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Tender coconut varieties for the benefit of coconut growers

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The Coconut palm (Cocos nucifera L.) in India is referred to as 'Kalpavriksha' which means "tree which gives all that is necessary for living". This palm continues to have hundreds of uses as a source of nutritious food, refreshing drink, oil (used in cooking, pharmaceuticals, industrial applications and biofuels), fibre of commercial value, charcoal, construction material and a variety of miscellaneous products for domestic and industrial use.

Global coconut production is widely dispersed in most of the tropical regions over an area of 12.47 million hectares. In India, coconut is grown in an area of 2.07 million hectares, across 18 states and three Union Territories. India ranks among the top three coconut producing countries in the world, with an annual production of 23,351 million nuts and productivity of 10,614 nuts/ha (Coconut Development Board, 2015-16). Traditional areas of coconut cultivation, accounting for 90% of the total area under coconut, are in the states of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh. Island territories like Lakshadweep Islands and Andaman and Nicobar islands have coconut as the major crop. Coconut cultivation has also spread to the non-traditional tracts like Bihar, Chhattisgarh, Gujarat, West Bengal and North Eastern states.

In recent years, coconut is being increasingly considered as a health food with tender coconut water, virgin coconut oil and inflorescence sap being promoted for consumption in addition to copra and oil. Tender coconut water is blooming increasingly popular as a refreshing health drink. Tender coconut water refers to the liquid endosperm obtained from 6-8 months old tender coconuts, the period before the solid endosperm or white kernel forms. It is a natural isotonic beverage with the same level of electrolytic balance as we have in our blood. Hence, during World War I and II, tender coconut water has been used as an intra-veinal fluid (IV fluid) for medical emergencies. In Ayurveda, tender nut water is believed to increase semen levels, promote digestion and clear the urinary path. Tender coconut water


Kalpa Samrudhi

Improved varieties for dual purpose - copra and tender nut					
Variety	Important traits	Vol. of tender nut water (ml nut-1)	Copra yield (t ha-1 year-1)	Recommendation for cultivation	Agency responsible for release
Tall					
Kera Chandra	High yield	450	3.68	Kerala, Karnataka, Konkan region, Andhra Pradesh, West Bengal	ICAR-CPCRI, Kasaragod
Kalpa Pratibha	High yield	448	4.12	Kerala, Andhra Pradesh, Tamil Nadu, Maharashtra	ICAR-CPCRI, Kasaragod
Kalpa Haritha	Green fruits, Less eriophyid mite damage	440	3.72	Kerala, Karnataka	ICAR-CPCRI, Kasaragod
Kalpa Shatabdi	High yield, Lesser incidence of rhinoceros beetle	612	5.01	Kerala, Karnataka, Tamil Nadu	ICAR-CPCRI, Kasaragod
Kalyani Coconut 1	High yield	274	3.84	West Bengal	Bidhan Chandra Krishi Viswavidyalaya (BCKV), West Bengal
Dwarf/Semi-Tall					
Kalparaksha	Semi-tall, High yield, green fruits	290	2.11	Kerala	ICAR-CPCRI, Kasaragod
Kera Madhura	Semi-tall, high yield, green fruits	287	4.80	Kerala	Kerala Agricultural University, Kerala
Gouthami Ganga	Dwarf, Green fruits	467	1.80	Andhra Pradesh	AICRP on plams, Ambajipeta, Andra Pradesh
Kalpasree	Dwarf, green fruits	240	1.51	Kerala	ICAR-CPCRI, Kasaragod
CARI-C1 (Annapurna)	Dwarf, high copra content, green fruits	470	2.23	Andaman & Nicobar Islands	ICAR-Central Island Agricultural Research Institute (CIARI), Port Blair

contains sugars, minerals and minor amounts of nitrogenous compounds (proteins/amino acids). The primary nutrient in coconut water is potassium. This makes it a high electrolyte beverage and helps to maintain blood volume, heart health, prevent dehydration and stress. In recent years, health benefits of coconut water continued to be fine tuned, as many marketers call it “natures sports drink” and a “life enhancer”. Worldwide awareness and popularity towards tender coconut water as a refreshing health drink, has resulted in many aerated drink manufactures venturing into this field. The global coconut market is expected to grow at a compound rate of 26.75% until 2020. Presently, Brazil is the world’s largest market for packaged coconut water, accounting for 67% of juice volume sales in 2010 and reportedly growing at the expense of orange juice. The tender nut water products are also gaining rapid popularity in both traditional and nontraditional areas, thus opening new vistas for coconut entrepreneurs to capture the widening tender nut market.

In order to meet the market driven demands for the tender coconut, ICAR-Central Plantation Crops Research Institute is continuously evaluating coconut germplasm, accessions as well as experimental hybrids at the institute for the quantity and quality of tender

Improved hybrid varieties for dual purpose - copra and tender nut						
Hybrid Variety	Source population of parents	Important traits	Vol. of tender nut water (ml nut-1)	Copra yield (t ha-1 year-1)	Area recommend-ed	Agency responsible for release
Chandra Sankara	COD x WCT	High yield	347	4.27	Kerala, Karnataka, Tamil Nadu	ICAR-CPCRI, Kasaragod
Chandra Laksha	LCT x COD	High yield, toler-ant to moisture stress	339	3.76	Kerala, Karnataka	ICAR-CPCRI, Kasaragod
Kalpa Samrudhi	MYD x WCT	Tolerant to moisture stress, higher nutrient use efficiency	346	4.5	Kerala, Assam	ICAR- CPCRI, Kasaragod
Kalpa Sreshta	MYD x TPT	High yield	368	6.28	Kerala, Karnataka	ICAR-CPCRI, Kasaragod

nut water towards developing improved varieties for tender nut purpose, including dual purpose varieties suitable for tender nut as well as copra production for release and cultivation in different agro ecological regions in the country. The varieties developed in the country under the National Agricultural Research System is listed in the given tables.

ICAR-CPCRI, ICAR-CIARI, various SAUs, State Department of Horticulture and the centres under AICRP on Palms as well as the Coconut Development Board – DSP farms supply seeds/seedlings of improved varieties/hybrids to farmers, NGOs, developmental agencies and research organizations also facilitate higher crop productivity and net returns. Farmers/ farmer's organizations and developmental agencies also encourage to establish seed gardens to promote supply of improved varieties and ensure higher productivity and remuneration to coconut growers.


Chandra Sankara

Improved dwarf varieties for tender nut and ornamental purpose					
Variety	Important traits	Vol. of tender nut water (ml nut-1)	Copra yield (t ha-1 year-1)	Recommended states/regions	Agency responsible for release
Chowghat Orange Dwarf	Orange fruits, less eriophyid mite damage	351	2.78	All coconut growing regions	ICAR- CPCRI, Kasaragod
Kalpa Jyothi	Yellow fruits, relatively tolerant to water deficit stress	380	2.83	Kerala, Karnataka, Assam	ICAR-CPCRI, Kasaragod
Kalpa Surya	Orange fruits	400	4.00	Kerala, Karnataka, Tamil Nadu	ICAR- CPCRI, Kasaragod
CARI-C2 (Surya)	Ornamental purpose, orange fruits	154	1.31	Andaman & Nicobar Islands	ICAR- CIARI, Port Blair
CARI-C3 (Omkar)	Ornamental purpose, yellow fruits	117	1.45	Andaman & Nicobar Islands	ICAR- CIARI, Port Blair
CARI-C4 (Chandan)	Ornamental purpose, orange fruits	198	1.74	Andaman & Nicobar Islands	ICAR- CIARI, Port Blair

To combat, the loss in remuneration due to lesser market price for mature coconuts and to tap the opportunity among the rising popularity of tender coconut water as a refreshing health drink, it is advised to establish gardens with tender nut varieties, dual purpose varieties for meeting the domestic demand for tender coconut water as well as to promote product diversification to avoid the ill effects of coconut price fall due to excess availability of copra in the market. Additionally, tender nuts are harvested at 6-8 months of maturity, so that it saves nutritional requirements for another 4-6 months of fruit development for production of copra and helps in the better fruit set and development in subsequent inflorescences, which in turn results in higher nut yield/palm. In Pollachi and Coimbatore districts of Tamil Nadu, wherein farmers have planted tender nut varieties in fairly large tracts of land to meet the local demand for tender coconut and also exploring avenues for tapping the export market. Now, this trend is drifting towards other states too namely, Kerala, Karnataka, Andhra Pradesh, Maharashtra and West Bengal. Hence, coconut farmers need to be motivated to plant improved varieties suitable for tender nut purpose including dwarf as well as dual purpose varieties and hybrids. Under irrigation and proper management practices, farmers can expect higher yield from hybrid coconut varieties compared to tall varieties. It is also advisable to plant these improved varieties not just for establishment of new plantations but also in the senile gardens where replanting and rejuvenation is recommended. This will help to boost the overall profitability of the coconut farming and promote coconut cultivation in the country. ■

Chandra Sankara

Kalpa Jyothy

Dr. Anup Kumar Nandi, Secretary, CDB retired

Dr. Anup Kumar Nandi, Secretary retired from the service of Coconut Development Board on superannuation on 31st December 2017. Dr. A. K. Nandi, a Ph.D holder in Horticulture from Viswabharati University, West Bengal was holding the post of Secretary, CDB since March 2010. He joined Coconut Development Board in 1992 as Senior Farm Manager at DSP Farm, Tripura. He has also served as Deputy Director at various offices of the Board.

