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From the desk of Chairman

Dear Coconut Farmers,

Price of coconut and coconut products shows an increasing trend since the beginning of 2017. The retail consumer price of coconut touched Rs. 34 per kg which is 62% higher than the price prevailed during the corresponding period of the previous year. The price of coconut was ruling at low level since April 2015 and the price started improving from the month of November 2016 onwards. International price of coconut and copra also showed an upward trend during 2016 and is still continuing. The domestic price of coconut products in India was ruling higher compared to the international price and during many times the domestic price was 100% higher than the international price. But after a long spell, the gap between international and domestic price has reduced during 2016. In March 2016, the international price became higher than that of the domestic price which opened immense opportunities for India for exporting coconut and coconut products.

The increasing demand for coconut and its products and decrease in production in major coconut growing countries like Philippines, Indonesia etc. are the major reasons for the increase in price. By breaking the conventional boundaries of an oil seed crop, coconut is gaining importance as a food crop which contributes to the health, nutrition and well being of human beings. The multiple medicinal and nutraceutical properties has added to the unprecedented increase in the demand of coconut products in the domestic and international markets.

Export of Indian coconut and coconut products (other than coir and coir products) touched Rs.1446.80 crores in 2016-17 (up to November 2016) which registered an increase of 50.22% over the corresponding period of the previous year. Since Coconut Development Board became Export Promotion Council (EPC) for coconut and coconut products, the export of coconut products is being actively promoted. The Board is also extending considerable support to the exporters.

I call upon all the coconut farmers particularly the Farmer Producer Organizations in coconut sector and the stakeholders to make use of the prevailing opportunities and to play the lead role in increasing the foreign exchange earning of the country through maximum coconut value addition and export.

With warm regards,

A K Singh

Chairman

Microbial and non-microbial technologies for plant and soil health management in coconut

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Introduction

Coconut palm is a unique plantation crop cultivated in 2.1 million ha in India. The palm is at once a food crop, an oil-seed crop, a medicinal crop, an industrial crop, a horticultural crop, an ecological crop and most importantly a cultural crop that supports the livelihood of more than 10 million Indians directly and indirectly. Its sustainability translates into sustainability of large swathes of humanity in coastal and hinterlands, Lakshadweep and Andaman and Nicobar islands of India. The two main factors that challenge the sustainability of coconut are the low national productivity as well as cyclical market economy. To address the first challenge, we at ICAR-CPCRI have developed several microbial and non-microbial technologies that can improve the soil

and plant health and thereby enhance the productivity in ecologically sustainable manner. The technologies developed are described below.

Bioinoculants

Bioinoculants are carrier-based preparations containing beneficial microorganisms in a viable state intended for seed or soil application and designed to improve soil fertility and help plant growth by increasing the number and biological activity of desired microorganisms in the root environment. Function-specific microbial groups such as nitrogen-fixers, phosphate solubilizers, plant growth promoting rhizobacteria (PGPR) and mycorrhizae are used as biofertilizers in coconut cultivation. These groups of microorganisms are responsible for nitrogen





'KerAM'
bioinoculant packet



'Kera Probio'
bioinoculant

fixation, phosphate solubilization/phosphorus mobilization and production of plant growth promoting substances.

The microbial inoculants are prepared by formulating living cells of beneficial microorganisms in suitable carriers such as talc or sterilized vermicompost. Biofertilizers/beneficial microbial inoculants improve crop stand by producing and secreting plant growth promoting substances (phytohormones) such as auxins, gibberellins, cytokinins; by stimulating root metabolic activities using bacterial surface components; by stimulation of phytoalexins in roots; by phosphate solubilization, by reducing the soil pH by production of organic acids or other acidic substances; and/or by supplying biologically fixed nitrogen. Consequently, germination, root development, mineral nutrition and water utilization are improved.

Plant growth promoting rhizobacteria (PGPR) are important microbial resources for developing bioinoculants. They are known to possess multiple plant growth promotion properties. PGPRs also influence plant growth by indirect mechanisms such as suppression of bacterial, fungal and nematode pathogens by the production of various metabolites, by induced systemic resistance and/or by competing with the pathogen for nutrients or for colonization space.

'Kera Probio', a talc formulation of the PGPR bacteria *Bacillus megaterium* with multiple plant beneficial traits, effective for raising robust coconut seedlings was developed at ICAR-CPCRI. The bioinoculant is being sold to farmers when they come to CPCRI for taking coconut seedlings during the months of June to August. Kera Probio has also been found to be effective for vegetable crops such as tomato, brinjal and chilli.

Similarly an Arbuscular Mycorrhizal bioinoculant, 'KerAM', has been developed at ICAR-CPCRI, which is a soil based AMF bioinoculant for coconut seedlings. The bioinoculant contains *Claroideoglomus etunicatum*, one of the dominant AM species isolated from coconut

agro-ecosystem with high potential to increase the growth parameters of coconut seedlings.

Biomass management technologies in Coconut

A substantial volume of recalcitrant biomass residue, in excess of 25 MT produced each year from this plantation crop that normally causes ecological and health issues, can be used in agriculture for rejuvenating soil health and fertility, increased crop production, enhanced economic benefits to resource poor farmers and for ecosystem sustainability through recycling technologies developed by at ICAR-CPCRI.

Coconut leaf vermicomposting technology

The natural decomposition of organic by-products resulting from coconut cultivation and the nutrient release is very slow due to the presence of lignin and polyphenols in it. But earthworms, which survive only in organic matter, known as compost worms or manure worms can enhance the decomposition of such organic materials and mediate humus formation. A local strain of earthworm was identified at ICAR-CPCRI, related to African Night Crawler (*Eudrilus* sp.), which is quite efficient in converting coconut leaves into granular vermicompost. Subsequently, a technology for producing vermicompost from lignin rich and highly recalcitrant coconut leaf litter using this earthworm species was developed at ICAR-CPCRI. It converts coconut leaves into vermicompost in less than three months period



Fallen dry Coconut leaves



Coconut leaf vermicompost



'Kalpa Organic gold'

and compost has C: N ratio of 10-17, 1.8 to 2.1 % N, 0.21 to 0.3 % P and 0.16 to 0.4 % K and organic carbon content of 18-20. As much as 4000 kg of good quality vermicompost can be produced from the wastes generated from 1 ha of healthy coconut garden every year by this earthworm that can meet a considerable percentage of nutrient need of the coconut palm. This technology is considered as an important component of sustainable production technology for coconut. This vermicompost can also be used for improving the productivity of other annuals, vegetables, fruits, flowers as well as cash crops.

Large-scale coconut leaf vermicompost can be produced in pits, thatched sheds, open ground and cement tanks. However, the bed system of compost production carried out in cement tanks was found to be most efficient. The length and breadth of the tanks can be made as per convenience; but, the depth should be less than 1 metre.

Coconut leaves weathered for 2-3 months are to be used. After chopping off the thick base, the rest of the leaf can be put as such or in two pieces. Above this, a layer of cow dung slurry is spread. Three such layers can be accommodated in one metre deep cement tank. The ratio of coconut leaves to cow dung slurry is kept at 10: 1 (e.g. 1000 kg leaves: 100 kg cow dung slurry). Sufficient moisture must be ensured by sprinkling water regularly and the whole substrate is allowed to pre-decompose for 2-3 weeks. At the end of this period, 1000 worms per tonnes of substrate are introduced into the tank.

Depending upon the extent of weathering and pre-decomposition, a maximum of 70% of the substrate would be converted to vermicompost within a period of 60-75 days. Watering is stopped at this stage so that worms move to the bottom. Ready vermicompost can be collected from the top, shade dried and packed. Earthworms accumulated at the bottom can be used for next round of composting.

The indigenous earthworm *Eudrilus* sp. also has affinity for wastes other than coconut leaf wastes. A coconut garden, where other intercrops/ mixed crops are grown, generates leaf wastes from these intercrops also. All these mixture of wastes can be successfully composted using *Eudrilus* sp. earthworm. It has been found that coconut leaves can be mixed with pineapple waste, banana pseudo stem or gliricidia leaves in 3:1 ratio for effective utilization of other wastes commonly produced in coconut based cropping system.

Vermicompost is a finely divided peat-like organic material with excellent structure, porosity, aeration, drainage and water holding capacity. It has appearance and many characteristics of peat. It can influence a number of soil physical, biological and chemical processes which have their bearing on plant growth, development and yield and is a better source of organic matter than other composts. Application of vermicompost improves the soil aggregation, aeration and water holding capacity; root growth, microbial activity and the overall crop production capacity of the soil.

The vermicompost produced from coconut leaves using the technology developed at ICAR-CPCRI is now available under the trade name 'Kalpa Organic gold'.

Coconut leaf vermiwash: liquid organic manure

Vermiwash (vermin-wash) is the clear brown coloured liquid collected after the passage of water through a column of actively vermicomposting substrate



Coconut leaf Vermiwash production unit



Coconut leaf Vermiwash



Raw coir pith



Composted coir pith

Biochar produced from tender coconut



(Immature) husk



Coir pith



coconut leaf petiole

with earthworms. It is a combination of the washings of the earthworms' body surface along with the leachate of the vermicomposting substrate.

Fresh coconut leaf vermiwash is alkaline and contains major and minor nutrients, growth hormones, humic acid and plant beneficial bacteria. Coconut leaf vermiwash acts as a plant growth stimulator. Application of appropriately diluted coconut leaf vermiwash has shown to increase germination and seedling vigour index of cow pea and paddy seeds in laboratory bioassays. Field trials with cowpea, maize and bhendi in ICAR-CPCRI farm showed its capacity to increase biomass and yield of the crops accompanied by enhanced soil microbial activities.

Adoption of this technology by farmers already carrying out vermicompost production involves very less investment. The vermiwash produced in addition to the vermicompost can be used for improving the yield of crops that give quick returns like vegetables, flowers and also export oriented crops like pepper, nutmeg, clove and vanilla.

Vermicompost and liquid vermiwash produced from other crop residues have also been found to be effective as an organic source of fertilizer comparable with inorganic source of fertilizer and biological disease prevention in a number of vegetable crops

Urea-free Coir pith Composting technology

Coir pith is a lignocellulosic waste biomass which accumulates around coir processing factories as a waste material. Though coir pith has a number of beneficial properties, its direct utilization as manure is not advisable as it contains large amounts of lignin and phytotoxic polyphenols.

A simple technology has been developed at ICAR-CPCRI for conversion of coir pith having a C:N ratio of 100:1 to acceptable manure that does not involve addition of urea. The raw coir pith with a C:N ratio



of 100 % is converted to an acceptable manure with a C:N ratio of 21 to 22 within a period of 45-60 days. The quality of coir-pith compost was found suitable for plant growth. The coir-pith compost can thus form an important recycled soil input for crop production.

For composting 900 kg of coir pith, 100 kg of poultry manure, 5 kg urea and 5 kg of lime are required. The technique involves spreading of coir pith in shaded place, with good quality poultry manure, lime and rock phosphate and mixing them properly. The heap should be kept moist by watering regularly and kept covered. Once in 15 days, the whole heap must be turned. After 45-60 days, the coir pith will become dark brown to black colour indicating the completion of composting process. The final product is shade dried and packed.

The coir-pith compost produced by ICAR-CPCRI technology is dark coloured with pH in the range of 6.1

to 6.9 and having up to 500% water holding capacity. The N, P and K content ranges between 1.3 to 1.4, 0.9 to 1.2 and 1.3 to 1.6 %, respectively, and is a good source of micronutrients as well.

