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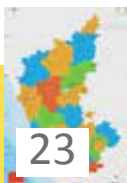
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Market Review



Message from the Chairperson's Desk

Dear readers,

Hearty Greetings from Coconut Development Board

The recently held Global Coconut Congress in Philippines was an eye opener for the coconut industry highlighting the growing immense potential of coconut products in the global market. India, though the largest producer of coconut in the world, has to go a long way ahead in processing, value addition and export. On a closer analysis the major bottlenecks experienced by this sector are the non availability of raw materials and its high price.

To achieve the vision of Government of India in doubling the farmers income by 2022, and to make India a forerunner in processing of coconut products there is an urgent need for expanding area under coconut cultivation. Coconut Development Board has targeted to cover an area of 21000 ha under new planting in 2019-20. Towards achieving this objective, area expansion is envisaged by bringing in more area under cultivation in traditional and nontraditional states and coupled with this rejuvenation of existing gardens by removing the senile unproductive palms. This two pronged approach along with good management practices will help in increasing the production and productivity of coconut. Agriculture and industry should go hand in hand with the farmer benefitted by an assured market and the entrepreneur benefitted by adequate supply of raw material at an affordable price.

Coconut is a wonder crop and the prospects of coconut are increasing with the numerous scientific studies on the nutritional and health benefits of coconut. Consumers who used to demand coconut, based on traditional knowledge or anecdotal evidences are now increasing its consumption due to its various innumerable health benefits. The potential of this crop could be utilized by the community to the benefit of our farmers only if we strengthen the coconut sector through production, processing, value addition and export. If not we will be left far behind.

I am happy to inform you that the International Coconut Community in its 55th session awarded Coconut Development Board, the Tree of Life award for its sustainable service in coconut sector. Let us work together in the way forward in making the Indian coconut sector globally competitive.



V Usha Rani IAS
Chairperson

Coconut Situation - India*

V. Usha Rani IAS

Chairperson, Coconut Development Board, India

Marketing and Product Promotion

Major Market Destinations of Traditional Coconut Products

The GCC countries are the major markets for fresh coconuts. Copra attracts very good demand from the countries like Nepal, Hong Kong, Vietnam and Pakistan. Coconut oil enjoys a good market in UAE, Saudi Arabia, Qatar and Vietnam. USA, UK, Japan, Germany and Russia are major buyers of activated carbon. Countries like Iran, UAE, Nepal, USA and Kuwait have good markets for products like desiccated coconut.

Major Market Destinations of Non-Traditional Coconut Products

As far as the non-traditional coconut products are concerned, VCO has a good demand in USA, United Kingdom & Australia. The export demand for frozen grated coconut is also steadily increasing and India is currently exporting the product to USA, UK, Canada, Australia etc.

Government Policies Related to Coconut Trade and Market

The Government of India implemented Goods and Services Tax (GST) from 1st July 2017 with the aim to improve ease of doing business in the country. GST was implemented by amalgamating large number of Central and State taxes into a single tax which would mitigate cascading or double taxation in a major way and paves way for a common national market. GST, being a simple tax regime, is expected to reduce the complications in doing business and improve trade. The GST applied on various coconut products ranges from 0 to 28 %.

Focusing on Make in India

A significant participant in world trade and on enabling the country to assume a position of leadership in international trade, Government of India is formulating its foreign Trade Policy. Under



the Foreign Trade Policy (2015-20) of the Govt. of India, most of the coconut products are having export incentives under “Merchandise Export from India Scheme (MEIS)”.

The Government of India’s price policy for agricultural commodities seeks to ensure remunerative prices to the growers for their produce with a view to encourage higher investment and production and to safeguard the interest of consumers by making available supplies at



reasonable prices with low cost of intermediation. The price policy also seeks to evolve a balanced and integrated price structure in the perspective of the overall needs of the economy. Towards this end, the Government announces, Minimum Support Prices (MSP) for 25 major agricultural commodities each year in both the crop seasons after taking into account the recommendations of the Commission for Agricultural Costs and Prices (CACP). Copra is one among the 24 commodities. In addition, MSP for De-husked coconut is fixed by the Government on the basis of MSP of Copra. Besides, announcement of MSP, the Government also organizes procurement operations of copra through public and cooperative agencies such as National Agricultural Cooperative Marketing Federation of India (NAFED) and National Cooperative Consumer Federation of India (NCCF). Besides, State Governments also appoint State agencies to undertake Price Support Scheme (PSS) operations. While deciding the MSP for various agricultural commodities, the recommendations of CACP, the views of Central Ministries and State Governments and such other relevant factors which are important in the opinion of the Government are considered.

Coconut and coconut products have very good market potential within as well as outside the country. Towards expanding the market for coconut products, the Govt. of India is extending support to the industry through different programmes viz., extending support for setting up of sales outlets/ kiosks for value added coconut products, facilitating participation in exhibitions/ trade fairs and buyer seller meets, instituting award for export excellence, arranging exposure visits, organizing seminars, extending support for quality certification etc.

Coconut Research and Development updates

India was lagging behind in technology development for product diversification till the last two decades. Introduction of Technology Mission on Coconut has given momentum to this area and now India possesses many technologies in value addition. Acceleration to the activities of CDB Institute of Technology has further quickened the product development. In the world, for the first time, technology for processing and packing of neera (sap from unopened inflorescence) and various downstream products like neera sugar, jaggery, honey etc have been developed. Food products like sweet/ spicy chips, sweet chunks, chocolate, cookies,

burfi, lemonade, flavoured juice, ice cream and milk spread are also the other very new additions of CIT's contribution in the product basket.

The following technologies have been developed and commercialized under sponsored research projects of the Board. These technologies have helped in increasing the product diversification.

Sl. No.	Name of Technology	Technology developed by the Board in association with
1	Processing and Packing of Flavored Coconut Milk and Culinary Coconut Milk	CDB Institute of Technology, Aluva, Kerala
2	Spray Dried Coconut Milk	Central Food Technological Research Institute, Mysore, Karnataka
3	Preservation and Packing of Tender Coconut Water	Defence Food Research Laboratory, Mysore, Karnataka
4	Coconut Vinegar Production from Matured Coconut Water	CDB Institute of Technology, Aluva, Kerala
5	Dietary Fibre from coconut residue	Central Food Technological Research Institute, Mysore, Karnataka
6	Production of Virgin Coconut Oil through cold process	Central Food Technological Research Institute, Mysore, Karnataka
7	Production of Nata-de-coco	CDB Institute of Technology, Aluva, Kerala
8	Production of Coconut chips	CDB Institute of Technology, Aluva, Kerala
9	Technology for Production of Cheaper and Healthier Blends of Coconut oil with other Vegetable oils	Central Food Technological Research Institute, Mysore, Karnataka
10	Preservation and Packaging of Coconut Neera and its value added products	CDB Institute of Technology, Aluva, Kerala

The few projects (ongoing) with respect to new coconut products are as follows:-

1. Development of ready-to-eat extruded snacks from co-products of coconut processing by Central Plantation Crops Research Institution (CPCRI), Kasargod, Kerala
 2. Processing of coconut milk, development of beverage from curcumin enriched nanoemulsified coconut milk (partially defatted) coconut by Central Food Technological Research Institute (CFTRI), Mysore, Karnataka
 3. Standardization of protocol for the preparation of frozen coconut delicacy by CPCRI, Kasargod, Kerala
- New Products developed at CDB Institute of Technology:

1. Coconut Clusters

Coconut cluster is amazingly delicious & healthy snack prepared from coconut chips and healthy edible seeds like pumpkin seeds, sunflower seeds, chia and sesame seeds. Another variant can be also prepared out of healthy nuts like cashew, almonds, pistachio etc. This snack is fibre rich and highly nutritious.

2. Coconut spicy chips

Coconut spicy chips can be prepared in two variations i.e., salt with spice powders coated and salt with spice extracts. It is an excellent choice for diabetic patients.

3. Coconut Ginger candy

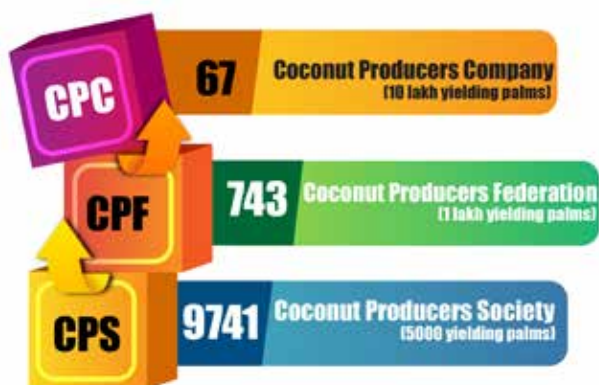
This is a delicious sweet with a beautiful blend of sweet and spicy taste. It has the health benefits of coconut gratings and soothing effect of ginger.

4. Coconut caramel toffee

The crunchy soft and sweet candy is a healthy combination of coconut kernel & coconut water blended with other ingredients.

5. Haustorium chunks

It is dried haustorium treated with less sugar.



Three tier Farmer Producer Organizations (FPO) in coconut sector:

CDB started a novel extension approach to organize farmers by formation of three-tier Farmer Producers' Organizations (FPO) with Coconut Producers' Societies (CPS) at primary level and integrate them to form Coconut Producers' Federation (CPF) at intermediate level and Coconut Producers' Company (CPC) at apex level. Overcoming the constraints imposed by the small size of their

individual farm, FPO members are able to leverage collective strength and bargaining power to access financial and non-financial inputs and services and appropriate technologies, reduce transaction costs, tap high value markets and enter into partnerships with private entities on more equitable terms. With fragmentation of holdings a continuing phenomenon, FPOs offer a form of aggregation which leaves land titles with individual producers and uses the strength of collective planning for production, procurement and marketing to add value to member's produce. So far, 9741 CPSs, 742 CPFs and 67 CPCs are formed in the country.

Skill Development Training Programmes (Friends of Coconut Tree - FoCT)

Acute shortage of palm climbers to harvest and adopt plant protection measures is one of the problems faced by coconut growers. With a view to tackle this problem, the Board is conducting a skill development programme from 2011-12 onwards, to train unemployed/underemployed youths in developing special skills and confidence in coconut climbing and plant protection activities for the benefit of coconut farming community. The skill fetches the youth handsome income for their decent living and helps to make available sufficient manpower to society in coconut harvesting and other plant protection activities.



Other issues/problems/recommendations

Indian coconut sector has to improve in many areas in spite of the unprecedented progress achieved in selected sectors. There are many issues to be addressed and solutions to be arrived at. Inadequate availability of quality planting material in tune with the increasing demand, low pace of value addition, low level of productivity than the potential, low pace of expansion of the crop area and low level of replanting and rejuvenation of old plantations, non availability of disease tolerant and short stature high yielding varieties in sufficient quantities are issues that still need solution. Development and standardization of mass multiplication technologies

Coconut Development Board approved 15 projects worth Rs. 2270.40 lakh



Coconut Development Board (CDB) in its 55th meeting of the Project Approval Committee (PAC) on Technology Mission on Coconut (TMOC) held at Kochi on 25th September 2019 under the Chairmanship of Smt. Usha Rani IAS Chairman, CDB approved 15 projects with an outlay of Rs 2270.40 lakhs. Out of the 15 projects approved by 55th PAC, 13 projects are from entrepreneurs for setting up of coconut based industries and 2 projects from various research institutes all over India.

for quality planting materials for commercial application is also to be addressed to meet the demands. Against the projected annual requirement of 10 million seedlings, the present supply is only 3.5 million seedlings. Considerable area suitable for coconut is available in traditional and non-traditional coconut growing areas in the country which need to be utilized for expanding the crop.

