



ENTREPRENEUR AND FARMER FRIENDLY TECHNOLOGIES

P. Chowdappa, H. Muralikrishna and A.C. Mathew



ICAR – Central Plantation Crops Research Institute

Kasaragod-671 124, Kerala



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Preface

The Central Plantation Crops Research Institute (CPCRI) has come into existence in 1970 as one of the agricultural research institutes in the National Agricultural Research System (NARS) under the Indian Council of Agricultural Research (ICAR) by merging Central Coconut Research Station, Kasaragod, Central Coconut Research Station, Kayamkulam as well as Central Arecanut Research Station, Vittal and its five substations at Palode and Kannara (Kerala), Hirehalli (Karnataka), Mohitnagar (West Bengal) and Kahikuchi (Assam). Headquarters of the institute is located at Kasaragod district of Kerala with Regional Stations at Kayamkulam and Vittal, Research Centres at Kohikuchi, Kidu, Minicoy and Mohitnagar, Krishi Vigyan Kendras at Kasaragod and Alleppy. Ever since inception, CPCRI has been conducting basic, strategic and applied research on coconut, arecanut and cocoa, which has resulted in a number of technologies for increasing production, productivity and quality.

The Commercially viable technologies are listed under the broad heading of varieties, biotechnology, bio-agents, equipment and machinery as well as value added products. Most of the technologies developed are suitable for small and marginal holder plantations, small scale industries and self help groups of farmers, to increase the farm based income and enhance profitability and sustainability to make the farming a remunerative enterprise.

This publication is brought out with a purpose to highlight the potential benefits and value of the technologies for the benefit the stakeholders and young entrepreneurs. Hope this would serve to a great extent for spread of the technologies for sustained growth of coconut, arecanut and cocoa around the globe.

Kasaragod,
05-01-2015

P. Chowdappa
Director

Introduction

ICAR-CPCRI is a premier organization, conducting research on coconut, areca-nut and cocoa. Technologies developed at the Institute under various research projects are evaluated and refined before giving it to the clientele. Technologies appropriate for the enterprises are transferred through Institute Technology Management Unit (ITMU) and the crop management practices, planting materials and technology products produced at the Institute are disseminated/sold from Agriculture Technology Information Centre (ATIC).

The ITMU was established in 2008 at CPCRI headquarters to identify and commercialise technologies and intellectual property (IP) generated as a result of the research and development activities. ITMU is also doing the IP related portfolio management at the institute. The ITMU is provided with technical support from the Zonal Technology Management Unit (ZTMU), which is under the Agricultural Technology Management Unit of IP&TM division of ICAR. ITMU deals with the issues under IP regime and technology transfer in this three tier set-up of ICAR. A Business Planning and Development unit (BPD) at the institute provides facilities, support and business incubation for the new entrepreneurs to establish themselves in agri-business.

Technology transfer is made from ITMU with the recommendations of Institute Technology Management Committee (ITMC) and with a memorandum of agreement between the client and the Institute. License fees and fees for transfer of know-how are fixed on non-exclusive basis, mainly targeting the rural entrepreneurs of small scale capacity. Primary objective is to upscale the technologies developed at the laboratory and Institute facilities to the enterprises and thereby for use of the common man. Ultimately, the products and IPs generated from the projects are commercialised for the benefit of entrepreneurs and the public. At global level, these IPs and technologies are disseminated to the potential users through Agri Innovate India Ltd., New Delhi (www.agrinnovate.co.in), which is the company initiated from ICAR for technology dissemination.



A. Varieties/ hybrids

1. Tender Coconut Varieties

Chowghat Orange Dwarf

Variety released in 1991

Description and special features

- ◆ Tendernut variety
- ◆ Nut yield : 112 nuts/palm/year.
- ◆ The average quantity of tender nut water is 350 ml/nut
- ◆ The tender nut water contains a total sugar content of 7g/100ml, sodium – 20 ppm and potassium – 2000 ppm.

Suitable growing region

All coconut growing areas



Kalpa Surya

Variety released in 2012

Description and special features

- ◆ Early bearing dwarf tender nut variety with orange colour fruits.
- ◆ Nut yield : 123 nuts/palm/year.
- ◆ Tender nut water content is 400 ml with total sugar -6.70g/100ml, sodium-35 ppm and potassium-2142 ppm.

Suitable growing region

Coconut growing tracts in Kerala, Karnataka and Tamil Nadu





Kalpa Jyothi

Variety released in 2012

Description and special features

- ◆ Early bearing dwarf tender nut variety with yellow colour fruits.
- ◆ Nut yield : 114 nuts/palm/year.
- ◆ Tender nut water content is 380 ml with total sugar -6.20g/100ml, sodium-36 ppm and potassium-1998 ppm.