Passion Fruit

a money spinning intercrop for coconut garden

R. Jnanadevan, Dy. Director CDB, Kochi -11

Coconut is a crop which prefer to grow along with other companion crops. Growing intercrops in coconut holdings produce more food and agricultural produce ensuring food security for many people of urban and rural areas. It also helps to increase the income from coconut holdings, generate employment, livelihood and alleviate poverty among farming communities. Coconut based integrated cropping systems enable better utilization of natural resources and improves the soil fertility due to the continuous biomass addition by the subsidiary crops. Hence it is recommended as one of the management practices to increase the productivity of coconut also by enriching the soil fertility and also for generating higher income from unit holdings. Coconut holdings as a mono crop does not fully utilize the basic resources like soil, water and sunlight available in the garden. In a scientifically planted coconut garden ie., at a spacing of 25 feet x 25 feet, 25% of soil only is used by coconut and the remaining soil is left aside for growing suitable companion crops. These holdings neither provide gainful employment opportunities for the family labour throughout the year nor generate sufficient income to meet the family requirement. Several crops like cocoa, nutmeg, clove, pineapple, pepper, banana, vegetables etc are identified through research as good companion crops for coconut.

Farmers are now looking for best companion crops in coconut garden as cultivating coconut alone is not profitable. To cope up with the increase in labour cost in adoption of management practices, harvesting, weeding etc., farmers are thinking of cultivating suitable money spinning companion crops with less cost of production in coconut garden. A new traditional semi-perennial fruit crop that attract the farmers as money spinning intercrops in coconut garden is Passion fruit (*Passiflora edulis*). It is a semi-perennial, herbaceous, tendril-bearing climber which can be cultivated as an inter crop along with other crops in coconut holdings. It is cultivated mainly for its multi-seeded delicious berry fruits. Passion fruit is a native of Brazil and it is mainly grown in India in parts of Western Himachal Pradesh and Eastern States of Manipur, Tripura and Meghalaya in India. This fruit is mainly consumed as juice rather than as a fresh fruit. Now this fruit is having very good demand in south

Indian market due to its nutritional and medicinal benefits. This delicious fruit is an excellent source of dietary fibre, vitamin C and minerals like protein, iron, copper, magnesium etc.

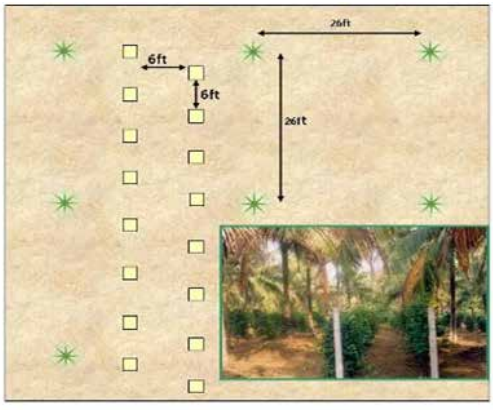
People in the urban areas who visit super markets get chance to taste this wonderful fruit. On tasting the juicy flesh inside the purple fruit may make people think "why I was not aware of this fruit before". Impact of this fruit is slowly finding ground in the urban areas of the states of Kerala and Karnataka. Farmers in some parts of Kerala and Karnataka have already tried this crop successfully in coconut garden as companion crop to coconut. In Sri Lanka it is recommended as a semi perennial inter crop in coconut garden.

Climatic conditions required for growing coconut in tropical and subtropical regions are suitable for growing passion fruit also. It requires well drained soil, well distributed rain fall and ideal with temperature 20^{o}C to 30^{o}C for getting best yield. Soils having enough moisture and organic matter is best for cultivation of passion fruit. This fruit vine grows best in light sandy loams and sandy clay loam, with a pH of 6.5–7.5, rich in organic matter. It grows in altitudes ranging from 750 to 1500 m above mean sea level. There are many varieties of Passion fruit available. However the yellow and purple colour passion fruit and hybrid variety (purple x yellow) are famous varieties recommended for commercial cultivation. These varieties can be cultivated in the partial shade of Coconut gardens above 25 years old. Yellow passion fruit is best for cultivation in tropical low elivated southern coconut growing States. Hybrid variety developed by Indian Institute of Horticulture Research is a high yielding variety with purple coloured fruit is also suitable for cultivation in coconut garden.

Planting Passion fruit in coconut garden

Passion fruit vines are usually grown from seeds. Seeds are sown in nursery beds or in poly bags. When the seedlings attain 20-30 cm height, they are transplanted to the coconut gardens of age above 25 years. However, they can also be grown through vegetative cuttings. Well matured vines with 3-4 nodes are cut into length of 22 -30 cm . Cutting should be well rooted in the nursery or poly bags and ready for planting in 90 days. Average economic life of fruit vine is seven years.

Seedlings/rooted cuttings can be used for planting in the coconut garden. Spacing recommended for planting Passion Fruit as an inter crop in coconut garden by Srilankan Coconut Cultivation Board is 6 ft x 6 ft in the middle of two rows of coconut planted at a spacing 26 ft x 26 ft as shown in the figure below.



Around 400 fruit vines can be planted in one acre of coconut garden. Planting should be done preferably at the beginning of the rainy season. Pits of size 45 cm x 45 cm x 45cm are prepared at least 30 days in advance, enriched with organic matter and top soil and left to weather. The young seedlings are to be planted very carefully so as to avoid injury to the roots. Irrigation and shade should be provided

> Passion fruit vines are usually grown from seeds. Seeds are sown in nursery beds or in poly bags. When the seedlings attain 20-30 cm height, they are transplanted to the coconut gardens of age above 25 years.

after transplanting the seedlings in coconut gardens in summer season. In one acre coconut plantation, planted at a spacing of 25ft x 25ft, 400 passion fruit plants can be planted at spacing of 6ft x 6ft.

Temporary support at the base of each plant is necessary to train it to get a good hold of the wires of the trellis. About 4– 6 laterals may be trained in the direction of the overhead wire and the sooner they come to a horizontal position on the pandal, they will start flowering. Passion fruit vines should be trained to a panthal made of rope or iron wires like other vegetables like bitterguard. Coconut trees can also be used as standard for making pandhal. A standard pandal, 7 to 8 ft tall, is recommended for passion fruit cultivation as it has the advantage of giving the best spread of vines, early returns, greater yield and accessibility for pruning and harvesting. Bamboos and tree branches are hung on the wires of the pandal. This gives support and provides better spread of the vines on the trellis.

Pruning is necessary to keep the vines within bounds, to make harvest easier, to keep the plants productive by maintaining vigorous growth and facilitate new shoot formation. Pruning is usually done after harvesting the crop. It is done by cutting back laterals to the nearest active bud.

Systematic pruning should be followed in passion fruit cultivation as it encourages the new growth of vines which results in high yield of fruits. Pruning should be done after harvesting by cutting the laterals back to 4 to 5 buds. For best yield of passion fruit it should be supplemented with organic manures and vermi compost at the rate of 10kg per vine. Regular watering is required in dry season to keep the vine flowering and fruiting continuously. Passion fruit vines start fruiting after 10 months of planting and fruit bearing reaches optimum after 15 – 18 months. It takes about 80-90 days for the fruit to mature. The fruit yield depends on the variety and weather condition. The average yield is 10 tonnes per hectare in the case of yellow/purple. In the hyrbid variety the yield would be high and is about 18-20 tonnes per hectare. In general the average yield is 8-9 tonnes (200-250 fruit) in a vine in an year. The present retail price in supermarkets for passion fruit in Kerala is Rs. 220 per kg . If the farmer gets a farm gate price of Rs. 40/kg the total income by sale of passion fruit from one acre coconut garden would be Rs. 1,60,000/- Considering the low cost production of high income passion fruit, it is ideal to cultivate in coconut holdings for increasing the income from the holdings and to provide a healthy delicious fruit to the society. ■

Bio-cleansing of coconut palms infested by **Rugose spiralling whitefly**

Josephrajkumar, A#., Chandrika Mohan, Poorani, J*., Merin Babu and Krishnakumar, V

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Rugose Spiralling Whitefly (RSW), Aleurodicus rugioperculatus Martin, an invasive pest of Neotropical origin was first reported in India on coconut from Palakkad, Kerala (10.7402 N ; 76.8346 E) and Pollachi, Tamil Nadu (10.4851 N ; 76.9658 E) during July-August 2016. RSW feeds from under surface of palm leaflets and honeydew excrements get deposited on the underlying palm leaflets and under-storey crops attracting sooty mould (Leptoxyphium sp.) encrustations. Such presence of sooty mould is the indicator of pest infestation and these deposits of sooty mould interfere with photosynthetic efficiency of palms. Coconut is the most preferred host of RSW followed by banana. Egg spirals are recorded on many intercrops grown along with coconut in homesteads.

