinal and aromatic cropping system model:** A remunerative coconut based medicinal and aromatic cropping system model was developed at the centre. Out of five 5 MAPs tried under coconut, the intercropping system of coconut + patchouli proved to be the best which recorded net return of Rs. 1, 78,089/ha and benefit cost ratio of 3.26 as against Rs. 52,750/ha and B:C ratio of 1.85 under coconut alone
- **Standardization of fertilizer application through micro-irrigation technique for coconut:** Application of 75 % RDF through drip irrigation has been recommended for recording the higher nut yield (87.2 nuts/palm/year) and net return of Rs. 105470/ha with B: C ratio of 2.23 followed by 100% RDF through drip irrigation.
- **Intercropping of flower crops in coconut garden:** Commercial flower crops such as

gerbera, tuberose, gladiolus and marigold can be grown as remunerative flower crops in adult coconut garden without reduction in nut yield. The cropping system coconut + gerbera was more profitable (Net income: Rs.380075/ha, B:C ratio: 3.5) than other flower crop.

- **Nutrient management in coconut based cropping system:** Application of 50% of RDF (345 g N, 200 g P₂O₅, 525 g K₂O/palm/year) and organic recycling with vermicompost 16.4 kg/palm/year, vermiwash 5 lit/palm/yr, biofertilizer 100g/palm/yr and *in situ* green manuring 10 kg/palm for enhancing productivity and profitability in coconut based high density multispecies cropping system with black pepper ,banana, pineapple, turmeric and Assam lemon as intercrops gave a net return of Rs. 3, 36,965.00/ha with a benefit cost ratio of 3.12.
- Mixed cropping of black pepper variety **Panniyur-1** and **Sreekara** could be practiced to obtain higher yield and income from coconut garden spaced at 7.5 m x 7.5 m. Black pepper saplings should be planted in pit size of 45 cm (l) x 45 cm (b) x 45 cm (d) dug at north-west side and 60 cm away from base of the coconut palm for ensuring good canopy development with more fruiting area of the vine.

Ambitions:

- Technology generation, training and capacity building and Transfer of technology and value addition
- Area expansion in coconut
- Quality planting materials

Action Plan:

- Varietal release through evaluation of location specific coconut germplasm for higher yield, relative tolerance to drought and acceptability to tender nut
- Development of location specific coconut hybrid
- Development of location specific suitable coconut based cropping system
- Assessment and refinement of location specific agro-techniques

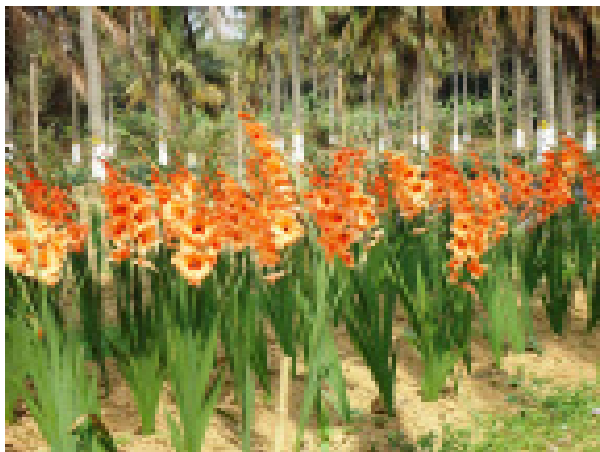
- New coconut plantation with recommended variety for area expansion across the different agro-climatic zones including hill zones
- Establishment of adequate nucleus seed garden, both on farm and off farm for generation of quality planting materials
- Capacity building initiatives in different dimensions such as value addition, business management & marketing management in addition to production technology
- Innovation excursion teaching / training methods such as Farmer-Farmer School, use of andragogical principles in training etc.
- Undertaking exposure visits to create motivation
- Value addition of coconut for preparation of locally demanded items such as jam jelly, chips etc.



Kamrupa



Kalpa Samrudhi



Intercropping of flower crops in coconut garden

9. Mondouri : Directorate of Research, P. O. Kalyani, Nadia Dt.

Sl.No.	Details	Particulars
1	Centre	Mondouri
2	State/UT	West Bengal
3	Year of commencement of centre	1982
4	Present mandate crops	Coconut
5	Institute/university/organization	Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur, Nadia, W.B.
6	Latitude in decimals	23.5° N
7	Longitude in decimals	89° E
8	Altitude	9.75 meters above mean sea level
9	Selected Agro-climatic features of Sub-region	The soil of the experiment field was Gangetic Alluvial, sandy clay loam in texture, with good water holding capacity, well-drained with moderate soil fertility status. The climatic condition of the experimental site is sub-tropical sub humid
10	Temp. Max	26-36°C
11	Temp. Min	10-20°C
12	RH	80%
13	Soil pH	Ranges between 5.48 - 6.77
14	Soil type	Gangetic Alluvial sandy clay loam texture
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1350-1780
17	No of rainy days	92-100 Days
18	Monsoon	South West Monsoon received from June to September with its peak in July and August
19	Organic/INM/both	INM
20	Improvement/Management/PHT/Extension	Improvement & Extension
21	Area available	10.00
22	Mother garden available	Developed 3 ha seed garden of Kalpa Mitra, Kalyani Coconut-1, and Kera Keralam to provide seed nuts to the farmers near future
23	Number of germplasm available for research	Local type -10

Accomplishments

Elite/improved varieties recommended for general cultivation in the Alluvial zone of West Bengal are:

Kalyani Coconut -1 – A selection from Jamaican tall supplied from ICAR- CPCRI has been released for

cultivation in the state with average nut yield of 110 nuts/palm/year.

Crop Production:

Intercropping system:

- Coconut (East Coast Tall) + Ginger (Annual) +Okra (Seasonal)

- Coconut (Tall) + Black pepper + pineapple (Biennial)
- Coconut + Black pepper + Tuberose + Heliconia

Ambitions

- Knowledge dissemination on high tech cultivation of coconut
- Conduct of demonstration and meetings to address major issues of coconut cultivation
- To promote farmer groups/ FPOs on coconut cultivation & value addition

Action Plan

- Collection, evaluation and maintenance of coconut germplasm.
- Evaluation of promising hybrids and varieties of coconut
- Development of coconut hybrids with high copra and oil content



Kalyani Coconut 1

10. ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari - 396 450

Sl.No.	Details	Particulars
1	Centre	Navasari
2	State/UT	Gujarat
3	Year of commencement of centre	2009
4	Present mandate crops	Coconut
5	Institute/university/organization	ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat
6	Latitude in decimals	20.6213 (20° 37' North latitude)
7	Longitude in decimals	72.9163 (72° 54' East longitude)
8	Altitude	11.98 meter
9	Selected Agro-climatic features of Sub-region	Zone-South Gujarat Heavy Rainfall Zone, AES-III. The soil of South Gujarat is locally known as 'black cotton soil'. As per the soil taxonomy, the experimental soil belongs to order Inceptisols, sub-order Ochrepts, great soil group verticustochrepts under the soil of Jalalpor series (South Gujarat)
10	Temp. Max	37-40 °C
11	Temp. Min	15-17 °C
12	RH	Morning - 89 % Evening - 55 %
13	Soil pH	7-8
14	Soil type	The soil of South Gujarat is locally known as 'black cotton soil'. As per the soil taxonomy, the experimental soil belongs to order Inceptisols, sub-order Ochrepts, great soil group verticustochrepts under the soil of Jalalpor series (South Gujarat)
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1500-1700
17	No of rainy days	60-65
18	Monsoon	South West Monsoon received from June to September with its peak in July and August
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Crop Improvement, Management and Extension work
21	Area available	5 ha
22	Laboratory/processing	Nil
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Coconut seedlings -(DxT-F2:5000 and selling of nuts to state Hort Dept-3000)
25	Mother garden available	DxT hybrid:100
26	Number of germplasm available for research	Coconut -40