Coir pith has property of high porosity and high water holding capacity that makes it a unique input as soil amendment. The addition of coir pith compost improves the physical properties and water holding capacity of soils. In addition to these important physical properties, it contains high concentration of potash which makes it more useful. It helps in better root formation and enhances crop growth and is an ideal medium for raising seedlings.

The coir-pith compost produced using the technology developed at ICAR-CPCRI has been released by the trade name 'Kalpa Soil Care'

Biochar production from coconut based residues

Biochar is a charred solid material obtained from thermochemical conversion of plant derived biomass in an oxygen limited environment. Attempts have been made to produce biochar from coconut leaf petiole, coir pith and immature coconut (tender nut) husk, a waste produced from coir industries and tender nut parlours, respectively, using a charring kiln. The biochars produced from coconut wastes were dark in colour, porous and of less density. Their pH ranged between 7.6 to 10, high potassium content (2.1-3.7%) and organic carbon content between 13-23%. Application of coconut waste biochars improved the soil pH, nutrient and microbiological properties making it highly suitable for the humid tropical soils, particularly those with low pH. ■

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Copra and Coconut Oil - the production trend in India

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Coconut is a versatile crop having products that has immense potential for commercial exploitation. The country shares 17.55 % of area and 31.02 % of production of total production of coconut in the world. India is the largest producer of coconut in the world contributing 20.44 billion nuts from an area of 1.98 million ha with an impressive productivity of 10,345 nuts per ha (2014-15). Contribution of coconut to the GDP of the country is around Rs.200 billion (US\$ 2.97 billion). Export of coconut products including coir from India grew to Rs. 3352 crores (US \$ 498.69 million) during the year 2015-16, which is 13.90 % higher than that of the previous year. India consumes almost 95% of its production indigenously. Of the total production of coconuts in India, almost 45 percent is used domestically. Out of which, roughly 10 percent nuts are retained in farmers house hold as seed nuts, for daily cooking and other uses. Remaining 35 percent comes to market which are sold to urban households and to pilgrims as religious offering. Out of the total production of coconut about 25 percent is used as tender nuts and about 30 percent is used for making copra and oil.

Production of copra and trade

Copra, the dried kernel has highest oil content (65-68%) as compared with other oil seeds. Two types of copra are produced in India, milling or cut copra and edible or ball copra. Out of 40 percent, 30 percent is used for making milling copra and only about 10 percent is used for ball copra. In Indian concept, milling copra equates to general concept of copra and in other countries this is used for coconut oil extraction. The quantity of

coconut is used to milling copra varies from state to state depending upon the area and production of coconut and culinary culture of the region. Except in south, hardly any conversions from coconut to copra takes place in other coconut growing states of India. Only about less than 10 percent of total production in India is used for manufacturing coconut based products and by-products.

Following the same trend of coconut production in India, copra production increased steadily from year to year till 2012-13 and then recorded a slight decline. Total copra production during 2014-15 was 1.072 million ton out of which milling copra production was 0.836 million ton (Table -1).

Table – 1: Trend of copra production in India

Years	Milling copra (million ton)	Ball copra (million ton)	Total copra (million ton)	Y to Y % increase
2010-11	0.809	0.166	0.975	
2011-12	0.940	0.294	1.234	26.56
2012-13	0.973	0.316	1.289	4.46
2013-14	0.900	0.265	1.165	-9.62
2014-15	0.836	0.236	1.072	-7.98

In India milling copra is produced only in six traditional coconut producing states in south India. Maximum copra is produced in Tamil Nadu (440 K tons) followed by Kerala (317 K tons). Together they produce over 90 percent of total copra produced in India (Table – 2).

Table – 2: State wise production of milling copra in India (2015-16) in '000 tons

Year	Kerala	Karnataka	Tamil Nadu	Andhra Pradesh	Andaman and Nicobar Islands and Lakshadweep Island	Total
2014-15	317	57	440	11	11	836
% of Total	37.91	6.81	52.63	1.32	1.32	100.00

About 86 % of the total copra is produced by three countries. The Philippines produces about 36 percent, followed by Indonesia about 28 percent and India about 22 percent (2014-APCC).

In India, market price of copra mostly depend on price of coconut oil and often experiences very high fluctuation. During 2012 to 2016, the annual fluctuation in average market price ranged between (-) 28.31 % to (+) 70.19 % (Table-3).

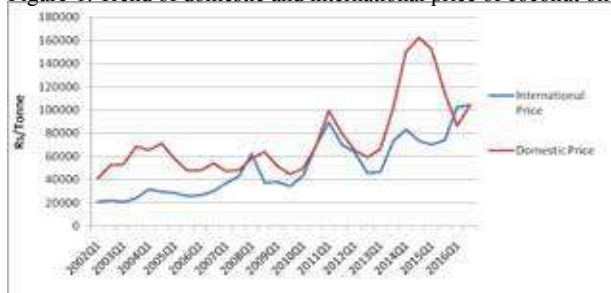
Table- 3: Trend of copra price in India

Year	AMP(Rs / Qtl)	Fluctuation in AMP	MSP(Rs / Qtl)	Variation in AMP & MSP
2012	4332		5100	-15.05%
2013	5365	23.84	5250	2.19%
2014	9131	70.19	5250	73.92%
2015	8408	-7.91	5550	51.49%
2016	6027	-28.31	5950	1.29%

AMP: Average market price. MSP: Minimum support price

To minimize the fluctuation in copra price, Government of India has introduced a price support system. Based on the suggestions of Coconut Development Board, Commission for Agricultural Costs and Prices (CACP) recommends to government minimum support price

Figure-1: Trend of domestic and international price of coconut oil



Source: 1.www.indexmundi.com for International Price 2.Mathrubhumi epaper(Kozhikode edition) for Domestic Price. Note: 1.Coconut oil(Philippines/Indonesia), bulk, c.i.f. Rotterdam 2.Domestic price at Kozhikode(Kerala)

(MSP) for copra. On receiving approval, Ministry of Agriculture announces MSP for copra at the beginning of the year. If and when market price of copra falls below MSP, National Agriculture Cooperative Federation (Nafed) intervenes in the market and start procuring copra at MSP through state cooperatives. Such market intervention is usually low volume due to fund limitation and succeeds when level of price fall is minimum. It was felt that a remunerative price on sustainable basis could be ensured only if added emphasis could be given on product diversification in coconut processing sector. During the last five years export of copra ranged between 17619 tons to 6749 tons per annum which was only 1.43 % to 0.55 % of the total copra produced in India.

Production of coconut oil and trade

There are two processing routes for extraction of coconut oil. One is drying process through the copra route and other is wet processing through coconut milk route

Out of the total coconut oil produced in the country, about 50 percent is consumed as edible oil, about 35 percent is used for toiletry and soap sector, 8 percent is used in various industrial applications and the remaining 7 percent is exported.

The price of all coconut products including raw coconuts is determined by the ruling price of coconut oil supply and demand of coconut oil and its derivatives which determine the growth and sustainability of coconut industry in India. The situation is similar in almost all the coconut growing countries of the world. Coconut oil economy dominates the coconut situation of the country. In India primary processing of coconut into copra and milling of oil are dominated by small units which do not enjoy the economies of scale and therefore, are not globally competitive.

Estimated production of coconut oil in the country was 5, 46,000 MT (2015-16). The total global production of coconut oil was 34, 24,467 MT in 2014. Philippines was the largest producer of coconut oil with a share of about 45.77 per cent, followed by Indonesia (about 28.94 per cent) and India (about 13 per cent) in 2014. These three countries contribute about 87.73 per cent of the global coconut oil production. Total global production of coconut oil increased by about 2, 24,685 MT. India's share in global production almost remained constant at about 13 percent in 2014. The total global export of coconut oil was 21, 90,911 MT in 2013-14. The Philippines was the largest exporter of coconut oil in the world with a share of 41 per cent followed by Indonesia (35 per cent) in 2013-14. The combined share of Philippines and Indonesia was about 76 per cent in the total global export of coconut oil in 2013-14. EU is the biggest importer of coconut oil with a share of 45 per cent followed by USA (28 per cent) in 2013-14.

Indian coconut oil has an unbeatable quality advantage in the export market. The average price of coconut oil during third quarter of 2016 in the international market was recorded at US\$ 1551 per tonne (approximately Rs. 104589 per tonne) while the domestic price for the same period was at Rs. 104290/- per ton (US\$ 1546 per tonne).

Irrespective of the price of Indian coconut oil, the ethnic Indian population of abroad prefers coconut oil origin. India mostly consumes what it produces. Only about two percent of total coconut oil production is exported from India. During 2015-16 domestic & international price was almost at par and there was increase in export. Till June 2013 export of coconut oil was permitted only in consumer pack of 5 Kg. After withdrawal of this restriction, export of coconut oil picked up since 2014-15 (Table-4).

Table-4: Trend of coconut oil production and export from India

Years	CNO export '000 tons	Total CNO Production '000 tons	% export of total production
2011-12	6.52	588	1.11
2012-13	6.83	608	1.12
2013-14	7.07	563	1.26
2014-15	6.94	523	1.33
2015-16	8.55	546	1.57

Various edible oils are substitutable and link the price of coconut oil to price of other vegetable oils especially to that of palm oil. Palm oil is the closest and the cheapest substitute of coconut oil as far as industrial and culinary purposes are concerned and it is also the largest imported edible oil. Coconut oil commands a premium of around 16 percent over palm oil given its superior dietary value, aroma and customary taste preference for coconut oil in the country. However, palm oil has a price advantage over coconut oil, especially for price sensitive consumers, which exerts a downward pressure on the prices of coconut oil.

The domestic demand for coconut oil in India is influenced by its use as edible oil. During last two decades demand for edible coconut oil registered a slow decline owing to adverse propaganda on the consumption of coconut oil branding it as 'not health friendly'. To disprove the hostile branding, studies on the health benefits and nutraceutical aspects of coconut oil was conducted through sponsored research projects by Coconut Development Board. Coconut Development Board has already sponsored many research projects to reputed research institutes in the field and also take up awareness programmes on health benefits of coconut oil. As a result of the sustained campaign by Coconut Development Board, use of coconut oil as edible oil in India has improved from about 34 percent a decade ago

to about 38 percent of total coconut oil production in the country during 2014.

Virgin Coconut Oil (VCO) is a wonder oil having high value use in nutraceutical and in cosmetic sector. There are many reports of its anti microbiological properties and VCO is being used as health support against quite a few important diseases like Alzheimer's, insulin disorders, autism etc. In India there are about 40 units of VCO at micro industry level and many of them are operating at low level of their installed capacity. Size of scale is the major problem which restricts them to continuously produce, attractively pack and aggressively market their products in spite of having an assured domestic demand. Total estimated production of VCO in India during 2013-14 was 3,800 tonnes and average whole sale price was Rs 300 per Kg. Estimated export during 2015 was 818.15 tonnes. From India, VCO was exported mainly to countries like USA, Britain, Japan, Australia and UAE.