Import of planting materials without proper quarantine in the era of liberalized trade could have paved entry of this invasive pest into our country. High maximum temperature (>33^{o}C) coupled with rainfall deficit (<50 mm) and low relative humidity (<55%) favoured gradient outbreak of this pest. It is primarily suppressed through biological control by the aphelinid parasitoids, Encarsia guadeloupae and Encarsia dispersa with parasitism recorded as high as 80%. Therefore, use of any insecticides is not recommended for the management of RSW (Chandrika Mohan et al. 2017).


Image : 1


Image : 2


Image : 3


Image : 4

Sooty mould scavenging beetle, Leiochrinus nilgirianus

For the first time at the International level, scientists from ICAR-Central Plantation Crops Research Institute, and ICAR-National Research Centre on Banana, Trichy have reported the occurrence of a sooty mould scavenging beetle, Leiochrinus nilgirianus Kaszab (Coleoptera : Tenebrionidae) on coconut palms infested by the rugose spiralling whitefly (RSW) (Josephrajkumar et al., 2018). This beetle, which resembles the predatory lady beetle in appearance, are found to feed on the sooty mould deposits developed on the honey dew excreted by the rugose spiraling whitefly. L. nilgirianus could be first located from sooty mould laden coconut palms at ICAR-CPCRI, Regional Station, Kayamkulam during July-August period which coincided with the south-west monsoon phase providing high humidity and morning wetness, that favoured the accurate niche for enhanced survival and feeding.


Image : 5


Image : 6

All stages of the beetles viz., eggs, grubs, pupae and adult beetles were found on the palm leaflets and other intercrops with sooty mould. Generally, the grubs and adult L. nilgirianus beetles are restricted on the under surface of the leaves. But they move on to the upper surface of the leaves with sooty mould deposits during early morning hours with dew drops and feed on the sooty mould. Eggs of this beetle are purplish, laid in groups and emerging neonates are transparent and turn black, assume spherical and


Image : 7


Image : 8


Image : 9


Image : 10

cylindrical shapes in movement due to the presence of elastic inter-segmental membrane. Creamish patches are developed during pre-pupating stages and pupae with distinct cream patches are also confined on the under surface of palm leaflet indicating its photo-sensitiveness. During observations, more than five beetles (Average 2.07±0.9) and immature grubs could be noticed on sooty mould laden leaves. Bristle-like tarsomeres and tarsal claws of adult beetles encouraged effective adhesion, scooping of mould and swift movement on fungal growth. L. nilgirianus

Image 1 : - Microscopic view of RSW

Image 2 : - RSW colony on infested leaf

Image 3 : - Encarsia guadeloupae

Image 4 : - Sooty mould laden palm leaflets

Image 5 : - Leiochrinus nilgirianus

Image 6 : - Purplish eggs

Image 7 : - Grub

Image 8 : - Pre-pupa

Image 9 : - Pupa

Image 10 : - Adult beetle

> Import of planting materials without proper quarantine in the era of liberalized trade could have paved entry of whitefly into our country. High maximum temperature (>33°C) coupled with rainfall deficit (<50 mm) and low relative humidity (<55%) favoured its gradient outbreak.

population was found very high and subsequently got reduced with the decline in RSW population and the sooty mould deposits. Mouth parts and gut lining of the beetle with fungal deposits could be located confirming the scavenging action of the beetle.

Though ecosystem services provided by insects include food for wildlife, pest destruction, crop pollination, scavenging, etc. which is estimated at around $57 billion in the United States of America alone, a thorough cleaning action on an economically significant crop like coconut is reported for the first time at global level. Habitat conservation of the sooty mould feeding scavenger beetle, L. nilgirianus in the palm ecosystem is very crucial and the conducive weather factors of high humidity and high rainfall prevailing in Kerala during monsoon phase are key factors for the survival and feeding efficiency of the beetle. Though report on scavenging action by insects such as termites disintegrating wood, springtail decomposing dead larvae and fly maggots feeding on dead animals exist in nature, the present instance appears to be unique in which sooty mould deposition is totally cleared by an insect scavenger in palms.

In addition to flaking out the sooty mould fungus by spraying 1% starch solution, which is currently recommended, conserving L. nilgirianus is a good strategy to improve palm health by clearing sooty mould encrustations. Conservation of E. guadeloupae by limited or zero pesticide usage coupled with *in situ* habitat preservation of scavenger beetles (L. nilgirianus) appears to be a very effective strategy that would help in controlling A. rugioperculatus and in clearing sooty mould from coconut palms at no cost in the most natural and eco-friendly manner avoiding chemical management options and other expensive methods. Further, the sustenance of Leiochrini beetle for scavenging action can be encouraged under the context of Organic Agriculture policy of Government of Kerala in vogue. ■

Shri. V K Somasundaran

Shri. V K Somasundaran retired from the service of Coconut Development Board on 30th November 2017. He has served the Board for more than 32 years.

Avanesh Prasad Singh

Shri. Avanesh Prasad Singh retired from the service of Coconut Development Board on 31st December 2017 after completing more than 30 years of service.He was working in the DSP Farm of the Board at Madhepura, Bihar.

P V Philomina

Smt. P V Philomona retired from the service of Coconut Development Board on 31st December 2017 on Voluntary Retirement. She has served the Board for more than 23 years.

How the wrong science is making people sick

The Truth About

Saturated Fat, Animal Fat and Coconut Oil

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Chairman, Scientific Advisory Committee for Health, Asian and Pacific Coconut Community

The 2017 AHA Presidential Advisory attacked coconut oil using studies that did not involve coconut oil. A careful review of the fatty acid composition of coconut oil and animal fat shows that: first, coconut oil has a vastly different fatty acid profile from animal fats; second, coconut oil has negligible cholesterol content while animal fats are high in cholesterol; and third, animal fats are actually not saturated fats. This casts doubt on the basis of the almost 60-year anti-saturated fat campaign which was focused on animal fat. Although the AHA Presidential Advisory claimed that it had new studies to present, it actually just reanalyzed old papers and selected the studies, some dating from the 1960s and 1970s, which agreed with its position and labeled these as high quality. It then rejected the studies which gave contrary conclusions, such as studies on HDL as a beneficial cardiovascular marker and the Minnesota Coronary Survey (MCS). The MCS study is important because it is a research

project which Ancel Keys himself undertook but which failed to support his saturated fat-heart disease hypothesis. In passing judgment that coconut oil has "no known offsetting favorable effects," the AHA has ignored evidence from thousands of years of its use in the tropics and Pacific islands that demonstrate its healthful properties, and the repeated observation that people who shifted from a coconut diet to a Western diet have gotten sick. The AHA produced no evidence that coconut oil causes heart disease. The AHA attack against coconut oil is a repeat of previous negative campaigns that have made the Americans obese and sick.

On June 15, 2017, the American Heart Association published its AHA Presidential Advisory entitled "Dietary Fats and Cardiovascular Disease." Although the title mentioned dietary fats, it was actually an attack on coconut oil. Although this Advisory tried to appear authoritative and objective, a detailed analysis shows that it is full of errors and biases.

AHA attacked coconut oil using studies that did not involve coconut oil.

Although the AHA Presidential Advisory claimed that it would present the most recent studies, on the effects of dietary saturated fat intake, it in fact just recycled old studies and reinterpreted them using statistical arguments. Four of the studies dated from the 1960s and 1970s and had been previously criticized for being poorly executed. But more to the point, all of these studies are irrelevant to coconut oil because none of them used coconut oil as a test material. These studies used animal fat and AHA just assumed that animal fat and coconut oil are the same, they are not. The study compares the fatty acid profiles and cholesterol content of coconut oil, butter, beef fat (tallow), and hog fat (lard). The following conclusions are clear:

Coconut oil has a vastly different fatty acid profile from animal fats and to assume a similarity which is simply incorrect. Further, coconut oil is about 63% medium-chain fat while beef and hog fat do not contain any medium-chain fat (butter contains 9% medium-chain fat). Coconut oil has negligible cholesterol content while animal fats are high in cholesterol; and animal fats are actually not saturated fats as Keys mistakenly assumed. In fact, animal fats contain comparable proportions of saturated fat and unsaturated fat.

Unfortunately, most studies, including those used by AHA, assume that animal fats are saturated fats and that coconut oil and animal fats are similar. In fact, animal fat is actually composed of long-chain saturated fat with lots of unsaturated fat. On this basis alone, we can say that the whole AHA campaign against saturated fat is based on the wrong definition of saturated fat and the warning against coconut oil is not valid. This represents over 50 years of defective dietary recommendations and false information!

The AHA provided an incomplete fatty acid profile of coconut oil in the table that it presented by not listing capoic acid (C6), caprylic acid (C8), and capric acid (C10) as components of coconut oil (Figure 1). These fatty acids, together with lauric acid (C12), are medium-chain fatty acids, and the AHA has consistently ignored medium-chain fatty acids as a distinct metabolic group from long-chain fatty acids. The fatty acid profile of coconut oil is given in Table 1.

The AHA ignored studies that were unfavorable to its position.