Suitable growing region

Coconut growing tracts in Kerala and Karnataka and Assam states



Kalpa Haritha

Variety released in 2012

Description and special features

- ◆ Dual purpose variety suitable for copra and tendernut production, less prone to eriophyid mite damage.
- ◆ Nut yield : 18 nuts/palm/year
- ◆ Oil Yield : 2.46 t/ha/year
- ◆ Copra oil content : 66.5%
- ◆ Tender nut water content is 440 ml with total sugar -4.2g/100ml, sodium-17.5 ppm and potassium-2100 ppm.

Suitable growing region

Coconut growing tracts in Kerala and Karnataka

2. Coconut Varieties

Kera Chandra

Variety released in 1995

Description and special features

- ◆ High yielding dual purpose variety for copra and tendernut.
- ◆ High yielding variety with the nut yield of 110nuts/palm/year.
- ◆ Copra content : 98 g/nut
- ◆ Oil content : 66%
- ◆ Oil Yield : 2.55 t/ha/year
- ◆ Tender nut water content is 450ml with total sugar-5.86g/100ml, sodium-24ppm and potassium-2273ppm.

Suitable growing region

Coconut growing tracts in the west coast of the country in Kerala, Karnataka and Konkan region and in the East coast of Andhra Pradesh and West Bengal.



Chandra Kalpa

Variety released in 1985

Description and special features

- ◆ Drought tolerant, high copra oil content, suitable for neera tapping.
- ◆ A high yielding variety with an average yield of 100 nuts/ palm/ year
- ◆ Copra content : 176 g/ nut
- ◆ Copra yield : 3.12 t/ ha/ year
- ◆ Oil yield : 2.32 tons oil/ ha.
- ◆ Oil content : 72%
- ◆ Tender nut water content is 285ml with total sugar -4.2g/100ml, sodium-50ppm and potassium-2760 ppm.

Suitable growing region

Coconut growing tracts of Tamil Nadu, Andhra Pradesh, Maharashtra, Kerala, Karnataka





Kalpa Pratibha

Variety released in 2008.

Description and special features

- ◆ High yielding dual purpose variety for copra and tendernut.
- ◆ Average yield : 91 nuts/ palm/ year
- ◆ Copra yield : 4.12 t/ ha/ year
- ◆ Oil yield : 2.76 t/ ha/ year
- ◆ Oil content : 67%
- ◆ Tender nut water content is 448ml with total sugar-5.50g/100ml, sodium-21.7ppm and potassium-2150 ppm.

Suitable growing region

Coconut growing tracts in Kerala, Andhra Pradesh, Tamil Nadu and Maharashtra.



Kalpa Dhenu

Variety released in 2008.

Description and special features

- ◆ Regular bearer, relatively tolerant to drought.
- ◆ Nut yield : 80 nuts/palm/year.
- ◆ Copra content : 244 g/nut
- ◆ Oil Yield : 2.23 t/ ha/ year
- ◆ Oil content : 65.5%
- ◆ Annual yield 3.66 tons copra/ha and 2.40 tons oil/ha
- ◆ Tender nut water 290ml with total sugar -4.92g/100ml, sodium 24.6ppm and potassium-2650 ppm.

Suitable growing region

Coconut growing tracts in Kerala, Tamil Nadu and Andaman and Nicobar islands.

Kalpa Mitra

Variety released in 2008.

Description and special features

- ◆ The high nut, oil yield and drought tolerant variety.
- ◆ Nut yield : 86 nuts/ palm/ year
- ◆ Oil Yield : 2.45 t/ ha/ year
- ◆ Oil content : 66.5%
- ◆ Annual yield 3.36 t copra ha-1 and 2.24 t oil ha-1
- ◆ Tender nut water content is 495ml with total sugar -5.70g/100ml, sodium-23.5 ppm and potassium-2150 ppm.

Suitable growing region

Coconut growing tracts in Kerala and West Bengal



Kalparaksha

Variety released in 2008.

Description and special features

- ◆ High yielding coconut variety with sweet tender nut water and field resistance to coconut root (wilt) disease.
- ◆ Nut yield : 88 nuts/palm/year.
- ◆ Copra content : 85 g/nut
- ◆ Oil Yield : 1.87 t/ha/year
- ◆ Oil content : 65.5%
- ◆ Tender nut water content is 290ml with total sugar -4.92g/100ml, sodium-19.5 ppm and potassium-2100 ppm.

Suitable growing region

Root (wilt) disease prevalent tracts





Kalpasree

Variety released in 2009

Description and special features

- ◆ Early bearing variety suitable for root wilt disease tracts with superior quality oil, sweet water, and sweet kernel and.
- ◆ Nut yield : 90 nuts/palm/year
- ◆ Copra Yield : 1.54 t/ha/year
- ◆ Tender nut water content is 240ml with total sugar -4.80g/100ml, sodium-22.40ppm and potassium-2150 ppm.