Accomplishments

- Development of Coconut Based Cropping System by growing of Coconut+Banana + Turmeric + EFY + Tannia under the coconut garden.
- Evaluation of nutrient management under coconut based cropping systems for different agro climatic regions.
- Screening of cocoa varieties/hybrids for their performance as intercrop in coconut gardens.
- Collection, evaluation and maintenance of indigenous and exotic germplasm.

Ambitions

- Large scale production of quality planting materials of different varieties/hybrids of coconut.
- Encouraging farmers in more coconut based farming system models in traditional and non-traditional areas.
- Optimum input management through proper organic recycling of farm wastes to maintain soil health.

Action plan

- Development of dwarf and high yielding varieties/hybrids.
- Development of eco-friendly, cost effective production and crop protection management systems.
- Expansion of area with multistoried cropping system.
- Development of machineries for farm mechanization.
- Standardize the post harvest processing techniques for value addition.
- Dissemination of knowledge using ICT tools.
- Dissemination of knowledge and facilitating entrepreneurship development.
- Human resource development for value added products (Home scale/farm level).



Turmeric intercropped in coconut garden (Navsari)

11. Regional Agricultural Research Station, Pilicode P.O., Kasaragod - 670 353

Sl.No.	Details	Particulars
1	Centre	Pilicode
2	State/UT	Kerala
3	Year of commencement of centre	2011
4	Present mandate crops	Coconut
5	Institute/university/organization	Kerala Agricultural University
6	Latitude in decimals	12.20151° N latitude
7	Longitude in decimals	75.16297° E longitude
8	Altitude	15 m above MSL
9	Selected Agro-climatic features of Sub-region	Zones- Sub humid red loam, Sub humid laterite, Humid forest loam
10	Temp. Max	33°C
11	Temp. Min	23°C
12	RH	87%
13	Soil pH	5.5-6.5
14	Soil type	Laterite, Brown hyromorphic, Alluvial and Forest loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	3379 mm
17	No of rainy days	122-181 days
18	Monsoon	Southwest Monsoon
19	Organic/INM/both	INM
20	Improvement/Management/PHT/Extension	Improvement & Extension
21	Area available	2.94 ha
22	Laboratory/processing	Nil
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Coconut seedlings -(WCT -20000 , Hybrid seedlings - 5000)
25	Mother garden available	WCT-269, Lakshadweep Ordinary Tall-94, Andaman Ordinary-45
26	Number of germplasm available for research	75 (30 exotic & 45 indigenous type)

Accomplishments

- Kerasagara (Selection from Sychelles), Keramadhura (Selection from Malayan Green Dwarf), Kerasulabha (Selection from Philipines Lono).
- Established first Neera plant in Kerala.
- Collection and conservation of coconut ecotypes, 56 no's (13 dwarf ecotypes, 16 semi-tall ecotypes, 27 tall ecotypes) from 14 districts of Kerala state.
- Farmer participatory hybrid coconut seed nut production in nearby panchayats.
- Awareness programmes and Trainings to coconut farmers.

- Supply of quality planting materials of WCT and hybrid coconut seedlings released from this station on 1st June of every year.
- Value addition & product diversification in Coconut.
- Released compendium on Coconut.

Ambitions

- Centre of excellence in coconut production.
- Develop D X D hybrids suited for copra and oil content.

- Studies on Tissue culture in coconut.
- Collection and conservation of exotic germplasm of coconut from all over the world.
- Establishment of mother garden of coconut varieties, MYD, CGD, COD, Spicata & GB.

Action Plan

- Farmers will be trained on how to increase crop productivity at an optimal cost, lower requirement of water and other inputs and the latest pest management techniques.

12. Central Island Agricultural Research Institute, Port Blair - 744 101

Sl.No.	Details	Particulars
1	Centre	Port Blair
2	State/UT	Andaman and Nicobar Islands
3	Year of commencement of centre	2015
4	Present mandate crops	Coconut and arecanut
5	Institute/university/organization	ICAR-Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands
6	Latitude in decimals	16.81
7	Longitude in decimals	92.71 E
8	Altitude	61 m above MSL
9	Selected Agro-climatic features of Sub-region	Warm and humid island region
10	Temp. Max	30.1 °C
11	Temp. Min	23 °C
12	RH	68 to 86 %
13	Soil pH	5 to 6
14	Soil type	Medium to deep Red loamy
15	Irrigation/rainfed	Rainfed
16	Annual Rainfall (mm)	3100
17	No of rainy days	150
18	Monsoon	SW and NE monsoons
19	Organic/INM/both	Organic
20	Improvement/Management/ PHT/Extension	Crop production and crop improvement
21	Area available	1 ha
	Laboratory/processing	Horticulture lab
22	Nursery facilities at the location	Yes
23	Mother garden available	CIARI Annapurna (26), CIARI Surya (18), CIARI Chandan (16), CIARI Omkar (14) and Samrudhi (32)
24	Number of germplasm available for research	Coconut – 4 Arecanut - 2

Accomplishments

- Identification of suitable intercrops under arecanut plantations:** Based on the study conducted during the period 2016 and 2017, intercrops such as elephant foot yam, banana and ginger were found to be profitable when compared with monocropping of arecanut.
- Establishment of nucleus seed garden of improved varieties of coconut and arecanut:** A nucleus seed garden of arecanut var. Samrudhi (32 palms) and coconut varieties CIARI Annapurna (26), CIARI Surya (18), CIARI Chandan (16) and CIARI Omkar (14) has been established.

- **Culantro as a profitable intercrop under arecanut plantations:** Culantro is a popular herb in the islands and it fetches premium prices in the island markets throughout the year. In the trials conducted with different herbs, culantro was found to be most profitable intercrop with a B:C ratio of 3.19.
- **Popularization of coconut climbing devices among the Nicobarese tribal farmers:** Use of coconut climbing devices was demonstrated to the tribal farmers of Harminder Bay, Little Andaman Island between 2016 to 2023 and the devices are regularly being used in their day-to-day activities.

Ambitions

- Identification of island suited varieties of black pepper for intercropping in the coconut plantations.
- Promotion of released varieties of coconut and arecanut among the island farmers.

Action plan

- Performance of improved varieties of black pepper under coconut as intercrop would be carried out for yield and quality characters.
- Planting material of arecanut and coconut would be multiplied from the nucleus seed gardens.