AHA selected information that was in favor of its agenda and ignored other facts that were unfavorable, in particular, those pertaining to LDL and HDL, and the Minnesota Coronary Survey.

Regarding LDL, the AHA stated that "because coconut oil increases LDL cholesterol, a cause of CVD, and has no known offsetting favorable effects, we advise against the use of coconut oil." (AHA page e13) This statement is scientifically unacceptable because the evidence of the link between LDL and CVD is only a correlation and its causality has not been proven. The AHA advisory cited two papers, neither of which presented convincing evidence that coconut oil was linked to CVD. In fact, one of the papers that AHA cited contradicted its position regarding coconut oil stating that: although coconut oil raised LDL cholesterol, "observational evidence suggests that consumption of

Figure 1. Reproduction of part of the fatty acid table from the AHA Presidential Advisory (AHA page e4). AHA excluded capoic acid (C6), caprylic acid (C8), and capric acid (C10) as components of coconut oil and lumped all saturated fats into one group.

Fatty acid composition of Fats and oils							
Saturated, g/100g			Mono unsaturated, g/100 g		Polyunsaturated, g/100 g		
Total	Lauric(12:0) Myristic (14:0) Palmitic(16:0)	Stearic (18:0)	Total	Oleic (18:1)	Total	Linoleic (18:n-6)	a-Linoleic (18:3n-3)
Coconut Oil	82	3	6	6		2	0

Table 1. Fatty acid profile and cholesterol content of coconut oil and various animal fats.

Fatty acid	Co-conut Oil1	Animal fat2		
		Butter	Beef fat (tal-low)	Lard (hog fat)
C4:0, % butyric acid	<0.7	3		
C6:0, % caproic acid	7	2		
C8:0, % caprylic acid	7	3		
C10:0, % capric acid	49	4		
C12:0, % lauric acid	63	9	0	0
Medium-chain fatty acids, %	63	9		
C14:0, % myristic acid	19	12	0	0
C16:0, % palmitic acid	9	26	3	2
C18:0, % stearic acid	3	11	27	27
Long-chain saturated fatty acids, %	31	49	37	40
C16:1, % palmitoleic acid		3	11	4
C18:1, % oleic acid	7.5	28	48	44
C18:2, % linoleic acid	1.8	2	2	11
C18:3, % linolenic acid	<0.2			
Unsaturated fatty acids, %	9	33	61	59
Cholesterol, mg/kg	0 to 3	62150	1090	950

1 Codex Alimentarius 210-1999, amended 2015. Median values are calculated.2 USDA Food Composition Databases. https://ndb.nal.usda.gov/

coconut flesh or squeezed coconut in the context of traditional dietary patterns does not lead to adverse cardiovascular outcomes."

The AHA tried to further discredit coconut oil by ignoring the beneficial effects of coconut oil on HDL claiming that: "changes in HDL cholesterol caused by diet or drug treatments can no longer be directly linked to changes in CVD, and therefore, the LDL cholesterol-raising effect should be considered on its own." (AHA page e13) The justification for this statement was based on a study that showed that a genetic variant rendered HDL as an unreliable marker for protection against heart disease. However, this genetic variant was found in only 2.6% of the population. Similarly, a recent paper reported that extremely high HDL levels may increase the risk of death but this was found in only 0.4% of men and

0.3% of women. Clearly, these examples represent a minority of the population and are outliers. Extremely high and low HDL (and LDL) levels are unhealthy but this does not negate the value of HDL as a beneficial cardio protective marker for coconut oil.

The Minnesota Coronary Survey (MCS) was a study that Keys himself designed and implemented together with Ivan Frantz Jr. MCS was meant to finally prove Keys's saturated fat-heart disease hypothesis using a large number of subjects (n=9,423), a long feeding period (4.5 years, from 1968-1973), a high level of dietary control and double blind randomized design. This study was conducted at the same time that Keys was coordinating the Seven Countries Study and would have provided powerful validation for his saturated fat-heart disease hypothesis. In the end, Keys did not participate in the publication of the results of the MCS study. A partial report was made in a 1989 paper with Frantz as lead author but without Keys as co-author. This work remained hidden until 2016 – forty-three years after its completion – when the raw data were unearthed and turned over to Ramsden and co-workers, who then analyzed the data. The main conclusion from the MCS study was that a high omega-6 diet effectively lowered serum cholesterol, but also increased the risk of heart disease, a result that was the opposite of what Keys desired.

The AHA eliminated the MCS study from its list of high quality core studies because of its short duration, large percentage of withdrawals from the study, and intermittent treatment, which is not relevant to clinical practice. (AHA page e7) They conveniently ignored the fact that the MCS study was longer than some of the high quality studies that it cited and was likely better designed and implemented (by Keys himself).

The AHA concern regarding subject withdrawals had already been adequately addressed previously by Broste and Frantz. The AHA also critiqued the use of lightly hydrogenated corn oil margarine in the polyunsaturated fat diet which would have contained trans-fat, which is known to raise cholesterol. Ramsden and coworkers addressed this concern in their paper by pointing out that both Keys and Frantz were well aware of this problem and had already devised diets from previous studies which achieved reductions in cholesterol. The MCS study should remain an important study for consideration notwithstanding the AHA objection.

Coconut has always been part of a healthy traditional tropical and Pacific island diet.

The AHA Presidential Advisory complained that a recent survey reported that 72% of the American public rated coconut oil as a 'healthy food' compared with 37% of nutritionists. This disconnect between lay and expert opinion can be attributed to the marketing of coconut oil in the popular press." (AHA page e13) Obviously, the AHA is of the opinion that the perception of coconut oil as a health food is just a health fad and that, as previously mentioned, it has "no known offsetting favorable effects." Coconut oil has been part of a healthy traditional diet in the tropics and Pacific islands for thousands of years. The AHA probably believes that a healthy diet can only be proven within the confines of its clinics and laboratories and not in the real world where people actually consume the food. The AHA does not realize that people cannot live on a tropical island and not consume coconut every day, and that despite this, do not suffer from heart disease. The AHA is obviously unaware of the numerous published studies that document how Pacific island inhabitants who shifted from a coconut diet to a Western diet became more prone to heart disease and obesity. The AHA wants us to miss the forest for the trees. There is no evidence that coconut oil causes heart disease; instead, they want to focus only on LDL.

At the same time AHA is attacking coconut oil, it has been promoting a high omega-6 diet. In 2009, AHA issued a science advisory which endorsed a minimum of 10% omega-6 in the diet,16 contrary to the recommendations of international health agencies to limit total omega-6 + omega-3 fat consumption to about 8%, and to keep an omega-6 to omega-3 ratio of no more than 5:1. The excessive consumption of omega-6 fat and deficiency in omega-3 fat may be one of the major contributors to the epidemic of obesity and diabetes in the US. It is soybean oil, an omega-6 fat, which has profited the most from the AHA support for a high omega-6 diet and warning against coconut oil.

In 1987, the American Soybean Association launched a truth-in-labeling campaign to demonize coconut oil to increase market share for soybean oil. This campaign, which came to be known as the Tropical Oils War, severely damaged the coconut industry. Today, soybean oil accounts for 55% of the edible vegetable oil consumption in the US and the soybean industry has been funding the AHA in the guise of supporting its health campaign to further increase its market share. In exchange, AHA is once again using defective science that demonizes coconut oil and makes Americans obese and sick. ■

Source: www.apccsec.org

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Better life, Better Health with NATA Nutrico

Sona John, Sub Editor, CDB, Kochi -11

Kalpavriksha, the most useful crop in the world is giving better life to Abdulla and his better half Shameema. For the 32 year old Abdulla who hails from Kannur district Kerala, coconut has been the means of sustenance from his very childhood. Being the son of a traditional coconut farmer, Abdulla had been to coconut farming and its related activity since childhood. His father was a coconut oil mill owner and Abdulla learned the basic principles of business from his family owned business.

Mature coconut water, the waste product of the coconut oil mill was being wasted on large quantity and was creating environmental pollution. Abdulla thought of making use of this waste product and vinegar was the first product to be developed. Abdulla attended a training in coconut vinegar production at CDB Institute of Technology in 2006 and later on in 2007 attended a training in Nata de coco production.

Since the vinegar was having less demand and as there was nothing much for Abdulla to experiment or explore, he turned to the production of Nata de coco. He learned that Thailand, Philippines and Japan were importing nata de coco in bulk quantity to India. Abdulla realized that it is one of the most sought after product in India. Thus Nata Nutrico Coconut Products was established based at Kannur, Kerala and half a dozen products with Nata de coco base is developed through Abdulla's 10 years of trial and error. Abdulla has been receiving the whole hearted support of Coconut Development Board since the very beginning. Presently around three tonne nata de coco is being produced monthly and his products are having high demand in star hotels and super markets. Abdulla is producing Nata de coco drink in various flavours, NATA nutrico life, Digestive food and NATA Nitrico Honey

For producing the Nata de coco, mature coconut water along with sugar solution is boiled. The mother culture is added and is kept at room temperature for 10 days. Abdulla is using high quality mother culture and keeps this solution in utmost hygienic condition. Maximum care is taken for avoiding contamination.