India has emerged as the number one coconut producing country in the world with a considerably high productivity. India is yet to become a prominent export earner in coconut sector. Possibly due to good domestic demand and an assured market, serious attempt for export was not made so far. Export of coconut oil from India during April-November 2016 was valued at Rs.318.56 Crore which is about 22% of the total exports of coconut products from India. India has become world leader in coconut production and is expected to experience substantial improvement in production and trade of coconut oil and other value added products within few years. ■





COCONUT FLOUR

Nutritional value and culinary application

S.R Priya* and Dr Lalitha Ramaswamy**

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Introduction

Coconut flour is the by-product of coconut milk industry. Coconut flour is prepared from coconut residue called “sapa” which is the meal usually discarded after milk extraction. Medium sized coconuts selected and grated for extraction of milk. Milk extracted from the grated coconuts by grinding process. The meal remaining, called the sapa washed in hot water to reduce the oil content. Treatment with boiling water helps to reduce the fat content of the residue from 62 percent to 45percent. The residue then sun dried for 48 hours and then ground. The flour obtained stored at room temperature and be used for the preparation of variety of dishes and bakery products.

Coconut flour is a rich source of dietary fiber, protein and low in digestible carbohydrate. Dietary fiber has shown to have important health implications in the prevention for risk of chronic diseases such as cancer,

cardiovascular disease, diabetes mellitus etc. Dietary fiber can control the release of glucose in the blood thus helping in the proper control and management of diabetes mellitus and obesity (Dietary fiber).

Nutritional content of coconut flour

Coconut flour is nutritious and is a healthy source of dietary fiber. Bruce Fife, a western naturopathic physician, states that coconut flour is a great source of dietary fiber, free of trans fatty acids and is low in carbohydrates. It contains 61 percent fiber which is the highest percentage of dietary fiber found in any flour (wheat bran has 27 percent fiber). The nutritional composition of coconut flour varies from one place to other where it is grown, which mostly depends on soil nutrition, manure, rainfall and geographical factors. Coconut grown in the Pollachi belt is used for the analysis of selected nutritional components presented in Table – I



Table - I - Nutritional composition of the coconut flour

Nutrients	Value per 100gm
Energy	485.76 kcal
Carbohydrate	57.42 g
Protein	17.86 g
Fat	15.81 g
Fiber	30 g

High in Protein

Coconut flour is a good source of protein. While coconut flour does not contain gluten (the type of protein found in many grains) it does not lack protein. A report from the coconut research center states that coconut flour contains more protein per serving than other leading flours such as wheat or cornmeal.

High in Fiber

Coconut flour contains almost double the amount of fiber found in wheat bran. According to a study published in the December 2006 issue of Innovative Food Science & Emerging Technologies, adding coconut flour in the diet can significantly reduce cholesterol levels. Coconut flour provides many health benefits. It can improve digestion, help regulate blood sugar, reduce the risk of developing heart disease, diabetes and certain types of cancer and aid in weight loss. Research revealed that consumption of high fiber coconut flour increases fecal bulk. Bruce Fife, explains that the recommended fiber intake is between 20 to 35 g per day. He suggests that adding coconut to the daily routine diet in the amount of a few tablespoons per day in the gravies, baked goods or even in smoothie will significantly raise the fiber consumption.



Low in digestible carbohydrate

Coconut flour contains less carbohydrate than soy or other nut flours, which is 57gm per 100 gm of coconut flour. This flour can be used much like all purpose flour to make a multitude of delicious breads, pies, cookies, cakes, snacks and desserts.

Gluten Free

Gluten is a protein found in wheat which has an elastic character, that allows dough together and trap air bubbles making bread soft and light. Although gluten has its part in bread making, all the people cannot use it for consumption because it is allergic to some people. The proportion of people affected by gluten allergy varies among different countries and population. In India gluten allergy prevalence is quite low. This rarity is most often attributed to the fact that rice, not wheat, is the dietary staple of most of southeast Asia. Patients with gluten allergy should avoid all products that contain gluten. This is the only treatment that works. Many products have hidden gluten in them. It is essential for patients to educate themselves. Patients should be aware which foods contain gluten and which foods are safe. They should learn how to have a balanced diet despite the restrictions, this may reduce the array of menu from the diet and they should be keen enough in including substantial amount of other food items to reduce the occurrence of malnutrition especially vitamins and minerals. Use of coconut flour exclusively in the bakery foods is an appropriate substitute for maida for preparing baked foods for gluten allergens.

Coconut flour is gluten free and does not trigger any inflammatory response within the body. It can be used in baking and cooking favorite desserts and sauces. In baked foods, maida can be fully replaced by coconut flour. In most cases, coconut flour cannot be substituted completely for wheat or other flours in typical bread recipes, but can replace up to 20 percent of the all purpose flour with coconut flour and gives better finished product. This much amount of substitution increases the fiber content considerably. Coconut flour can be added in breads, muffins, cakes, cookies, crackers, tarts, pies, rusk etc. For the full replacement of maida by coconut flour, addition of egg in the preparation helps in improving the appeal of the final product.

Culinary use of coconut flour

- Coconut flour can be added in the porridges to slow

down the sudden increase of blood sugar by the diabetic patients.

- Coconut flour goes well by mixing with beverages, smoothies, soups, and hot cereal. Instead of adding coconut milk, grounded coconut paste or coconut flour alone can be added in the recipe preparation which enhances the fiber value of the dish. This is a simple and easy way to add fiber in the daily diet.

- Another way to enhance the fiber content in the diet is by using coconut flour in baking. Baked foods usually made with maida flour can be fully or partially replaced by coconut flour. A sample cookie preparation using coconut flour and coconut sugar is given below.

Cashew nut and chocolate chips coconut cookies

Ingredients

Chopped Cashew nuts – 100g
Coconut flour – 100g
Grated coconut – 150 g
Chocolate chips – 50g
Butter – 100g
Coconut Sugar – 200g
Eggs – 4

- Preheat oven to 180 °C for 5 minutes
- Beat butter with finely powdered coconut sugar (If sugar is not getting mixed add a 1 teaspoon of boiled milk). Beat eggs separately until fluffy and add to butter sugar mixture
- Add pinch of salt, chopped almond, chocolate chips, coconut flour and grated coconuts.
- Grease the baking tray with butter and drop the mixture with spoon by leaving one inch space
- Bake for 15 – 20 minutes until slightly browned. Cool, remove from baking tray and store in airtight container.

Advantages of consuming fiber rich foods

- **Digestive health** - Dietary fiber normalizes bowel movements by bulking up stools and making them easier to pass. This can help relieve and prevent both constipation and diarrhea. Eating plenty of fiber can also reduce the risk for diverticulitis (inflammation of the intestine), hemorrhoids, gallstones, kidney stones, and irritable bowel syndrome (IBS). Some studies have indicated that a high-fiber diet may help to lower gastric acid and reduce the risk for gastroesophageal reflux disorder (GERD) and ulcers.

- **Heart disease** - Fiber, particularly soluble fiber, is an important element of any heart healthy diet. Eating a diet high in fiber can improve cholesterol levels by lowering LDL (bad) cholesterol. A high fiber intake can also reduce the risk for metabolic syndrome, a group of risk factors linked to coronary heart disease, diabetes, and stroke. Fiber can help to lower blood pressure, reduce inflammation, improve levels of HDL (good) cholesterol and shed excess weight around the abdomen.

- **Helps control blood sugar levels** - In people with diabetes, fiber slow down the absorption of sugar and helps to maintain the blood sugar levels. A healthy diet that includes insoluble fiber may also reduce the risk of developing type 2 diabetes.

- **Cancer** - Fiber acts like a broom, sweeping the intestinal contents through the digestive tract. Parasites, toxins, and carcinogens are swept along with the fiber, leading to their timely expulsion from the body. This cleansing action helps prevent toxins that irritate intestinal tissues and cause cancer from getting lodged in the intestinal tract. Colon cancer is second to lung cancer as the world's most deadly form of cancer. Many studies have shown a correlation between high fiber diets and a low incidence of colon cancer. In European countries, it was found that those who had the highest fiber intake were 40 percent less likely to develop colon cancer. Researchers at the University of Sweden, found that fiber in the diet can absorb toxins that promote cancer. Various types of fiber were examined for their absorption capacity and found to absorb 20 to 50 percent of these carcinogenic compounds. One of the primary reasons that the dietary fiber protects against colon and other cancers is that it increases intestinal transit time. If carcinogenic substances, hormones, and toxins are quickly moved through the digestive tract out of the body, they do not get a chance to irritate tissues and instigate cancer. Evidence suggests that coconut fiber prevent the formation of tumors in the colon by moderating the harmful effects of tumor promoting enzymes.

Conclusion

Coconut flour is a promising substitute for all purpose flour for baking crispy products (cookies, rusk etc). It is available as grocery item like other flours in western countries. In India, coconut flour is not available at stores, only desiccated coconut(dried coconut scrapping) is in use. Traditionally most of the south Indian recipes are prepared with coconut. Approximately every 100g of freshly grated coconut has 3 – 4 g of fiber. It is high time to evoke the fiber value of coconut. Research shows that adding even a little fiber to the diet can have a significant influence on health. It is easy to increase the fiber in the diet by simply adding a few tablespoons of coconut flour into the food preparations daily. ■



Pest and Disease Free Coconut

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1. Introduction

Integrated Pest and Disease Management (IPDM) in coconut is a holistic concept wherein all components of management strategies are integrated in as compatible manner as possible so as to prevent the insect population/diseases attaining action threshold. While ensuring the pest and disease incidence under tolerant level, IPDM maintains a quality environment for the use by next generation. Adoption of IPDM practices enable sustainability of ecosystem which is extremely important in economic productivity in agriculture. It considers whole production system and always leaves a pest residue for the natural enemies to sustain. Coconut is affected by a wide array of insects, mites, rodents and lethal / debilitating diseases. The IPDM tools for a united convergence for sustainable pest/ disease management tactics will be discussed hereunder. With the formation of Coconut Producer's Societies and Federations throughout the coconut growing tracts of the country, community-mode in extension outreach of pest/disease

management options are wide open and many a time successfully accomplished through farmer-participatory approach.

2. Approaches in Pest and Disease Management

2.1. Cultural Approaches: Simple adoption of good agricultural and agronomic practices will be handy for pest avoidance as prevention is always better than cure. Planting coconut seedlings with correct spacing and fully exposed to sun light and libidum are the best agronomic practices to avoid infestation by rhinoceros beetle, red palm weevil and rodents. Shallow planting leads to heavy incidence by red palm weevil and pits of size 1 m³ are recommended for seedling planting. Coconut seedlings planted in shallow pits show exposed bole region and proliferating roots that invite bole entry of red palm weevil. Never mulch seedlings with coconut leaves during the early stage of establishment. Poorly-drained soil is unsuitable for coconut planting and seedlings in water logged condition would invite skipper butterfly attack and root grub incidence. Timely crown cleaning





reduces the damage caused by coreid bug and coconut eriophyid mite. Destruction of red palm weevil infested palms, beyond recovery reduces the floating weevil population quite considerably. Avoiding injuries to palm and cutting petiole beyond 1.2 m from trunk is advised to ward off red palm weevil attack. Avoid succulence by excess application of nutrients. Farm hygiene and removal of breeding grounds of rhinoceros beetle is the foremost option in the management of rhinoceros beetle. Soil-test based nutrient application along with dolomite and in situ biomass recycling through raising cow pea in palm basin and incorporation during flowering are sound techniques to improve the palm health after invasion by coconut eriophyid mite and leaf eating caterpillars. Removal and destruction of heavily infested leaves are sound options in the management of black headed caterpillar and slug caterpillars. Summer ploughing exposes the white grubs for avian predators. Mulching of palm residues around the basin, raising green manure crops as well as providing summer irrigation improves the health of the palm significantly.

