Organic farming in coconut, problems and prospects

M Thomas Mathew

Chief Coconut Development Officer, Coconut Development Board, Kochi-11

The modernization of Indian agriculture had brought in tremendous growth in plantation sector too. The remarkable growth in the production and productivity of coconut in the country is an outcome of these agrarian reforms. However, the rapid stride in the production has also brought in distressing situation, the emergence of new pests and diseases.

Introduction

The ecological security and livelihood security is dependent on bio-diversity and natural resources. Preservation of biological diversity is possible by following the nature's order and harmonious use of natural resources. The Vedic era strictly adhered to the natural law and practiced a holistic approach in agriculture. They revered the *mother earth* and protected her structure and bio-dynamical properties. However, in the contemporary world the man exploited the *mother earth* for his personal benefit, forgetting the natures' order. In modern agriculture, the rules of environmental protection and conservation are neglected for self gain. The farmers of ancient India had respected the natural laws of farming practices and adhered to those while developing and practicing the farming systems. India initiated national economic development with the establishment of the Planning Commission in 1950. The economic growth, self-reliance and social justice were the broad strategies of the Indian economic development. The population explosion coupled with the shrinking stock of food grains prompted the country to find alternative technology for a grain revolution to feed the growing requirements of food. India's dependence on import of food grains to feed the population was too acute to explore new alternatives. The transforming traditional agriculture gained momentum in the context of food grain shortage. The slogan *gharibi hatao* and the motto of self-sufficiency in food production have revolutionized the Indian agriculture scenario. The use of synthetic fertilizers, pesticides, weedicides and growth hormones have promoted to double or triple the food grain production in the country. The traditional farming practices were slowly replaced by modern agriculture technology. The modernization of Indian agriculture had brought in tremendous growth in plantation sector too. The remarkable growth in the production and productivity of coconut in the country is an outcome of these agrarian reforms. However, the rapid stride in the production has also brought in distressing situation, the emergence of new pests and diseases. The continuous use of inorganic fertilizers and pesticides has damaged the soil physical properties. As a result of this post independence agrarian reforms, a large area of cultivable land in the country has become non-fertile and hence the land productivity has declined considerably. The emerging production constraints in coconut culture has now awakened the minds of scientists, farming community and other agencies to

resort to traditional organic farming. Practicing organic farming in coconut cultivation is an age-old tradition in Indian agriculture. Indian coconut and coconut products are getting competitive advantage in occupying world market. However, in many of the EEC countries Indian coconut products are inaccessible due to the fact that the products do not comply to the quality standards prescribed in the European market as well as for want of organic certification. In view of the emerging economic scenario and also due to the tremendous growth in the production and productivity of coconut in the country it is inevitable to explore new markets for these products abroad for the stability of domestic market. Promotion of organic cultivation in coconut gardens is therefore inevitable.

Economic Importance

Coconut palm is considered as the benevolent and benign tree which provides food, drink and shelter to mankind. Coconut kernel, nucleus part of the seed, forms an important ingredient in the diet of many people in India. Coconut milk, a liquid extracted from the grated wet kernel, is an additive in culinary preparations to make the food more nutritious and tastier. Copra, the dried kernel, is one of the richest sources of vegetable oils. It is also used as dry fruit which commands high demand in northern parts of India during winter. As edible oil its consumption is mostly confined to the state of Kerala , a few parts of Tamil Nadu and Karnataka and in the UTs of A&N Islands and Lakshadweep. Coconut oil is an important raw material for many industrial products; such as toilet soap, liquid soap, shaving cream and natural shampoo besides being used in the paint industry. Similarly coconut oil finds extensive use in the food industry due to its characteristics such as easy melting behaviour, resistance to oxidative rancidity, pleasing flavour and good digestibility besides using directly as hair oil and body oil. Coconut oil derivatives are used in most of the cosmetic products. The coconut oil cake, the by product of oil industry is in great demand and is a major ingredient in the manufacturing of cattlefeed.

The inflorescence sap, traditionally called "neera", is produced from the unopened spathe/ inflorescence of selected healthy palms, through a process known as tapping by skilled climbers. It has varied commercial application. Neera, without fermentation is an ideal isotonic drink composed with vitamins, minerals and free nuclei. It is used for production of palm sugar, jaggery, vinegar, wine and arrack in many countries. Besides, the inflorescence is used to make ayurvedic medicines. Another important product that has got consumer demand, throughout the country, is tender coconut. It is a nutritious health drink which is diuretic and re-hydrating fluid. The tender coconut water is a base for many ayurvedic preparations. Of late tender coconut is also used for making wine. The water of mature nut yields various products such as vinegar, nata-de-coco, edible jelly and wine.