While many foreign companies are using artificial mother culture, Abdulla is using only natural mother culture for producing nata de coco which ensures that the product is very soft and slim. After ten days the thin and soft nata de coco is formed at the bottom of the solution. This is put in water for 24 hours and is thoroughly cleaned. Later on the product is sterilized in 100^{o} Celsius. The water is drained and the product is put in sugar solution. The raw nata de coco is now ready to use. Abdulla is selling the nata de coco in bulk packing of five kg to juice companies based in New Delhi and Hyderabad.

Nata de coco drink

With the nata de coco, Abdulla is producing the Nata de coco drink in various flavours of litchi, orange, strawberry, guvava etc. The drink is made with both tender coconut water and mature coconut water base. The products are having a shelf life of six months. The drink is packed in pet bottles. Instead of pasteurization, Abdulla resort to retort processing for enhancing the shelf life of the product.

Dietary food supplement with nata de coco base

Abdulla is producing a dietary food supplement with nata de coco base. Milk is added to mature coconut water. Yeast and sugar along with the mother culture is added and is kept for seven days. The produced Nata de coco is soaked for six hours in equal quantity of water with 10% sugar and 10% glucose mix. The product is packed and sold in polypropylene pouches and is sold through super markets.

Dietary fibre honey

Dietary fibre honey is another product developed by Abdulla. Tender coconut water or mature coconut water is boiled at 100^{o}C. The mother culture is added and is kept for six days. Later on the product is soaked in water for 24 hours, washed, added sugar syrup and is dried in oven and is cut into cube size. Instead of the sugar syrup Abdulla is also using neera honey or bee honey in the preparation, making it more health friendly.

Nata de coco

Nata-de-coco a cellulosic white to creamy yellow substance formed by acetobacter aceti subspecies Xylinium, on the surface of sugar enriched coconut water / coconut milk / plant extract / fruit juices or other waste materials rich in sugar. It is popularly used as a dessert and as an ingredient in other food products, such as ice cream, fruit cocktails, etc.

The Process
(from Matured Coconut Water)

Mix strained coconut water with sugar and glacial acetic acid in stipulated proportions. Boil for ten minutes and cool. Add the culture solution and distribute the mixture in wide mouthed glass or plastic jars. Cover the jar with a paper or a thin cloth to protect from dust. Keep aside the solution undisturbed for two to three weeks. After this period, the white jelly like thick surface growth is harvested, washed thoroughly to remove all the acids and sliced into cubes. It is then immersed in flavoured sugar solution, again boiled and packed in glass jars or retortable pouches, sterilized and sealed.

Abdulla is already running a coconut oil mill, which he inherited from his father. Abdulla's Green Kera brand coconut oil is sold in pouches. 10 labourers along with Abdulla and his wife are managing the unit. Abdulla is very keen in following strict quality standards and keeps experimenting in developing newer products. A kind of edible paper sheet that can be used for rolling food products and surgical thread that can be absorbed into the body are the two new products in the pipeline.

Abdulla has already invested around Rs. 15 lakhs for the purchase of the machinery and equipments for setting up the unit. Eventhough Abdulla is into this business since the last 10 years, he could get income from Nata Nutrico since the last four years only. A new plant with Rs. 75 lakh investment with the financial support of Coconut Development Board is in the pipeline at the Kinfra park in Thaliparambu, Kannur. The unit is expected to start functioning from March 2018 onwards. ■

NATA DE COCO

Nata de coco, a chewy, translucent, indigenous dessert in the Philippines which is very popular in Japan. In 1993, Japanese people, especially young people consider nata de coco a popular dessert, however, its popularity declined because their interest moved to another trendy dessert. Small coconut farmers and those who started manufacturing nata de coco in the Philippines began to export more nata de coco to Japan in 1993. Though Japan imported 90 percent of the Philippines nata de coco, its supply did not meet the demand for the dessert in Japan. About one year later, the product's astonishing popularity quieted. Environmental and unemployment problems arose and Japan was importing nata de coco from the Philippines.

Nata fruit salad with custard

Ingredients :

Milk – 250ml
Custard powder -25g
Sugar – 50g
Nata life – 1 Pkt

Method of preparation

Boil milk with sugar and Nara Life. Add Custard powder to it, Stir well. Cool down the mix. Drain the fruit syrup and add to the mix.

Nata life candy

Ingredients :

Nata Life 100 gm – 1 Pckts
Condensed milk -400ml
Chopped cashew nuts/ground nuts – 100gm
Glucose- 2 table spoon
Glass cup for serve

Method of preparation

Boil the milk and nata life and wait for 10 minutes. Grind the mixture to a fine paste. Place the first 4 ingredients in a thick bottom cookware. Cook in low heat. Continuous stirring is needed until it gets thicker. Wait to cool down and make balls of de coco in oval shape.

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Mulberry as a fodder tree under coconut plantation

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Diary farming is an integral part of rural livelihood. Eventhough it is having high prospects in Kerala, it is highly uneconomical due to major constraints like high cost of feed and scarcity of quality fodder that offset farmers profit to a considerable extent.

Cultivating good quality fodder ensures sustainable and profitable milk production and helps in maintaining the health of animal. Among various fodder sources, fodder trees with nutritive foliage are good sources, especially during lean period as a supplement to roughages & partial substitute to concentrates.

Among various fodder trees mulberry is a promising species by virtue of its nutritive foliage with high CP content (Crude Protein content), higher biomass yield, ability to withstand severe pruning, good coppicing ability that suit well to humid tropics of Kerala and shade tolerance.

Mulberry is commonly used as silkworm feed in Kerala, but its fodder potential is unknown to farmers. However numerous studies confirm superiority of mulberry fodder for ruminants.

Cultivation of this fodder tree can reduce the fodder deficit in Kerala. Due to acute land scarcity in Kerala the possibility of growing this fodder tree as a sole crop in open land is rather limited. The only alternative is to integrate with the existing cropping system in the state. Coconut is the most dominant plantation crop in Kerala. Due to availability of wider interspace there is good scope for integrating trees under coconut garden. While integrating with coconut, tree should be maintained as hedge rows for reducing intercrop competition and ease of harvesting.

In hedgerows management aspects like plant density and pruning frequency influences biomass yield, quality of fodder, sustainable production and survival of trees.

Lack of information on management aspects of mulberry underneath coconut plantation is a major constraint for optimizing yield and quantity. Hence the study was conducted in College of Forestry,

Table 1: Interaction effects of plant density and pruning frequency on annual dry fodder yield and crude protein (CP) underneath coconut plantation.

Treatments	Dry fodder yield (tones/ha)	Crude protein (CP) (%)
T1 - D1F1	11.05	19.14
T2- D2F1	8.31	16.40
T3 – D3F	6.11	16.72
T4- D1F2	12.28	13.56
T5 – D2F2	11.98	10.33
T6 – D3F2	9.29	10.42
T7-D1 F3	13.85	13.99
T8-D2 F3	8.68	13.45
T9-D3 F3	7.66	14.41

Vellanikkara to assess the influences of plant density and pruning frequency on forage yield and quality. The result gives that the best treatment combination was T_1 involving highest density and shortest pruning interval of eight weeks with dry fodder yields of 11.05 tonnes/ha and crude protein of 19.14% (Table: 1).

In Kerala mulberry variety VI is common. Mulberry is raised from uniform stem cuttings of 6-8 months maturity, 20cm length, having 3 nodes and of pencil thickness in polythene bags and is transplanted to main field at three months stage. Seedlings of mulberry can be transplanted to the main field with the onset of premonsoon showers.

Field area (excluding coconut basin of 2m radius) is ploughed twice and pits are taken at a spacing of 45cm x 45cm and seedlings of mulberry can be transplanted into the main field with the onset of premonsoon showers. Manures and fertilizers can be applied. Plants can be weeded and irrigated as and when required.

After attaining a height over 1m, the first harvest need to be done. Subsequent cuttings can be taken after 2-3 months. During this period large quantity of young shoots are formed and it can be harvested and used as feed to cattles.

Mulberry is commonly used as a silkworm feed in Kerala, but its fodder potential is unknon to farmers. Mulberry tree with its nutrient rich leaves constitute a potential source of quality green fodder to livestock especially during lean period. By growing this in the farm at cost effective, modest management level, instead of buying costly dairy feed, farmers can save money and can achieve substantial increase in milk production. Cultivation of mulberry also offers numerous ecological services that help to maintain better soil properties and overall productivity of the system. ■

Reaching the farming community and other stakeholders

● Kisan Mela ● Agri-business Expo ● Interface Programmes

ICAR-Central Plantation Crops Research Institute regularly organizes various front line extension initiatives to benefit farming community and other stakeholders. Apart from dissemination of technologies evolved at the Institute among the stakeholders these programmes provide opportunity to the institute for fine-tuning the technology development process Accordingly a series of programmes including Scientist-Farmer Interface Programmes on various subject matter areas, Kisan Mela and Agri-business Expo- 2018 was conducted during 5-10 January 2018 at CPCRI, Kasaragode. These programmes were organized as the major technology transfer initiative in connection with the Foundation Day of CPCRI and 25 years of Krishi Vigyan Kendra, Kasaragod functioning under the institute.