ICAR - Central Island Agricultural Research Institute, Port Blair

13. Regional Coconut Research Station, Bhatye, Ratnagiri Dt. - 421 612

Sl.No.	Details	Particulars
1	Centre	Ratnagiri
2	State/UT	Maharashtra
3	Year of commencement of centre	1972
4	Present mandate crops	Coconut & Cocoa
5	Institute/university/organization	Dr.Balashebsawant Konkan Krishi Vidyapeeth ,Dapoli
6	Latitude in decimals	17.00° N Latitude
7	Longitude in decimals	73.40° E Latitude
8	Altitude	3 m above MSL
9	Selected Agro-climatic features of Sub-region	South Konkan costal zone
10	Temp. Max	32.24°C
11	Temp. Min	23.53°C
12	RH	76.08%
13	Soil pH	5.52
14	Soil type	Sandy loam soil
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	2742.6
17	No of rainy days	96
18	Monsoon	Southwest Monsoon
19	Organic/INM/both	INM
20	Improvement/Management/ PHT/Extension	Crop Improvement, crop production and crop protection and extension
21	Area available	26 ha.
22	Laboratory/processing	Laboratory and biocontrol unit
23	Nursery facilities at the location	Yes (Coconut Nursery accredited with two stars rating for the year 2022 to 2024)
24	Planting material production (Nos)	28000 (Banawali, T X D, D X T, COD, GBGD and other varieties. Coconut seed nuts 40000)
25	Mother garden available	1800 Banawali
26	Number of germplasm available for research	24 Coconut
27	Other major strength	Cocoa and poultry unit (Experimental blocks) <i>Goniozus nephantidis</i> (40,0000)

Accomplishments

- Released 3 varieties of coconut viz., Banawali, Pratap and Konkan Bhatye Coconut Hybrid -1.
- For the control of black headed caterpillar a larval parasite *Goniozus nephantidis* should be released

- at the rate of 20.5 per cent of the pest population or 3,500 adult parasites per hectare (when 20 per cent leaves are infested with the pest) (1999).
- Release of Baculovirus infected adults of rhinoceros beetle @ of 10 to 15 per acre were

- recommended for biological control of the rhinoceros beetle (2001).
- A fertilizer dose of 1000 g nitrogen, 500 g phosphorous and 1000g of potash per palm per year in three splits (June, October, and February) was recommended for coconut cultivation in sandy soils of the Konkan region of Maharashtra state. (2002).
 - Application of recommended dose (1:0.5:1 Kg NPK/palm/year) with 1.5 Kg Ormichem Micronutrient (Zn 3.15 %, Mg 1.8 %, Cu 0.65 %, Fe 1.97 %, Mn 2 %, Mo 0.05 % and B 0.68 %) recorded the maximum yield (129 nut/palm/year) in coconut and also the per cent increase in yield was higher in post treatment period when compared with pretreatment period at Regional Coconut Research Station, Bhatye, Ratnagiri. (2002).
 - On the basis of long term experiments conducted at RCRS, Bhatye, on inter cropping of cinnamon, nutmeg and black pepper in one acre coconut plantation, it was concluded that, the farmers adopting this farming system can earn an income of Rs.1 lakh and therefore this system should be called as Lakhibaug (2003).
 - The drip irrigation with 30 liters water /palm/day during October to January and 40 liters during Feb to May with six drippers placed at a distance of 1.25 mts away from the bole in the sandy loam soils of Konkan region of Maharashtra was recommended for adult coconut palm. (2005).
 - Spraying with Azadirachtin 10,000 ppm @ 4 ml per litre of water on fourth bunch onwards is also recommended for the control of eriophyide mite (2005).
 - Application of vermicompost at the rate of 50kg/ bearing palm/year was found economical for stable yield in coconut (2007).
 - On the basis of cumulative yield and economics of the fertilizers dose was recommended for hybrid coconut palms as the dose should be applied in three splits. Full dose of P₂O₅, 1/3 N and K₂O and FYM should be applied in the month of June and remaining 2/3 N and K₂O in two splits in October & February (2010).
 - Intercropping of turmeric, banana, pineapple and tapioca was recommended in coconut plantation in Konkan region of Maharashtra for getting more economic returns (2010).
 - Considering the performance of different medicinal crops as an intercrop and market demand, the arrowroot and lemongrass, have been recommended as a intercrops in coconut plantation for Konkan region of Maharashtra (2010).
 - The use of PO29 Ferro lure 400 mg trap at an interval of three months is recommended for the management of coconut red palm weevil (2011).
 - Drenching of Eriophyid smash (Azadiractin 0.03 per cent plus micronutrients) at the rate of 250 ml in 20 lit. of water per palm at interval of three months is recommended for the management of coconut Eriophyid mite (2011).
 - Noni (*Morinda citrifolia*L.) as a compatible economical, and perennial mixed crop under Konkan conditions of Maharashtra. (2014).
 - On the basis of net economic returns gained, it is recommended to interplant nutmeg, cinnamon and clove in the coconut orchard with recommended spacing in Konkan region (2014).
 - It is recommended to retain 5 sprouts after coppicing in regular harvesting season (October to May) to get maximum yield of cinnamon bark and leaves (2015)
 - Root feeding of Azadirachtin 50,000 ppm @ 7.5 ml + 7.5 ml water or Azadirachtin 10,000 ppm @ 10 ml + ml water was recommended for eriophyide mite (2015).
 - For getting the higher yield and returns in coconut based cropping system, it is recommended to cultivate lily flower crop as an intercrop under Konkan agro-climatic condition (2017).
 - It is recommended to cultivate cinnamon, nutmeg, black pepper, banana and pineapple as an intercrops under Konkan agro-climatic condition, for getting the higher yield and returns from coconut based *multistoried cropping system* (2018).
 - The hanging of chlorantraniliprole 0.4 % GR @ 6 g/palm in perforated sachet is recommended for effective management of rhinoceros beetle. It

should be hanged in innermost leaf axil of coconut palm at four monthly intervals.

- It is recommended to manage the coconut orchard through integrated nutrient management by using 2/3rd recommended fertilizer dose along with recycling of biomass by vermin composting gives the best economic benefit in a sustainable manner and gives positive impact through improvement of soil health. The system is more sustainable for production and productivity of coconut orchard without affecting the ecosystem (2019).

The INM with IPM package includes

- Recommended NPK dose – 3kg S.S.P., 750g Urea and 650g Potash in June, 750g Urea and 650g Potash in Oct also in Feb.
- FYM @ 10 kg/palm - May and Sept
- Vermi-compost @ 10 kg/palm- May and Sept
- Neem cake @ 5kg/palm – June
- Green manuring with cowpea @ 50g/palm in coconut basin- June
- Coconut husk incorporation – June
- Micronutrient application @500g/palm - June, Oct.
- Keraprobio (Pseudomonas) @ 100 g/palm in well irrigated garden - Oct.
- Root feeding with Fenpyroximate 5 % EC @ 10 ml + 20 ml water - March.
- Spraying with palm oil @40 ml+ sulphur @5g + soap powder 2.5g in 800ml of water – Dec. is recommended per palm/ year for the management of coconut eriophyid mite and increasing of nuts yield with health of the palm.