In the long term, the major challenge is to produce enough to meet the growing demand under changing climate conditions, the dwindling agricultural land/water and other natural resources and skilled labourers. Impending global warming and related climate change might lead to prolonged drought as well as emergence of new pests and diseases in majority of the coconut growing regions, necessitating development of strategies for drought mitigation and pest management. Establishment and strengthening of network of domestic quarantine stations with diagnostic labs to prevent the spread of non endemic areas are of prime importance. Development of environmentally safe integrated disease management strategies, diagnostic kits for early and accurate detection of diseases like root (wilt), basal stem rot and bud rot need to be developed. Development of an effective and easy way of delivery of biocontrol agents or chemicals with machineries for the management of the diseases like bud rot, leaf rot, leaf blight or basal stem rot, is to be given top most priority to achieve success in plant health management in the scenario of labour constraints in the agricultural sector.

Through convergence of various programmes and bridging the gap in existing schemes, India will try to make coconut a more remunerative crop by enlarging the scale and size of operations and reducing production costs giving more thrust on input management, irrigation, drought management and soil and moisture conservation considering the challenges like reduced resources like water and changing climate scenarios. Fabricating simple, reliable and affordable harvesting and spraying devices to undertake from ground itself is also one of the challenges in the field of mechanization.

An appreciable growth in total factor productivity and appropriate capital substitution are the possible alternatives and to achieve these, strengthening the traditional coconut based farming system through the use of modern research tools would be the starting point.

Restructuring of planting population, giving more stress on hybrids and dwarfs; stabilizing FPOs in coconut sector; more diversion of production to value addition; improvement in quality standards matching with international standards; adoption of new marketing strategy for tapping domestic and international markets; and widening the skill development in all essential areas of production and processing will be other areas of priority. Indian Coconut sector is striving hard to grow further for the benefit of millions of farming community. The country is aiming at sustaining the premier status enjoyed at global level in production and productivity and also in the process of gaining the prime position in export front too. ■

**Country paper presented during 55th ICC Session/ Ministerial Meeting - 26-30 August 2019, Manila, Philippines*



Farmer participatory approach for planting material production

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Introduction

Cultivation of high yielding improved varieties is one of the important strategies to enhance productivity of coconut to make it a remunerative crop. Though a large number of improved varieties and hybrids of coconut have been released by different research institutes, field level adoption of these varieties is very low due to various reasons (Thamban and Venugopalan, 2002).

Lack of availability of quality seedlings continues to be a major problem faced by farmers in adopting the improved varieties. Coconut is a long duration crop with a long juvenile period spanning 7 to 10 years and a long productive period of above 50 years. Hence, use of quality planting materials is very important in realizing high productivity. There is high demand for seedlings of the released improved

Farmer participatory approach for enhancing production of seedlings of improved varieties should be promoted by establishing more nucleus seed gardens in farmer fields. Such seed gardens may be encouraged in marginal and small farmer holdings.

varieties and hybrids from growers. Of late, growers are showing keen interest in cultivating dwarf varieties of coconut also mainly to overcome the problems experienced due to lack of availability of skilled palm climbers and high wage rate.

Gap between demand and supply of quality coconut seedlings

For a sustainable growth of coconut sector, it is recommended to have tall, dwarf and hybrid varieties cultivated in the ratio of 60:20:20. However, the field level scenario indicates a different story; tall cultivars constitute more than 90 per cent of coconut palm population. While the national average productivity of coconut is 6966 kg copra per ha, in Kerala (which accounts for 36 per cent of coconut production in the country) the productivity is much less, i.e., only 5152 kg copra per ha. Predominance of senile and unproductive genetically inferior local tall palm population is a major constraint in improving



productivity of coconut in major coconut growing tracts like Kerala. Massive programmes for replacing old and unhealthy palms are necessary to increase productivity and make coconut cultivation profitable. Replacing old palms will require enormous quantity of seedlings.

The average annual requirement of coconut seedlings is estimated at 15 million. However, production and supply of coconut seedlings by the public sector research and developmental agencies including ICAR-CPCRI, State Agri./Horticulture Departments and Coconut Development Board is only 4.2 million seedlings per year thus revealing a huge gap between demand and supply. Intermediaries have been hugely benefitted by the situation who supplies inferior/spurious planting materials to farmers thus adversely affecting sustainable growth of coconut sector.

Strategies for augmenting planting material production

Both long term and short term strategies are required to overcome the challenges in production

and distribution of quality coconut seedlings to meet the demand from coconut growers. The important long term strategy to meet the growing demand for coconut seedlings is to establish new seed gardens in suitable locations in different coconut growing tracts. Besides, rejuvenation of existing seed gardens and replanting with planting material of newly released varieties for different agro-ecological zones also needs much attention. Utilisation of superior genetic resources of coconut available in farmers' gardens is the most important short term strategy to meet the demand for coconut seedlings.

Farmer participatory approach for planting material production

Farmer participatory seedling production initiatives are to be promoted to meet the planting material requirement utilizing the locally available resources/mother palms. However, it has to be ensured that utmost care is taken to locate and identify the superior mother palms of locally adapted coconut varieties in farmer's garden. Identification of superior mother palms with farmer participation and its validation by seedling progeny testing as well as molecular markers assumes much significance. Such initiatives will empower local farming community for mother palm selection, controlled pollination for seednut production, community management of nursery and seedling selection.

This can set in a movement that will result in the establishment of highly productive palms leading higher productivity in coconut. Coconut Producers' Societies (CPS), the grass root level collective of coconut growers facilitated by Coconut Development Board, and trained youths under the 'Friends of Coconut Trees' (FoCT) programme can play a significant role in the accelerated production and distribution of quality hybrid coconut seedlings. The process can be technically supported by research organizations such as ICAR-CPCRI.

Farmer participatory approach for enhancing production of seedlings of improved varieties should be promoted by establishing more nucleus seed gardens in farmer fields. Such seed gardens may be encouraged in marginal and small farmer holdings.

Experiences of ICAR-CPCRI

There are few initiatives facilitated by ICAR-CPCRI worthy of emulation for farmer participatory seedling production in coconut.



CPCRI on nursery techniques of coconut including mother palm selection, seed nut collection, sowing and management of seedlings in nursery. Mother palms were identified in coconut farmers' gardens within the panchayat and 8,000 seed nuts were collected and sown in eight nurseries. About 5000 quality seedlings were raised in these nurseries managed by self help groups. Periodical monitoring for the proper management of nurseries was done by the monitoring team consisting of

i. Farmer participatory characterisation of coconut varieties and raising community nursery

Farmer participatory characterisation of coconut varieties was conducted under COGENT/IPGRI sponsored project entitled 'Developing coconut based income generating technologies on poor rural communities' implemented by ICAR-Central Plantation Crops Research Institute, Kasaragod in two localities viz., Pallikkara village in Kasaragod District, Kerala State and Ariyankuppam village in Pondichery (Thamban *et al.*, 2007). PRA tools such as transect walk, resource mapping, matrix ranking and focused group discussion were employed to analyse the land use, local agro-ecology and problems and opportunities in the coconut community and to characterize and evaluate the coconut varieties found in their community. As many as 12 diverse coconut types, six each in two localities, were identified and their significant characteristics documented. Seed nuts were collected from the identified mother palms of the elite coconut ecotypes in these two localities and community nurseries were raised. Quality seedlings were selected and distributed to the farmers under the project.

ii. Farmer's participatory approach and implementation

a) Decentralized coconut seedling production as an initiative of Local Self Government (LSG) Under a unique scheme implemented by Madikkai grama panchayat in Kasaragod District of Kerala state, farmer participatory approach was successfully employed for the production of quality coconut seedlings with technical support from ICAR-CPCRI. Under the scheme, members of five selected women self help groups from the panchayat were trained at ICAR-

scientists from ICAR-CPCRI, extension personnel from the local Krishibhavan, people's representatives and Women SHG representatives was constituted to ensure production of quality seedlings. Training for members of self help group, field visit by scientists and other technical support for implementing the scheme were provided as part of extension activities of ICAR-CPCRI. Funds for implementing the programme was mobilized from the plan of the panchayat for the year 2011-12 and the scheme was linked to NREGS for providing the labour component required for nursery management. The coconut seedlings raised under the scheme were distributed to the farmers on 5th June 2012, World Environment Day at Madikkai. Sustainance of such local initiatives needs continuous support from coconut research and development agencies apart from the involvement of local self governments.

b) Raising mother palms and seed gardens in farmers plots

Another approach to planting material production is through equipping individual farmer for taking up propagation of improved varieties. ICAR-CPCRI, Kasaragod successfully initiated establishment of seed gardens with mother palms of improved varieties. In one such initiative, a progressive farmer from Kasaragod district with 1.5 ha land planted seven improved varieties. This garden named as Mooladkkam seed garden can produce planting materials in seven improved selections and three hybrids. In this model only the technical support and the planting material is provided from ICAR-CPCRI. Entire cost, including that of planting material, is borne by the farmer. Cultivation of crops like pineapple, papaya, and yams help the farmer to

recoup the initial expenditure.

c) Raising mother palms and seed gardens in land under public sector institutions

Major constraint in establishing seed gardens in public sector is the non-availability of land. Coconut planting material production requires large area for planting mother palms of improved varieties. One hectare land, that can accommodate 175 palms, can produce approximately 5000 quality seedlings. Various departments under government have land that can be utilized for establishing mother palms of improved varieties that will serve as source material for future. Innovative thinking of ICAR-CPCRI and Government of Kerala has resulted in establishment of coconut mother garden in open prison in Thiruvanthapuram. Such innovations and collaborations hold the key to take the planting material production to the next higher levels.

d) Farmer participatory decentralized coconut seedling production as an initiative of state agriculture department in collaboration with FPOs and CPCRI

Productivity in Kerala (9641 nuts/ha), which accounts for 33.5% of production in the country, is less than that of many other states. Predominance of senile and unproductive palms is one of the reasons attributed to the low productivity of coconut in Kerala. Massive programmes for replacing old and unhealthy palms are necessary to increase productivity and make coconut cultivation profitable. Replacing old palms will require enormous quantity of seedlings. Production of quality planting material in coconut is an uphill task because of difficulties in locating superior mother palms and identification of quality seedling. In this background, an innovative initiative for farmer participatory decentralized coconut seedling production is being implemented by CPCRI in 12 districts of Kerala state with the financial support of Department of Agriculture and Farmers Welfare, Government of Kerala, since the year 2017. The project envisages establishing decentralized community nurseries for the production and distribution of coconut seedlings including hybrids

by utilizing elite mother palms available in farmers' coconut gardens. Involvement of FPOs in coconut sector and Krishi Bhavans, the grass root level office of Department of Agriculture, will help in managing community nurseries and distribution of seedlings. Further their involvement will facilitate the participatory evaluation of performance of these seedlings in the farmer's field even after the project period.