Unique feature of the series of programmes was the linkage and collaboration with various research, extension and development institutions in organizing the events. Major collaborators included Coconut Development Board (CDB), Directorate of Arecanut and Spices Development (DASD), Directorate of Cashew and Cocoa Development (DCCD), Agricultural Technology Management Agency (ATMA) Kasaragod, State Department of Agriculture, ICAR institutes including Central Tuber Crops Research Institute (CTCRI), Indian Institute of Spices Research (IISR), Indian Institute of Horticultural Research (IIHR), Central Institute of Fisheries Technology (CIFT), Central Marine Fisheries Research Institute (CMFRI), Directorate of Cashew Research (DCR) and Central Coastal Agricultural Research Institute (CCARI).

Kisan mela

A mega Kisan Mela was held at ICAR-CPCRI, Kasaragod on 8th June 2018. Shri D.V. Sadananda Gowda, Hon'ble Union Minister for Statistics and Programme Implementation, Government of India, inaugurated the Kisan Mela. In his inaugural address, Shri Sadananda Gowda highlighted the efforts taken by the union government for supporting the farming community and mentioned about various schemes like Prime Minister's Krishi Sinchayee Yojana, Pradhan Manthri Fasal Bima Yojana, Scheme on distribution of soil health cards etc. Interventions by the government through fixing Minimum Support Price, procurement schemes and other market interventions to protect the farmers from price crash and price fluctuations were also highlighted in the inaugural address. Elaborating on the current scenario in plantation crops sector, the minister lauded the research achievements of CPCRI and urged the farmers to effectively utilize the improved technologies from agricultural research institutions like CPCRI to achieve higher productivity and income. Shri Sadananda Gowda also stressed the need for concerted efforts by all the agencies to achieve the objective of 'Doubling farmers' income by 2022'.

Shri P. Karunakaran, Hon'ble Member of Parliament, Kasaragod presided over the function. Dr. A.K. Singh, Deputy Director General (Horticulture), ICAR delivered the introductory remarks.

A postal stamp to commemorate the 100 years of ICAR-CPCRI was released by Col. S.F.H. Rizvi, Post Master General, Northern Region, Kozhikode.

Publications, namely, a book on 25 years of ICAR-Krishi Vigyan Kendra – A Journey with the Farmers, technical bulletins on Entrepreneur and Farmer Friendly Technologies in Hindi and Coconut in Malayalam and Kannada were released during the programme.

Micronutrient formulations KalpaVardhini and Kalpa Poshak" for coconut developed at the Institute were released by the Minister.

Exchange of MoUs on transfer of commercialized technologies were also held in the inaugural function of Kisan Mela. MoU on Arecanut tissue culture for large scale production of dwarf hybrids and yellow leaf disease (YLD) tolerant palms, Coir pith composting and coconut leaf composting were exchanged with Southern Petrochemical Industries Corporation (SPIC). Another MoU was exchanged to Madhura Agro, Coimbatore on Virgin Coconut Oil (VCO), Coconut Chips, frozen coconut delicacies and Kalparasa technologies.

Selected farmers were felicitated in the Kisan Mela for their achievements in farming. Shri Sibi Joseph, Balal, Kasaragod, Kerala selected as the Best Coconut Farmer, Shri Rama Kishore, Bantwal, D.K. district, Karnataka selected as the Best Arecanut Farmer and Shri Vishwanatha Rao, Ajjavara, Sullia, D.K. district, Karnataka selected as the Best Cocoa Farmer were honoured in the Kisan Mela by the Hon'ble Union Minister.

Shri N. A. Nellikunnu Hon'ble MLA, Kasaragod, Shri A.G.C. Basheer, President, Kasaragod District

Panchayath, Shri A.A. Jaleel, President, Mogral Puthur Grama Panchayath and Smt. T.R. Ushadevi, Principal Agriculture Officer, Kasaragod offered felicitations. Dr. P. Chowdappa, Director, ICAR-CPCRI welcomed the gathering and Dr. C. Thamban, Principal Scientist and Secretary, organinsing committee proposed vote of thanks.

About 3000 farmers participated in the Kisan Mela. After the inaugural function, the Scientist-Farmer Interface Programme on 'Doubling farmers' income through effective use of crop production technologies' was held in which was attended by 300 farmers. Shri N.A.Nellikkunnu, Hon'ble M.L.A. Kasaragod, inaugurated the interface programme.

Agri-business Expo - 2018

Conducting exhibition on improved farm technologies is an important method to create awareness among the farming community about the benefits of new farm technologies. An elaborate exhibition entitled 'Agri-business Expo – 2018' was conducted at ICAR-CPCRI, Kasaragod during 5-10 January 2018.

About 150 stalls were put up in the Agri-Business Expo-2018. The exhibitors included ICAR institutes viz., CTCRI, IISR, IIHR, CIFT, CMFRI, DCR and CCARI, commodity boards like CDB, co-operative institutions such as CAMPCO and Dinesh Foods, corporate sector agri business firms such as SPIC, various private firms dealing with marketing of agro-inputs including seeds and palnting material and farm equipments and machineries, Farmer Producer Organisations and Women Self Help Groups, ATMA Kasaragod, Department of Soil Survey and Soil Conservation and Department of Agriculture. Department of Posts and BSNL also put up stalls in the exhibition apart from CPCRI and KVK Kasaragod. Selected farmers exhibited farm produce like banana and tuber crops. As part of the exhibition a separate stall was set up for exhibiting the agro-biodiversity in the region and farmers and Farmer producer Organisations from different parts of Karnataka and Kerala exhibited their collections of traditional varieties and landraces of different agricultural crops. The Agri-business Expo – 2018, on an average, had about 3500 visitors daily, comprising of farmers, extension personnel, entrepreneurs and school children.

The exhibition was inaugurated by Shri E. Chandrasekharan, Hon'ble Minister for Revenue and Housing, Govt. of Kerala on 5th January, 2018. In his inaugural address Shri Chandrasekharan emphasized the need for strengthening the technology transfer initiatives to benefit the farming community. In the current scenario of crisis in the farm sector farmers should be facilitated for making effective use of innovative farm technologies to enhance productivity and income. Minister highlighted the need to promote eco-friendly farming practices. Also there is a need to integrate indigenous knowledge in farming with the modern farm technologies, minister opined. Dr. P. Chowdappa, Director, ICAR-CPCRI welcomed the gathering in the inaugural function of Agri-business Expo – 2018.

Prizes for the best exhibition stalls were distributed by Dr. P. Chowdappa in the valedictory function held on 10th January 2018. Coconut Development Board secured the first prize. Second prize was won by Saya Enterprises, Puttur and Farmers' Self help group on Mushroom cultivation, Kasaragod won the third prize. Certificates and cash prizes were distributed to farmers who exhibited farm produce in the exhibition. Shri Thomas Elavankal, Panathadi Panchayath won first prize for banana and second prize was won by Shri Moideen Kunhi of KaradkaPanchayath. For elephant foot yam first prize was secured by Shri Aithappa Poojary, Karadka Panchayath and second prize was won by Shri Suresh Ambiladi of BedadkaPanchayath.

Scientist-Farmer interface programmes

As part of the Kisan mela and Agri-business Expo a series of Scientist-Farmer interface programmes on selected thematic areas were conducted at CPCRI, Kasaragod. Presentations by scientists and experts followed by detailed discussions and experience sharing by farmers made these interface programmes highly effective.

The interface programmes

Sl. No.	Topic of interface programme	Date	No. of partici-pants
1	Soil and water conservation and integrated soil health manage-ment	05-01-2018	150
2	High value under-utilized fruits	05-01-2018	150
3	Arecanut based multispecies cropping system and man-agement of root grub using entomopathogenic nematodes (EPN) in arecanut	06-01-2018	150
4	Production and processing of cocoa	06-01-2018	150
5	Income generating enterprises in animal husbandry and fisher-ies sector	06-01-2018	180
6	Doubling farmers' income through effective use of crop production technologies	08.01.2018	300
7	Bee keeping	09.01.2018	300
8	Urban and Peri-urban Horti-culture	10-01-2018	220
9	Value addition in coconut, jack fruit and mango	10-01-2018	250

The poster on invasive rugose spiraling whitefly on coconut released during the workshop on Bio-suppression of rugose spiraling whitefly

Workshop on Bio-suppression of Rugose Spiraling Whitefly

A workshop on "Bio-suppression of rugosespiraling whitefly" of coconut was conducted on 6th January 2018 at ICAR-CPCRI Kasaragod. Invasive rugose spiraling whitefly which was reported in India during 2016 is becoming a major problem in the coconut growing tracts in southern states including Kerala, Tamil Nadu, Karnataka and Andhra Pradesh. Dr. N.K. Krishna Kumar, Regional Representative, South and Central Asia, Bioversity International and Former DDG (Hort), ICAR inaugurated the workshop. He highlighted the importance of strict quarantine measures and biological control to manage invasive pests. Dr. P. Chowdappa, Director, ICAR- CPCRI chaired the session. Dr. P. K. Chakrabarty, Hon'ble ADG (Plant Protection) co-chaired the session. Officials from ICAR institutes, state departments, Agricultural Universities and KVKs participated in the workshop. Technical bulletins and posters on "Invasive rugose spiraling whitefly on coconut" in six different languages including Hindi, English, Malayalam, Kannada, Tamil and Telugu were released during the programme.