- For the management of coconut rugose spiralling whitefly (RSW) adhered yellow sticky bands at 4 feet height from ground level around palm trunk followed by three sprays of Neem oil 0.5 % @ 5ml /litre of water at 15 days intervals. First spray should be given in second fortnight of October. After that apply three spray of plain water with HTP sprayer pump @ 15 days interval is recommended.

Ambitions

- Development of dwarf hybrid for the region
- Development of sustainable coconut based integrated farming system.
- Integrated pest and disease management system
- Area expansion of coconut at RCRS, Bhatye
- Strengthening post harvest management and value addition efforts in coconut.

Action Plan

- Collection, conservation and evaluation of different coconut types & hybrids.
- To asses social – economic feasibility of different coconut based farming system model.
- To develop integrated pests and disease management model with crop habitat diversification.



Pratap

14. Bihar Agricultural College, Sabour, Bhagalpur Dt. - 813 210

Sl.No.	Details	Particulars
1	Centre	Sabour
2	State/UT	Bihar
3	Year of commencement of centre	2009
4	Present mandate crops	Coconut & Palmyrah
5	Institute/university/organization	Bihar Agricultural University, Sabour, Bhagalpur, Bihar
6	Latitude in decimals	25 °14' 15' N
7	Longitude in decimals	87 ° 04' 44 E
8	Altitude	46m above MSL
9	Selected Agro-climatic features of Sub-region	Lower Gangetic Plains
10	Temp. Max	37-40 °C
11	Temp. Min	6-8 °C
12	RH	Morning-84 % Evening- 62 %
13	Soil pH	6.8-7.6
14	Soil type	Alluvial Sandy-loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1050-1200 mm
17	No of rainy days	68-91 days
18	Monsoon	South west monsoon
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Improvement, Management and extension
21	Area available	3.8 ha
22	Laboratory/processing	Horticulture lab

Ambitions

- To study the best performing variety / hybrids of coconut for agro climate of Bihar.
- To study pattern of vegetative growth, flowering and fruiting behaviour of coconut varieties in agroclimatic condition of Bihar.
- To increase the area under coconut in Bihar.
- To promote processed product of palmyra.
- To identify the dwarf type palmyra.
- Identifying suitable variety for commercial cultivation in Bihar.
- Studies on floral biology and flowering pattern of coconut in Bihar condition to elucidate cold tolerance.
- To study the impact of cold on yield and quality of coconut.
- To study the impact of cold on abiotic and biotic stress in coconut in Bihar condition.
- Standardization of neera collection, packing and storage for use for longer period under Bihar conditions.

Action plan

- Developing standard package and practices for coconut under Bihar conditions.

15. Coconut Research Station, Veppankulam, Thanjavur Dt. - 614 906

Sl.No.	Details	Particulars
1	Centre	Veppankulam
2	State/UT	Tamil Nadu
3	Year of commencement of centre	1958
4	Present mandate crops	Coconut
5	Institute/university/organization	Tamil Nadu Agricultural University, Tamil Nadu
6	Latitude in decimals	10.459813°N
7	Longitude in decimals	79.365036°E
8	Altitude	20 m above MSL
9	Selected Agro-climatic features of Sub-region	East Coast Plains and Hills Region (XI) Cauvery Delta Zone (TN-4)
10	Temp. Max	38.50°C
11	Temp. Min	26.00°C
12	RH	Morning - 93.25/Evening - 77.90%
13	Soil pH	6.6-7.2
14	Soil type	Sandy loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1157
17	No of rainy days	54
18	Monsoon	North East Monsoon received from August to December with its peak in October and November
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Crop Improvement, production, protection and extension
21	Area available	33.18 ha
22	Laboratory/processing	Soil science lab, Entomolog and pathology lab
23	Nursery facilities at the location	Varietal and hybrid nursery blocks
24	Planting material production (Nos)	Coconut Seedlings (Tall - 50000 & Hybrid -10000)
25	Mother garden available	Coconut tall-2141 dwarf: 110
26	Number of germplasm available for research	56 Tall (Indigenous and Exotic), 8 dwarf
27	other major strength	Hybridization, Coconut tonic, predators and biocontrol agents <i>Encarsia</i> , <i>T. Viride</i> & <i>Bacillus substilis</i>

Accomplishments

- Since inception, 57 Tall and six dwarf genotypes are conserved

- Three T x D hybrids (VHC1, VHC 2 and VHC 3), one T x T hybrid (VPM 5) and two tall coconut varieties (VPM 3 and VPM 4) were released for commercial cultivation in Tamil Nadu.

- Establishment of D X T and T X T mother garden in an area of 6.25 acres at the station.
- Total of 42 nos. crop management technologies viz., fertilizer, irrigation and weed management practices, TNAU coconut tonic, inter crop and multiple cropping were released for the benefit of the farmers.
- Crop Protection oriented management technologies, 26 nos. were released for the benefit of coconut farmers.
- Bio-priming of coconut seed nuts with talc formulation of *Trichoderma viride* and *Pseudomonas* was achieved as promising technology to obtain disease free and the increased vigour of the coconut seedlings in the nursery
- Nursery with a production capacity of 1,00,000 nos. tall, 5,000 nos. dwarf and 15,000 nos. hybrids developed.
- Linkage with FPO - Peravurani Coconut Agro Producer Company Ltd (sponsored by SFAC) - 2016, Members – 1060
- Since inception 19 nos. of national and state awards were received by this station.

Ambitions

- To release high yielding varieties /hybrids suitable based on industrial need *i.e* tall (ect) and dual purpose hybrids in T X D, D X D and t x t and dwarf for commercial cultivation for Tamil Nadu conditions.
- Release of cocoa variety suitable for intercrop in coconut plantations for Tamil Nadu
- Establish multitier cropping system and also high value inter cropping models for eastcoast region
- To cater and solve the location specific pest and disease problems in coconut with suitable management through research and extension.
- To facilitate value addition and zero waste management in coconut.

Action Plan

- Proposal for a tall and D x D hybrid is to be submitted in the ensuing agm for approval from the trails on tall, T xT, T x D and D x D.
- Release of better performing dwarf varieties suitable for tamilnadu from the evaluation trials of this centre for the past 20 years is to be presented

in forthcoming agm to be released for tamilnadu conditions

- Two T X T and one T X D dual purpose hybrids are in pipeline
- Establishing model farm in one ha area for multitier cropping and high value inter crops
- Venturing into dwarf seeding production and D x T hybrid seedlings production
- Introduction of suitable new intercrops in coconut based on farmers category
- Establishing EDP centre for value addition in coconut through external funded projects.
- Execution of Zero waste management in coconut cultivation and development of products TNAU branded products viz., Virgin coconut oil, vinegar, chips and coconut sugar
- Surveillance of new/emerging coconut diseases in east coast region of Tamil Nadu
- Standardization of IDM module in combating basal stem rot disease through demonstrations in disease hot spot areas.