For a perennial crop like coconut, cultural practices form an important component of integrated disease management (IDM). Phytosanitation plays a vital role in the management of crown diseases viz., bud rot, leaf rot and grey leaf spot of coconut. Removal of the infected tissues eliminates or reduces the amount of inoculum facilitating the effective management of the disease by biological/chemical means. Moreover, rotten/fermented tissues in palms with leaf rot and bud rot diseases produce a spectrum of odorants that elicit stronger attraction in red palm weevil. The attracted weevils lay eggs on the moist rotten tissues in the disease affected portions of the palm. These diseased tissues serve as the point of entry/ breeding site of the pest. In bud rot endemic areas, priority has to be given to the removal and destruction of severely affected or dead



palms as they may serve as inoculum reservoirs of the pathogen. Removal of inoculum/ infected tissues help to bring down the possibility of recurrent infection and prevent greater losses incurred from the spread of the disease. Providing proper irrigation and drainage in the field plays a critical role in the incidence and spread of bud rot, stem bleeding and basal stem rot diseases. Since wounds on the trunks predispose the palms to infection by stem bleeding pathogen, care should be taken not to injure the stem base while ploughing and avoid trash burning near the base of the palm. Isolation of diseased palms from healthy ones by digging a trench (60 cm deep and 30 cm wide) around the affected palm (1.2 m away from the base of the trunk) and avoiding flood irrigation or ploughing reduce/check the spread of the basal stem rot disease. Application of farm yard manure, neem cake, recommended dose of nutrients and moisture conservation by coconut husk burial enhances the health of the palm and reduce the severity of disease in root (wilt) disease (RWD) affected palms.

2.2. Use of Mechanical Tools: Use of mechanical devices and direct involvement of mankind are grouped under this category which is quite compatible with all techniques. Collection of emerging adult beetle of white grubs during June-July and use of light traps in monitoring the pest reduces the incidence of white grub. Mechanical hooking of rhinoceros beetle is perhaps the



best method of management that a marginal farmer can adopt. Banding the palm trunks using polythene sheets or metal bands avoids climbing of rodents to crown. Tying fertilizer gunny bags on the crown as well as baiting with traps are sound techniques in rodent management. Establishment of light traps could help both in monitoring and reducing the population of the slug caterpillar moths in endemic tracts of Andhra Pradesh and Kerala.

2.3. Biological Suppression: Biological pest suppression is the most ecologically sound and environmental-friendly approach that acts slowly with long-term effect. Some of the classical examples in coconut pest management come under this category. Application of an entomopathogenic green muscardine fungus, *Metarhizium anisopliae* on the breeding pits @ 5 x 10¹¹ spores / m³ is an effective low cost farmer friendly technology in the sustainable management of rhinoceros beetle. This has been successfully implemented through farmer participatory mode by the Institute. *Oryctes rhinoceros nudivirus* is utilized for bio-suppression of rhinoceros beetle. Release of 10-12 viroseed beetles/ha reduced rhinoceros beetle incidence. Placement of three filter paper sachets containing 12-15 *Heterorhabditis indica*-infected *Galleria mellonella* cadavers on the leaf axils after application of 0.002% imidacloprid suppressed the grubs of red palm weevil. Augmentative release of stage-specific parasitoids viz., the larval parasitoids *Goniozus nephantidis* (Bethyridae) @ 20 parasitoids/palm, *Bracon brevicornis* (Braconidae) @ 30 parasitoids/palm, the pre-pupal parasitoid, *Elasmus nephantidis* (Elasmidae) @ 49%/100 pre-pupae, and the pupal parasitoid *Brachymeria anisopliae* (Chalcididae) @ 32%/100 pupae at the appropriate time was found effective in the sustainable management of black headed caterpillar. This technology also has been validated in large area demonstrations by ICAR-CPCRI. Application of talc based preparation of *Hirsutiella thompsonii* @ 20 g / 1/ palm containing 1.6 x 10⁸ cfu with a frequency of three sprayings per year significantly reduced eriophyid mite population on coconut. Drenching aqua suspension of EPNs *Steinernema carpocapsae* in the interspaces of palms at 5-10 cm depth with a dosage of 40 - 50 lakh



infective juveniles/5 liter of water suppressed white grub incidence. The application of EPN shall be repeated as and when needed based on the grub population. Coccinellid beetles, *Chilocorus nigritus*, *Cryptognatha nodiceps*, *Pseudoscymnus anomalus*, *Pseudoscymnus dwipakalpa*, *Scymnus luteus*, *Rhyzobius* spp. and *Telsimianitida* suppress the scales and mealy bug population by predation. Hence, chemical pesticides in management of these sucking pests have to be judiciously used.

Management of disease using bioagents is an ecofriendly and sustainable component of IDM in coconut. Use of antagonistic microbes with biocontrol potential has been proved to be an effective tool in the management of leaf rot, stem bleeding and basal stem rot diseases. Application of 10% solution of talc based formulation of *Pseudomonas fluorescens* *Bacillus subtilis*/consortium of these microbes (50 g talc based formulation in 500 ml water) to the spindle leaf axils twice in a year can be adopted as a prophylactic measure during April-May and October-November in leaf rot disease endemic areas. Placement of *Trichoderma* coir pith cakes (2 nos.) in the inner most leaf axils protects the palms from bud rot. For stem bleeding affected palms, smearing of a paste of talc based formulation of *Trichoderma harzianum* (CPCRI TD 28) on bleeding patches along with the basin application of neem cake (5 kg) enriched with *T. harzianum* per palm during



September-October effectively manages the disease. Basin application of neem cake (5 kg) fortified with *T. harzianum* (CPCRI TD 28) manages basal stem rot disease.

2.4. Use of Botanicals: Botanicals constitute yet another biorational approach in coconut pest management. Since time immemorial, use of botanicals has been leading from the front in sustainable pest management in coconut. Incorporation of the common weed plant, *Clerodendron infortunatum* on the manure pits to induce larval-pupal abnormalities in feeding grubs is an easily adoptable practice against rhinoceros beetle. Filling up top most leaf axils with 250 g neem cake/maroti cake / pongamia cake along with equal volume of sand in palms reduced rhinoceros beetle attack. Spraying 2% neem oil-garlic mixture or azadirachtin 10,000 ppm @ 0.004% or root feeding with neem formulations containing azadirachtin 50,000 ppm at 7.5 ml or azadirachtin 10,000 ppm at 10 ml with equal volume of water three times during March-April, October-November and December-January is recommended for the management of the coconut eriophyid mite. Placement of tablet-mode botanical cake on the leaf axils was found effective in the management of rhinoceros beetle. Spraying of azadirachtin 300 ppm (Nimbecidine) @ 0.0004% (13 ml / 1) reduced the coreid bug incidence at the highest level. Two rounds of azadirachtin spray on young 1-5 months old coconut bunches during May-June and September-October are quite essential for satisfactory control of coreid bug in the field.

2.5. Host plant resistance: The most effective, at the same-time a very difficult and time-consuming approach in perennial crop system is the development of tolerant cultivars against biotic stresses. Kalpaharitha (a selection of Kulasekaram Tall) recorded the lowest mite incidence in the field and could be a preferred choice in endemic zones. Dwarf genotypes such as CGD, MGD and Gangabondam are relatively more susceptible to red palm weevil attack than Tall genotypes.



Disease resistant/tolerant varieties are the cheapest and effective means of disease management especially in a perennial crop which remains in the field for many years. Use of a resistant genotype reduces the cost involved in plant protection and is of utmost importance in the management of phytoplasmal diseases which are not cured by any known chemical/ biocontrol measures. Use of disease free quality seedling is recommended for planting in disease endemic areas as this will help in the better initial establishment. ICAR-CPCRI has released two resistant/tolerant varieties viz., Kalparaksha (selection from Malayan Green Dwarf), Kalpasree (selection from Chowghat Green Dwarf) and a hybrid Kalpasankara (Chowghat Green Dwarf X West Coast Tall) for RWD endemic tracts.

2.6. Behaviour modulation tactics: Volatile chemistry is the buzz word in innovative pest management approach and uses of semiochemicals has been very successful in monitoring as well as trap and kill strategy. Use of PVC pheromone traps 'Oryctalure [ethyl 4 methyloctonoate]' and field delivery using nanomatrix @1 trap / ha is an innovative method in pest suppression. Avoid installation of traps in gardens with juvenile palms. Installation of pheromone traps with ferrugineol embedded on nanoporous matrix @ 1 trap / ha was found effective in mass trapping of weevils. Impregnation of kairomonal blends containing host-induced volatiles enhanced the weevil catches substantially. Timely



servicing of traps with fresh food baits once in 6 days and avoiding placement of traps in gardens with juvenile palms or palms intercropped with tall intercrops (banana) are essential in successful adoption of the technology. A farmer-participatory community approach would be the key factor in successful field realization. Pheromone lures to attract *Opisinaarenosella* moths are available in the market. It is dispensed in the field in sticky traps and a trap density of 40 traps/ ha is recommended along with parasitoid release for pest management. Olfactory conditioning of parasitoids using the volatiles from larval frass enhanced the host searching ability and swift recognition of the host, *O. arenosella* by the parasitoid.

2.7. Agro-ecosystem based approach: The stimulo-deterrent approach rather push-pull strategy is emerging as an important pest management component in perennial cropping system. ICAR-CPCRI has developed a crop habitat diversification strategy in the management of rhinoceros beetle and red palm weevil through volatile confusion and disorientation of pest through diverse-cropping techniques. Habitat manipulation with crop diversity (nutmeg, rambutan, papaya, banana, glyricidia, curry leaf, coral vine, and sunflower) along with coconut subdued rhinoceros beetle attack to 53.2%.

Disease management needs in inter/mixed cropping system differ from those in pure stands. With the increase in crop diversity due to multi-species cultivation the incidence and intensity of diseases may increase or decrease. The intercrop should not serve as an alternate/collateral host of the pathogens affecting coconut. Growing non host crops helps to check the spread of soil borne diseases like basal stem rot.

2.8. Chemical control: This is the most powerful technique that needs to be judiciously used only on a need based manner. Residual toxicity need to be studied before recommendation of a chemical pesticide. Application of imidacloprid 18.5 SL 0.02% (1 ml per 1 of water) or spinosad 2.5 SC 0.013% (5 ml per 1 of water) or indoxacarb 14.5 EC 0.04% (2.5 ml per 1 of water) was found effective in the suppression of red palm weevil with no residue detectable for imidacloprid in nut meat, water and leaves. Drenching the root zone with chlorpyrifos 20EC @ 2.5ml/lit or imidacloprid @ 240 g ai/ha or bifenthrin @ 4.0 kg ai/ha during May-June and September-October is recommended for management of white grubs. Spraying lambda cyhalothrin @ 1ml/1 on the pollinated bunches was found effective in the management of coreid bug. In coconut, application of 10 g Bromadiolone (0.005%) blocks two times at an interval of 12 days on the crown of one palm out of every five palms is recommended for effective control of rat. This method is highly cost-effective. If the damage is restricted to certain palms, only such palms require baiting.

