Central Plantation Crops Research Institute, Kasaragod

George V. Thomas
Director

1. VARIETIES

Coconut

The CPCRI, Kasaragod, has released eight varieties and five hybrids of coconut capable of producing up to three tonnes of oil per hectare per year. Varieties tolerant to biotic and abiotic stresses and those suitable for tender nut have also released for making coconut cultivation economically-viable (Table 1).

2. CROP MANAGEMENT

Cropping Systems

Coconut-based inter/mixed, multi-storied multi-species cropping systems developed are being widely adopted by farmers. The high-density multi-species cropping system and coconut-based integrated farming system helps maximise profits and can even buffer the price crash of the main crop. For maximising economic returns, high-value medicinal and aromatic crops and flower crops have been recommended in coconut-based cropping system. The carbon sequestration potential of coconut plantations is assessed to be very high, opening up new opportunities for

Table 1. Improved coconut varieties and hybrids.

	Nut yield (palm/year)	Copra yield (g/nut)	Oil content (%)	Suitable for
			Varieties	
Chandra Kalpa	97	195	70	Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra
Kera Chandra	110	198	66	Kerala, Karnataka, Konkan region, Andhra Pradesh, West Bengal
Chowghat Orange Dwarf	63	Tender nut variety	-	All coconut-growing areas
Kalpa Pratibha	91	256	67	West Coast region, Peninsular India
Kalpa Dhenu	86	242	65.5	West Coast region and Andamans and Nicobar Islands
Kalpa Mitra	80	241	66.5	West Coast region and West Bengal
Kalparaksha	65 (87 under disease free condition)	215	65.5	Kerala including root (wilt) disease prevalent tracts
Kalpasree	90	Tender nut variety	-	Root (wilt) disease prevalent tracts
			Hybrids	
Chandra Sankara	110	208	68	Kerala, Karnataka, Tamil Nadu
Kera Sankara	106	198	68	Kerala, Karnataka, Maharashtra, Andhra Pradesh
Chandra Laksha	109	195	69	Kerala and Karnataka
Kalpa Samrudhi	117	214	67.5	Kerala and Assam
Kalpa Sankara	84	170	67.5	Root (wilt) disease prevalent tracts

Kalparaksha, a root (wilt) disease tolerant variety of coconut

Coconut-based high-density multi-species cropping system

claiming higher carbon credit under clean development mechanism along with natural vegetations. Management of coconut garden under root (wilt) disease prevalent tracts and arecanut under yellow leaf disease areas by adopting integrated organic farming and sustainable agricultural practices have been recommended.

Fertigation

Fertigation at 50% of recommended NPK with drip irrigation at 66% open pan evaporation gives higher yield in coconut. In coastal sandy soil management, pineapple, banana, elephant-foot yam and vegetable crops like brinjal can be profitably cultivated as intercrop in coconut garden by adopting adequate soil moisture. Various bio-engineering measures have been developed to sustain production in rainfed areas of west coast region. The low-cost water

Vermicomposting of coconut waste by utilising indigenous earthworms

harvesting structures has helped in augmenting groundwater recharge to a great extent, wherever installed.

3. PLANT PROTECTION

Placing perforated sachets containing Mancozeb in innermost leaf axils around spindle leaf is very effective prophylactic measure for controlling bud rot disease in coconut. Application of *B. subtilis* and *P. fluorescens* in combination, after removal of rotten portion of spindle leaf is very effective in managing leaf rot disease of root (wilt) affected coconut palms. Leaf rot disease of coconut, caused by *Colletotrichum gloeosporioides*, *Exerohilum rostratum* and *Fusarium solani*, can be controlled either with Contaf-5EC 2 ml or Dithane M-45/ Indofil M-45 or by biocontrol agents such as bacterial (*Bacillus subtilis* and *Pseudomonas fluorescens*) and fungal (*Trichoderma viride*) bicontrol agents in integrated management. Stem bleeding of coconut, caused by *Thielaviopsis paradoxa*, can be controlled through root feeding of 5% Calixin and application of neem cake along with antagonistic fungi like *Trichoderma*.