Suitable growing region

Root (wilt) disease prevalent tracts



Kalpatharu

Variety released in 2009

Description and special features

- ◆ High yielding variety suitable for ball copra production, relatively tolerant to drought.
- ◆ Nut yield : 117 nuts/palm/year.
- ◆ Copra content : 172 g/nut
- ◆ Oil Yield : 2.45 t/ ha/ year
- ◆ Oil content : 67.2%
- ◆ Tender nut water content is 265 ml with total sugar -5.0g/100ml, sodium-60ppm and potassium-3200 ppm.

Suitable growing region

Coconut growing tracts in Kerala, Karnataka, Tamil Nadu.



3. Coconut Hybrids

Chandra Sankara

Variety released in 1985

Description and special features

- ◆ This is a D x T hybrid with Chowghat Orange Dwarf as female parent and West Coast Tall as male parent
- ◆ High yielding variety suitable for copra production
- ◆ Nut yield : 116 nuts/palm/year
- ◆ Oil Yield : 2.90 t/ha/year
- ◆ Copra oil content : 64-68%

Suitable growing region

Coconut growing tracts in Kerala, Karnataka and Tamil Nadu



Chandra Laksha

Variety released in 1985

Description and special features

- ◆ This is a hybrid with Laccadive Ordinary Tall as female parent and Chowghat Orange Dwarf as male parent
- ◆ High yielding variety drought tolerant
- ◆ Nut yield : 175 nuts/palm/year
- ◆ Oil Yield : 2.59 t/ha/year
- ◆ Copra oil content : 69%

Suitable growing region

Coconut growing tracts in Kerala and Karnataka and Tamil Nadu





Kera Sankara

Variety released in 1991

Description and special features

- ◆ This is a T x D hybrid with West Coast Tall as male parent and Chowghat Orange Dwarf as female parent
- ◆ Nut yield : 108 nuts/palm/year
- ◆ Copra Yield : 3.78 t/ha/year
- ◆ Oil Yield : 2.57 t/ha/year
- ◆ Copra oil content : 68%

Suitable growing region

Coconut growing tracts in Kerala, Maharashtra and coastal Andhra Pradesh



Kalpa Samrudhi

Variety released in 2009

Description and special features

- ◆ The hybrid IND 376(IND058S x IND069S) has good tender nut water quality with TSS 6° Brix and quantity (346 ml/ nut) and has been found to be relatively drought tolerant with high nutrient use efficiency compared to other released hybrids
- ◆ High yielding dual purpose variety suitable for copra and tender nut production.
- ◆ Nut yield : 117 nuts/palm/year
- ◆ Oil Yield : 2.94 t/ha/year
- ◆ Copra oil content : 67.5%

Suitable growing region

Coconut growing tracts in Kerala and Assam

Kalpa Sankara

Variety released in 2009

Description and special features

- ◆ This coconut hybrid (CGD x WCT) is suitable for cultivation in the root (wilt) disease prevalent tracts. It has tolerance to root (wilt) disease. The palms are semi tall in nature, precocious bearing and relatively higher yield
- ◆ Nut yield : 84 nuts/palm/year
- ◆ Copra Yield : 3.20 t/ha/year

Suitable growing region

Coconut growing tracts in root (wilt) diseased tracts



Kalpa Sreshta

Variety released in 2014

Description and special features

- ◆ Dual purpose high yielding variety.
- ◆ Parents; MYD × TPT
- ◆ Nut yield : 165 nuts/palm/year
- ◆ Copra Yield : 6.28 t/ha/year
- ◆ Oil Yield : 4.21 t/ha/year
- ◆ Oil content : 67%
- ◆ Tender nut water content is 368 ml with total sugar -5.81g/100ml, sodium-33.3 ppm and potassium-2081 ppm.

Suitable growing region

Coconut growing tracts in Kerala and Karnataka.



4. Arecaunt Varieties



Mangala

Released in the year 1972

Description and special features

- ◆ High yielding Semi Tall palm, with partially drooping crown, earliness in bearing, more number of female flowers/Inflorescence, higher nutset, quicker stabilization.
- ◆ Round and medium sized yellow coloured nuts
- ◆ Chali/dry kernel yield is 3.00kg/palm/year

Suitable growing region

Coastal Karnataka and Kerala



Sumangala

Released in the year 1985

Description and special features

- ◆ High yielding tall palm with partially drooping crown, oval to round shaped deep yellow coloured nuts.
- ◆ Average chali/dry kernel yield is 3.28 kg/palm/year

Suitable growing region

Karnataka and Kerala



Sreemangala

Released in the year 1985

Description and special features

- ◆ High yielding tall palm with sturdy stem, partially drooping crown. round and bold with deep yellow coloured nuts.
- ◆ Average chali/dry kernel yield is 3.18 kg/palm/year.