Use of plant protection chemicals in disease management gained momentum with the discovery and development of Bordeaux mixture by PA Millardet. The introduction of fungicides revolutionized the entire concept of disease management and became the most widely adopted and accepted component of IDM. Crown application of 300 ml of fungicidal solution containing 2 ml of hexaconazole 5 EC in the cavity around the base of the spindle is recommended as prophylactic (April-May and October-November) and curative treatment in disease endemic areas. Crown cleaning and application of Bordeaux mixture (1%) to palms in disease endemic areas before the onset of monsoon preferably during the first week of June protect the palm from bud rot disease. Bordeaux paste (10%) is recommended for the curative treatment of bud rot affected palms. Root feeding of hexaconazole SEC 2% (100 ml solution per palm) and soil drenching with hexaconazole 5EC @ 0.2% or Bordeaux mixture @ 1% (40 l solution per palm) at quarterly intervals are recommended for the management of basal stem rot disease.

2.9. Legislative mode: The most needed one but the least emphasized tool in pest and disease management is the legislative component. Sustained surveillance, scouting and sensitization programme have already been made in the look out of the invasive pest, coconut leaf beetle, *Brontispaalonigissima* which has not so far entered our country due to strict quarantine programme. However, this needs to be further strengthened with the formation of an incursion management team for tackling the disaster upon accidental entry. The diseases prevalent in other countries viz., cadangcadang, lethal yellowing and foliar decay virus are the major biosecurity threats to coconut sector in India. Domestic quarantine stations with diagnostic labs have to be equipped to prevent the spread of RWD to non endemic areas. The upsurge in the report of new diseases on coconut in recent years from other coconut growing countries warrants the strengthening of the disease surveillance, diagnostics and management techniques.

3. Conclusion

Judicious integration of all aforesaid techniques in a need based manner with sustained scouting and surveillance are key factors accomplishing plant health management for enhancing productivity in coconut. A social outreach programme through these tools would be realistic for sustainable coconut production which has redefined its position through product diversification and creating demand among public. Integration of IPDM practices along with other crop management components for a cost effective productivity of the crop is essential in making the farmer more competitive to face the challenges of the changing agricultural scenario. ■

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Its business time for tender coconut growers

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Mother nature has blessed the human kind with the magical drink tender coconut water, which is considered to be the healthiest drink. The health benefits of tender coconut are immense. Tender Coconut Water is high in electrolyte content and has been reported as an isotonic beverage due to its balanced electrolytes like sodium and potassium that help restore losses of electrolytes through skin and urinary pathways. Coconut water was claimed as a natural contender in the sports drink market with its delicate aroma, taste and nutritional characteristics together with the functional characteristics required in a sports drink. Some of the health benefits for which tender coconut water is famous are as follows

- Good for feeding infants suffering from intestinal disturbances.
- Oral rehydration medium
- Contains organic compounds possessing growth promoting properties
- Keeps the body cool

- Application on the body prevents prickly heat and summer boils and subsides the rashes caused by small pox, chicken pox, measles, etc.
- Kills intestinal worms
- Presence of saline and albumen makes it a good drink in cholera cases
- Checks urinary infections.
- Excellent tonic for the old and sick
- Cures malnourishment.
- Diuretic
- Effective in treatment of kidney and urethral stones
- Can be injected intravenously in emergency case.
- Found as blood plasma substitute as it is sterile, does not produce heat, does not destroy red blood cells and is readily accepted by the body.
- Aids the quick absorption of the drugs and makes its peak concentration in the blood easier by its electrolytic effect.
- Urinary antiseptic and eliminates poisons in case of mineral poisoning.



Chowghat varieties – the famous tender coconut varieties

Chowghat or Chavakkad is a place in Thrissur district in Kerala, which is believed to be the birth place of Chowghat coconut varieties. Chowghat Orange dwarf and Chowghat Green Dwarf are the famous Chowghat varieties. The palms are dwarf in nature with early bearing capacity. Chowghat Orange Dwarf is considered to be the coconut variety with the sweetest coconut water. The attractive orange colour of the husk and considerable volume of tender coconut water makes it a premium variety in the market. Chowghat Orange Dwarf gives on an average of 300-350 ml of tender coconut water. The nuts are harvested at the age of seven to eight months for tender coconut purpose. The acceptability for this variety for other traditional culinary purposes is low as it has low oil content. However Chowghat Orange Dwarf is considered to be one of the best parent in coconut hybridization. This was utilized for developing prominent hybrids like Chandra Sankara, Kera Sankara and Chandra Laksha by Central Plantation Crops Research Institute.

Its Business time for tender coconut growers!

Day by day the temperature is increasing and as the heat rises up the demand for tender coconut is also increasing. The tender coconut farmers have a reason

Tender Coconut Water	
Total solids%	6.5
Reducing sugars %	4.4
Minerals %	0.6
Protein %	0.01
Fat %	0.01
Acidity mg %	120.0
pH	4.5
Potassium mg%	290.0
Sodium mg%	42.0
Calcium mg%	44.0
Magnesium mg %	10.0
Phosphorous mg%	9.2
Iron mg%	106.0
Copper mg%	26.0



to cheer up. It's time for peak tender coconut sales as summer is shooting up. There is no other better option than tender coconut water in this escalating heat season. It's high time for thinking of taking up smart cultivation by way of product oriented coconut cultivation. Cultivation exclusively for harvesting and marketing of tender coconut is to be targeted. Starting with establishment of tender coconut farm; the location should be selected based on criteria like easy access to transport and market, fertile land, year round availability of water for irrigation etc. Availability of water for irrigation is of very much importance as any stress in available moisture will reduce the quality of tender nuts. Supply of adequate nutrients during growth period through judicious application of organic and inorganic manures ensures better yield. Marketing of the tender nuts can be taken up through Coconut Producer Societies too. Group marketing brings more bargaining power to the farmer as well as help avoiding the foul plays by middlemen.

The market potential for tender coconut has never gone down. The demand for tender coconut will be on an escalating trend in proportion to the increasing health awareness among consumers. This is a golden opportunity for fellow farmers to fetch a decent income. Harvesting at least two to three bunches of coconut in a year and marketing it through Farmer Producer Organizations (FPOs) can create wonders. After all ensuring supply of 'hazardous chemical free' tender coconut in local market is the social responsibility of each FPO and all coconut stake holders. ■



Coconut Tender Mango Chutney

Ingredients

Tender mango (Kannimanga): A hand full
 Coconut, grated : 2 cups
 Red Chili Powder - 1 tsp
 Small onion - 4 nos
 Curry leaf - A spring
 Salt - To taste
 To garnish - Spices and curry leafs



Method ●●●●●

Wash tender mango and make slices after removing its outer skin. Add rest of the ingredients, little water and grind well. Transfer to a plate making it into a ball and garnish with 2 springs of curry leaves. This chutney goes well with porridge and rice.

Coconut Carrot Chutney

Ingredients:

Carrot, grated - 1 small
 Coconut, grated - 1 cup
 Red chilies - 2 nos
 Red chili powder - ½ tsp
 Salt - To taste
 Small onion - 2 nos
 Curry leaves - 5-6 nos. + 1 Spring
 Mustard seeds, urad dal - ¼ tsp each



Method ●●●●●

Grind grated carrot, coconut, 5-6 curry leaves, salt, red chili powder and sliced onion well with a tbsp of water. Transfer this to a bowl. Add enough water. It should be like pouring consistency. Pour oil in a pan. Add 2 red chilies, 5-6 curry leaves, mustard seeds and urad dal. When the mustard seeds start to splutter, pour the chutney to this. When it starts to boil turn off the gas. This chutney is colorful and hence children will like this. This can be used with dosa and idli.

Indu Narayan



Drink Coconut Water – any time, anywhere

Tender coconut water, nature's own energy drink is the best health drink that is consumed around the world. It contains sugars, minerals, amino acids and vitamins and is a natural source of electrolytes, minerals, vitamins, amino acids and other nutrients. Even though international giant brands are competing in the market with many soft drinks, tender coconut water still reigns unbeatable as the best health drink. 100s of truckloads of tender coconut commuting daily from Maddur district of Karnataka to the metros of India is a live example on the importance of tender coconut in India.

Tender coconut water is the safest health drink. Medical science emphasizes the relevance of tender coconut and is advocated as IV fluid for patients of many illness. The availability of tender coconut water, that too fresh from the garden is the biggest problem that tender coconut lovers are facing now. Moreover, once opened, tender coconut water cannot be kept for longer periods. As a remedial measure and also to make tender coconut water readily available, various companies have introduced bottled tender coconut water. The greatest challenge of this preservative added pasteurized packed tender coconut water is the difference in taste.

As a solution to all the above problems, Antony S Pathadan a Kerala based young entrepreneur, has introduced a novel product in the market, NaturUp, tender coconut water powder mix. He is hailing from Chalakkudy in Thrissur district. Tender coconut water lovers can now consume tender, natural and pure tender coconut water at any time anywhere. Through spray drying technology, tender coconut water is converted into powder form and is produced on a commercial scale which is packed and distributed in plastic sachets.

Antony has introduced this tender coconut water

Instant Coconut Water Powder - $\text{COCO} \cdot \text{H}_2\text{O}$

It is a revolutionary evolution of coconut water, says Antony S. Pathadan, MD of NaturUp. When reconstituted with water, it gives the same feeling as sipping from a green coconut. It is without preservatives and there are no synthetic flavours. It is fortified with essential Minerals, Electrolytes- Calcium, Sodium, Magnesium, Potassium and Phosphorous to make it a perfect Energy Drink. It is more Eco- friendly, less expensive and more versatile than packaged coconut water. It is even more convenient to drink coconut water- Anytime and Anywhere with CoCoH_2O

powder mix after several sessions of brainstorming and research with his business partners and cousins Nilin Babu, Nileena Santin and her husband Shantin Joy.

Antony, a former IT entrepreneur, who completed his computer science engineering from Rajagiri College of Engineering, sensed a business opportunity when he visited a hospital and found a board which said no coconuts allowed on the premises. Tender coconut water was prescribed for recovering cancer patients undergoing chemotherapy and many other illness. yet, coconuts were not allowed because of the practical difficulties involving in the waste they would generate. Why not do something with tender coconut water, he thought.

Antony and his cousins discussed the idea and researched on coconut water, while developing a business plan. Once the plan was conceived, the team



reached a steady success. NaturUp is currently sold in small sachets for Rs. 15 and also in gift packets of 10-sachets and 300 gm boxes.

NaturUp tender coconut powder is approved by the US Food and Drug Administration (USFDA), and is being sold in the US and a few countries in Europe. The team is looking for exploring more international markets as well. In Kerala, NaturUp is available in select supermarkets and bakeries in Thiruvananthapuram, Kochi and Thrissur. It would expand to other cities as well. Besides individual customers, NaturUp has already found patrons among caterers and dessert specialists. The product is being sold through Amazon also. "The idea is to take it to restaurants, cafes, and hospitals as well. We are already selling it to them, but we want to reach out to more, says Antony. Around five tone product is being sold in Kerala alone in a month and the unit is producing 15 tonnes in a month.

NaturUp has its administrative office in Chalakkudy, Kerala. The company has plans to diversify into other products such as coconut milk-based beverages, preservative-free fruits mocktails and syrups. ■

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had to decide whether they would sell it as water. They visited many manufacturing plants throughout India, to design a feasible methodology and finally arrived at the powdered form. The team decided to take up the spray-drying technology as it was felt to be most convenient method.

The powder is manufactured at a plant in Puducherry, in association with Antony's friend Anil. Spray drying is the process by which the liquid is heated to remove moisture and produce a stable powder. This gives the powder a longer shelf life. NaturUp has a shelf life of a year if unopened and once opened, it would have to be consumed within six hours.