Another important aspect of the project is developing expertise and skill in quality planting material production of coconut. Extension personnel and coconut farmers are trained in various steps involved in planting material production, so that decentralized planting material production becomes a reality. The project also envisage developing a network with adequate facilities for planting material production and distribution in different parts of the state. Identification of superior mother palms with farmer participation and its validation by seedling progeny testing as well as molecular markers forms focal point of this project. More than 7000 mother palms have been identified, about 56000 seednuts

have been collected and 30 community nurseries have been established under the project across the state in 12 districts. The real impact of the project will be in empowering local farming community for mother palm selection and geo-tagging, seed production, community management of nursery and quality planting material production. This along with established infrastructure as envisaged in the project will result in the establishment of productive dwarf/semi-tall coconut plantations leading to improvement of coconut productivity as well as higher returns to coconut growers.



Stakeholder synergy

Public sector agencies including Coconut Development Board and State Agri/Horticulture Departments are having programmes for procuring seednuts from farmers' gardens. Recently in Kerala, State Department of Agriculture has implemented 'Kerasamrudhi' scheme which envisaged identifying mother palms of dwarf coconut varieties in farmers



garden and collecting seednuts. To ensure quality of planting material, the criteria fixed for identification of mother palms have to be scrupulously followed in decentralized initiatives and pressure to achieve the physical target should in no way dilute the scientific procedures to be followed in selecting mother palms. Inventory with GPS based photo tags of available mother palms in farmer's garden can be prepared by all agencies involved in coconut planting material production. To achieve this, convergence and coordination of efforts of research, development and extension agencies in coconut sector and farmer organizations are needed. Convergence of efforts of agencies and farmer organizations is highly relevant to augment seedling production in the root (wilt) disease prevalent tracts. Selection and identification of disease-free mother palms in 'disease hotspots' should be given more emphasis rather than large scale procurement of seed nuts from other areas. For achieving this, a farmer participatory approach is to be followed with technical support from research institutions like ICAR-CPCRI.

Farmer participatory coconut breeding

There is a growing recognition that research on coconut crop improvement needs to focus on location and trait specific varietal development in which farmers are to be included as an important stakeholder. Perception of coconut farmers about

the traits of preferred varieties has to be taken into cognizance for streamlining coconut breeding programmes. The 'National Workshop on Planting Material Production In Coconut -Issues And Strategies' conducted at ICAR-CPCRI, Kasaragod on 10th February 2015 has recommended that farmer participatory approaches have to be followed for developing location specific coconut varieties. Thrust should be given for developing varieties for rainfed areas, for low level of external input use, for tender nut purpose and production of neera.

Conclusion

Making available quality seedlings for replacing the old, senile and unproductive palms and for new planting is crucial to enhance productivity and income from coconut farming. Public sector institutions alone can't meet the demand for coconut seedlings and hence farmer participatory decentralized approach for production and distribution of quality coconut seedlings assumes much significance. Research and development agencies in coconut sector including ICAR-CPCRI, State Agri./Horticulture Universities, CDB and State Department of Agriculture/Horticulture need to support the Farmer Producer Organizations to effectively manage the community nurseries for the decentralized production and distribution of quality coconut seedlings. ■

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Protect Your Vision with Coconut Oil

Dr. Bruce Fife*



Can you avoid age-related degenerative eye disease? Our eyesight naturally diminishes to some extent as we age, but regardless of our age, our eyes should provide us with good service for a lifetime. New research reveals that age-related eye disorders can be prevented and possibly even reversed. The key to maintaining good vision depends on your diet.

The body has an amazing ability for self-repair. If we get a cut, a bruise, break a bone, or suffer some other injury, the body knows exactly what to do to repair the damage. In time, the cut is completely healed, damaged blood vessels in a bruise are repaired, and broken bones are fused back together, in many cases the repair is so complete that there is little or no trace that an injury ever occurred.

Like other tissues, peripheral nerves throughout

our bodies have a high capacity for regeneration after injury, however injury to nerve cells within the central nervous system (brain and spinal cord) do not. In fact, for many years it was believed that brain tissue, could not be repaired or regenerated. Once an injury occurred, the neurons, or brain cells, were gone forever. It was thought that the brain cells we were born with were all that we would ever have. We now know that this is not correct, brain cells can be regenerated and new brain cells do grow and develop just like other cells throughout the body.

The eyes are extensions of the brain and consist of neurons or nerve cells similar to those in the brain and, likewise, have the potential to regenerate. The light sensitive portion of the eye is the retina, which lines the inside of the eyeball. When light hits the retina it sends nerve impulses to the brain. These impulses are sent to the brain through long thread-like appendages of the retina that combine to form the optic nerve.

Any damage that occurs to the retina or optic nerve can cause visual impairment and if serious enough, complete blindness. When injured, the retina and optic nerve generally have little ability for self repair and eventually die, eliminating any chance for regeneration. Injury to the optic nerve usually leads to lifelong visual impairment.



to keep them from leaking. This permanently scars the retina, but may prevent or slow further vision loss.

Macular degeneration is the slow destruction of the macula—the portion of the retina that is needed for sharp, central vision. In macular degeneration central vision is lost first and gradually progresses out affecting side or peripheral vision. Vision loss is permanent. The cause of macular degeneration is unknown and there is no effective treatment. When macular degeneration occurs later in life it is usually referred to as age-related macular degeneration to distinguish it from other forms that may be inherited and appear early in life.

If you want to preserve your vision and protect yourself from encountering age-related degenerative eye disorders that affect the retina and optic nerve, your safest and most effective approach would be to incorporate coconut oil into your daily diet.

For many years the inability of damaged retinal neurons and optic nerve to regrow was accepted almost as a “law of nature,” and on the clinical level, retinal injury was seen as being irreversible and corresponding vision loss was permanent. Today medical researchers are starting to unlock the secrets of neuronal regeneration. Under the right conditions, injury to

The most common degenerative eye diseases that involve damage to the retina and optic nerve are glaucoma, macular degeneration, and diabetic retinopathy. These three conditions cause the vast majority of irreversible vision loss in people living in affluent countries.

Glaucoma is believed to be caused, in part, by abnormal pressure within the eye. The eyeball is filled with a viscous fluid that helps maintain the shape of the eye and circulate nutrients. This fluid is constantly entering and leaving the eyeball. If it enters faster than it exits, the pressure within the eye builds up damaging the retina and optic nerve. Treatment is focused on lowering fluid pressure with the use of medicated eye drops, drugs, laser therapy, surgery, or some combination of these. However, once the retinal cells are damaged they are considered gone for good.

Diabetic retinopathy is caused by inadequately controlled diabetes. High blood sugar causes the blood vessels feeding the retina to degenerate and become leaky. This distorts the retina leading to permanent damage. Besides trying to get blood sugar under control, treatment may involve laser surgery to burn or cauterize damaged blood vessels

the retina and optic nerve can be healed. A growing number of studies over the past two decades have demonstrated that the retina can be transformed into an active regenerative state allowing these neurons to survive injury and to regenerate the damaged optic nerve.

Almost all clinical studies using drugs as a means to protect the retina, optic nerve, and other components of the eye have failed. However, a special group of naturally occurring proteins called brain-derived neurotrophic factors (BDNFs) show great promise. BDNFs play a key role in regulating survival, growth, and maintenance of neurons. They help support the survival of existing neurons and encourage the growth and differentiation of new neurons.

Normally, injury to the optic nerve induces a rapid die-back leading to retinal cell death. However, when an adequate amount of BDNFs are present, the effects of injury are diminished and the optic nerve and retina can be repaired or regenerated.

Animal studies have shown that after cutting the

optic nerve in adult rats, retinal cells progressively degenerate until, after two months, a residual population of only about 5 percent of these cells survive. When BDNFs are present, however, survival rate significantly increases. For example, in one study researchers cut the optic nerves in a group of rats. The injury to the optic nerve caused a rapid, progressive degeneration and death of the retinal neurons. After 3 weeks, only 10 percent of the retinal neurons survived. After 5 weeks, the number dropped to 8 percent, and by the 7th week only 5 percent remained. In a second group of rats BDNFs was injected into their eyes before the optic nerve was severed. In this group, two to three times as many retinal neurons survived compared to untreated controls.

Studies show that after cutting the optic nerve, BDNFs not only protect the retinal neurons from dying, but promote regrowth. The retinal neurons sprout new growths that elongate and form functional connections with other neurons. In lab mice that have had their optic nerves severed, BDNFs allowed the animals to recover the ability of light-dark discrimination. In essence, researchers have been able to restore partial sight to blind mice.

We always have some BDNFs circulating in our central nervous system that helps protect our brains and eyes from degeneration. However, people with diabetic retinopathy, glaucoma, and macular degeneration have a deficiency of BDNFs, which makes them more susceptible to neurodegeneration and visual problems.

BDNFs provide the potential for preventing degenerative vision loss and possibly even partially restoring lost vision. In animal studies, BDNFs can be injected directly into the eyeball to boost levels of these protective proteins. Clinically, this process is not feasible because in order to maintain therapeutic levels of BDNFs, multiple injections are needed over a period of time to maximize the benefit.

Fortunately, BDNFs are produced naturally in our bodies. Using this fact, another approach to raise BDNFs to therapeutic levels is to boost the body's own production of these protective proteins. This

can be done quite simply through diet.

The production of BDNFs is stimulated by the presence of ketones. Ketones are produced from fatty acids stored in body fat and provide an alternative to glucose as a source of fuel for the brain. Normally, our cells, including our brain cells, use glucose as their primary source of fuel. Most of the



glucose in our bodies comes from carbohydrates in our foods. When we eat a meal, carbohydrates are converted into glucose and released into our bloodstream. Between meals or when we don't eat carbohydrates, blood glucose levels fall. Our cells need a continual supply of energy to function, so when this happens, fat stores in the body are mobilized and fatty acids are released into the bloodstream. Our cells can use fatty acids for fuel just like they do glucose.

The brain, however, cannot use these fatty acids and must have an alternative source of fuel. Some of these fatty acids are converted into ketones, which are readily used as fuel by neurons. Ketones not only supply the brain with energy, but also trigger the production of BDNFs.

One way to increase the body's levels of BDNFs is to eat a low-carb diet. A low-carb diet keeps blood glucose levels low, which causes the release of fatty acids and the production of ketones. A very low-carb or ketogenic diet stimulates greater ketone production and higher BDNF levels. Therapeutic levels of BDNFs can be attained and maintained for an indefinite period of time on a very low-carb diet.

Another way to raise ketones, and consequently BDNFs, is by eating coconut oil. Coconut oil is composed predominately of the unique group of fatty acids known as medium chain fatty acids (MCFAs). When consumed, a significant proportion of these MCFAs are automatically converted into ketones,

The brain, however, cannot use these fatty acids and must have an alternative source of fuel. Some of these fatty acids are converted into ketones, which are readily used as fuel by neurons. Ketones not only supply the brain with energy, but also trigger the production of BDNFs.



regardless of blood glucose levels. You can raise blood ketone and BDNF levels simply by adding coconut oil into your daily diet.