Suitable growing region

Kerala and Coastal tracts of Karnataka.



Mohitnagar

Released in the year 1985

Description and special features

- ◆ High yielding tall palm with medium thick stem, partially drooping crown, orange yellow coloured oval to round shaped nuts.
- ◆ Average chali/dry kernel yield is 3.67 kg/palm/year

Suitable growing region

West Bengal and Coastal tracts of Karnataka and Kerala.





Swarnamangala

Released in the year 2009

Description and special features

- ◆ High yielding tall palm with medium thick stem and comparatively shorter internodes, partially drooping crown.
- ◆ Average chali/dry kernel yield is 3.88 kg/palm/year.

Suitable growing region

Coastal tracts of Karnataka, Kerala and Maharashtra



Kahikuchi

Released in the year 2009

Description and special features

- ◆ A high yielding tall variety with medium thick stem possessing comparatively shorter internodes. Nuts are bigger and heavier with high recovery of chali/ dry kernel (25.16%) from fresh fruits.
- ◆ The average yield of this cultivar is 3.70 kg dry kernel/palm/year.

Suitable growing region

Assam and North Eastern tracts of India

Madhuramangala

Variety released in 2013

Description and special features

- ◆ High yielding variety, medium tall, high nut recovery (25.90%) from fresh nuts suitable for green nut and ripe nut processing.
- ◆ The average yield is 3.54 kg dry kernel palm/year
- ◆ The average yield of this cultivar is 3.70 kg dry kernel/palm/year.

Suitable growing region

Areca growing tracts of Karnataka and Konkan region of Maharashtra



Nalbari

Variety released in 2013

Description and special features

- ◆ High yielding variety suitable for ripe nut processing high nut recovery (25.18 %) from fresh nuts, comes to bearing by 5th year .
- ◆ The average yield is 4.15 kg chali dry kernel palm/year

Suitable growing region

Areca growing tracts of Karnataka, North Bengal and North Eastern region.



5. Arecaunt Hybrids



VTLAH1

Released in the year 2007

Description and special features

- ◆ VTLAH-I is a hybrid variety [Hirehalli dwarf (VTL-56) X Sumangala (VTL-11)]
- ◆ Medium yielding dwarf hybrid variety suitable for reduced cost of cultivation
- ◆ Sturdy stem with super imposed nodes, reduced canopy size, well spread leaves, medium sized oval to round shaped nuts and early stabilization and medium yielder
- ◆ Average chali/dry kernel yield is 2.54 kg palm/year

Suitable growing region

Areca growing tracts of Kerala and Coastal regions of Karnataka



VTLAH2

Released in the year 2006

Description and special features

- ◆ VTLAH2 is a hybrid variety [Hirehalli dwarf (VTL-56) X Mohitnagar (VTL-60)].
- Medium yielding dwarf hybrid variety suitable for reduced cost of cultivation
- Sturdy stem with super imposed nodes, reduced canopy size, well spread leaves, medium sized oval to round shaped nuts and early stabilization are the salient features of this hybrid variety
- Average chali/dry kernel yield is 2.64 kg/palm/year

Suitable growing region

Areca growing tracts of Kerala and Coastal regions of Karnataka

6. Cocoa Varieties



VTLCC-1

Released in the year 1995

Description and special features

- ◆ This Cocoa Clone is early, heavy bearer, both self and cross compatible.
- ◆ The colour of the pod is green to yellow, no. of pods -75 (tree/ year), no. of beans/ pod- 37, each pod weighing about 321g and single dry bean weight is 1.05g.
- ◆ Dry bean yield/ tree/ year is 1.33 kg

Suitable growing region

Kerala, Karnataka and Tamil Nadu



VTLC-1

Released in the year 2011

Description and special features

- ◆ Yields 55 smooth red pods/ tree/ year
- ◆ Pods are of 360 g weight with 41 beans
- ◆ Potential yield of 2.52 kg/ tree/ year and the yield/ha is 1700 kg
- ◆ Shelling percentage of 11% fat content 52%.

Suitable growing region

Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa





VTLC-57

Released in the year 2011

Description and special features

- ◆ Yields 54 green pods/ tree/ year
- ◆ Pods are of 400 g weight with 41 beans
- ◆ Yield 2.70 kg/ tree/ year and the yield/ ha is 1840 kg

Suitable growing region

Kerala, Karnataka and Tamil Nadu

7. Cocoa Hybrids



VTLCH-1

Released in the year 2007

Description and special features

- ◆ VTLCH-1 is a hybrid variety obtained by crossing with II-67 x NC-42/94 (Malaysian & Nigerian) which was released in the year 2006 by CPCRI, Kasaragod. This Cocoa hybrid is early, heavy bearer, tolerant to water stress.
- ◆ The colour of the pod is yellow, no. of pods -50 (tree/year) and single bean weight is 1.00g.
- ◆ Dry bean yield/ tree/ year is 1.25 kg and yield/ ha is 856 kg and shelling is 12%.