VPM 5

16 Indian Institute of Oil Palm Research, Near Jawahar Navodaya Vidyalaya, Pedavegi, West Godavari Dt. -534 450

Sl.No.	Details	Particulars
1	Centre	Pedavegi
2	State/UT	Andhra Pradesh
3	Year of commencement of centre	2014
4	Present mandate crops	Oil Palm
5	Institute/university/organization	ICAR-Indian Institute of Oil Palm Research, Pedavegi
6	Latitude	16° 48' 43" N
7	Longitude	81° 07' 55" E
8	Altitude	76m above MSL
9	Selected Agro-climatic features of Sub-region	East Coast Plains and Hills Region, Krishna Godavari Agro climatic zone
10	Temp. Max	39°C (Mean Max) (May)
11	Temp. Min	19°C (Mean Min) (Dec)
12	RH	60 (Feb) to 90 (July & Aug) %
13	Soil pH	7.5
14	Soil type	Sandy clay loam (Entisol)
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	950 mm
17	No of rainy days	75 to 80 days
18	Monsoon	SWM and NEM
19	Organic/INM /both	Both
20	Improvement/Management/ PHT/Extension	Crop Improvement (Voluntary centre)

Accomplishments

- Intensive evaluation of African germplasm D x D and D x P by ICAR-IIOPR, Pedavegi resulted in the identification of a few remarkably high-yielding accessions. Ten hybrid cross combinations were evaluated.
- The hybrid cross combination NRCOP-4 (Godavari Swarna) recorded higher FFB yield (30.11 tonnes/ha) and appeared to have better prospects for adaptation under West Godavari area (Andhra Pradesh) and Tungabhadra command area (Karnataka).
- At Mulde (Maharashtra), hybrid NRCOP-2 (Godavari Ratna) recorded higher FFB yield (22.69 tonnes/ha) with better prospects for adoption under Konkan in Maharashtra.

- NRCOP 17 (Godavari Gold) recorded significantly highest FFB (28.37 tonnes/ha) productivity under Cauvery Delta region in Tamil Nadu.

Ambitions

- Development of hybrids with higher yield potential, resistant to biotic and abiotic stresses.
- Self sufficiency in quality planting material production.

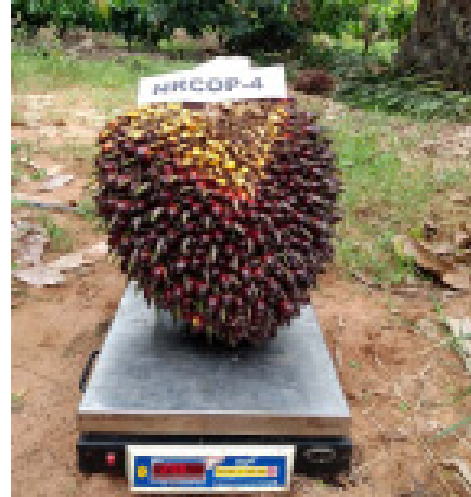
Action Plan

- Eight D x D hybrids were produced and supplied to Pattukottai, Mulde and Pasighat centres
- Eleven new oil palm hybrids namely DOPR 41 to DOPR 51 were supplied to Agricultural

Research Station, Vijayarai, Andhra Pradesh of AICRP on Palms for evaluation.

Developing newer oil palm hybrids for MLT evaluation in targeted areas.

Strengthening the quality material production capacity in released /recommended oil hybrids.



Godavari Swarna

17. College of Horticulture, Mulde, Kudal Taluk, Sindhudurg Dt. - 416 520

Sl.No.	Details	Particulars
1	Centre	Mulde
2	State/UT	Maharashtra
3	Year of commencement of centre	1986
4	Present mandate crops	Oil Palm
5	Institute/university/organization	DR.Balashebsawant Konkan Krishi Vidyapeeth ,Dapoli
6	Latitude	16°02'
7	Longitude	73°42'
8	Altitude	17 meters above MSL
9	Selected Agro-climatic features of Sub-region	Hot and humid climate
10	Temp. Max	33.2°C
11	Temp. Min	21.6°C
12	RH	Morning 89 %-Evening 61%
13	Soil pH	5.7
14	Soil type	lateritic
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	3477
17	No of rainy days	109
18	Monsoon	South East monsoon
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Improvement & Extension.
21	Area available	13 ha
22	Laboratory/processing	Well furnished with equipment necessary for UG and PG Lab
23	Number of germplasm available for research	Oil palm- 45

Achievements

- NRCOP-2 is recommended for release in Maharashtra as Godavari Ratna with FFB yield of 22.69 t/ha.
- Based on last ten years data on evaluation of oil palm genotypes for drought tolerance, five genotypes viz., (ZS-3-R-3-3), (ZS-1-R-3-2), (ZS-6-R-2-2), (ZS-3-R-2-6) and (TS-5-R-3-3) were selected as mother palms for improving the dura type and development and evaluation of D x P, D x D crosses.

- Intercropping in juvenile oil palm garden with banana, pineapple and amorphophallus has been recommended.
- Fertigation in oil palm with 1200:600:1800 g N, P₂O₅, K₂O / palm/ year in six equal splits at bi-monthly interval is recommended.

Ambitions

- To expand the area under oil palm cultivation in Maharashtra
- To establish the seedling nursery of oil palm at Mulde location

- To find out dwarf oil palm genotype

Action Plan

- Evaluation of different oil palm hybrid genotype for dwarfness and FFB yield
- To asses social-economic feasibility of inter cropping model in oil palm
- To develop integrated pest and disease management model with crop habitat diversification technology



Godavari Ratna

18. College of Horticulture & Forestry, Pasighat - 791 102

Sl.No.	Details	Particulars
1	Centre	Pasighat
2	State/UT	Arunachal Pradesh
3	Year of commencement of centre	2009
4	Present mandate crops	Oil Palm
5	Institute/university/organization	Central Agricultural University Imphal
6	Latitude	28.07873°N
7	Longitude	95.32358°E
8	Altitude	153m above MSL
9	Selected Agro-climatic features of Sub-region	Eastern Himalayan Region (Planning Commission), Humid Bengal – Assam Basin (ICAR), North East Hill Region (NARP)
10	Temp. Max	36°C
11	Temp. Min	7°C
12	RH	Mor. 77.4 to 94.5%. EV.60.1 to 91.9 %
13	Soil pH	5.6
14	Soil type	Sandy Loam with gravels and stones
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	4000 to 6000 mm
17	No of rainy days	120- 130 Days
18	Monsoon	SW monsoon (June-Sep)
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Improvement/ Management/ Extension
21	Area available	13 ha
22	Laboratory/processing	Well furnished with equipment necessary for UG and PG Lab

Achievements

- Based on FFB yield of hybrids under evaluation, NRCOP 21 to 23, which are promising, are to be looked for release.
- In North East Region, oil palm planted in the year 2006 under Maximization Plot and all the recommended crop management practices are being adopted, the number of FFB produced per plant were 8.38 with an average bunch weight of 18.7 kg and with the FFB yield of 22.8 t/ha.

Ambitions

- To popularize the oil palm cultivation for socio-economic upliftment of the tribal farmers of NE region of India
- To develop technologies suitable for oil palm cultivation in NE region of India

- Capacity Building of Extension Functionaries and Farmers for cultivation of Oil palm in NE region of India

Action Plan

- Evaluation of NRCOP cross combinations to identify high yielding tenera hybrids suitable for commercial cultivation in the NE region
- Demonstration on oil palm production potential to demonstrate the technologies' for oil palm cultivation to the extension functionaries and farmers of the NE region of India
- Nutrient management studies in oil palm under North East Region for standardization of nutrient requirement of oil palm under.