If you eat enough coconut oil, you can raise blood ketones and BDNFs to therapeutic levels. This would require the consumption of 2-4 tablespoons of

coconut oil daily. A smaller amount would be needed if you combine coconut oil with a very low-carb diet.

If you want to preserve your vision and protect yourself from encountering age-related degenerative eye disorders that affect the retina and optic nerve, your safest and most effective approach would be to incorporate coconut oil into your daily diet. If

you have already experienced some vision loss due to glaucoma, macular degeneration, or diabetic retinopathy, combining coconut oil with a low-carb diet can help you prevent any further vision loss and possibly even regain some of your lost vision. ■

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Weird Seedlings in Coconut Nursery

M. Shareefa and Regi Jacob Thomas

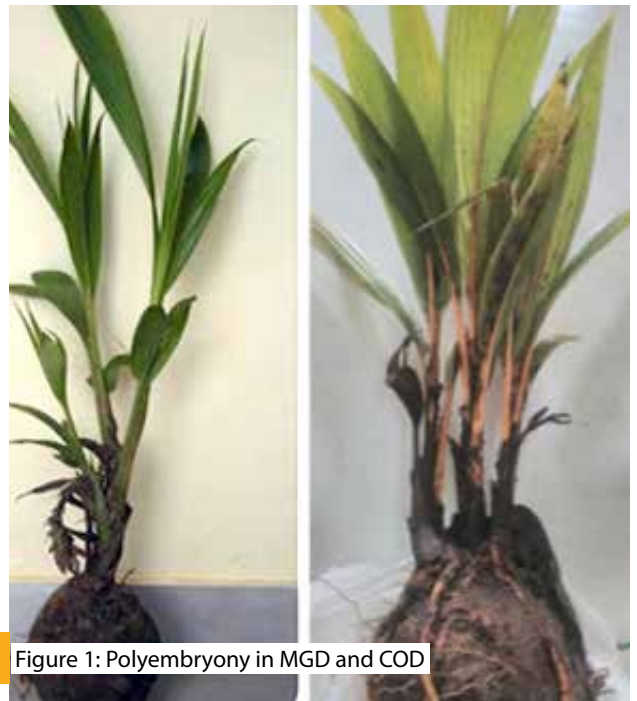
ICAR - CPCRI, Regional Station, Kayamkulam, Alappuzha

Coconut palm (*Cocos nucifera* L.) is one of the valuable gifts of nature to mankind. It is considered as the tree of life and is eulogised as Kalpa Vriksha, the all giving tree or the 'Tree of Heaven'. Coconut is unique among all horticultural crops as a source of food, drink, shelter, fibre, medicine and a variety of raw materials for industrial exploitation. The crop assumes considerable significance in the national economy on account of its contribution to the rural economy and employment generation. The coconut palm grows even in marginal coastal conditions, tolerating drought and poor soils. It is very resilient to typhoons and flooding and several small coral islets often continue to exist mainly because of the palms' fibrous root systems which prevent coastal erosion.

Success with regard to establishment of coconut plantation starts with production of good quality planting materials. In big nurseries and seed gardens where large number of seednuts of different varieties are sown, rarely few abnormalities in the seedlings are being reported. This article describes some of weird or unusual coconut seedlings observed in the coconut nursery.

Polyembryony

Usually a seednut of coconut on germination gives rise to one shoot. But rarely more than one shoot is seen emerging through a single eye. This phenomenon of producing more than one seedling from a single nut is known as Polyembryony, ie. development of two or more embryos from a



single fertilized egg. The ovary of coconut is three carpellary and corresponding to the three carpels of the ovary, there are three markings, known as eye on the endocarp. Of which two usually become abortive at an early stage of development and only one attains maturity and remain comparatively soft. The viable embryo is located beneath the soft eye. In polyembryonic seedlings, two or more



Figure 2: Albedo seedlings in CGD

shoots develop from a single soft eye and grow as distinct shoots. These shoots squeeze their way out through the single soft eye, all the while maintaining themselves as separate individuals. The multiple embryos were found clustered together under the 'soft eye' of the nut but they do not share any tissue. There is variation in the growth and vigour of these seedlings. The number of shoots developed in these cases may be two, three or four.

A case of polyembryony noticed in Malayan Green Dwarf and Chowghat Orange Dwarf is shown in figure 1. In Malayan Green Dwarf, four shoots emerged from a single seednut whereas in COD, three shoots were observed. The frequency of occurrence of polyembryony was less than 0.01% in dwarf seedling and this phenomenon has not yet been observed in seedlings of West Coast Tall (WCT). However, occurrence of twin seedlings i.e., two shoots from a single nut was observed both in tall and dwarfs seedlings and this was more frequently noticed in seedlings of dwarf varieties.

Albedo seedling

Occurrence of albedo seedling is frequently noticed mostly in Chowghat Green Dwarf seedlings (Figure 2). In albedo seedlings, the colour of leaves was white or yellowish white instead of dark green and devoid of chlorophyll. These seedlings do not respond to manurial treatments and generally dies after producing 4 to 6 leaves. The frequency of albedo seedlings was 0.05 %. Patel (1938) opined that albinism is due to genetic factors, while Furtado (1926-29) believed that this occurred as a result of chlorosis due to absence of ferruginous substances in the endosperm of coconut. Pandalai and Pillai (1959) reported that albinism is the result of inadequate availability of iron and probably due to

the inability of the plant to utilize the iron already present in the leaves. The requisite mobilization of iron appears to be a factor controlled by recessive genes, since albinism is an inherited character. In our observation, the frequency of albedo seedlings were more in dwarf seedlings compared to seedlings of tall varieties.

Chimera



Figure 3: Chimera in WCT

Chimera is a plant or plant part that is a mixture of two or more genetically different types of cells. Usually in albedo seedlings the entire leaf exhibits white or yellowish-white colouration, whereas in chimera a portion of leaf alone was observed to be albedo and remaining portion was green in colour. This is due to somatic or bud mutation and has been reported from India and Sri Lanka (Satyabalan, 1997). A case of chimera noticed in WCT seedling is shown in figure 3.

Midget

Rarely certain coconut palms flowered at the early infant stage referred as 'midget' palms. Davis (1955)



Fig 4: Midget palm in CGD

first reported the curious phenomenon of coconut seedlings producing inflorescences within 12 months of sowing and referred to them as 'midget palms'. The inflorescence bearing is terminal and they die soon after producing the first inflorescence. The inflorescence was conspicuous for the absence of the spathe. They bear only female flowers and these ranged upto thirty five in an inflorescence. These seedlings are normal in their habit with adventitious root system. Breathing pores are present on the main roots and in some rootlets. Generally in midgets, the number of main roots (only 7) is less than the normal seedlings (about 10). The inflorescence appeared at the terminal portion of the short regular stem. Presence of unsplit leaflets in midget palm is a remarkable feature and the leaves have narrow stipular sheaths. Decrease in the size of subsequent leaves was noticed and the last two leaves appeared at the base of the inflorescence resembles bracts which enclose the young spadix. This decreasing size of leaves and terminal inflorescence are rare occurrence among coconut palms which usually bear axillary inflorescence. However, this is generally observed in some members of monocot family where the terminal bud transforms into an inflorescence or flower.

In midget palm, the inflorescence is a simple spadix without a regular spathe but the two bracts found just below this terminal inflorescence serves the function of spathes. Midget palm dies or withers

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Very unusual occurrence of coconut seedling that is fruiting. The seedling is not even planted on the ground so it is just the nutrients in the meat inside the nut may be sustaining the growth.

Picture courtesy: Bororoa Italo, Vanuatu Coconut Development Officer/
Facebook page of Bororoa Italo

after flowering and this palm is monocarpic instead of polycarpic coconut palms (Morris, 1892). Hence, this phenomenon of early flowering in seedling stage has no significant utility to the farmers since the palm dies before producing any nut. Immature flowering noticed in midget palm may be due to some photoperiodic induction which occurred in the unsplit immature leaves of the seedling as these leaves are highly sensitive and capable of initiating flowering through photoperiodic response.

The variants observed in coconut seedlings could be either genetic or physiological in nature. Most of the abnormalities are due to mutations or expression of lethal genes. A recessive gene is only expressed when an organism has two recessive alleles for that gene. Expression of recessive lethal genes is more noticed in autogamous types which promotes homozygosity. Hence, these weirdness or unusual seedlings are frequently observed in dwarf varieties due to their homozygous nature. Although these unusual traits may not have practical relevance, such occurrence stimulates curiosity to everyone. ■



Occurrence of slug, *Darna sp* in coconut nursery

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The Coconut (*Cocosnucifera L.*) palm known as "Kalpavriksha", is a major plantation as well as an oilseed crop in the tropics of the world. India accounts for 33.02% of the world's coconut production and is one of the major players in the world's coconut trade. In India, it is grown in 2.10 million ha with an annual production of nearly 23.79 million nuts as per 2017-18 statistics. The coconut palm is susceptible to the attack of large number of pests of major and minor importance. The annual loss due to pest complex in coconut in Kerala has been estimated to be 618.50 million nuts (Abraham, 1994). The pests of coconut nursery are broadly classified as internal borers, subterranean pests, sap feeders, defoliators and nematode pests. Pest management is an integral component of nursery operations for the successful production of quality coconut seedlings. Some of the nursery pests such as ash weevil, whiteflies, scale insects and mealy bugs affect the appearance of coconut seedlings. Though such seedlings may be vigorous, preference by farmers is lost due to damage symptoms on coconut seedlings (Josephraj Kumar

et al., 2012). The slug caterpillar is a sporadic outbreak pest on coconut and the larvae feeding on leaf lamina results in development of necrotic spots in early stage. In severe cases caterpillars feed on the coconut leaves sparing only the midrib, leaf stalks as well as nuts and in severe outbreak gumming on the nuts was also observed. The incidence of coconut slug caterpillar *Contheyla rotunda* on a severe scale in 2011-12 and on moderate scale in 2012-13 was observed in Aiyampalayam village in Tamil Nadu. Outbreak of coconut slug caterpillar *Macroplectra nararia* was observed in 2007, 2012 and in 2013 in coconut gardens of East and West Godavari districts of Andhra Pradesh. Light trap studies were initiated and results revealed that this sporadic pest can be successfully managed by installation of 200 W light traps installed at 1 1/2 feet above ground with water pan @ 3 light traps /ha. In the roving surveys carried out in 2012 in East Godavari district of Andhra Pradesh, two new larval parasitoids *Euplectrus sp* and *Euplectromorpha sp* belonging to family *Eulophidae* (*Hymenoptera*) and a pupal parasitoid *Eurytoma*

monemae and an entomopathogen *Paecilomyces lilacinus* (Thom) Samson were identified on coconut slug caterpillar *Macroleptra nararia* and these parasitoids were found parasitizing slug caterpillar under field conditions effectively.