Apart from the sucrose added, no other preservative is added into NaturUp. The sucrose is added only because a little bit of the sweetness is lost when the tender coconut water is spray-dried. The coconuts are sourced from Palakkad, Coimbatore and Pollachi. At the source, only the coconut water is taken by NaturUp, while the pulp is given to ice-cream manufacturers. This saves the costs of storing and processing whole coconut shells and eliminating problems of waste management.

Launched in July 2016, Antony and team gradually





Rural Development through Responsible Tourism in Coconut Producer Organizations

Abdul Razak C

Executive Officer, Thejaswini CFPC Ltd, Kannur

The United Nations 70th General Assembly has designated 2017 as the International Year of Sustainable Tourism for Development. This is a unique opportunity to raise awareness on the contribution of sustainable tourism development among public and private sector decision-makers and the public at a large while mobilizing all stakeholders to work together in making tourism a catalyst for positive change. Issues such as climate change, effective resource management, poverty reduction and inclusive growth need to be at the centre of tourism development. Tourists are demanding the greening of tourism. More than a third of travellers are found to favor environment- friendly tourism and are willing to pay between 2 to 40% more for this experience. The future of tourism is pointing on positive impacts through the distribution of its benefits among

host communities.

Farm based tourism is the best way to distribute the positive impacts of tourism in to a large community and to achieve sustainable tourism development via coconut Farmer Producer Organizations. In the present condition, farmers have to adopt a new outlook and switch their thinking from production towards providing today's consumers with what they want. This might include farm tours, value-added products or even adding a petting zoo. People visit farms these days not for buying large quantities of produce, but for the immersion experience for themselves and their children. They are looking for a farm-fresh feeling, not just food. The best way to link sustainable development and farming community in the field of tourism is possible through Responsible Tourism.

Responsible tourism (RT) is mainly conceived

with three kinds of responsibilities which are termed as the 'triple bottom line' economic responsibility, social responsibility and environmental responsibility. It generates greater economic benefits to local people and enhances the well being of local communities. It also makes positive contributions to the conservation of natural and cultural heritages and maintenance of the world's diversity. Thus RT focuses on maximizing the positive impacts and minimizing the negative impacts.

Coconut producer organizations and Responsible Tourism

Coconut producer organizations especially because of its unique nature of association with small holder farmers with various activities open up new vistas of opportunities in RT. There are about 7000 Coconut Producer Societies (CPS) in Kerala, each of which has an average of 100 farmer members. All these units may join hands with the Responsible Tourism programme. The farmers' groups as well as farmer families involve in homestead farming also can play a part. Altogether, about 7000 families can take part in the RT activities. All the RT initiatives need to be planned in such a way that engaging various activities as well as farming, processing and marketing aspects of producer organizations, exclusive events like coconut climbing, harvesting, coconut dehusking etc. Small production units of CPSs and Coconut Producer Federations (CPF) and big processing stations of Coconut Producer Companies (CPC) homestead farmers, farmers' events, various cultural and environmental activities and folklore arts festivals of CPS are also involved. The programmes may be coordinated by the executive committees of CPSs. The National Rural Employment Guarantee Act (NREGA) can be clubbed with RT activities. The standard of living of the member farmers can be uplifted by involving them in tourism activities which help to contribute a major part of the revenue generated from tourism to reach themselves. Ensuring the participation of the member farmers in the supply of goods and services is yet another alternative to achieve this goal.

Whether the tourists are domestic or international, their expenditure in local farming communities contribute to the economic development of the area. The greater the proportion of total tourism spending that stays in the local area with farmers, the stronger and more diverse would be the local economic base. The multiplier effect is greatest where the local linkages are strongest – the imperative is clear. Source the inputs for all tourism enterprises as locally as possible in order to maximize local economic benefit and to assist in diversifying the local farming economy. Reducing economic leakages from the local area and increasing linkages will bring significant economic development and assist in local economic diversification. Similarly the development of



complementary products of the farmers will strengthen their economy and farmer's enterprises, groups of established enterprises working together can make a significant difference.

Coconut Producer Societies may involve in tourism development also. They can also act as pressure groups. CPSs may be invited to join tourism working groups so that they are included in decision making and can put the point of view of the community to officials. By linking the farming community with Responsible Tourism, the sustainability in farming as well as tourism can be achieved. There is an increasing aspiration for Fair Trade in Tourism in several of the international originating markets; part of a trend towards increasing demand for equitably traded products. The increasing number of consumers are purchasing products that demonstrably benefit local communities more fairly than competitor products. As associations of thousands of farmers, the coconut farmer organizations can utilize the opportunities in Fair Trade.

Benefits of implementing Responsible Tourism in CPSs

Responsible tourism generates greater economic benefit for farmer members and enhances the well-being of host communities which in turn improve working condition and access to the industry. Responsible tourism involves farmer members in decisions that affect their lives and life chances. RT will make positive contributions to the conservation of natural and cultural heritage, to the maintenance of the world's diversity. It is expected to provide more enjoyable experiences for tourists through more meaningful connections with local



farming community and a greater understanding of local cultural, social and environmental issues. Responsible tourism minimizes negative economic, environmental and social impacts and creates respect between tourists and hosts and build local pride and confidence.

Coconut farmer organizations can adopt Agrotourism as well as rural tourism perspectives in their area. Agrotourism is a sub category of ecotourism and rural tourism. It encourages tourists to experience and learn about agricultural life for periods of a day, overnight, or longer-term. Visitors may have the opportunity to work in the fields along with coconut farmers, intercropping, mixed farming practices or its harvesting. Coconut farmer organizations can host agrotourism initiatives in their places especially in traditional type farming practices. Rural tourism provides travellers with an opportunity for recreational experiences involving visits to non-urban settings for the purpose of participating in or observing activities, events, or attractions that are fundamental part of rural communities and environment. These are not necessarily agricultural in nature. Working with farmers in their farm land also help the tourists in cultural exchange.

Things to do by Coconut Farmer Organizations as part of RT

The Coconut Farmer Organizations like CPCs, CPFs and CPSs have to do the following things as part of creating a Responsible Tourism environment in their locality.

Employment

Recruit and employ staff transparently, aiming to create a diverse workforce in terms of gender, ethnicity, age and disability. Clearly describe how positions are advertised, the criteria for selecting new staff and your human resources policies. Set targets to increase the number of local people you employ and the percentage of your wage bill going to local residents (e.g. 50% of the wage bill going to people living within 50 km of your enterprise, with a 5% increase per annum). Provide appropriate skill training programmes for staff. Draw up a community labour agreement with local representatives, setting out targets for employment and skills training. Pay above the minimum wages for your area and link wages to positions and experience and provide staff with incentives and bonuses linked to performance or service levels.

Purchasing

Set targets for the percentage of services and products purchased from local enterprises (e.g. 15% of services and products sourced from enterprises located within 50km, increasing by 5% per year for 3 years). Set a target for the proportion of locally made furniture, crafts, clothing, agri produce and other goods that you buy. Assist local producers to achieve the needed quality and quantity. Encourage guests to buy locally made goods. Set up an in house value added products sales area, which showcases local products. Create contract with local entrepreneurs who provide good service. Buy your basic supplies locally or enable local store owners to buy products for you. Encourage local suppliers to provide

handcrafted packaging for soaps, menus, courtesy gifts etc. Pay fair prices for goods and services





sourced locally. Try to establish the time taken and the cost of materials to help local entrepreneurs arrive at a price, which exceeds their costs and apply fair practices when marking up goods and explain how your markups are applied.

Product Development

Visit local places of interest, such as farm lands, restaurants and homes. Market local festivals and visits to nearby markets. Offer guests traditional food, cultural events and opportunities to be a part of the farm land by helping them to involve in local farming activities. Help CPSs and CPFs to source credit and seed capital by putting them in touch with MSME support. Consider providing micro-loans to CPSs and CPSs you work with. Let member farmers and producers know about the quality, range, size, weight and style of products that would be attractive to your visitors. Provide produce suppliers with feedback from clients. Market local farm products in your brochures and on your website and put tour operators and foreign businesses in direct contact with local producers and producer associations.

Community Training and Capacity Building

Assist member farmer entrepreneurs to prepare business plans and funding proposals. Link farmer members with MSME support agencies that can help with skills training and capacity building and help coordinate or fund training programmes to develop member farmer business skills.

Success Stories

In a workshop conducted during 15-16 December 2016 at Bakel, Tourism Minister of Kerala emphasized the importance of Responsible Tourism. He pointed out the need for community based tourism development and declared that the next five year focus zone will be at the northern part of Kerala. Coconut Farmer Organizations (CFO) has big opportunities to explore in this field. Mr. Rupesh Kumar (State Coordinator, Responsible Tourism, Kerala) pointed out some of the successful examples for the CFOs to follow.

In Kovalam, as part of Responsible tourism, community based organizations hosting visit of coconut shell products unit, weaving unit copra unit etc. In Kovalam, 'Panathurakadavu' visit by tourists to see the age-old processes used to create fascinating coir products. The tourists can check out the various steps involved and try their hand at coir spinning with Lekha and her family. In Kumarakom, as part of Responsible Tourism, local communities are doing various events for tourists related to coconut. Their main focus is to share our cultural values as well as to show the traditional methods of livelihoods. At Kumarakom, Ajeesh shows the tourists two ways of climbing a coconut tree - the laborious traditional way using a 'Thalappu' and the modern way using the latest instruments like climber. The end of the session will be by treating tourist a fresh tender coconut.

Kumarakom RT ensures the tourists to taste the famed Kerala beverage, toddy, fresh out of the pot. They are also allowed to watch toddy being tapped from a coconut tree closely. The tourists also tour the vegetable plantation nearby, and learn about unique plants and spices. Coconut Farmer Organizations may utilize the opportunity to show the Neera tapping in the farm field and the tourist will definitely attract if he/she gets a glass of fresh Neera at the spot. Showing the art of weaving coconut leaves and then letting the tourist hand at it will make them satisfied. In Kumarakom, local women weave coconut leaves into roof thatching. These leaves provide very efficient thermal insulation to houses. The tourists are allowed to observe the skill and speed, with which they weave one leaf after another. Also, have opportunity to hand at it with expert guidance from the ladies here. At Kumarakom, the RT operations are coordinated by linking various activities exclusively for the tourists. They can select their interested activity by checking the brochure and paying appropriately. Coconut Farmer Organizations can also explore the same kind of strategy to attract tourists and spread the message of responsible tourism among interested hosting farmers and farmer organizations.