Suitable growing region

Kerala and Karnataka



VTLCH-2

Released in the year 2007

Description and special features

- ◆ VTLCH-2 is a vigorous early and heavy bearer, hybrid variety obtained by crossing with ICS-6 x SCA-6.
- ◆ The colour of the pod is yellow, no. of pods – 70 (tree/year), and single dry bean weight is 1.15g.
- ◆ Dry bean yield/ tree/ year is 1.15 kg and yield/ ha is 850 kg.
- ◆ Fat content is 54% and shelling is 11%.

Suitable growing region

Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa.



VTLCH-3

Released in the year 2007

Description and special features

- ◆ Early, heavy bearer, drought tolerant hybrid variety obtained by crossing with II-67 x NC 29/66.
- ◆ The colour of the pod is yellow, no. of pods – 45 (tree/year), and single dry bean weight is 1.07g.
- ◆ Dry bean yield/ tree/ year is 1.45 kg and yield/ ha is 993 kg.
- ◆ Fat content is 50% and shelling is 13%.

Suitable growing region

Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa.





VTLCH-4

Released in the year 2007

Description and special features

- ◆ Early, heavy bearer, drought tolerant hybrid variety obtained by crossing with II-67 x NC-42/94.
- ◆ The colour of the pod is yellow, no. of pods – 40 (tree/year), and single dry bean weight is 1.01g.
- ◆ Dry bean yield/ tree/ year is 1.25 kg and yield/ ha is 856 kg.
- ◆ Fat content is 50% and shelling is 13%.

Suitable growing region

Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa.



B. Technologies

8. Biotechnological processes

Mass production of arecanut varieties by tissue culture

Application/Use :

Tissue culture seems to be the only vegetative propagation tool applicable to areca palm. Among the various explants tried, immature inflorescence and unopened female flowers (ovary) were found to be the best explants for arecanut tissue culture.

Description:

Tissue culture protocol for arecanut was standardized from immature inflorescence. Plantlet regeneration was obtained via callus, callus induction takes about 6-8 months, in Eeuwens Y3 medium supplemented with picloram 200 μ M.

Output/ capacity/ unit :

Approximately 350-400 plants per inflorescence



Embryo collection protocol for coconut germplasm collection

Application/Use :

Embryo extraction from immature nuts.

Useful in field collection of coconut germplasm from distant places.

Description:

A protocol for aseptic collection of embryos in coconut, their storage and successful culturing to develop plantlets.





Cryopreservation of coconut pollen for commercial hybrid production

Application/Use:

Conservation of coconut diversity for long term.

Description:

Cryopreservation techniques have been standardized for mature coconut zygotic embryos and coconut pollen.

9. Bio Agents

PGPRs for coconut and cocoa

Application/Use :

For production of healthy and vigorous seedlings of coconut and cocoa.

Description :

Plant Growth Promoting Rhizobacteria (PGPR) such as *Pseudomonas* have been isolated and identified for production of healthy and vigorous seedlings of coconut and cocoa.

Output/ capacity/ units :

Their inoculation resulted in 30 - 38 % increase in total dry matter of coconut seedlings compared to un-inoculated control.

In case of cocoa, an improvement of 27- 56 % total dry matter was recorded.

Bioagent - *Oryctes* Baculovirus against Rhinoceros Beetle

Application/Use :

Application of OBV helps to reduce the 6 per cent yield loss in coconut due to rhinoceros beetle damage

Description:

Oryctes baculovirus (OBV) infects nuclei of the midgut epithelium and fat body of *Oryctes* larvae. Both larvae and adult of Rhinoceros beetle are susceptible to infection by the virus.



Bioagents - *Goniozus Nephantidis* and *Bracon brevicornis* against coconut black headed caterpillar, *Opisina arenosella*

Application/Use:

Field release of *G. nephantidis* causes 77 per cent reduction in the population of *O. arenosella* larvae

Description:

G. nephantidis is an ecto-parasitoid of *O. arenosella*. The parasitoids lay their eggs on the larvae. On hatching, they feed on the host larval contents and pupate as cocoons outside.



Coconut leaf vermicompost

Application/Use:

It is a low cost organic fertilizer for improving soil health and fertility. It will improve seedling establishment, crop growth and yield.

Description :

A dark brown coloured granular organic material made through vermicomposting of coconut leaves.

Output/ capacity/ units:

700 kg per tonne of dried coconut leaf biomass



On farm production of *Trichoderma* and *Metarhizium* using cocoa wastes

Application/Use :

Using cocoa wastes like sweating and pod husk, a low-cost technology was developed for production of bio-agents

Description :

If the cocoa wastes are utilized for the production of biocontrol agents, the income per unit area of cocoa garden will increase.