Occurrence of slugs in coconut nursery of Coconut Research Station, Veppankulam and symptoms of damage, damage potential and management options are discussed in this paper.

Scientific classification	
Kingdom:	Animalia
Phylum	Arthropods
Class	Insects
Order	Lepidoptera
Suborder:	Glossata
Infraorder	Heteroneura Division:
Division	Ditrysia
Superfamily	Zygaenoidea
Family	Limacodidae
Subfamily	Limacodinae
Genus	Darna

Symptoms of damage

Early-instar caterpillar feeds from under surface of coconut leaflets by scrapping the surface tissues giving a glistening appearance on the feeding area. Leaf spot-like black halo marking develops on the feeding areas which later coalesce and form bigger lesions. During heavy infestation caterpillars feed on the entire leaflet sparing only the midrib. These caterpillars are covered with tiny spines that cause severe irritation on contact.

Biology

Eggs are flattened and thin. They are highly transparent and the larva can be seen developing inside. They may be laid on under surface of leaves.

The larvae have greenish body with white lines and four rows of spiny scoli tipped red or black, which cause irritation and pain. The larvae are typically very flattened, and instead of prolegs, they have suckers. The thoracic legs are reduced, but always present, and they move by rolling waves rather than walking with individual prolegs. They even use a lubricant, a kind of liquefied silk, to move.

Larvae might be confused with the similarly flattened larvae of lycaenid butterflies, but those caterpillars have prolegs, are always longer than they



are wide, and are always densely covered in short or long setae (hair-like bristles). The head is extended during feeding in the lycaenids, but remains covered in the Limacodidae. The final instar constructs a silk cocoon and hardens it with calcium oxalate excreted from its malpighian tubules. It pupates in a compact elliptical chocolate brown shell like cocoon, which is convex above and flat ventrally as stems. Cocoons are covered with irritating spines and hairs. Cocoons have a circular escape hatch, formed from a line of weakness in the silk matrix. It is forced open just prior to emergence of the adult.

The moths are small, hairy, with reduced or absent mouthparts and fringed wings. They often perch with their abdomens sticking out at 90° from their thoraces and wings.

Management

- Collection and destruction of the immature stages of the slug viz., larvae and pupae.
- Cutting and burning infested leaflets to prevent the further spread of the pest.
- Set up light traps to trap and collect adult moths @ 5 light traps /ha.
- Spraying of *Bacillus thuringiensis* @ 2 g/lit
- Spraying of dichlorvos 76 WSC @ 2 ml or triazophos 40 EC @ 5 ml/ lit of water. ■

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Introduction

Coconut (*Cocos nucifera* L.) is the most valuable natural gift to mankind and is commonly known as Kalpavruksha, which fulfils all his vital needs. It is unique among horticultural crops as a source of food, drink, shelter, fiber, medicine and a variety of raw materials for industrial use. It is cultivated in more than 93 countries including Philippines which has the largest area followed by Indonesia, India and Sri Lanka. These four countries altogether accounted for 80 per cent and 79 per cent of the world's coconut area (11.96 M ha) and production (67,128 million nuts), respectively (ICC, 2017). India became the world's largest coconut producer with the production of around 23,798 million nuts from 2.09 M ha. with the productivity of 11,350 nuts/ha. In India, Kerala, Karnataka, Andhra Pradesh and Tamil Nadu accounts for 89 per cent of area and contribute 93 per cent of the production with unique consumption pattern as tender coconut (20 %), matured coconuts (50 %) and copra (30 %).

Karnataka is bestowed with varied climate and soil type which suits well for a wide range of horticultural crops. In Karnataka, Tumkur, Hassan, Chikmagalur, Chitradurga, Mandya, Ramanagara and Mysuru are the major coconut growing districts

with the production share of 84 per cent with the productivity of 7818 nuts/ha which is lesser than the national average (11,350 nuts/ha). Coconut is mainly cultivated by small and marginal farmers with less fertile, uncultivated and rainfed areas which stagnates production and productivity of the crop in the state. Hence, the study was undertaken to assess the land resource inventory and suitability for coconut in watershed areas of Karnataka.

Location of the study area

The study was conducted in Tumkur district under the assistance of Watershed Development Department, Karnataka during the academic year 2017-18. The brief description of the study area is presented as below:

Biligere micro-watershed (Siddappanapalya sub-watershed, Tumkur taluk, Tumkur district) is located at North latitude 130 14 39.794" and 130 16' 13.145" and East longitude 76058' 43.14" and 770 0' 11.714" covering an area of about 509 ha bounded by Agrahara Biligere, Chikkeguddadha A Mahalkavalu, Govindarajapura, Siddegowdanapalya and Ariyur villages. Sandy clay and sandy clay loam are the dominant soil textural classes with an average annual rainfall is 635 mm and the major crops grown in the

study area are arecanut, coconut, mango and ragi.

Methodology adopted

To assess the land resource inventory and land suitability for coconut cultivation in the study area, 50 surface soil samples were drawn at 250 m grid intervals to cover the entire watershed and the samples were analyzed in the laboratory for 14 various soil fertility indicators such as macro, secondary and micro nutrients. Further, 16 profiles (up to 2 metre depth) were opened to study the detail soil characteristics viz., soil depth and sub surface soil gravelliness parameters.

Soil Parameters	Suitable Soil characteristics for coconut cultivation	Soil Site characteristics observed in the study area	Remarks
Depth	Very Deep (>150 cm)	Moderately Shallow(50-75 cm)	Not Suitable
Texture	Sandy clay loam to Sandy clay	Sandy clay	Suitable
Slope	Nearly level to Very gently sloping	Very gently sloping	Suitable
Soil pH	Slightly acidic to neutral (5.10-6.50)	Very strongly acidic (4.5-5.0)	Not Suitable
Available N, P & K	730: 180: 680 g/ plant/ year (> 10 years)	Low in N, Medium	Not Suitable in P & K
Exchangeable Ca & Mg	Recommended Dose of Fertilizer	Deficient	Not Suitable
Fe, Mn, Cu and Zn	Recommended Dose of Fertilizer	Deficient	Not Suitable

Results and discussion

The results of the fertility analysis data of surface soil samples indicated that, about 32.40 per cent of the area (165 ha) is slightly acidic to moderately acidic while, 283 ha (55.60 % of the area) is strongly acidic to extremely acidic (pH values of 3.50 -5.50) which is not suitable for coconut cultivation. Regarding the major nutrients status of soils, available phosphorous and potassium content was medium while, 89.30 per cent of the area (454 ha) is low in available

nitrogen with the values of less than 280 kgs/ha. The secondary and micro nutrients namely calcium, magnesium, sulphur, zinc and boron were found to be deficient to the extent of 17.70, 43.50, 14.90, 89.30 and 89.00 per cent of the area, respectively.

The results of the soil profile study revealed that, majority of the cultivated land (36.40 %) is having sandy clay, non gravelly soils with very gently sloping lands. Soil depth refers to the depth of soil from the surface to parent material or bedrock or the layer of obstacles for roots. It was observed in the study area that, 64.40 per cent of the area (328 ha) has very deep soils while, 24.90 per cent of the area (126 ha) has moderately shallow soils (50-75 cm depth) which are not suitable for coconut cultivation, as the crop has deep rooted system which requires deep soils (>150 cm depth) for better crop growth and yield.

Conclusion and policy implications

The results of the land resource inventory study indicated that, survey numbers 158 to 163, 166, 168, 169, 176, 196 and 197 has moderately shallow soils (50-75 cm) in which coconut crop was grown. The average annual yield was found to be 17 nuts per palm for the above survey numbers. Though, the crop is not economical, as it was the only source of income for livelihood of the households. Hence, unique crop plan has to be prepared based on the existing soil site characteristics and replace the crop gradually. Further, intercropping coconut plantations with Ragi + Cowpea (4:2) and Ragi + Redgram (8:2), horticultural crops like Indian gooseberry, custard apple, guava and sapota, vegetable crops like drumstick and curry leaves, forestry trees like *Glyricidia* and *Melia dubia* has to be encouraged for doubling farm income.

In addition to the above, majority of the farmers usually follow and cultivate the same crops as what the neighbours do. This is unscientific and also not economically worthy since, the soil characteristics are highly dynamic in nature and vary from place to place. Hence, knowledge and importance of the land resource inventory and soil test based crop suitability has to reach all the farmers through adequate extension education and village level trainings. ■

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AICRP on Palms celebrated World Coconut Day

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Every year, September 2nd is designated as World Coconut Day by the International Coconut Community (ICC) headquartered at Jakarta, Indonesia. The celebration is aimed at creating awareness about the importance of the coconut and its potential in alleviating poverty, encouraging investments and promoting the development of the coconut industry in the member countries. This year coconut day was celebrated with a theme “Coconut for Family Wellness”. India is one of the major coconut producing country across the world while Kerala, Tamil Nadu, Karnataka and Andhra Pradesh are the major coconut producing states in India. ICAR-All India Coordinated Research Project on Palms coordinates research on coconut with special emphasis on Genetic Resource Management, Crop improvement, Crop Production and Pest and disease Management across 14 states and one Union territory. World coconut day was celebrated by the AICRP centres with various training programmes and exhibitions. A detailed report of the celebrations at different centres is given below.

Aliyarnagar (Tamil Nadu)

The world coconut day was jointly organized by Tamil Nadu Agricultural University, Coconut Research Station, Aliyarnagar, Coimbatore coconut producers company and Vinayaga coconut producer company on 07.09.2019 at PA College of Engineering and Technology, Pollachi, Coimbatore District. The Dean, Horticultural College & Research Institute, Tamil Nadu Agricultural University, Coimbatore, Prof. & Head, Dept of Spices and Plantation Crops, TNAU, Coimbatore, Professor and Head, CRS, Aliyarnagar, Mr. T. A. Krishnasamy Gounder, Board Member, TNAU and Dr Pollachi V. Jayaraman, Deputy Speaker of Tamil Nadu legislative assembly participated and graced the occasion. More than 1000 farmers attended the function.



An exhibition on innovative latest hi-tech technologies of coconut cultivation including bio inputs was arranged by CRS, Aliyarnagar. Dr. L. Pugalendhi, Dean, Horticultural College & Research Institute, TNAU, Coimbatore delivered special lecture on ‘new innovations on commercial cultivation and

by-products of coconut’. In the afternoon session, an interactive session was arranged under the leadership of Dr. K. Balakrishnan, Professor and Head, Dept. of Spices and Plantation Crops, TNAU and various queries raised by the farmers regarding coconut crop improvement, crop production, and crop protection were clarified by the team of scientist of AICRP (Palms) and Coconut Research Station, Aliyarnagar.