The shell is used as a fuel besides manufacturing various commercial products like shell powder, shell charcoal, shell based activated carbon, ice cream cups, buttons of garments, utility articles and show pieces. The soft bud known as cabbage or coconut "heart" is edible and nutritious. The matured coconut timber is a strong building material apart from making furniture, wall panels, show pieces and floor tiles. The plaited leaf of the palm is used for thatching, fencing, shading, etc. Dried leaves and other palm parts are used as fuel. The spindle leaf is used for decoration and costuming in folk dances. The midribs of leaves are used to make brooms, fish traps, baskets and tongue cleaner. The husk yields fiber and pith. Coconut fiber is used for making an array of products ranging from coir mats to geo-textiles which command consumer demand throughout the world. The coir and coir products form an export commodity of the producing countries. Coconut pith, a by-product of coir industry is an ideal organic manure for composting, soil conditioner and rooting medium besides having many other end uses. The spathe and stipules are used as fuel and also for making handicrafts and other attractive articles. Coconut is a perennial eco-friendly plant which helps to conserve soil, provides aesthetic beauty to the nature less exhaustive and ideal for bio-hedging on the coastal ecosystem. Coconut farming, trade and processing activities sustain the livelihood of millions of people across the globe. It provides livelihood security to more than 10 million people in 18 states and 3 union territories of India. It is a source of permanent income to 5 million farm families. Coconut contributes more than Rs. 8900

crores to the country's GDP apart from an export earning of Rs. 795 crores. Coconut industrial sector alone generates more than 340 million rupees. Out of the total production of about 16000 million coconuts, 8000 million nuts are utilized for the production of coconut oil, 420 million nuts converted into edible ball copra for using as dry fruit, 2400 million nuts are consumed as health drink and the balance being used for edible and culinary purposes as well as for religious and social rituals. Coconut cultivation and industry in the country is therefore the back bone of all the producing states as it provides livelihood security, food security and employment guarantee to millions of people besides contributing considerably to country's GDP. In short it is essential to guarantee the uninterrupted production of coconut in the country to meet the consistent demand while considering any change in the cultivation practices, particularly when converting the gardens under modern agriculture to organic farming.

Coconut Palm: Its distinct features of growth and yield

The coconut palm is a perennial horticulture crop having long economic life span of 50-60 years after planting. The cultivation of the palm involves heavy pre-bearing investments in the initial years and recurring maintenance expenditure continuously till the tree dies. The tall varieties of the palm attain 30-100 ft height and the height is an impediment in harvesting operations and adoption of proper plant protection measures. Being a perennial crop, coconut has concurrent growing and yielding phases which has made possible to harvest this crop once in every 45-65 days. The coconut palm is therefore characterized by high rate of investments in the initial years and the realization of out put or the pay off in succeeding periods. Because of its unique nature of continuing growth and yielding phases, any change in the cultivation practices may upset the growth and the physiology of the crop. A vast stretch of area under coconut in the country is rain-fed. The success of coconut growing depends on the uniform distribution of an annual rainfall ranging between 1000mm and 3000mm. In states like Tamil Nadu, Andhra Pradesh, Karnataka etc., the annual precipitation in most of the coconut growing districts varies from 700 mm to 1500mm with only 40-70 rainy days in a year. Hence a large number of coconut plantations in these states are maintained under irrigation. Since the growth and the reproductive phases of the plant proceed simultaneously, the palm requires nutrients and water regularly. The primordial formation of inflorescence, spikelets and buttons in coconut takes place 12-33 months before the appearance of the inflorescence. Any hindrance to successful growth of the tree during these productive phase results in the reduction in the yield and the cumulative effect of these adverse growth of the tree appears only after 2-3 years. Therefore the crop production practices warrant the need for uninterrupted pattern of input application over longer periods to ensure continuous flow of returns. The Indian Coconut industry is vulnerable to the influence of natural calamities. Serious incidence of pests & diseases, adverse climatic conditions, drought, cyclone, etc. retards the productivity of the palms and often causes heavy loss to farmers. Various pathological agents are involved in different diseases; some of them are localized to specific part. A few of the diseases are lethal, while others reduce the vigor of the palms causing yield loss. The root (wilt) disease of Kerala, Tatipaka disease of Andhra Pradesh, basel stem rot in Karnataka and Tamil Nadu, crown chalking in Orissa and North Eastern states, leaf rot, bud root and stem bleeding are the major diseases causing damages to the crop and heavy loss to the farmers unless timely remedial measures are adopted. The recommended package of practices for the control of most of these pests and diseases are resorted through only chemical means. The epidemic and endemic outbreak of pests like, eriophyid mite, leaf eating cater pillar etc. in recent years prompted the farmers and the policy makers to resort to massive application of chemicals which have caused considerable damages to environment. The morphological and physiological nature of the tree does not permit sudden structural changes in the maintenance and management of the crop.