Output/ capacity/ units :

The populations of both biocontrol agents are higher in pod husk and bean shell compared to that in neem cake, a conventional substrate. If biocontrol agent production is taken up by the chocolate factories as a separate byproduct utilization unit, the bean shell from the factories can be utilized for biocontrol production at a low cost.

Trichoderma Coir Pith Cake

Application/Use :

Biological control of pests and diseases is an alternative to noxious chemical pesticides to curtail the hazards of intensive use of toxic chemicals.

Description:

The processing technology for production of Trichoderma coir pith cake (TCPC) dry formulation, a very useful biocontrol agent, with long shelf life of 12 months.

Output/ capacity/ units :

The new, simple and low cost technology developed, thus, contains cheap coir pith, a waste from coconut industry converted into value added and environment friendly commercial organic product for management of plant diseases.



Nanomatrix based pheromone lure to trap red palm weevil and rhinoceros beetle

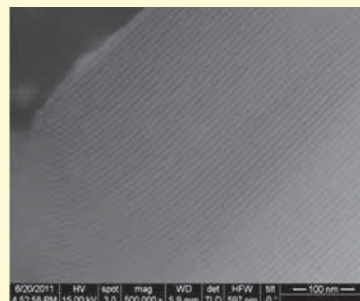
Application/Use :

The product from CPCRI has an edge over the existing polymer membrane or polypropylene tube dispensers as they aid to scale down the cost involved due to extended field efficacy of the lure and the lower load of pheromone use. The controlled release of semiochemicals from the nanomatrix enables the extended duration of trapping efficiency of the lure. The commercially available lures have increased release rates and warrant frequent replacement. Nanomatrix based dispenser has lower load of semiochemicals than commercial lures and in terms of efficacy in trapping of insects it is effective or at par with the existing commercial lures.



Description :

A nanomatrix for efficient delivery of red palm weevil pheromone (4-methyl-5 nonanol + 4 methyl -5 nonanone) and rhinoceros beetle pheromone (ethyl 4-methyloctanoate) has been developed. Both lures can be placed @ one per ha.



C. Machinery

Coconut de-shelling machine - Patent Number: 233742

Application/Use :

Useful for large scale copra processing units.

Description :

Traditionally after partial drying of split coconut, the kernel and copra is separated using a traditional wooden mallet. It is done manually by holding the coconut in one hand and scooping the kernal (copra) out of the shell. It is a time consuming and cumbersome process. To overcome this problem, a power operated coconut de-shelling machine was designed and developed. The capacity of the machine was 200 coconuts (400 half cups) per batch.

Output/ capacity/ units : 5000 nuts / hr



Tender nut punch and cutter - Patent Number: 233744

Application/Use:

It is a simple device to pierce tender coconut and cut open the nut after drinking the water inside. Risk of injury while using traditional knife is totally eliminated.

Description :

In a tender nut punch, the tender nut is placed on the nut holder and by operating the lever mechanism a hole of 12mm diameter is made in just 4-5 seconds. In a tender nut cutter, the cutting blade is mounted concentric to the stand and can be used to cut the tender nut easily.

Output/ capacity/ units : 150 – 200 nuts/hr.



Telescopic sprayer for palms - Patent Number: 246751



Application/Use:

In view of acute shortage of skilled labour, this device will be very helpful for large scale spraying in a short period of time.

Description :

The developed sprayer comprises of two co – axial pipes of ultra – light weight (0.5 kg /m), which can be used to spray up to a height of 12.5m (40ft) from the ground.

Output/ capacity/ units:

Arecanut-100palms/hr, Coconut-15-20 palms/hr

Shell fired copra dryer

Application/Use :

Production of quality copra in 24 hours.

Labour saving up to 75%

Description :

The quality of copra obtained was light brown in colour which fetches good price in the market.

Output/ capacity/ units :

It is natural convection copra dryer where coconut shell is used as fuel. Once fired the dryer can supply heat 4-6 hours without attention. It can dry coconut in one day where as in the open sun drying it take eight days to convert coconut into copra. Coconut oil of low free fatty acid level and long shelf life can be produced. The capacity of the dryer developed is 1000 nuts per batch.



Snow Ball Tender nut Machine

Application/Use :

To make ready to serve tender coconut without shell and husk. Value addition of up to 500% can be achieved.

Description :

The machine is used to take a groove around the shell of the husked tendernut. A flexible knife, scooping tool, is used to scoop out the tender nut kernel from the shell. Remove the detached shell and keep the snowball tendernut in an ice cream cup with the eye portion facing up.