Ambajipeta (Andhra Pradesh)

The world coconut day was celebrated on 2nd September 2019 as State programme by Coconut Development Board, State Centre, Vijayawada, Andhra Pradesh in association with Dr. YSR Horticultural University, AICRP on Palms, Horticultural Research Station, Ambajipeta and Department of Horticulture, Govt. of Andhra Pradesh at J .B. Function Hall, V. V. Meraka, Sakhinetipally Mandal, East Godavari District. In this connection an exhibition stall was arranged jointly by Horticultural Research Station, Ambajipeta and Coconut Development Board, State Centre displaying the live specimens of parasitoids, different coconut varieties/Hybrids, production, protection technologies and value added products. Dr. R. V .S. K. Reddy, Director of Research, Dr.YSRHU, VR Gudem was the chief guest and Smt. Chintha Anuradha, Hon’ble M.P., Amalapuram presided over the function. Other dignitaries who participated in the meeting were Sri Tandon Raju, President, Mahima Coconut Producer Company and local leaders of East Godavari District, along with Dr. B. V.



K. Bhagavan, Principal Scientist (Hort) & Head and Dr. N. B. V. Chalapathi Rao, Principal Scientist (Ent.), HRS, Ambajipeta.

A technical session was held by Dr. N. B. V. Chalapathi Rao on 'the incidence of pest and diseases in coconut and recent invasive Rugose spiraling whitefly and its management' duly giving emphasis on bio control based management practices. Another lecture on 'coconut production technologies' was handled by Dr. B. V. K. Bhagavan. About 300 farmers participated in the World Coconut Day 2019 celebration from different coconut growing districts of Andhra Pradesh like East Godavari and West Godavari.

Arsikere (Karnataka)

The world coconut day was celebrated in Horticulture Research and Extension Centre, Arsikere on 9th September 2019. The programme was organized by HREC, Arsikere in collaboration with AICRP on Palms HREC Arsikere, Coconut Development Board, Bangalore and HEEU, Arsikere. The programme was inaugurated by Dr. Basavaraja, N., Director of Research, UHS, Bagalkot and Dr. T.B. Basavaraju, Associate Director of Extension (South zone) COH, Kolar., Mr. M.R. Shankar Narayana Reddy, Honorable Board Member, CDB, Bangalore., Dr. E. Aravazhi, Director (Regional office) CDB, Bangalore. Mr. K. Vinayaka Pai, Project Co-ordinator, SKDRP, Arsikere, Mr. Harish Gowda, Virgin Coconut Oil Producer, Hassan and Mr. T.R. Somashekaraiah, President, Kalpatharu Coconut Producer Company Ltd. Thurvekere, attended the programme. Nearly 550 farmers attended the function.



Kahikuchi (Assam)

World Coconut Day 2019 was observed at Horticultural Research Station with a day long programme organized jointly by the Horticultural Research Station, AAU, Kahikuchi and Coconut Development Board, RO, Guwahati. Addressing the inaugural meeting of the programme as chief guest, Jayantamall Barua, Chairperson of the Assam Tourism Development Corporation said that coconut is a potential commodity to strengthen the socio-economic status of rural Assam and urged all the stake holders to rejuvenate the coconut sector of the state. The acting Vice-Chancellor of Assam Agricultural University, Dr. Ashok Bhattacharya, stated that charting out a scientific and strategic roadmap for development of coconut sector was the need of the hour. Shri. Lughar Obed, Director, Coconut Development Board participated as guest of honour in the programme, explained about the different coconut-based schemes and programmes of the government and urged the farmers to take the advantage of the same.

Dr. Pranab Mahanta, Director of Horticulture and Food Processing, Govt. of Assam stressed upon the selection of coconut varieties and availability of irrigation facilities for improving the productivity of coconut in the state. Earlier, in his welcome address, Dr. Sarat Saikia, Chief Scientist, Horticultural Research Station, Kahikuchi, emphasized the socio-economic



role of coconut in augmenting farm income and the recent trends in value addition of coconut. To commemorate the day, a ceremonial plantation of coconut seedling was undertaken in the campus of the Horticultural Research Station. The programme also included training-cum-field demonstration of coconut-based technologies as well as farmer-scientist interaction. A competition on coconut bunch and coconut products was also organized 100 farmers from different CPS of Kamrup district took part in the programme.

Navsari (Gujarat)

World Coconut Day on was jointly organized by AICRP (Palms), Navsari centre on 9th September, 2019 with Okha Farmer Producer Organization (Okha), Tata Chemicals Society for Rural Development (Mithapur) and Department of Horticulture, GoG at Varvala village (Devbhumi Dwarka) while, the day was celebrated on 10th September, 2019 at Talala (Gir Somnath) in collaboration with Department of Horticulture, GoG and Coconut Development Board.

More than 125 progressive coconut farmers participated and shared their views and queries regarding improvement, production and protection of coconut crop. A technical session was held, wherein Dr. Pankaj P. Bhalerao, Project In-charge, AICRP (Palms) made a detailed power point presentation on how farmers can double income through coconut farming. In his presentation he covered topics like importance of crop, varieties, application of manures and fertilizers, irrigation



management, cropping systems/multistoried cropping system, IPDM, value additions etc. Mr. C. O. Laskari, Deputy Director of Horticulture, Devbhumi Dwarka as well as Mr. A. M. Detroja, Deputy Director of Horticulture, Gir Somnath presented the details of government policies/schemes related to coconut crop for expansion of area, equipments for processing and value addition of coconut in Gujarat state. Mr. Mohbatsingh Manek, CEO of Okha Farmer Producer Organization, Okha (Devbhumi Dwarka) delivered special address on 'Status, future and need of FPO for upliftment of farmer's standard of living as well as income and profit through FPO'. During the training programme at Talala, Mr. Narendrabhai spoke on various programmes implemented by CDB in Gujarat during the last year.

Ratnagiri (Maharashtra)

The world coconut day was celebrated at Regional Coconut Research Station, Bhatye, Ratnagiri on 28th August, 2019. On this occasion exhibition and technical sessions were arranged on coconut

production and protection technologies. Hon'ble Vice Chancellor Dr. B. S. Konkani Krishi Vidyapeeth Dapoli, Dr. Sanjay Sawant inaugurated the function by watering coconut seedlings and highlighted the importance of coconut in Agro-tourism, coconut oil extraction, group farming for betterment of farmers. Dr. Shrirang Kadrekar, Hon'ble Ex-Vice Chancellor, Dr. Rajabhau Limaye, Ex-Vice Chairman, CDB, Kochi, Dr. Sanjay Bhawe, Director of Extension, Dr. Parag Haldankar, Director of Research and Dr. B. N. Sawant, Associate Director of Research, Regional Fruit Research Station, Vengurle attended the programme as chief guests and delivered lecture on different aspects. Dr. Dhakersingh, Associate Dean, College of Fisheries, Shirgaon and Dr. B. D. Waghmode, Officer In charge, Agricultural Research Station, Shirgaon and other extension officers graced the function. Dr. Vaibhav Shinde, Agronomist made introductory



remarks about the programme, Dr. Santosh Wankhed delivered lecture on 'Pest Management' and Dr. Sunil Ghavale delivered lecture on Coconut Production,. About 180 stakeholders and farmers were participated in the function.



World Coconut Day celebration at different centres

Krishi Mela and Horti Fair

A mega Krishi Mela and Horti Fair was conducted at ICAR-CPCRI Research Centre, Kidu during 12-13 October 2019. Krishi Mela was inaugurated by Shri S.R. Satishchandra, President, Central Arecanut and Cocoa Marketing and Processing Cooperative Ltd. (CAMPCO). In his inaugural address, he hailed the services of the Research Centre, Kidu for the betterment of farming community and appreciated various skill development programmes conducted at CPCRI in association with CAMPCO. He also mentioned about how CAMPCO is helping the farmers to realize better price for arecanut and cocoa.

Shri. Nithyananda Mundoodi, President, Committee of Management, Kukke Shree Subramanya Temple inaugurated the Horti Fair. Shri. Radhakrishna Borker, President, Taluk Panchayath, Puttur released handouts on pest and disease management of coconut, arecanut and cocoa.

Dr. Anitha Karun, Acting Director, ICAR-CPCRI presided over the function. Smt. Sharada Dinesh Gowda, President, Grama Panchayath, Bilinele; Shri. P.P. Varghese; Member, Zilla Panchayath, Kadaba, Shri. Satish Kalige, Ward Member, Bilinele, and Shri. Bhanu Prakash, Project Director, ATMA and Deputy Director of Agriculture, Mangalore, offered felicitations. Dr. Ravi Bhat, Head, Crop Production welcomed the gathering and Dr. K. Samsudeen proposed vote of thanks.

Shri. Nalin Kumar Kateel, Hon'ble Member of Parliament, Dakshina Kannada and Shri. Angara S, MLA, Sullia visited the Krishi Mela and Horti Fair on 13th October 2019 and addressed the farmers. An interface programme on soil and water conservation organized in collaboration with ATMA, Mangalore, a seminar-cum training programme on Crop Production Technologies in Arecanut sponsored by Directorate of Arecanut and Spices Development, Kozhikode, seminar-cum training programme on Crop Production Technologies in Cocoa sponsored by Directorate of Cashewnut and Cocoa Development, Kochi, a Workshop on Honey bee farming sponsored by Department of Horticulture, Government of Karnataka, training on Arecanut and Coconut based Cropping System & Management of pests and diseases sponsored by Directorate of Arecanut and Spices Development, Kozhikode at Kidu, Belthangady, Vittal, Quiz and Essay writing



competition for farmers and Horti-Fair/ exhibition sponsored by DCCD, Coconut Development Board and CAMPCO, with participation of over 80 agencies. were also conducted alongwith the Krishi Fair.

Sri Kalbavi Rajendra Rao, Project Director, DK Nirmithi Kendra, Suratkal, Dr. Vijayakumar, Assistant Scientist, AICRP on Honey Bees and Pollinators, UAS, GKVK Bangalore, Mr. Mohan, Asst. Manager Rural Development, Syndicate Bank, Guttigar, along with scientists from ICAR-CPCRI viz., Dr. Ravi Bhat, Dr. Vinayaka Hegde, Dr. A. C. Mathew, Dr. Elain Apshara, Dr. NR Nagaraja, Dr. Rajkumar, Dr P Subramanian, Dr V Niral, Dr K Samsudeen, Dr Ganesh Khadke and Dr VH Pratibha were the resource persons for the interface/training programmes.

Memento and certificate for the winners of the essay writing and quiz competitions were distributed by Shri. Vidyaprasanna Teertha Swamiji, Kukke Subrahmanya Matha in the valedictory function which was presided over by Dr. Anitha Karun, Acting Director. Dr. V. Niral offered welcome address and Dr. Ganesh Khadke proposed vote of thanks.

India International Cooperative Trade Fair

Coconut Development Board participated in the India International Cooperative Trade Fair (IICTF) held at Pragathi Maidan, New Delhi from 11th to 13th October, 2019. The hallmark of IICTF has been the promotion of cooperative to cooperative (C2C) trade. The fair had the participation of delegates from 37 countries. The fair provided unique opportunity for buyers, sellers, exporters, policy makers, technologists and general visitors. Coconut Development Board's focus of participation in IICTF was to promote Farmer Producer Organizations and cooperatives in coconut sector manufacturing and marketing various coconut products and create a linkage for future marketing opportunities between entrepreneurs/distributors/retailers and end users of coconut products in India and abroad. Various FPOs and cooperatives from coconut sector displayed their products in CDB stall.