Basal stem rot of coconut, also called as '*Ganoderma* wilt'/ 'Anabe Roga'/ 'Thanjavur wilt', can be controlled by calixin through root feeding (2 g/100 ml), drenching the soil with fungicides (25 litres of calixin 0.1% or) with soil application of neem cake @ 5 kg/ palm/ year, along with the recommended dose of organic manures.

Management of rhinoceros beetle (*Oryctes rhinoceros*) can be done through IPM package using a beetle hook during the peak period of pest abundance (June-September) from crown of all the palms, treatment of all possible breeding sites (farmyard manure dump, fallen coconut logs, etc.) of insect with 0.01% Carbaryl (50% WP) on w/w basis. Biological suppression of pest can be carried out by releasing 10^{-15} beetles inoculated with *Oryctes* virus in one ha of garden and application of 5×10^{11} spores of *Metarhizium anisopliae* fungus/m^3 area of breeding site of pest, during monsoon period. Prophylactic measure include leaf axil filling of palms with 12.0 g naphthalene balls /palm covered with sand at 45 days interval.

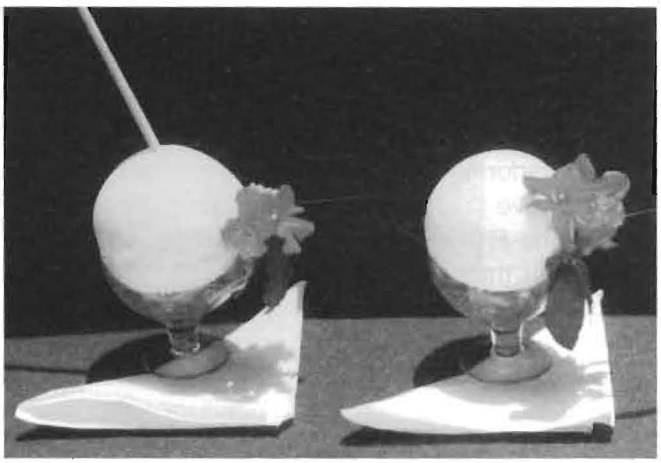
The placement of three pheromone vials (synthesized by CPCRI) per trap could catch comparable number of red palm weevils to that of commercial pheromone lure. The protocol for estimation of red weevil antennal response to volatiles in electroantennography has been standardized, as a novel approach to shortlist potential compounds to be assessed for behavioural response. Nanomatrix loaded pheromone trap is effective in trapping red palm weevil on coconut. Leaf-eating caterpillar (*Opisina arenosella*) can be controlled by release of *Goniozus nephantidis* for third instar larval stages (@20%) *Elasmus nephantidis* (@50%) for pre-pupal stage and *Xanthopimpla punctata* (@30%) for pupal stage. Eriophyid mite (*Aceria guerreronis*) can be managed with 2% palm oil, garlic and soap mixture during April-May, October-November and December-January, in such a way that all mite infested palms in an area should be covered at the shortest possible interval. White grub (*Leucopholis coneophora*) can be controlled by insecticidal application with phorate 10G @ 100 g/palm during May-June and September-October. Coreid bug (*Paradasynus rostratus*) can be controlled with 0.1% carbaryl.

4. POST-HARVEST MANAGEMENT

Value-Added Products

Coconut chips slicing machine, an agricultural waste fired virgin coconut oil cooker, solar tunnel dryer for ball copra preparation, a simple coconut and arecanut palm climbing device, safety device for coconut palm climbing device are very useful implements and gadgets. Technologies for making snowball tender nut and coconut chips of various flavours have been commercialised.

Waste fired copra dryer



Snowball tendernut

Three equipments – tender nut punch and cutter, coconut deshelling machine – have been awarded national patents.

Arecanut

In arecanut, six varieties and two hybrids have been released. The hybrids are dwarf in nature which are very useful under situations of labour shortage for crop management and harvesting.

Table 2. Arecanut varieties and hybrids.