Output/ capacity/ units :

Ten snowball tendernuts per hour



Agriculture Waste Fired Copra Dryer

Application/Use :

Production of good quality copra using any agricultural waste as fuel.

Description :

An indirect type dryer where only hot air comes into contact with copra. Any agricultural waste can be used as fuel. The dryer has a capacity of 400 coconuts.

Output/ capacity/ units :

Production of good quality copra in 36 hours.



Palm Climbing Device

Application/Use :

Device is a simple equipment for climbing coconut and arecanut palms without highly skilled climbing experience

Description :

A simple coconut and arecanut palm climbing device consists of a pair of U shaped frames. A foot rest each is provided at one side of the frame. Provision is given on the foot rests for the user to fix a pair of shoes of his size and choice. The user can fix the climbing device to his feet by wearing the shoes attached to the device and can move up and down the coconut and arecanut tree as easily as he climbs a vertical ladder. A safety gadget also is provided along with the climbing device. The same mechanism could be used to sit and relax while climbing and also to do other operations such as cleaning the palm crown, harvesting and spraying.



Other machinery

Coconut Testa Removing Machine



Coconut kernel is pressed to the surface of the rotating friction wheel either by hand or using a fork. Removed testa is collected at the bottom. With the help of this machine, testa can be removed from 75 nuts in an hour.

Coconut slicing machine



Coconut endosperm is pressed to the surface of the rotating wheel through the slot provided on the feeder at the top of the machine. When it comes into contact with the blades, the coconut endosperm gets sliced and chips produced. The sliced coconut chips are then guided towards the outlet by the exit guide and are collected in a container. Coconut chips of uniform and required thickness could be produced using this machine. Capacity of the machine is 50 coconuts per hour.

Manual coconut slicing machine



Coconut endosperm, is fed to the surface of the blade supporting disc through the slot provided in the feeder by the operator. When the blade supporting disc rotates the kernel pieces are pressed towards its surface. When it comes into contact with the slicing blade, coconut kernel gets sliced. The sliced kernel, coconut chips, is guided towards the outlet by the guide. Coconut chips coming out through the outlet is collected in a tray. Coconut chips of required thickness could be made by adjusting the clearance between the slicing blade and the blade supporting disc. Approximately 25 coconuts can be sliced in one hour using this machine.

Batch type coconut flaking machine

Coconut kernel pieces are kept in the bowl. The cutting blades rotating in the vertical direction cut the kernel in to small pieces. The rotating bowl brings the fresh kernel to be cut, to position. The machine can make 10kg coconut flakes in one hour.



Coconut grating machine

The coconut grating machine scrapes off the coconut flesh into fine gratings with the help of a specially designed stainless steel blade. An operator feeds the coconut half into the grating machine during the grating process. The single user machine has a capacity of 60 nuts/ hr and the multi user has a capacity four times of the single user one.



Coconut pulveriser

Cut coconut kernel is fed through a hooper, which turns into fine powder. The machine has a capacity of 250 nuts per hour.



Hydraulic Coconut milk extracting machine



This machine is useful for large scale extraction of coconut milk in coconut milk processing industries and virgin coconut oil (VCO) production.

Double screw coconut milk expeller



The double screw coconut milk expeller extracts milk from coconut kernel. The expeller has a capacity to extract milk from 1000 coconuts in one hour. Maximum milk could be extracted in two runs itself. Milk extraction efficiency remains the same when the coconut kernel is fed with or without pulverization. The machine would be of great help to all processing units involved in coconut milk extraction.

Coconut milk expeller with cooling mechanism



Milk expellers of various types are available to extract coconut milk from kernel. Among the expellers screw type expellers are the preferred, since they have high milk extraction efficiency. However, while compressing the coconut kernel gets heated up, especially near the outlet. In order to dissipate the heat generated during the extraction process, a coconut milk expeller has been fabricated with an in built cooling mechanism. The expeller is basically a single screw type expeller. Heat energy generated due to compression of coconut is dissipated by circulating cold water.

The above individual machinery are developed in association with some of the previously mentioned technologies. However, design drawings of these may be obtained exclusively on request from Director, CPCRI.

D. Product/Process

A simple device to collect fresh and hygienic neera (inflorescence sap) from coconut tree

Application/Use:

The sap collected using the above device is hygienic, fresh and healthy and can be promoted as ready to serve natural drink in parks, roadside kiosk, restaurants, tourist spots etc. The sap can be used for the preparation of natural coconut sugar, jaggery or honey without the addition of lime or other chemicals.

Description:

Sequential neera & nut production (SCTNP) technology which produces neera and nuts from the same spadix of the palms has provided the farmers to increase farm income without sacrificing the copra products and fully maximize the economic potential of the palms with the addition of another product which is the coconut sap.

Output/ capacity/ units : 1-4 ltrs per inflorescence per day.