19. Agricultural Research Station, Pattukkottai, Thanjavur Dt. -614 602

Sl.No.	Details	Particulars
1	Centre	Pattukkottai
2	State/UT	Tamil Nadu
3	Year of commencement of centre	1986
4	Present mandate crops	Oil Palm
5	Institute/university/organization	Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
6	Latitude	10°25' N
7	Longitude	79° 20' E
8	Altitude	20 m above MSL
9	Selected Agro-climatic features of Sub-region	East Coast Plains and Hills Region (XI) Cauvery Delta Zone (TN-4)
10	Temp. Max	37.3 ° C
11	Temp. Min	25.4 ° C
12	RH	76.0 %
13	Soil pH	7.25
14	Soil type	Sandy loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1106 mm
17	No of rainy days	55
18	Monsoon	North East Monsoon received from August to December with its peak in October and November
19	Organic/INM/both	Evaluation
20	Improvement/Management/PHT/Extension	Crop Improvement and Extension
21	Area available	8.5 ha
22	Laboratory/processing	No
23	Number of germplasm available for research	46 Tenera Hybrid combinations
24	Other major strength	Seed production center

Accomplishments

- Since inception, 39 Tall and seven dwarf tenera genotypes are maintained in-vivo.
- One tenera Oil palm hybrid “Godavari Gold” released during the for commercial cultivation in Cauvery Delta Regions of Tamil Nadu.
- Establishment of 16 tenera hybrids (Tall (9) and Dwarf (7) in an area of 8.65 acres at the station.

Ambitions

- To evaluate oil palm hybrids under ICAR- AICRP on Palms scheme and to standardize technologies in oil palm suitable for Tamil Nadu
- To produce quality coconut seedlings under GOI-sponsored Coconut Development Board scheme and Venture capital scheme

- To serve as testing and verification centre for the varieties and technologies developed at other research stations and its adaptability to this region
- To impart training for Agricultural Extension staff and farmers on improved crop production technologies.
- To serve as the centre of excellence in oil palm at Agricultural Research Station, Pattukkottai
- To cater and solve the location specific pest and disease problems in Oil Palm with suitable management through research and extension.

Action Plan:

- Establishing model Oil Palm field at ARS, Pattukkottai for the benefit of the farming community in Cauvery delta region of Thanjavur districts of Tamil Nadu.



Godavari Gold

20. Horticulture Research Station, Vijayarai, West Godavari Dt. - 534 475

Sl.No.	Details	Particulars
1	Centre	Vijayarai
2	State/UT	Andhra Pradesh
3	Year of commencement of centre	1983
4	Present mandate crops	Oil Palm & Cocoa
5	Institute/university/organization	Dr.YSR Horticultural University
6	Latitude	16° 48' 43" N
7	Longitude	81° 07' 55" E
8	Altitude	76m above MSL
9	Selected Agro-climatic features of Sub-region	East Coast Plains and Hills Region , Krishna Godavari Agro climatic zone
10	Temp. Max	40°C
11	Temp. Min	19°C
12	RH	Morning -85 to 90% Evening 70-80%
13	Soil pH	7.5
14	Soil type	Sandy loam
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	900 to 1150 mm
17	No of rainy days	40 to 60 days
18	Monsoon	South East monsoon
19	Organic/INM/both	Evaluation
20	Improvement/Management/PHT/Extension	Crop improvement and extension
21	Area available	27.12 ha
22	Laboratory/processing	Nil
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Coconut seedlings (Tall-50,000 + Hybrid-10,000) and cocoa 50,000Poly clonal garden of Cocoa- 15

Achievements

- NRCOP-4 is recommended for release in Andhra Pradesh as Godavari Swarna with FFB yield of 30.11t/ha.
- Fertigation in oil palm with 1200:600:1200 g N, P2O5, K2O / palm/ year in six equal splits at bi-monthly interval is recommended.

Ambitions:

- To identify the suitable oil palm hybrids for yield performance
- To disseminate the oil palm production technology and aid in area expansion

Action Plan

- To evaluate the hybrids developed by ICAR-IIOPR, Pedavegi having potential FFB yield of 40 t/ha/year, with 8 t/ha/year oil yield which can cater the needs of Andhra Pradesh farmers.
- To work on water use efficiency in oil palm
- To work on canopy management in oil palm (leaf area maintenance 6-7 sq. m) to test feasibility for inter crop like cocoa.
- To work on seasonal variation in flowering and fruit development and yield of cocoa in palms.

21. AHRS, Bavikere, College of Agriculture, Navile, Shivamogga

Sl.No.	Details	Particulars
1	Centre	Bavikere
2	State/UT	Karnataka
3	Year of commencement of centre	2015
4	Present mandate crops	Oil Palm
5	Institute/university/organization	Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga
6	Latitude	13.7277 ° N
7	Longitude in decimals	75.726°E
8	Altitude	654 .18m above MSL
9	Selected Agro-climatic features of Sub-region	Zone-7 Southern Transition Zone of Karnataka
10	Temp. Max	26.70-33.9°C
11	Temp. Min	14.10 - 20.89°C
12	RH	Morning - 73.15% / Evening - 55.3%
13	Soil pH	6.2-6.9
14	Soil type	Red and Black
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	1080mm
17	No of rainy days	90
18	Monsoon	SW monsoon (June-Sep)
19	Organic/INM/both	Inorganic
20	Improvement/Management/ PHT/Extension	Crop Management
21	Area available	8.00 ha
22	Laboratory/processing	Horticulture lab

Accomplishment

The Centre was initiated during 2015-16 with the following technical programme.

- Optimization of fertilizer dose for oil palm plantation and Plant geometry studies in oil palm with four spacing Viz., (M1: 9m x 9m x 9m Triangular planting M2: 9m x 9m Square planting; M3 : 10m x 10m x 10m Triangular planting; M4: 10m x 10m Square planting

Ambitions

- Area expansions of oil palm in Karnataka

Action Plan

- Identification of suitable oil palm hybrids for Karnataka
- To assess the feasibility in intercropping models in oil palm and standardize management practices under Karnataka conditions.