Varitety/Hybrid	Habit	Nut yield (dry, kg/palm)	Recommended for
		Varieties	
Mangala	Semi tall	3.00	Karnataka and Kerala
Sumangala	Tall	3.20	Karnataka and Kerala
Sreemangala	Tall	3.18	Karnataka and Kerala
Mohitnagar	Tall	3.67	West Bengal, Kerala and Karnataka
Swarnamangala	Tall	3.78	Karnataka and Kerala
Kahikuchi	Tall	3.70	Assam and NEH Region
		Hybrids	
VTLAH1	Dwarf	2.54	Karnataka and Kerala
VTLAH2	Dwarf	2.64	Karnataka and Kerala

CROP MANAGEMENT

Arecanut-based inter/mixed, multi storied multi-species cropping systems are being widely adopted by farmers. For maximising economic returns, high-value medicinal and aromatic crops and vanilla have been recommended in arecanut-based cropping system. The carbon sequestration potential of arecanut and cocoa plantations has been assessed to be very

high. Fertigation at 75% of recommended NPK with drip irrigation at 100% open pan evaporation gives higher yield in arecanut. Vermicomposting technique using arecanut and other farm wastes with indigenous earthworm, is very effective for bioconversion to quality organic manures. Mushroom cultivation in arecanut wastes is remunerative.

PLANT PROTECTION

Mahali of arecanut caused by *Phytophthora arecae* can be prophylactically controlled by spraying of 1% Bordeaux mixture. Management package to improve the productivity of yellow leaf disease affected arecanut palms has been developed. It involves application of 220 g urea, 200 g superphosphate and 230 g muriate of potash palm/year in two split doses during pre- and post-monsoon period, application of one kg of superphosphate in affected gardens and organic manure @ 12 kg each of compost and green leaves per year. Avoid water stagnation by providing drainage facility.

Healthy plant of arecanut

POST-HARVEST MANAGEMENT

Manual/power-operated sprayer developed is convenient for spraying arecanut palms up to the age of 25 years. It is highly useful in rainy season when palms are slippery, this machine is highly useful for spraying from the ground itself. This telescopic sprayer has been awarded national patents.

VARIETIES

COCOA

One superior cocoa clone and four hybrids have been developed. All of them are high-yielding and drought resistant to a certain extent.

Table 3. Cocoa clone superior and hybrid.

Genotype	Pod colour	Bean yield (kg dry beans/tree)	Recommended for
		Clone	
VTLCC-1	Green to yellow	1.33	Kerala, Karnataka and Tamil Nadu
		Hybrid	
VTLCH 1	Green to yellow	1.48	Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa

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Genotype	Pod colour	Bean yield (kg dry beans/tree)	Recommended for
VTLCH 2	Green to yellow	1.15	Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa
VTLCH 3	Green to yellow	1.47	Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa
VTLCH 4	Green to purple	1.25	Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Goa

CROP MANAGEMENT

Cocoa is an ideal mixed crop for coconut and arecanut gardens. If it is grown as a mixed crop with arecanut. Its crop should be irrigated once in a week during November-December, once in 6 days during January-March and once in 4-5 days during April-May (with 175 litres of water). Maximum yields are obtained in cocoa irrigated through drip with 20 litres water/day/tree.

PLANT PROTECTION

Black pod disease of cocoa, caused by *Phytophthora palmivora*, can be controlled by spraying of 1% Bordeaux mixture and by frequent removal and destruction of infected pods. A large number of young pods of 2-3 months age dry up and remain on tree as mummified fruits. This type of drying of pods is commonly referred as 'Cherelle wilt'. Bavistin WP (Carbendazim 0.05%) or Indofil M-45 (Mancozeb 0.2%) can be sprayed to manage this disease.

Superior cocoa hybrid - VTLCH1

For further interaction, please contact to :

Director
Central Plantation Crops Research Institute
Kasaragod 671124, Kerala
Tel.: 04994-232322, 04994-232893, Fax: 04994-232322
E-mail: *cpcri@nic.in*, Website: www.cpcri.gov.in