Coconut chips

Application/Use :

It is a simple technology to produce ready to serve coconut chips. It is an ideal cottage industry and women self help groups are the main beneficiaries.

Description :

Coconut chips is a ready to serve product produced by osmotic dehydration and subsequent drying of coconut kernel.

Output/ capacity/ units : 500 coconuts / day



Production of virgin coconut oil by fermentation technique



Application/Use :

It is a newly emerging high value product which has lot of medicinal properties and cosmetic applications which is the need of the hour for the highly health conscious consumers. It is also used as hair and skin conditioner, oil base for various cosmetic and skin care products, carrier oil for aroma therapy and massage oils.

Description :

In fermentation method, the VCO can be produced in a home-scale operation using ordinary kitchen utensils after extracting coconut milk.

Output/ capacity/ units :

Oil recovery is 18-20% from fresh coconut kernel.



Production of virgin coconut oil by hot process technique



Application/Use :

It's a newly emerging high value product which has lot of medicinal properties and cosmetic applications which is the need of the hour for the highly health conscious consumers. It is also used as hair and skin conditioner, oil base for various cosmetic and skin care products, carrier oil for aroma therapy and massage oils.

Description :

In the modified hot process method for producing VCO controlled heating prevent the oil from turning brown and maintain the moisture content less than 0.2 % to prolong its shelf life.

Output/ capacity/ units :

Oil recovery is 20-22% from fresh coconut kernel.



E. FARMER FRIENDLY TECHNOLOGIES

Technologies for enhancing livelihood of small and marginal farmers

Coconut

Coconut based high density multispecies cropping systems (HDMSCS)

Crops: banana, pineapple, clove, and pepper was established as highly remunerative cropping system.

Coconut based farming system (CBFS)

Components: coconut, dairy, poultry, rabbitry, sericulture and pisciculture

System provided organic manures for recycling of biomass.

Drip irrigation from December to May to save 34 per cent of water.

Drip fertigation saves fertilizer 50% and yields on par to normal fertilizer dose.

Utilization of coconut wastes for oyster mushroom cultivation is remunerative.



Arecanut

Arecanut based high density cropping system

Crops: cocoa, pepper, banana and clove is highly remunerative.

Arecanut based farming system (ABFS)

Components: grass, dairy and fishery along with recycling of biomass is a remunerative enterprise.

Drip irrigation resulted in 45% yield increase and saving of water in arecanut garden. Fertigation of 75% fertilizer with highest net returns per rupee investment (4.57).



Cocoa



Pruning and training

Canopy architecture by pruning and planned cutting of branches for canopy management under intercropping.

Technologies for enhancing productivity through integrated pest and disease management

Coconut



Bud rot management

Prophylactic treatment of pouring mancozeb coupled with placing of mancozeb sachets in leaf axils is effective.

Leaf rot control in root (wilt) affected palms

Application of consortium of biocontrol agents, phytosanitation are effective.



Stem bleeding control

Soil application of neem cake Bio-agent *Trichoderma* found effective against stem bleeding pathogen.

Rhinoceros beetle control

Metarhizium anisopliae is a potential pathogen on beetle grubs. The green muscardine fungal (GMF) mass multiplication technology developed.



Eriophyid mite control

Spraying palm oil sulphur mixture is effective.

Diagnostic kit

Early diagnosis of root (wilt) disease in seedlings using serological technique.



Statistical models

Based on sample survey, models developed for production forecasting and for estimation of yield loss.

Arecanut

Koleroga control

Covering bunches with polybags prior to monsoon prevents mahali/ fruit rot

Spray 1% Boudreaux mixture periodically prevents the disease.

Integrated management of diseases such as yellow leaf disease of arecanut, inflorescence die-back, foot rot (anabe disease), leaf blight and IPM of mite and pentatomid bug were developed.



Cocoa

Integrated disease management (IDM) for black pod and canker of cocoa

Spray of fungicide, phytosanitation and application of bio-agent consortia

Biocontrol agent, *Trichoderma harzianum* in the form of Trichoderma coir pith cake highly effective.

Farm level mass production of *Trichoderma* using cocoa sweating

Diluted cocoa sweating is a superior culture medium.

Placing of bromodiolone cake is effective against arboreal black rat.



Technologies for enhancing productivity through organic farming and natural resources management

Moisture conservation

Mulching with coconut leaves, husk, coir dust, farm waste etc.

Water conservation

Bunding, terracing, cover crops etc.

Organic recycling

Composting, manures or green manures, intercropping, etc. Leguminous cover crops as green manure.



Technologies for quality planting material production

Selection of mother palms for seed production,
selection of seednuts and quality seedlings in arecanut and
coconut

Nursery management techniques and the technique for raising
polybag nursery

Softwood grafting is the most successful propagation technology
in cocoa.





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भारतीय कृषि अनुसंधान परिषद

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