Seminar on Crop Diversity

A seminar on "crop diversity" was conducted on 6th January at ICAR- CPCRI, Kasaragod with the objectives of documenting and showcasing the plant genetic diversity in the region, promoting agro-biodiversity conservation and to promote community seed chain in agricultural crops. The seminar was inaugurated by Dr. N.K. Krishna Kumar, Regional Representative, South and Central Asia, New Delhi

and formerly DDG (Horticultural Science), ICAR. The inaugural session was chaired by Dr. P. Chowdappa, Director, ICAR-CPCRI. Various aspects of plant genetic diversity were dealt in the technical session. Dr. H. Sooryaprakash Shenoy, Principal Scientist, Dr. Shivarama Karanatha Pilikula Nisargadhama, Pilikula, Mangalore made a presentation on 'Plant Diversity in Western Ghats'. Shri Jayakumar from 'Thanal' a Thiruvananthapuram based NGO, spoke about the role of NGOs in conservation. Mrs. Manorama Joshi, Secretary, Vanastree organization, Sirsi, Karnataka shared her experience on the crop diversity conservation in homesteads, community seed production and livelihood opportunities. Dr. D. Chandrasekhara Chowta, President, Farmers Producer Company from Meeyapadavu spoke on the challenges of production of 'safe to eat food'. Shri Jayaprakash, Secretary, 'Pulari' an NGO in Kasaragod, Shri Prameshwara Bhat,a traditional rice farmer from Belthangadi and Shri Suresh, a farmer

from Wayanad, shared their experiences in the field of crop diversity conservation. Farmers and Farmer Producer Organisations from different parts of the Karnataka and Kerala exhibited their collections of seeds and planting material of traditional varieties and landraces of different agricultural crops.

Start-up Green 2018 - Enabling Agri-preneurship

"Start-up Green 2018-Enabling Agripreneurship" programme was organized at ICAR-CPCRI Kasaragod as a part of the Kisan Conference and Agri-Business Expo with the objective of bringing companies, entrepreneurs, business experts, business students, agri-business incubators and those having a passion for entrepreneurship to share experience, expectations and aspirations to enable a quantum leap in Agribusiness.

Dr. Sajith Babu IAS, CEO, Additional Skill Acquisition Programme (ASAP), Government of Kerala inaugurated the programme and made a presentation on Start ups and skilling avenues in agriculture sector. Dr. P. Chowdappa,Director, ICAR-CPCRI presided over the inaugural function. Presentations on different topics such as Network of Indian Agribusiness Incubators by Dr. Manoj Samuel, ICAR-CIFT, Kochi; Entrepreneurship development experience of ABI by Dr.Sudha Mysore, ICAR-IIHR, Bangalore; Technology based incubation at NIT by Preeti M., NIT Kozhikode; Marketing of technology and technology products by Dr. K.Muralidharan, ICAR-CPCRI Kasaragod; Business ventures with root crops by Dr. T.Shivakumar, ICAR-CTCRI,Thiruvanathapuram; Coconut value added products by Dr. M.R.Manikantan, ICAR-CPCRI Kasaragod and Preparation of DPRs: Key issues by Shri S. Jayashekar,ICAR-CPCRI Kasaragod was held as part of the programme. Around 250 registered delegates participated in the programme.

Valedictory Function

The valedictory function of Kisan Mela was held on 10th January, 2018 under the chairmanship of Dr. P. Chowdappa, Director, ICAR-CPCRI. Dr. Chowdappa distributed prizes to the institutions and farmers who participated in the Agri Business Expo – 2018. Dr. K. Muralidharan Head, Division of Social Sciences welcomed the gathering and Dr. C. Thamban, Principal Scientist and Secretary, organizing committee proposed vote of thanks.

Report compiled by: P. Chowdappa, Thamban. C, and H. Muralikrishna, ICAR-CPCRI, Kasaragod. ■

Aspects & Prospects of Coconut Production & Value addition- State level workshop

State Level Workshop on Aspects & prospects of coconut production and value addition was organized by Coconut Development Board, State Centre & DSP Farm, Pitapally, Odisha at Bhubaneswer on 17th January, 2018. Renowned scientists, Professors, Heads, Senior level government officials of Central Horticultural Research Station(CHES), Central Tuber Crops Research Institute(CTCRI), Orissa University of Agriculture & Technology(OUAT), Central Integrated Pest Management Centre(CIPMC),Directorate of Horticulture, Government of Odisha, APICOL etc were present at the workshop as resource person and guests. Dr.Biswanath Rath, Board Member, Coconut Development Board, was the Chief Guest of the workshop. Dr.Govinda Acharya, Head, CHES; Dr.R.K.Mishra, HOD, Dept of Economics, OUAT; Dr.Sudarshan Panda, Ex-Retd Director of Horticulture, Government of Odisha; Shri Sreekumar Poduval, Processing Engineer, CDB,Kochi and Dr.Rajat Pal, Dy.Director, Coconut Development Board, Odisha were present during the ocassion. More than 350 farmers and members of Coconut Producer Societies from different districts Puri, Cuttack, Kendrapara, Ganjam, Jagatsinghapur, Khordhaetc participated in the programme and participated in the interactive session. Dr. Biswananth Rath in his inaugural speech emphasized on minimum support price of coconut which should be Rs.20 for one mature nut. He also briefed the role of CDB in coconut cultivation and production and setting up of coconut oil industry in Odisha. Dr.Rajat Pal, Dy.Director, CDB, Odisha in his keynote address spoke about the objectives of the workshop and the road map to be prepared for successful implementation of different CDB schemes. He stressed on the need for formation of Coconut Producer Societies.

In the technical session which followed, Dr.Nedunchezhiyan, Head, CTCRI spoke on the importance of tuber crop cultivation as intercrop in coconut orchard. Dr.S. C. Sahoo, Prof. & OIC, AICRP, OUAT spoke on key factors for productivity improvement of Coconut like timely application of

organic manure and fertiliser, basin management, irrigation, mulching, green manuring etc. Shri Choudhury B.P.Das, Agri-consultant, Orissa State Marketing Board briefed on the prospects and problems of coconut marketing in Odisha. He highlighted the e-marketing of coconut through portal of National Agriculture Market(NAM) which may overcome the distress sale of coconut. Shri Sreekumar Poduval, Processing Engineer, CDB Institute of Technology spoke on value added products of coconut like virgin coconut oil, desiccated powder, tender coconut water packaging, coconut chips, shell charcoal, activated carbon and many other products which can fetch good return through processing and manufacturing. Shri Chand, Horticulture Officer of Directorate of Horticulture briefed about the role of State Government in coconut development converging with schemes of Coconut Development Board.

5th Assam International Agri- Horti show 2018

Coconut Development Board Regional office, Guwahati participated in the 5th Assam International Agri Horti Show organized by the Department of Agriculture, Government of Assam in association with Indian Chamber of Commerce (ICC) and Assam Agricultural University (AAU) held from 5 to 8 January'2018 at Chowkidingee Ground, Dibrugarh. The Assam International Agri-Horti Show is an annual event held in Assam which showcases the advance technologies and new opportunities available in agriculture, horticulture, food processing, floriculture and allied sectors.

Shri. Sarbananda Sonowal, the Chief Minister of Assam inaugurated the 5th Assam International Agri-Horticultural show, 2018. The Chief Minister in his inaugural address informed that the Government is committed to strengthen the agriculture sector to attract the new generation and assured the farmers that soon the government would ensure minimum support price for their products. The state Agriculture Minister Shri Atul Bora in his address mentioned that the Agri-Horticultural Show would help in the growth of export and investment in agriculture sector in Assam. He also said that the farmers of the State would be highly benefited from the show as the same would give them an exposure of advanced farming technologies. Chief secretary to the Government of Assam Shri.V.K Pipersenia, Additional Chief Secretary (Agriculture) Dr. KK Mittal, Commssioner and Secretary (Agriculture) Shri Amlan Baruah, IAS and Shri Prasanta Phukan MLA were present in the inaugural session.

The show was attended by 228 organizations which included participants from countries like Thailand, Taiwan Nepal, Canada, and China. Coconut Development Board was provided with two large stalls inside the main pavilion. The Board displayed various varieties of coconut, coconut convenience foods, value added products from coconut kernel, coconut shell & coconut water, coconut shell/wood based handicrafts and leaflets, books & publications on coconut and postures on the nutritional and health benefit on coconut and its products.