These are some of the examples coconut farmer organizations can adopt as part of implementing Responsible Tourism initiative in their locality. The number-one requirement for a successful Responsible Tourism venture is energy and enthusiasm. The willingness to think unconventionally may be equally important. Whatever you do, do it with a flair for showmanship. With enough thought, ingenuity, determination and capital, almost any farm anywhere could be adapted to Responsible Tourism. A willingness to provide what the tourists truly wants and is willing to pay for is the way to success. ■

128th meeting of CDB

The 128th Meeting of Coconut Development Board was held on 11th January 2017 at Bihar Agricultural Management & Extension Training Institute (BAMETI), Patna under the Chairmanship of Dr. A.K. Singh, Chairman, Coconut Development Board. The meeting elected Shri P.C. Mohanan Master from Kerala as the Vice Chairman of the Board. Members of the Board: Shri Thota Narasimham, MP (Lok Sabha), Dr. P. Chowdappa, Director, CPCRI, Shri S.S. Thakur, Director (Cooperation), Ministry of Consumer Affairs, Food & Public Distribution, Government of India, Shri Chiranjiv Choudhary IFS, Commissioner of Horticulture & Sericulture, Government of Andhra Pradesh, Shri P.C. Mohanan Master, Kerala, Shri P.R. Muralidharan, Kerala, Shri S. Mohanraj, Tamilnadu, Shri M.R. Shankara Narayan Reddy, Karnataka, Smt. Daksha Rami, Gujarat, Shri Johar Khan, Andhra Pradesh and Dr. Biswanath Rath, Odisha attended the meeting. Shri Saradindu Das, Chief Coconut Development Officer and Dr. Anup Kumar Nandi, Secretary, Coconut Development Board also attended the meeting



128th Board meeting in progress

New members of CDB



Shri P.C. Mohanan Master
(Vice Chairman)

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CDB organized Exporters Meet

CDB organized an exporters meet on 22nd February 2017 at Kochi. Shri. Saradindu Das, Chief Coconut Development Officer, CDB inaugurated the programme. In his introductory remarks, he informed that CDB is planning to come up with many beneficial schemes to coconut product exporters in the ensuing Five Year Plan Period, which is expected to boost the export of coconut products and will motivate the exporters to explore the opportunities in the sector to its fullest. Smt. A M Girija, Quality Council of India approved consultant and CEO, Insight Quality consultancy services, spoke on quality systems and standards for a competitive edge in exports and Shri. Sreekant Bhat of M/s. Logon Logistics and Shipping spoke on minimizing the risk of export business. Shri. K S Sebastian, Assistant Director, Marketing, CDB made a presentation on the present scenario of Indian coconut product exports. An interactive session of exporters was also held as part of the programme. Dr. A K Nandi, Secretary, Shri. R Jnanadevan, Deputy Director and other senior officers of the Board along with 40 major coconut product exporters took part in the programme. Shri. Sardar Sing Choyal, Deputy Director, CDB delivered the welcome address and Shri. Siddarameswara Swamy, Assistant Marketing Officer, CDB proposed the vote of thanks.

The program provided an opportunity for exporters to show their experience and suggest fresh schemes or modifications to be made in the existing schemes to bridge the gap between the requirements and government interventions incorporated in the future policies.

A sizeable quantity of Indian coconut and coconut products are exported to various destinations. United States, GCC, United Kingdom, EU Countries, Japan, Iran, South Africa etc. are some of the major export destinations.

In terms of export, India is the fourth largest exporter of coconut products behind Philippines, Indonesia and Sri Lanka. The Government of India notified Coconut



Introductory remarks by Shri. Saradindu Das, Chief Coconut Development Officer, CDB

Development Board as Export Promotion Council (EPC) on 1st April 2009, for promoting the export of coconut and coconut products from India other than coir and coir products. Since then, the export of coconut products recorded a steady increase with a CAGR of 22.35%. During 2009-10, the export of coconut products from India was Rs.432.38 crores and it reached to Rs.1450.24 crores during FY2015-16. During the FY 2015-16, when the total exports of India declined by 15.8%, coconut product exports marked a remarkable increase of 10.50% compared to FY 2014-15. The export of coconut products since FY2009-10 is given in Table 1.



Smt. A M Girija speaking on quality systems and standards for a competitive edge in exports



Shri. Sardar Sing Choyal, Deputy Director CDB delivering the welcome address



Shri. Sreekant Bhat of M/s. Logon Logistics and Shipping speaking on minimizing the risk of export business.

Table - 1 Export of coconut products

Year	Export (Rs. in Crores)
2009-10	432.38
2010-11	525.65
2011-12	838.65
2012-13	1022.53
2013-14	1156.12
2014-15	1312.38
2015-16	1450.24

The current trend in export of coconut products also indicates a positive growth. The export of coconut products during the period April to November 2016 was Rs.1446.80 Crores which shows a growth of about 50% compared to the same period of the previous year.

CDB issues Registration cum Membership Certificate (RCMC) to coconut exporters. RCMC from the Export

Promotion Council is mandatory for exports, so as to avail the various benefits under the Foreign Trade Policy and the duty neutralization schemes of the Department of Revenue. A considerable increase in the number of exporters is recorded since CDB is registered as EPC. The cumulative number of exporters registered with CDB during the FY 2015-16 was 2088. As on 20th February 2017, the number of exporters registered with CDB has reached 2631.

Coconut and value added products has immense potential in the international markets which is growing year by year. The sector still has opportunities for the exporters, who can tap that opportunities and achieve more heights. The exporters meet conducted by CDB provided a common platform for exporters of coconut and its value added products, to get an overall understanding of the present export scenario and the beneficial schemes and provisions enabled by government agencies for supporting exporters. This platform also helped exporters to share their knowledge, thoughts and concerns regarding the sector.



A view of the audience

Farmers awareness programme

Coconut Development Board, Regional Office, Patna organized a farmers awareness programme on 5th February 2017 at Lalpur, Bhaironj, Banka District, Bihar. Shri Sonelal Hembram ex MLA, Katoria, Banka inaugurated the programme. Shri Nuneshwar Lal Marandi, Mukhiya South Barane panchayat, Shri Rajeev Bhushan Prasad, Deputy Director, Coconut Development Board Regional Office, Patna, Shri Santosh Kumar Chairman, Gram Bharti, Simultala, Jamui Dist., Shri Pankaj Kumar Technical Officer CDB, RO, Patna, farmers of Bhaironj Block and other dignitaries were present during the occasion.

Shri. Rajeev Bhushan Prasad, Deputy Director, Coconut Development Board, Regional Office, Patna delivered the introductory remarks. Shri Nuneshwar Lal Marandi, Mukhiya in his address informed that even though the area is new for coconut but it can be cultivated well in the area. Shri Sonelal Hembram, Chief Guest in his inaugural address informed that it is for the first time that such a programme is being organized in the area and the farmers have enthusiastically come forward to attend the programme. He hoped that the farmers will take benefit of Board's programmes and called upon the farmers to take up cultivation of coconut in Bihar.

In the technical session which followed, Shri Santosh Kumar, Gram Bharti briefed on vermi compost production and its use. Shri Pankaj Kumar, Technical



Shri Rajeev Bhushan Prasad Deputy Director briefing on cultivation of coconut and diseases pest management etc.



Shri Sonelal Hembram ex MLA, Katoria, Banka, Bihar delivering the inaugural address.

Officer spoke on CDB schemes and Shri Rajeev Bhushan Prasad, Deputy Director briefed the farmers on coconut cultivation, various cultivars, irrigation management, intercrop, mother palm selection, seed nut selection, nursery raising, coconut disease & pest and its integrated management, coconut harvesting tender nut, mature nut, value added product, handicrafts, FOCT, etc. An interactive session was also held as part of the programme.

Food and Hospitality World-2017

Coconut Development Board, State Centre, Thane participated in Food & Hospitality World-2017 from 19 to 21st January-2017, at Mumbai, Maharashtra. Smt. Snehal Ambekar, Mayor, Mumbai Municipal Corporation Mumbai inaugurated the programme.

Coconut Development Board participated in this exhibition with the objective of identifying distributors, entrepreneurs and retailers for coconut products in Mumbai areas. Shri.K.Rajesh representative of Keratech (P) Ltd. Kerala, the manufacturer of virgin coconut oil, desiccated coconut powder, virgin plus tablets, coconut cream; Shri.Ismail Shaikh, M/s.MSC Packaging, Solapur, manufacture of desiccated coconut powder & flakes; Shri.R.M.Hariharan Nair, representative of Benzy Food and Beverages Pvt.Ltd., Kerala, the manufacturer of Benco coconut oil; Shri.Shripathy, representative of Green nut International, Engandiyur, Trissur, manufacturer of virgin coconut oil, Shri.Sonu Suresh, Marketing Head, Suryashoba, Shoba Engineering Company Complex, Trissur, Kerala, manufacturer of coconut milk powder and coconut chips and Smt.Sweta Jethani, Marketing Manager, Pure Tropic, Tirupur, Tamil Nadu, manufacturer of coconut water and coconut milk shake had their display cum sales counters in the Board's stall.

Coconut Development Board displayed various value added coconut products, well informative charts and posters and Board's publications. National, international and local experts and more than 150 exhibitors participated in the programme.



A view of Board's stall

Market review – January 2017



Domestic price

Coconut Oil

During January 2017 the price of coconut oil opened at Rs. 11500 per quintal at Kochi market, Rs.11500 per quintal at Alappuzha market and Rs.11900 per quintal at Kozhikode market. The price of coconut oil at all markets expressed an upward trend during the month.

The price of coconut oil closed at Rs.14400 per quintal at Kochi market, Rs.14100 per quintal at Alappuzha market and Rs.14300 per quintal at Kozhikode market with a net gain of Rs.2900, Rs.2600 and Rs.2400 per quintal at Kochi, Alappuzha and Kozhikode markets respectively.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.10800 per quintal also expressed an increasing trend except a slight decline in prices during the first week.



Table1: Weekly of price of coconut oil at major markets Rs/Quintal)

	Kochi	Alappuzha	Kozhikode	Kangayam
01.01.2017	11500	11500	11900	10800
08.01.2017	11500	11500	11900	10667
15.01.2017	11800	11800	12000	11200
22.01.2017	12900	12600	12600	12067
29.01.2017	13800	13500	13500	13267
31.01.2017	14400	14100	14300	13733

Milling copra

The price of milling copra at major markets moved in tune with the prices of coconut oil. During the month the price of milling copra opened at Rs.7500 per quintal at Kochi, Rs.7450 per quintal at Alappuzha and Rs.7650 per quintal at Kozhikode markets. The price of milling copra in Kochi and Alappuzha markets expressed an upward trend during the month. At Kozhikode market also the prices expressed an upward trend with a slight declining trend during the first week. The prices closed at Rs.9700 at Kochi and Rs.9200 at Alappuzha and Kozhikode markets with a net gain of Rs.2200 per quintal at Kochi, Rs.1750 per quintal at Alappuzha and Rs.1550 per quintal at Kozhikode markets.

At Kangayam market in Tamilnadu, the prices opened at Rs.7200 and closed at Rs. 9300 per quintal with a net gain of Rs.2100 per quintal. The prices expressed an upward trend similar to that of the prices quoted in Kerala markets.

Table2: Weekly price of Milling Copra at major markets (Rs/Quintal)

	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kangayam
01.01.2017	7500	7450	7650	7200
08.01.2017	7500	7450	7600	7100
15.01.2017	7800	7600	7700	7300
22.01.2017	8700	8200	8300	7800
29.01.2017	9300	8800	8850	8800
31.01.2017	9700	9200	9200	9300

Edible copra

The price of Rajapur copra at Kozhikode market which opened at Rs.7700 per quintal expressed a slight declining trend during the first week and thereafter expressed an upward trend. The price closed at Rs.9700 with a net gain of Rs.2000 per quintal.

Table3 :Weekly of price of edible copra at Kozhikode market (Rs/Quintal)

01.01.2017	7700
08.01.2017	7550
15.01.2017	7800
22.01.2017	8800
29.01.2017	9200
31.01.2017	9700

Ball copra

The price of ball copra at Tiptur market opened at Rs.6500 per quintal, expressed an upward trend and closed at Rs.8200 with a net gain of Rs.1700 per quintal.