22. Horticultural Research Station, Pandirimamidi, Ramapachodaram, East Godavari Dt. - 533 288

Sl.No.	Details	Particulars
1	Centre	Pandirimamidi
2	State/UT	Andhra Pradesh
3	Year of commencement of centre	1993
4	Present mandate crops	Palmyrah
5	Institute/university/organization	Dr. YSR. Horticultural University
6	Latitude	17°25'26.90 N
7	Longitude	81°47'28.39°E
8	Altitude	84m above MSL
9	Selected Agro-climatic features of Sub-region	Coastal Zone characterized by sub humid climatic condition comes under High altitude zone in agency area of ASR district
10	Temp. Max	28°C-45°C
11	Temp. Min	15°C-20°C
12	RH	71-94%
13	Soil pH	7-7.5
14	Soil type	Red sandy loam
15	Irrigation/rainfed	Rainfed
16	Annual Rainfall (mm)	1250-1400mm
17	No. of rainy days	60-90 days
18	Monsoon	70% of the rainfall will be received from the south west monsoon
19	Organic/INM /both	Organic
20	Improvement/Management/ PHT/Extension	Crop Improvement/Management & PHT
21	Area available	3.93 ha
22	Laboratory/processing	Palmyrah processing pilot plant
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Palmyrah seedlings-2000
25	Number of germplasm available for research	272 palmyrah accession
26	Other major strength	Palmyrah processing pilot plant

Achievements

- 272 germplasm accessions were maintained and evaluated for yield and quality.
- Composting technology for palmyrah leaf/base/pith has been evolved.
- Preservation of neera using chemical processing can be stored under refrigerated condition up to 7

days with heating for 5 min under 90°C followed by 0.1% KMS or 0.1% sodium benzoate and with membrane processing, neera can be stored under refrigerated condition for 60 days by heating for 5 min under 90°C followed by micro filtration under 1kg/cm² pressure for 10 minutes.

- Storage study of different RTS sap collected following CPCRI method had a storage life of 10 hours without any preservative. The study suggested that the RTS beverage maintained under refrigerated condition, showed minimum deviation in quality from their initial value and remained in acceptable condition for 24 hours.
- Palmyrah jaggery prepared from inflorescence sap collected by adopting CPCRI method having a shelf life of six months was recommended for commercial release.

Ambitions

- Research on the use of physiological and agronomic methods to stimulate Palmyrah to flower early.
- To study, identify, and conserve dwarf, early-flowering, high-yielding palms from palmyrah hotspots. Exploiting them for varietal improvement.
- Researches on the creation of a protocol for low-cost, hygienic neera production technology that will help tapper communities.

- To investigate and preserve the traditional methods used in palmyrah growth hotspots. To create hybrids using assessed collected germplasm accessions.
- To promote knowledge about the value addition of palmyra and its uses in Andhra Pradesh, including its leaves, petiole fibre, trunk, neera, nungu, endosperm, and apicolon.

Action Plan

- Induction of early flowering by applying irrigation/nutrients/growth hormones to induce early flowering in Palmyrah
- Protocol development for low cost hygienic neera production for the benefit of tappers.
- Trainings on palmyrah promotion and its utilization.
- Developing better performing palmyrah varieties and their promotion.



Palmyrah Jaggery

23. Agricultural College & Research Institute, Killikulam, Vallanad, Tuticorin Dt. - 628 252

Sl.No.	Details	Particulars
1	Centre	Killikulam
2	State/UT	Tamil Nadu
3	Year of commencement of centre	1995
4	Present mandate crops	Palmyrah
5	Institute/university/organization	Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
6	Latitude	8°46 N
7	Longitude	77°42 E
8	Altitude	40m above MSL
9	Selected Agro-climatic features of Sub-region	Foothills of the Vallanadu Black Buck Sanctuary
10	Temp. Max	39.0 ° C
11	Temp. Min	20.0 ° C
12	RH	74-91%
13	Soil pH	6.2-7.0
14	Soil type	Sandy loam to Sandy clay
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	736.7 mm
17	No of rainy days	40 days
18	Monsoon	Both South West and North East monsoon
19	Organic/INM/both	Both
20	Improvement/Management/PHT/Extension	Crop improvement and Crop Management
21	Area available	12.0 ha
22	Laboratory/processing	Horticulture Lab
23	Nursery facilities at the location	Yes
24	Planting material production (Nos)	Palmyrah seedlings-10000 Nos
25	Mother garden available	No
26	Number of germplasm available for research	265 Palmyrah accession
27	Other major strength	Palmyrah processing pilot plant

Achievements

- 265 accessions of palmyrah since 1995 were collected and maintained at AC&RI, Killikulam from different states of the country viz., Orissa, Bihar, Tamil Nadu, Andhra Pradesh and

Karnataka which included targeted collections for earliness, high yield and neera.

Ambitions

- Studies on induction of agronomical and physiological techniques to induce early flowering in Palmyrah

- To survey, identify and conserve dwarf, early and high yielding flowering accessions from palmyrah growing regions of the world.
- To survey and conserve the traditional knowledge from palmyrah growing regions of the country
- Production of hybrids from evaluated germplasm accessions
- To promote the importance of Palmyrah and its utility in Tamil Nadu
- Studies on development of protocol for low cost hygienic neera production technology for the benefit of tapping communities
- Studies on increasing the shelf life of neera by advocating sequential membrane filtration technology to curtail spoilage causing micro-organisms

- Studies on tapping of neera through artificial intelligence

Action Plans

- Studies on induction of early flowering in Palmyrah by adopting improved cultural practices and through growth hormones.
- Developing protocol for shelf life enhancement in neera
- Trainings on palmyrah promotion and its utilization
- Farmers participating approaches for identifying better performing palmyrah populations for varietal development.



Natural view of palmyrah

24. Horticultural Research Station, Konda Mallepally Mandal, Nalgonda Dt.- 508 243

Sl.No.	Details	Particulars
1	Centre	Kondamallepally
2	State/UT	Telangana
3	Year of commencement of centre	1991
4	Present mandate crops	Palmyrah
5	Institute/university/organization	Sri Konda Laxman Telangana State Horticultural University, Telangana
6	Latitude	16.7178° N
7	Longitude	79.0023° E
8	Altitude	224 m above MSL
9	Selected Agro-climatic features of Sub-region	Central Telangana zone
10	Temp. Max	27-38 °C
11	Temp. Min	18-24°C
12	RH	73-91%
13	Soil pH	7-7.5
14	Soil type	Red sandy loam
15	Irrigation/rainfed	Rainfed
16	Annual Rainfall (mm)	1100-1350 mm
17	No of rainy days	60-85 days
18	Monsoon	South West monsoon
19	Organic/INM /both	INM
20	Improvement/Management/ PHT/Extension	Crop Improvement
21	Area available	2.5 ha for palmyrah
22	Laboratory/processing	Citrus nursery seedlings production, Horticulture lab, Soil Science lab, Entomology lab, Plant Pathology lab, Bio-control laboratories of Entomology and Plant Pathology

Achievements

The Centre was initiated during 2017-18. Nalgonda Dist, of Telangana state which know for Palmyrah palm groves. The tree has huge population and been in long use by the tappers community of the region. To tap these diverse germplasm in the region, a survey was undertaken for collection of diverse palmyrah germplasm from Nalgonda Dist. with specific focus on dwarf types. A total of 30 accessions were collected in the survey from Ganugubelli, Gundrampally, Udthalapally and Ratnavaram villages in Nalgonda and Suryapet Districts during the year 2019 and 2020 and conserved.

Ambitions

- Survey and in *situ* characterization and conservation of palmyrah germplasm for special traits
- Popularization of palm climbing device among palmyrah tappers.
- Evaluation of palmyrah tender fruit processing machine developed by CIAE Centre
- Popularise the CPCRI cool box among farmers for collection of unfermented neera as recently Govt. of Telangana started “NEERA CAFÉ” at Hyderabad.



- Production of quality seeds and supply to the palmyra growers.

Action plan

- Refinement of climbing device and neera collection box suitable for palmyrah palm

- Trainings in major growing areas of palmyra
- Strengthening facilities for nursery for production of quality seed.