Shri. R. Jnanadevan, Deputy Director, CDB hoisting the National Flag on Republic day at CDB, Kochi premises

Project Approval Committee of CDB clears 23 projects worth Rs 22.69 Crores

Coconut Development Board (CDB) in its 51st meeting of the Project Approval Committee (PAC) on Technology Mission on Coconut (TMOC) held at Kochi on 19th January 2018 under the Chairmanship of Dr. B.N.S. Murthy, Chairman, CDB approved 23 projects with an outlay of Rs. 22.69 Crores and financial assistance of Rs. 4.75 Crores with annual processing capacity of 521 lakh coconuts and 4200 MT production of coconut shell charcoal. The cleared projects include three research projects and 19 projects on processing of coconuts for value addition and one project on market promotion.

Under the sub component 'Processing and Product Diversification', four projects for Desiccated Coconut Powder for processing 330 lakh nuts per year, four Integrated Processing units for Desiccated Coconut Powder and Virgin Coconut Oil, Coconut milk & Sugar, Coconut vinegar and nata-de-coco and coconut water processing etc for processing 118.95 lakh nuts per year 1.5 lakh liter neera per year and three lakh litre matured coconut water per year, one Tender Coconut water processing and packing unit to process 15 lakh nuts per year, seven Ball copra making units with processing capacity of 42.10 lakh coconuts per year, one coconut oil unit for processing 15 lakh nuts per year and two Shell Charcoal units with capacity to produce 4200 MT Shell Charcoal per year were sanctioned.

In Kerala, two Desiccated Coconut Powder unit for processing 72,500 coconuts per day, one Integrated Coconut Processing unit with a capacity to process 1000 nuts per day and 1,000 litre coconut water per day for Coconut Vinegar, Nata-de-coco and coconut chips, one coconut oil unit for processing 5,000 coconuts per day, three Ball Copra making units with a capacity to process 4.30 lakh coconuts per year and one shell charcoal unit to produce 19 MT Charcoal per day were sanctioned.

In Tamil Nadu, two Desiccated Coconut Powder making units with a capacity to process 37,500 nuts per day, one Tender Coconut water processing and packing unit to process 5,000 nuts day and three Integrated Coconut Processing units with a capacity to process 38,650 nuts per day and 500 liter neera per day for VCO, DC & Coconut sugar and one Shell Charcoal unit to produce 4 MT Charcoal per day were sanctioned.

In Andhra Pradesh, four Ball Copra making units with a capacity to process 37.80 lakh coconuts per year was sanctioned.

Dr. Navin K Rastogi, Sr. Principal Scientist, CFTRI, Mysore; Shri. PK Hameed Kutty, Deputy Agricultural Marketing Advisor, Directorate of Marketing and Inspection, Kochi; Smt Usha K, DGM, NABARD, RO, Thriuvananthapuram; Shri. Vasanthakumar P, Asst. General Manager, Indian Overseas Bank, R.O, Kochi; Shri Saradindu Das, Chief Coconut Development Officer, Shri. E. Aravazhi, Shri R. Jnanadevan and Shri. Sardar Singh Choyal, Deputy Directors and Shri. Sreekumar Poduval, Processing Engineer, CDB attended the meeting.

Monthly Operations- February

Andaman & Nicobar Islands: Continue watering the nursery. Start collection of seednuts from the 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 cater pillar 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 chlorpyriphos 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.

Chattisgarh: 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 three 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. Continuecollection 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 Azadiractin 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 in 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 Azadiractin (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. ■

Market review – December 2017

Domestic price

Coconut Oil

During December 2017 the price of coconut oil opened at Rs.19000 per quintal at Kochi market and Alappuzha market and Rs.21300 per quintal at Kozhikode market. The price movement in all three markets in Kerala expressed an overall upward trend during the month.

The price of coconut oil closed at Rs.20400 per quintal at Kochi market and Alappuzha market and Rs.22000 per quintal at Kozhikode market with a net gain of Rs.1400 at Kochi market and Alappuzha market and Rs.700 per quintal at Kozhikode market.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.17333 per quintal, expressed a mixed trend and closed at Rs.19133 per quintal with a net gain of Rs.1800 per quintal.

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

	Kochi	Alappuzha	Kozhikode	Kangayam
01.12.2017	19000	19000	21300	17333
10.12.2017	19700	19400	21600	19333
17.12.2017	20300	20300	21900	19000
24.12.2017	20200	20200	21700	18667
31.12.2017	20400	20400	22000	19133

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.13800 per quintal at Kochi, Rs.12600 per quintal at Alappuzha market and Rs.13900 per quintal at Kozhikode market. The price movement in all three markets in Kerala expressed a mixed trend during the month.

The prices closed at Rs.14300 at Kochi, Rs.13400 per quintal at Alappuzha market and Rs.14300 at Kozhikode markets with a net gain of Rs.500 per quintal at Kochi and Rs.800 per quintal at Alappuzha market and Rs.400 per quintal at Kozhikode market.

At Kangayam market in Tamilnadu, the prices expressed an upward trend. The prices opened at Rs.12300 and closed at Rs. 12900 per quintal with a net gain of Rs.600 per quintal.

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

	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kan-gayam
01.12.2017	13800	12600	13900	12300
10.12.2017	14500	12800	14200	12700
17.12.2017	15000	13300	14400	12800
24.12.2017	14100	13250	14000	12900
31.12.2017	14300	13400	14300	12900

Edible copra

The price of Rajapur copra at Kozhikode market which opened at Rs.15000 per quintal expressed mixed trend during the month and closed at Rs.15300 per quintal with a net gain of Rs.300 per quintal.

Table3 :Weekly price of edible copra at Kozhikode market (Rs/Quintal)	
01.12.2017	15000
10.12.2017	15800
17.12.2017	15000
24.12.2017	14400
31.12.2017	15300

Ball copra

The price of ball copra at Tiptur market which opened at Rs.12600 per quintal expressed a slight upward trend during the month and closed at Rs.13400 per quintal with a gain of Rs.800 per quintal.

Table 4 : Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal)	
	Tiptur
01.12.2017	12600
10.12.2017	13000
17.12.2017	13000
24.12.2017	13000
31.12.2017	13400

Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.9350 per quintal. The price expressed an upward trend and closed at Rs.10200 with a net gain of Rs.850 per quintal.

Table5 : Weekly price of Dry Coconut at Kozhikode market (Rs/1000 coconuts)	
01.12.2017	9350
10.12.2017	9650
17.12.2017	9900
24.12.2017	10200
31.12.2017	10200

Coconut

At Nedumangad market the price of partially dehusked coconut opened at Rs. 21000 and closed at Rs. 22200 with a gain of Rs.1200 per thousand nuts. At Pollachi market in Tamil Nadu, the price of coconut opened at Rs. 19000 and closed at Rs.20000 per thousand nuts with a net gain of Rs.1000 per thousand nuts. At Bangalore APMC, the price of partially dehusked coconut opened at Rs. 18500 and closed at Rs. 18000 with a loss of Rs.500 per thousand nuts during the month. At Mangalore APMC market the price of partially dehusked coconut of grade-I quality ruled at Rs.22500 per thousand nuts.

Table 6: Weekly price of coconut at major markets (Rs /1000 coconuts)				
	Neduman-gad	Pollachi	Banglore	Mangalore (Grade-1)
01.12.2017	21000	19000	18500	22500
10.12.2017	21000	20000	18500	22500
17.12.2017	22200	20000	18000	22500
24.12.2017	22200	20000	18000	22500
31.12.2017	22200	20000	18000	22500

Tender coconut

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

Table7 : Weekly price of tender coconut at Maddur market (Rs/1000 coconuts)	
01.12.2017	10000
10.12.2017	10000
17.12.2017	10000
24.12.2017	10000
31.12.2017	10000

International price

Coconut oil

The international and domestic price of coconut in major coconut oil producing countries expressed an erratic trend during the month. The price of coconut oil quoted at different international/ domestic markets is given below.

Table 8: Weekly price of coconut oil in major coconut oil producing countries during December 2017				
	International Price(US$/MT)	Domestic Price(US$/MT)		
	Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia	India*
2/12/2017	1514	1481	1490	2973
9/12/2017	1510	1475	1479	3067
16/12/2017	1525	1420	1480	3160
23/12/2017	1427	1375	1474	3144
30/12/2017	1458	1400	1420	3175
				* Kochi Market

Coconut

The price of coconut quoted at different domestic markets in Philippines, Indonesia, Srilanka and India are given below.

Table 11: Weekly price of dehusked coconut with water during December 2017				
Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India*
2/12/2017	232	236	446	654
9/12/2017	202	229	447	669
16/12/2017	223	217	447	685
23/12/2017	223	217	447	724
30/12/2017	223	217	447	724
				*Pollachi market

Copra

The domestic price of copra at Philippines and Indonesia expressed a downward trend whereas price of copra in Srilanka and India expressed a mixed trend during the month. The price of copra quoted at different domestic markets are given below.

Table 9: Weekly price of copra in major copra producing countries during December 2017				
	Domestic Price(US$/MT)			
	Philippines	Indonesia	Srilanka	India*
2/12/2017	936	827	1485	2164
9/12/2017	927	827	1486	2257
16/12/2017	893	795	1483	2459
23/12/2017	880	795	1497	2195
30/12/2017	880	757	1497	2226
				* Kochi Market