Meri Dilli Utsav and 6th Vibrant India 2019



Coconut Development Board participated Meri Dilli Utsav and 6th Vibrant India 2019 held during 18th to 20th October 2019 at Pitampura, Dilli hut, New Delhi. The objective of the event was to promote Research & Development, Horticulture & food Processing, Government schemes and programmes among the masses. The event was an ideal platform for showcasing Board's achievements, policies and development schemes, coconut handicrafts and value added products such as Tender Coconut Water, Coconut Oil, Virgin Coconut Oil, Coconut Milk etc. More than 200 exhibitors including ministries, government departments, research institutions, Boards, Public Sector Undertakings etc participated in the show. Coconut based entrepreneurs displayed and sold their products in Board's stall.

Coconut Development Board participated in Hotel Tech Kerala exhibition



Coconut Development Board participated in Hotel Tech Kerala held at KTDC event centre Bolgatty, Kochi during 10 - 12th October 2019. Coconut Development Board displayed various coconut value added products in the stall. M/s Ketatech, M/s Kavalangadu CPF and M/s Tazza Coco Products had their display cum sales of products in the CDB stall. Kerala culinary challenge with coconut oil and recipe competitions were held as part of the programme. Coconut oil produced by Ms Kavalangadu CPF was used for the coconut oil culinary challenge.

Orientation Programme for Technical Resource Group



A three day orientation programme for the selected members of Technical Resource Group at Coconut Development Board, Kochi during 16th October to 18th October 2019. Twenty four members have been selected under Technical Resource Group from Tamilnadu, Andaman Nicobar Islands, Andhra Pradesh, Odisha, Maharashtra, West Bengal, Kerala and Assam. The participants were briefed about CDB schemes and programmes. The team visited the DSP farm of the Board at Neriamangalam, CDB Institute of Technology and CPCRI, Kayamkulam.

CDB is organizing field trainings for farmers with an objective to improve productivity.

The Technical Resource Group will be implementing the training programme to the selected farmers of FPOs. Training will be given to a group of farmers. The two day training programme is proposed to cover various subjects related to coconut such as scientific coconut cultivation technologies, soil and water conservation methods, nutritional management, pest/disease management on coconut etc.

Delegation from Malaysian Ministry of Agriculture and Agro based industry visited CDB



A delegation from Malaysian Ministry of Agriculture and Agro based Industry visited Coconut Development Board on 10th October 2019 and had discussion with senior officials of the Board. Mr. Sreekumar Poduval, Deputy Director briefed on the coconut value addition in India and Mr. Pramod. P. Kurian, Assistant Director spoke on coconut cultivation. The delegation also visited CDB Institute of Technology, Aluva, M/s Thirukochi Coconut Producer Company, Coir Board, Kochi and Central Coir Research Institute, Kalavoor.

Farmers Exposure Visit



Coconut Development Board, Regional Office, Guwahati conducted two days exposure visit programme of Nagaland state farmers to CPCRI, Kahikuchi and HRS, AAU, Kahikuchi during 17th and 18th October 2019. Dr.L.S Singh, Scientist, CPCRI, Kahikuchi briefed on scientific method of coconut cultivation and plant protection. During the visit at Horticulture Research Station, AAU, Kahikuchi, Dr. Sarat Saikia, Chief Scientist, HRS, AAU, Kahikuchi briefed on coconut fertilizer application, green

manure and also described about intercropping system in coconut plantation area.

The team visited DSP Farm, Abhayapuri and Shri Bilich Dan Bara, Farm Manager welcomed farmers and spoke on how to maintain the coconut palm and how to protect the coconut palms from affecting disease. Farmers visited different blocks of DSP Farm, Abhayapuri. Shri Bilich Dan Bara, Farm Manager proposed vote of thanks to farmers for visiting DSP Farms.

Manipur farmers visited CDB



As part of exposure visit of farmers, an eight member delegation including four farmers from Manipur visited CDB Kochi and had interaction with senior officials of the Board. The team visited the DSP Farm of the Board at Neriamangalam and Coir Research Institute, Kalavoor, Kerala,



Dr. K.V. Ahamed Bavappa passed away

Dr. K.V. Ahamed Bavappa, the first director of Central Plantation Crops Research Institute passed away on 1st October 2019. During the four decades of research and resource management in plantation crops, Dr. Bavappa evolved and released four high yielding varieties each in arecanut, coconut, pepper and cashew. Taking his outstanding contribution to the development of new hybrid coconuts, he was called as The Coconut Man. He also worked as FAO Consultant in Indonesia, Maldives, Fiji Islands, Vietnam, Philippines and Sri Lanka. He has published about 200 research papers in national and international journals and five books.

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Cultivation practices for coconut

November

Irrigation for seedlings

- Seedlings are to be given irrigation either through drip or basin method. If drip irrigation is adopted provide on an average 10 litres of water per seedling per day. Through other methods like basin irrigation 40 litres of water once in four days is sufficient.

Irrigation for adult palms

- Irrigation can be started in coconut gardens, except in localities which receive rain through north east monsoon. Even in localities where rainfall through north east monsoon is not received in adequate quantity (rainless period extending for more than 10 days) irrigation has to be provided to the palms.
- If basin irrigation method is adopted, provide irrigation once in four days @ 200 litres per palm.
- Drip irrigation is the ideal method of irrigation for coconut. Small pits of 1'x 1' 1' size should be taken 1 m away from the tree trunk at four equidistant points within the basin. The pits are to be filled with coir pith. The drippers/microtubes are to be placed sub surface in these pits through a polythene conduit pipe. The number of dripping points should be six for sandy soils and four for other soil types. 30-45 litres of water per palm per day is to be provided through drip irrigation system.

of potash can be given along with drip irrigation system. For the coconut palms, these fertilizers as per the general recommendation (50% of the recommended dose ie 545 g urea and 1000 g of Muriate of potash per palm per year) can be given in equal splits through monthly fertigation schedule. However, quantity of chemical fertilizers is to be worked out based on soil test results and yield targeted.

- Wherever Boron deficiency is noticed 100 g Borax may be applied in the basin.
- For coconut palms showing yellowing of leaves due to Magnesium deficiency, 0.5 kg of magnesium sulphate can be applied in the basins.



Drainage

- Ensure adequate drainage facilities in coconut gardens in localities which receive rain through north east monsoon. Depending up on the soil type and water table drainage channels of appropriate size, minimum of 50 cm depth and width, can be taken either manually or mechanically. Drainage channels are to be constructed for every two rows of palms.

Manuring

- Drip fertigation may be started for coconut palms. Water soluble fertilizers like urea and Muriate

Green manuring

- In regions benefitted by north east monsoon like Tamil Nadu, the green manure plants can be ploughed back in to the interspace of coconut garden if the plants have attained 50 percent flowering. Similarly, green manure plants grown in the coconut basins also can be incorporated into the soil.

Mother palm selection

- Select mother palms for seed nut collection to raise quality planting material.
- In tall varieties, seed nuts should be collected

from mother palms which should have attained an age of 20 years, yielding constantly more than 80 and 120 nuts per palm per year for rain fed and irrigated conditions respectively with nut weight more than 600 g and copra weight of 150 g and above. Further, the palm should have a minimum of 30 leaves and free of any disease. The trees should have short and strong petioles with wide leaf base firmly attached to the stem. The bunch stalk should be short, stout, strong and should not show any tendency to droop down or buckle. Palms which produce barren nuts or those shedding large number of immature nuts should be discarded. Very old age palms i.e., above 60 years may be avoided and growing in very favourable conditions e.g. trees near manure pits are to be avoided. Palms showing alternate bearing tendency also should be avoided. In dwarf varieties seed nuts can be collected from mother palms which have attained an age of 12 years or more and yielding more than 60 and 100 nuts per year for rain fed and irrigated condition, respectively. Further it should have a minimum of 30 leaves with nut weight more than 400 g.



Nursery management

- Weeding should be done in the nursery.
- Five month old ungerminated nuts and dead sprouts should be removed from the nursery.
- Mulching with coconut leaves or dried grass or live mulch by raising green manure crops can be done in the nursery
- Provide irrigation
- Need based plant protection measures against pests and diseases are to be undertaken. Soil drenching of chlorpyrifos @ 2ml/litre is to be done in the nursery, if termite infestation is



observed. Spraying of water on the leaves can be done against white fly infestation in the coconut nursery.

Mulching

- Mulching of palm basins can be undertaken if not done earlier. Fallen dried coconut leaves available in the coconut garden can be used for mulching. In the non traditional areas like Bihar, Madhya Pradesh, Chhattisgarh and North Eastern states, ensure thick mulching in the basin to regulate soil temperature. Irrigation can be started to negate the effect of low temperature in such areas.

Plant protection

Currently, a drastic shift in pest damage level on coconut is being experienced in the event of unprecedented weather vagaries. Gradient outbreak of the invasive rugose spiralling whitefly (*Aleurodicus rugioperculatus* Martin) in Peninsular and North-East India, black headed caterpillar (*Opisina arenosella* Walker) in Karnataka and slug caterpillar (*Darna nararia* Moore) in Andhra Pradesh and Karnataka are classical examples to support this phenomenon. Rhinoceros beetle (*Oryctes rhinoceros* Linn.) and red palm weevil (*Rhynchophorus ferrugineus* Olivier) are cosmopolitan pests recorded predominantly in monsoon and post-monsoon periods in Peninsular India. The most unnoticed and a serious sucking pest observed during North-East monsoon phase is the attack by coreid bug (*Paradasynus rostratus* Distant). At least 2-3 bunches would be affected with complete button shedding leading to barren bunches. Incidence of bud rot disease, nut fall, leaf rot, stem bleeding and Basal Stem Rot/*Ganoderma* wilt also cause damage to coconut. Under the changing weather conditions systematic monitoring is very crucial to

suppress outbreaks of pests and diseases in coconut. Regular observation and monitoring should be done in the coconut garden to identify incidence of pests and diseases and need based and appropriate plant protection measures are to be adopted to avoid crop loss. Recommendations for the management of pests and diseases in coconut for the month of November are furnished below.