25. Arecanut Research Station, Shivamogga Dt. - 577204

Sl.No.	Details	Particulars
1	Centre	Shivamogga
2	State/UT	Karnataka
3	Year of commencement of centre	2014
4	Present mandate crops	Arecanut
5	Institute/university/organization	Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka
6	Latitude	14°27' N
7	Longitude	74° 44' E
8	Altitude	570 m above MSL
9	Selected Agro-climatic features of Sub-region	Southern Transition Zone (Zone-7)
10	Temp. Max	36.3 ° C
11	Temp. Min	22.0 ° C
12	RH	82.0 %
13	Soil pH	6.50-7.50
14	Soil type	Red sandy loams
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	850mm
17	No of rainy days	45
18	Monsoon	South West Monsoon received from June to October with its peak in July and August
19	Organic/INM/both	Both
20	Improvement/Management/PHT/Extension	Crop Improvement, Crop Production and Protection
21	Area available	14.50acre (only 4.50 utilized)
22	Laboratory/processing	Laboratory
23	Other major strength	Crop Protection laboratory

Accomplishments

Management of koleroga disease in arecanut:

- Alternate management practice in the place of Bordeaux mixture (1%) is recommended for Malnad region of Karnataka. This practice involves application of Fenamidone 10% + Mancozeb 50% (w/w) (sectin) (@ 0.3% spray) + adhesive

- application of *Trichoderma harzianum* (IMI 304056) + *Pseudomonas fluorescens*(NCIB 9046)+*Bacillus megatarium*(NCTC 9848) @ 20 ml (105×107 cfu/ml stock solution/l water)+ soil application of microbial consortia (talc formulation) containing all the three isolates @ 100 g/plant (*Pseudomonas fluorescens*+ *Bacillus megatarium*@ 25 g each and *Trichoderma harzianum* @ 50 g) along with 1 kg of FYM/ decomposed compost to the soil per year.

Entomopathogenic nematodes (EPN) for the management of arecanut white grubs

- Application of EPN (*Steinernema carpocapsae*) (@ 0.75 billion IJs/ha) alone during June-July and combined application of EPN @ 0.75 billion IJs/ ha + Imidacloprid 17.8 SL (0.5 ml/ 2 l water) during September- October to the root zone are found to be effective against white grubs.

Ambitions

- To evaluate arecanut hybrids suitable for processing and to standardize technologies in arecanut for Malnad region.
- To serve as testing and verification centre for the varieties and technologies developed at other research stations and its adaptability to this region

- To impart training for State agriculture department and farmers on improved crop production technologies.
- To cater and solve the location specific pest and disease problems in arecanut with suitable management through research and extension.

Action Plan

- Collection, evaluation and conservation of arecanut germplasm.
- Evaluation of promising hybrids and varieties of arecanut.

26. Central Experimental Station, Asond block, Wakavali, Daopli Taluk.

Sl.No.	Details	Particulars
1	Centre	Wakawali
2	State/UT	Maharashtra
3	Year of commencement of center	2014
4	Present mandate crops	Arecanut
5	Institute/university/organisation	Dr. Balasheb Sawant Konkan Krishi Vidyapeeth, Dapoli
6	Latitude in decimals	17.68° N
7	Longitude in decimals	73.27° E
8	Altitude	27 m above MSL
9	Selected Agro-climatic features of Sub-region	South Konkan Costal Zone
10	Temp. Max	31-35°C
11	Temp. Min	12-20°C
12	RH	Morning – 88 % Evening - 59.03 %
13	Soil pH	5.5 – 6
14	Soil type	Red Laterite soil
15	Irrigation/rainfed	Irrigated
16	Annual Rainfall (mm)	3000-4000 mm
17	No of rainy days	122 Days
18	Monsoon	South West monsoon
19	Organic/INM/both	INM
20	Improvement/Management/PHT/Extension	Improvement/Management /Extension

Accomplishments

The Centre was initiated during 2015-16 with the following technical programme collection, conservation and evaluation of arecanut germplasm

Ambitions

- To evaluate arecanut hybrids suitable for processing and to standardize technologies in arecanut for Konkan region.

- To serve as testing and verification centre for the varieties and technologies developed at other research stations and its adaptability to this region
- To impart training for State agriculture department and farmers on improved crop production technologies.

Action Plan

- Collection, evaluation and conservation of arecanut germplasm.
- Evaluation of promising hybrids and varieties of arecanut

27. Horticultural Research & Extension Centre, Sirsi, Karnataka-581 401

Sl.No.	Details	Particulars
1	Centre	Sirsi
2	State/UT	Karnataka
3	Year of commencement of centre	2019
4	Present mandate crops	Cocoa
5	Institute/university/organization	University of Horticultural Sciences, Bagalkot, Karnataka
6	Latitude	14° 36' N
7	Longitude	74° 50' E
8	Altitude	570 m above MSL
9	Selected Agro-climatic features of Sub-region	Zone IX- Northern Hilly zone
10	Temp. Max	32.0 ° C
11	Temp. Min	19.2 ° C
12	RH	Morning - 89 Evening – 62 %
13	Soil pH	6.2 -6.7
14	Soil type	Laterite soil
15	Irrigation/rainfed	Irrigation
16	Annual Rainfall (mm)	2300-2500mm
17	No of rainy days	108
18	Monsoon	South West Monsoon
19	Organic/INM /both	Both
20	Improvement/Management/ PHT/Extension	Crop Improvement
21	Area available	7.1 ha
22	Laboratory/processing	No

Ambitions

- Evaluation of cocoa varieties/ hybrids under arecanut gardens.
- Establishment of clonal orchards/seed gardens of cocoa for the production of quality planting materials.

Action Plan

- Establishing model cocoa field at HREC Sirsi for the benefit of the farming community in hilly zone of Karnataka.

28. Cocoa Research Centre, Kerala Agricultural University, Thrissur

Sl.No.	Details	Particulars
1	Centre	Thrissur
2	State	Kerala
3	Year of Commencement	2018
4	Present mandate crop	Cocoa
5	Institute/University/Organisation	Cocoa Research Centre, Kerala Agricultural University, Thrissur
6	Latitude	10°52' N
7	Longitude	76°22' E
8	Altitude	6 meters above MSL
9	Selected agroclimatic features of sub region	Central mid land(IIa)
10	Temperature Max.	32.31°C
11	Temperature Min.	23.61°C
12	RH	89.58 % (Morn.) 62.58 % (Even)
13	Soil PH	6.03
14	Soil type	Laterite
15	Irrigation /Rain fall	Irrigated
16	Annual rain fall(mm)	208.04 mm
17	Number of rainy days	116
18	Monsoon	South West monsoon received from June to August and also from North East monsoon comes around October- November
19	Organic/INM/both	Both
20	Crop Improvement/ Management/ PHT/Extension	Crop Improvement
21	Area available	0.39 ha
22	Laboratory/Processing	No

Accomplishments

- Maintain Poly clonal garden in an area of 0.39ha at the Station
- Seedlings from this garden is supplied through out the country through Mondelez International and from the station

Action Plan

- Supply of planting material for the establishment of polyclonal garden