Table 4 : Weekly of price of Ball copra at major markets in Karnataka (Rs/Quintal)

	Tiptur
01.01.2017	6500
08.01.2017	6600
15.01.2017	6578
22.01.2017	7863
29.01.2017	8204
31.01.2017	8200

Dry coconut

At Kozhikode market the price of dry coconut opened at Rs.7300. The price expressed a fluctuating trend and closed at Rs.7860 with a net gain of Rs.560 per thousand nuts.

Table5 : Weekly of price of Dry Coconut at Kozhikode market (Rs/1000 coconuts)

01.01.2017	7300
08.01.2017	7300
15.01.2017	7000
22.01.2017	7500
29.01.2017	8250
31.01.2017	7860

**Coconut**

At Nedumangad market price opened at Rs. 11000 and closed at Rs.14667 per thousand nuts with a net gain of Rs.3667. At Bangalore APMC, price opened at Rs.8500 per thousand nuts and closed at Rs.10000 per thousand nuts with a net gain of Rs.1500 .At Mangalore APMC market the price of partially dehusked coconut opened at Rs.14500 per thousand nuts and closed at Rs.15000 per thousand nuts with a net gain of Rs.500.

Table 6: Weekly of price of coconut at major markets (Rs /1000 coconuts)

	Nedumangad	Banglore	Mangalore (Grade-1)
01.01.2017	11000	8500	14500
08.01.2017	11556	9500	14500
15.01.2017	12000	9700	15000
22.01.2017	12000	10000	15000
29.01.2017	14667	10000	15000

Tender coconut

The price of tender coconut at Maddur APMC market in Karnataka opened and closed at Rs.10000 per thousand nuts. The price of tender coconut remained constant throughout the month.

Table7 : Weekly of price of tender coconut at Maddur market (Rs/1000 coconuts)

01.01.2017	10000
08.01.2017	10000
15.01.2017	10000
22.01.2017	10000
29.01.2017	10000
31.01.2017	10000

International price

Coconut oil

The international (CIF Rotterdam) and domestic price of coconut oil at Philippines expressed an upward trend during the month. The price quoted at Indonesia expressed an upward trend till the third week, but declined during the last week. The domestic price of coconut oil in India expressed an upward trend during the month. The domestic price of coconut oil in India opened at US\$ 1690 and closed at 2027 per MT. The price of coconut oil quoted at different international/domestic markets is given below.

Table 8: Weekly price coconut oil in major coconut oil producing countries October 2016

	International Price(US\$/MT)	Domestic Price(US\$/MT)		
	Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia	India*
07.01.2017	1770	1695	1740	1690
14.01.2017	1790	1699	1757	1730
21.01.2017	1970	1760	1950	1895
28.01.2017	1970	1834	1783	2027

* Kochi Market

Copra

A surge in price of copra was observed at the Philippines and Indonesia markets during the month. The price of copra in India expressed an upward trend during the month. Price of copra in Srilanka expressed a fluctuating trend.

Table 9: Weekly Price of copra in major copra producing countries October 2016

	Domestic Price(US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
07.01.2017	1019	992	1225	1102
14.01.2017	1041	992	1180	1143
21.01.2017	1062	1031	1200	1278
28.01.2017	1088	1032	1228	1366

* Kochi Market

Desiccated coconut

The FOB price of desiccated coconut in India during the month of January was very competitive compared to the prices of major DC exporting countries.

Table 10: Weekly price of desiccated coconut in October 2016

	Domestic Price (US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
07.01.2017	2469	2210	2403	1742
14.01.2017	2475	2250	2434	1659
21.01.2017	2480	2300	2371	1821
28.01.2017	2590	2300	2425	1870

*FOB

Coconut

Among major coconut producing countries, the price of coconut at Philippines and Indonesia expressed an upward trend. At Srilanka a minute fluctuation in the prices of dehusked coconut was observed during the month. The domestic price of dehusked coconut in India was slightly higher compared to other major coconut producing countries.

Table 11: Weekly price of dehusked coconut with water during October 2016

Date	Domestic Price (US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
07.01.2017	216	232	247	316
14.01.2017	220	240	240	337
21.01.2017	239	255	261	367
28.01.2017	240	240	264	426

*Pollachi market

Coconut shell charcoal

The FOB price of coconut shell charcoal in India remained stable during the month and was competitive compared to the prices quoted by major coconut producing countries. Indonesia's price was the highest among major coconut shell charcoal exporting countries.

Table 12: Weekly price of coconut shell charcoal during October 2016

Date	Domestic Price(US\$/MT)			
	Philippines	Indonesia	Srilanka	India
07.01.2017	340	412	365.0	264
14.01.2017	340	412	362	264
21.01.2017	340	412	341	264
28.01.2017	340	436	338	264

*Kangayam



Monthly operations in coconut gardens - March

Andaman & Nicobar Islands: Continue watering the nursery. Start collection of seednuts from mother palms. Store them for about one month before sowing. Prepare land for new plantation by removing weeds and cutting down unwanted plants.

Andhra Pradesh: Search for rhinoceros beetles on the crowns of the palms with beetle hook and kill the beetles. Fill the top three leaf axils of the palm with a mixture of 25g sevidol 8G with 250g fine sand. Spray the manure pits with 0.01 per cent carbaryl. Continue irrigation. Collect seednuts from selected mother palms. Release parasitoids if the attack of black headed caterpillar is noticed, particularly in coastal belt. If the palms are infected by scale insects, spray the palms with 0.01 per cent malathion or fenthion.

Assam: Dig isolation trenches of one metre depth and 30 cm width two metres away from the base of the Ganoderma affected palms. Cut down and destroy the affected trunk of dead palms in the garden. If planting pits have not been dug in January or February dig them during this month and fill up with top soil+sand+cow dung manure mixture up to 60 cm for transplanting. After one or two showers, bring the soil to a fine tilth around the palms. Start preparing the nursery beds for sowing of seednuts.

Bihar/Jharkhand: Irrigate the palms. Apply plant protection chemicals to avoid attack of pests and diseases. Repair the irrigation channels. Prepare the land and dig pits of 1m x 1m x 1m size at a spacing of 8m x

8m. Replant/transplant the seedlings in low-lying areas where flood water is a problem. Adopt surface planting if water table is high. Check for the incidence of termite attack, especially in young palms. For the management of termite, adequate soil moisture is a prerequisite. Drench the nursery with 0.05 per cent chlorpyrifos twice at 20-25 days interval. Fill the top three leaf axils of the palms with 25g Sevidol 8G mixed with 250g fine sand to prevent rhinoceros beetle/red palm weevil attack.

Chhattisgarh: Irrigate the palms, nursery and inter crops in the garden. Remove weeds from the garden. Plough the land and mulch the basins. Plant summer vegetables and other intercrops. Apply vermi compost to coconut palms.

Karnataka: Irrigate the garden. Give 70-80 litres of water per palm per day under drip irrigation. Plant suitable intercrops under irrigated conditions. Check the attack of rhinoceros beetle. Clean the crowns of the palm and fill top 3 leaf axils of the palms with a mixture of 25g sevidol with 200 gm fine sand. Fill the leaf axils with two naphthalene balls covered with fine sand at 45 days interval. Treat manure pits and other possible breeding sites of rhinoceros beetle with carbaryl (0.1 per cent) which is to be repeated in every three months. Spray 1 per cent bordeaux mixture against leaf spot. Adopt integrated control measures against the attack of leaf eating caterpillar. Release parasitoids of suitable stage immediately after noticing the infestation and subsequently three times at fortnightly intervals. For tall

plants and large orchards a combination of biological and chemical methods are suggested. If the attack of mite is noticed, spray neem oil formulation containing 0.1 per cent Azadirachtin / Neemazal@ 4 ml/ litre of water. The spray droplets are to be directed towards the second to fifth immature bunches. In order to improve the nutrient status of the soil grow green manure crops like daincha in the basins of the palms and incorporate into the soil within 45 days. Apply organic manure @ 25 kg/ tree/ year. Provide neem cake @5 kg / tree/ year.



Kerala/Lakshadweep : Continue irrigation. Continue collection of seednuts from selected mother palms and store them in a cool dry place. Apply one fourth of the fertilizers in irrigated gardens. If the attack of mite is noticed, spray neem oil formulation containing 0.1 per cent Azadirachtin / Neemazal@ 4 ml/ litre of water. The spray droplets are to be directed towards the second to fifth immature bunches.

Maharashtra/Goa/Gujarat: Undertake hoeing in the garden. Remove the grasses and shrubs and burn them. Check for attack of pests/diseases and take appropriate steps to control them. Ensure irrigation. Start collection of seednuts for raising seedlings.

Odisha: Irrigate the palms. Remove weeds from the garden. Mulch with dry coconut leaves and coirpith for moisture conservation. Collect seednuts from selected mother palms and store them in cool and dry place. Spray the palms affected by leaf eating black-headed caterpillar with 0.02% dichlorvos or malathion 0.05 per cent. Repeat the spraying after an interval of 15 days if the attack is severe. Before spraying, cut down the affected leaves and burn them to prevent further infestation. Alternatively liberate parasites of black-headed caterpillar on the affected palms after 15 days of spraying. Palms on which the parasites have been released should not be sprayed with insecticides as it will kill the parasites also. If the attack of mite is noticed, spray neem oil formulation containing 0.1 per cent Azadirachtin / Neemazal@ 4 ml/ litre of water. The spray droplets are to be directed towards the second to fifth immature bunches.

Tamil Nadu/Puducherry: If the attack of mite is noticed, spray neem oil formulation containing 0.1 per cent Azadirachtin / Neemazal@ 4 ml/ litre of water. The spray droplets are to be directed towards the second to fifth immature bunches. Spraying has to be done especially on the perianth region of buttons and affected nuts. Wherever spraying is difficult root feeding may be

done with Azadirachtin 50% formulation 7.5 ml in 7.5 ml water. Continue irrigation. Treat manure pits and other possible breeding sites of Rhinoceros beetle with 0.01 per cent carbaryl to control grubs. Continue collection of seednuts from selected mother palms and store them in a cool dry place.

Tripura: Irrigation should be continued and the frequency of irrigation should be based on the quantum of rainfall received. Regular irrigation will improve the production of bearing plants.

West Bengal: Continue irrigation. Apply 200 litres of water in basin twice a week depending upon moisture retention capacity of the soil. If drip irrigation is adopted give 70 to 80 litres of water per palm per day. Provide proper shade to newly young seedlings. Mulch the basins with coconut husk, green leaves, dried coconut leaves in 3 to 4 layers or spread coir pith in six-inch layer for moisture conservation. Harvest mature nuts. Collect the seednuts from the selected mother palms, which are regular bearers and have an annual yield of hundred nuts and above. Store the collected seednuts in shade. Check for the attack of rhinoceros beetle (triangular cuttings in new spindle leaves). Hook out the beetles from affected palms. Clean the crowns of the palms and fill the top most axils of the palms with 25g sevidol 8G with 250g fine sand at 45 days interval. Treat manure pits once every three months with carbaryl (0.1 %). If bud rot is noticed remove all the affected portions. Treat the wound with Bordeaux paste or paste of Blitox. Spray the crown with Blitox @ 5g per litre of water or Dithane M 45 @ 2 g per litre of water. To manage eriophyid mite infestation, spray the crowns with 0.1 per cent Azadirachtin (Neemazal) @ 4.0 ml per litre of water. The spray droplets are to be directed towards the second to fifth immature bunches. Alternately, root feeding with 7.5 ml of Neemazal (5%) dissolved in 7.5 ml of water can also be done. Plough the interspaces and destroy weeds. Grow summer vegetables and flowers like marigold as intercrop.