Integrated Pest Management

► *Rhinoceros beetle*

- Adopt mechanical method of control by extracting beetles with beetle hooks, without causing further injury to the growing point of the palm
- The top most leaf axils may be filled with powdered neem cake/marotti cake (*Hydrocarpus sp/pongamia*) @ 250 g + fine sand (250g) per palm as a prophylactic measure
- Filling the innermost three leaf axils with 4 g each of naphthalene balls covered with sand (12 g/ palm) for juvenile palms
- Placement of two perforated sachets containing chlorantraniliprole a.i. 0.4% (5 g) or fipronil (3 g) or one botanical cake (2 g) developed by ICAR-CPCRI
- Incorporation of the biomass of weed plant *Clerodendron infortunatum* Linn. in the cow dung/ compost pit
- The breeding sites may be treated with green muscardine fungus (*Metarhizium anisopliae*)

► *Red Palm Weevil*

- Avoid causing injury to the palms, as they would attract the weevil to lay eggs. Mechanical injury if any, caused should be treated with coal tar
- While cutting fronds, petiole to a length of 120 cm is to be left on the trunk to prevent the entry of weevils into the trunk
- Removal and burning of palm at advanced stage of infestation would aid in destruction of various stages of the pest harboured in the trunk
- Prophylactic leaf axil filling suggested for rhinoceros beetle is very essential as this pest pave way for red palm weevil
- If damage occurs in the crown, the damaged tissue has to be removed and insecticide suspension, imidacloprid (0.02%) @1 ml/L of water may be poured in. In case of entry of weevil through the trunk, the hole in trunk may be plugged with cement/tar and the top most hole is made slanting with the aid of an auger and the insecticide solution

is poured through this hole with funnel

► *Leaf eating caterpillar*

- Cutting and burning the heavily infested and dried outer most 2 - 3 leaves helps to prevent the spread of the pest.
- Improving soil and infested palm health through balanced dose of chemical fertilizers and organic manures.
- Since a very rich natural enemy fauna is associated with the pest in the field, chemicals are generally not encouraged for management of *O. arenosella*. As this pest is subject to parasitism by a good number of indigenous larval and pupal parasitoids, biological suppression is a feasible and viable approach. Augmentative release of stagespecific parasitoids viz., the larval parasitoids *Goniozus nephantidis* (Bethylidae) @ 20 parasitoids/palm, *Bracon brevicornis* (Braconidae) @ 20 parasitoids/palm, the prepupal parasitoid, *Elasmus nephantidis* (Elasmidae) @49/100 pre-pupae, and the pupal parasitoid *Brachymeria nosatoi* (Chalcididae) @32/100 pupae at the appropriate time was found effective in the sustainable management of the pest. Combined release of the parasitoids is required in multi-stage prevalence of the pest in the field. Conditioning of parasitoids on larval frass before release enhanced the field level parasitism.

► *Eriophyid mite*

- Spraying on the terminal five pollinated coconut bunches with neem oil garlic soap mixture @ 2 per cent concentration (neem oil 200 ml, soap 50 g and garlic 200 g mixed in 10 litres of water)
- or spraying neem formulations containing 1 per cent azadirachtin @ 4 ml per litre of water
- or spraying palm oil (200 ml) and sulphur (5g) emulsion in 800 ml of water
- Root feeding azadirachtin 10,000ppm @ 10 ml + 10 ml water is also effective
- Along with the recommended dose of manures and fertilizers, 5 kg neem cake should be applied

► *Coreid bug*

- Spraying of neem oil-soap emulsion (0.5%) on the pollinated bunches. The emulsion can be prepared by adding 5 ml neem oil and 8 g bar soap in one litre water.

► *Rugose Spiralling Whitefly*

- No chemical insecticide should be sprayed on

leaves

- Application of 1% starch solution on leaflets to flake out the sooty moulds.
- In severe case, spray neem oil 0.5% and no insecticide is recommended.
- Installation of yellow sticky traps on the palm trunk to trap adult whiteflies.
- Encourage build up of parasitoids (*Encarsia guadeloupae*) and re-introduce parasitized pupae to emerging zones of whitefly outbreak.
- *In situ* habitat conservation of the sooty mould scavenger beetle, *Leiochrinus nilgirianus*.

Integrated Disease Management

► **Bud rot**

- Remove the infected tissues of the spindle completely. Two or three healthy leaves adjacent to the spindle may have to be removed, if necessary, for easy removal of all rotten portions and thorough cleaning. After removing the affected tissues apply 10% Bordeaux paste and cover the wound with a polythene sheet to prevent entry of rain water. The protective covering has to be retained till normal shoot emerges.
- Destroy the infected tissues removed by burning or deep burying in the soil
- Spray 1% Bordeaux mixture to the surrounding palms

► **Stem bleeding**

- Avoid burning of trashes near the tree trunk
- Avoid injury to the tree trunk
- The affected tissues should be completely removed using a chisel and smear the wound with 5% hexaconazole (5 ml in 100 ml of water) and drench the basins @ 25 lit. of 0.1% solution
- Smearing paste of talc based formulation of *Trichoderma harzianum* on the bleeding patches on the stem (The paste can be prepared by adding 50 g of *Trichoderma* formulation in 25 ml of water)
- Soil application of *Trichoderma harzianum* enriched neem cake @ 5kg per palm and adopt recommended irrigation/moisture conservation practices.

► **Leaf rot**

- Remove rotten portion of the spindle leaf and 2-3 successive leaves and pour fungicide solution containing 2 ml hexaconazole 5 EC in 300 ml water/palm or talc based formulation of *Pseudomonas*



fluorescens or *Bacillus subtilis* @ 50 g in 500 ml water/palm into the well around the base of the spindle leaf

- Undertake prophylactic measures to prevent rhinoceros beetle attack

► **Basal Stem Rot/Ganoderma wilt**

- Removal of dead palms, palms in advanced stages of the disease and destruction of the bole and root bits of these palms
- Isolation of diseased palms from healthy palms by digging isolation trenches of 2 feet depth and one feet width around the basin
- Avoiding flood irrigation or ploughing in infected gardens to prevent spread of the inoculum.
- Addition of 50 kg of farmyard manure or green leaves per palm per year.
- Application of *Trichoderma harzianum* enriched neem cake @ 5 kg per palm and irrigating the palm once in 4 days and mulching around the basin
- Raising banana as intercrop wherever irrigation is possible
- Root feeding of hexaconazole @ 2% (100 ml solution per palm) or soil drenching with 0.2% hexaconazole / 1 % Bordeaux mixture @ 40 litre solution per palm. ■

Prepared by : C. Thamban, P. Subramanian, Joseph Rajkumar and S. Jayasekhar, ICAR-Central Plantation Crops Research Institute, Kasaragod

Market Review – September 2019

Domestic Price

Coconut Oil

During the month of September 2019 the price of coconut oil opened at Rs.16400 per quintal at Kochi and Alappuzha market and Rs.17300 per quintal at Kozhikode market. The price of coconut oil at all three markets in Kerala expressed a mixed trend during the month.

The price of coconut oil closed at Rs.16300 per quintal at Kochi, Rs.16400 per quintal at Alappuzha market and Rs.17450 per quintal at Kozhikode market with a net loss of Rs.100 per quintal at Kochi market and a net gain of Rs.150 per quintal at Kozhikode market.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.13333 per quintal, expressed a mixed trend during the month and closed at Rs.13000 per quintal with a net loss of Rs.333 per quintal.

Weekly price of coconut oil at major markets Rs/Quintal)				
	Kochi	Alappuzha	Kozhikode	Kangayam
01/09/2019	16400	16400	17300	13333
08/09/2019	16300	16400	17300	13133
15/09/2019	16300	16300	17000	13000
22/09/2019	16600	16500	17850	13667
30/09/2019	16300	16400	17450	13000

Milling copra

During the month, the price of milling copra opened at Rs.10700 per quintal at Kochi and Kozhikode market and Rs.10600 per quintal at Alappuzha market. The price of copra at all three markets in Kerala expressed a mixed trend during the month.

The prices closed at Rs.10600 at Kochi and Alappuzha market and Rs.10650 at Kozhikode market with a net loss of Rs.100 at Kochi market and Rs.50 per quintal at Kozhikode market.

At Kangayam market in Tamilnadu, the prices opened at Rs. 9700 per quintal and closed at Rs.9500 per quintal with a net loss of Rs.200 per quintal.

Weekly price of Milling Copra at major markets (Rs/Quintal)				
	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kangayam
01/09/2019	10700	10600	10700	9700
08/09/2019	10600	10600	10600	9550
15/09/2019	10600	10500	10550	9500
22/09/2019	10900	10700	11100	10000
30/09/2019	10600	10600	10650	9500

Edible copra

The price of Rajapur copra at Kozhikode market opened at Rs. 13100 per quintal expressed an overall fluctuating trend during the month and closed at Rs.13200 per quintal with a net gain of Rs.100 per quintal.

Weekly price of edible copra at Kozhikode market (Rs/Quintal)	
01/09/2019	13100
08/09/2019	12900
15/09/2019	13500
22/09/2019	13200
30/09/2019	13200

Ball copra

The price of ball copra at Tiptur market which opened at Rs.13600 per quintal expressed a mixed trend during the month. The price closed at Rs.12500 per quintal with a net loss of Rs.1100 per quintal.

Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal)	
01/09/2019	13600
08/09/2019	13000
15/09/2019	12400
22/09/2019	12500
30/09/2019	12500

Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.11500 per quintal expressed a downward trend during the month. The prices closed at Rs.10900 per quintal with a net loss of Rs.600 per quintal.

Weekly price of Dry Coconut at Kozhikode market (Rs/Quintal)	
01/09/2019	11500
08/09/2019	11200
15/09/2019	11200
22/09/2019	11100
30/09/2019	10900

Coconut

At Nedumangad market the price of partially dehusked coconut opened at Rs.16000 per thousand nuts and closed at Rs.15000 per thousand nuts during the month. At Pollachi market in Tamil Nadu, the price of coconut opened at Rs.13000 per thousand nuts and closed at Rs.12000 per thousand nuts. At Bangalore APMC, the price of partially dehusked coconut opened at Rs.14000 and closed at Rs.19000 per thousand nuts during month. At Mangalore market the price of partially dehusked coconut opened at Rs.21000 per thousand nuts and closed at Rs.22000 per thousand nuts.

Weekly price of coconut at major markets (Rs / 1000 coconuts)				
	Neduman-gad	Pollachi	Banglore	Mangalore (Grade -1)
01/09/2019	16000	13000	14000	21000
08/09/2019	15000	12000	14000	21000
15/09/2019	16000	12000	14000	21000
22/09/2019	15000	13000	19000	22000

International price

Coconut

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

Weekly price of dehusked coconut with water				
Date	Domestic Price (US\$/MT)			
	Philippines)	Indonesia	Srilanka	India*
07.09.2019	96	124	122	385
14.09.2019	97	124	122	371
21.09.2019	97	124	122	392
28.09.2019	99	124	127	378

*Pollachi market



Coconut Oil

The international price of coconut oil and domestic price of coconut oil in Philippines and Indonesia expressed an downward trend during the month. Whereas the domestic price of coconut oil in Srilanka and India expressed a fluctuating trend. The price of coconut oil quoted at different international/ domestic markets is given below.

Weekly price of coconut oil in major coconut oil producing countries					
	International Price(US\$/MT)	Domestic Price(US\$/MT)			
	Philippines/ Indonesia (CIF Europe)	Philip-pines	Indone-sia	Sri lanka	India*
07.09.2019	738	660	658	1659	1840
14.09.2019	719	648	650	1553	1821
21.09.2019	710	647	651	1616	1915
28.09.2019	700	630	631	1568	1868

* Kangayam

Copra

The domestic price of copra at Philippines, expressed a downward trend during the month. The domestic price of copra at Indonesia, Srilanka and India expressed a fluctuating trend. The price of copra quoted at different domestic markets is given below.

Weekly International price of copra in major copra producing countries				
Date	Domestic Price (US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
07.09.2019	425	417	791	1338
14.09.2019	419	423	754	1331
21.09.2019	415	412	769	1401
28.09.2019	403	409	766	1345

* Kangayam