Diversity in coconut cropping system: impediment for organic farming

In many coconut growing states, coconut is largely cultivated as homestead gardens where the available space is fully exploited for the cultivation of other horticulture crops. Most of the palms are also used as standards for betel vine,

pepper and other creepers. In states like Tamil Nadu, Karnataka and Andhra Pradesh it is cultivated on a plantation scale where other commercial crops like banana, maize, ginger, turmeric etc are raised as intercrops. The success of the cultivation of these crops depends on the timely application of inputs including irrigation. Planting of high value perennial horticulture crops like cocoa, black pepper, nutmeg (*Myristica fragrans*), clove(*Eugenia caryophyllus*), cardamom (*Elettaria cardamomum*), cinnamon (*Cinnamomum zeylanicum*), vanilla (*Vanilla fragrans*) etc are the common cultivation practices adopted by many innovative farmers and has become lucrative enterprises. The coconut based cropping system adopted by such farmers render enhanced level of gross income and employment opportunities besides improving the productivity of the land. While the coconut under mono-cropping provides employment opportunities of only 150 man days per ha per year and net income of Rs. 10,400/ha, the coconut based cropping systems generate additional employment between 130-606 man days/ha/year. The rooting pattern of coconut is such that only 25 % of the land area is utilized in the recommended spacing of 7.5 x 7.5m, the remaining 75% space could effectively be tapped. As coconut canopy's space utilization is very low, plenty of sun light infiltrates and fall on the ground unutilized. The Venetian structure of the coconut crown and orientation of the leaves facilitates intercropping. As much as 56% of the sunlight is transmitted through the canopy during peak hours, the diffused sunlight facilitates growing of number of spice crops in the interspaces. Coconut based cropping system is important and most relevant activity in the present era for sustaining income from unit area. The cultural requirements of these crops under mixed cropping system with coconut warrant regular and balanced application of both organic and inorganic fertilizers and the proper adoption of plant protection measures apart from keeping the moisture level in the plantation at field capacity. Excess or deficit of any of these critical inputs will affect the health of the plants which ultimately results in the yield reduction among the main and complementary crops in the coconut based agro-eco system. Even though organic farming in coconut plantations is advocated, proper restructuring and reengineering the existing gardens, which are practicing modern agronomic practices to traditional organic farming are essential pre-requisites.

Organic cultivation in coconut: Current Status.

Universally, coconut is cultivated under traditional agriculture except in countries like India, Sri Lanka and to some extent the Philippines where coconut is maintained under modern agriculture. Coconut cultivation in India, particularly in Kerala, has a recorded history of more than 3000 years. It has been cultivated under traditional agriculture till 1960s, the pre-green revolution era. The aftermath of the green revolution brought in indiscriminate use of chemical fertilizers and pesticides for the crop production. Though the transforming traditional agricultural has resulted in the enhanced production of coconut in the country, it has given rise to the emergence of multiple problems in crop production. The emergence of new diseases and pests, exhaustive depletion of available nutrient and soil matter content and increasing phenomenon of soil salinity were the repercussions experienced in the field. As a result of the modern agriculture, the tropical soils are turned unproductive. There is increasing concern about the sustaining productivity rather than enjoying high but short-lived out-put and financial return. In case of perennial crops, the soil salinity and the depletion of soil have affected the plant health and its yield. The presence of pesticide residues in the harvested fruits as a consequence of this revolution has become an alarming issue.

The increase in purchasing capacity of a large segment of consumers, mainly the middle income groups and their desire for healthy and natural products, has led to the genesis of a holistic approach in agriculture. A new school of thought, *Organic Agriculture* has emerged which has been reflected in all the sectors including coconut culture and industry. However, the prevailing cultivation practices adopted by the coconut farmers in the country is inadequate to immediately go in for organic farming and hence this situation called for the re-engineering and revitalization of coconut culture to avoid any ditch in current level of the production, instead to ensure an increasing trend in the production of coconut in the country at least to the level of India's demographic growth rate.

Coconut Production and Organic Farming: Current situation, An analysis:

India contributes about 16.51 per cent in area and 26.65 per cent in production of coconut in the world. The productivity of coconut in the country is highest among the major coconut growing countries in the world. Unlike other world countries, India has the comparative advantage of having the crop grown under varied agro-climatic zones and hence there is distinct difference in the pattern of distribution of coconut in the country. As a result of this unique distribution a steady supply of coconut is ensured in the country throughout the year. The crop is grown in 18 States and 3 Union Territories covering an area of 1.94 million ha with a production of 15.84 billion nuts (2006-07). The bulk of the coconut acreage is concentrated on the West Coast region of the country comprising the states of Kerala, Karnataka and Maharashtra followed by the East Coast areas of Tamil Nadu, Andhra Pradesh, Orissa, and Puducherry. The Islands of Andaman & Nicobar, Lakshadweep and the coastal regions of Gujarat are the other traditional coconut areas. About 90 per cent of area under and 89 per cent of production of coconut are from the four southern states viz. Kerala, Karnataka, Tamil Nadu and Andhra Pradesh.

The biggest impediment to the competitiveness of India's coconut sector is the low rate of returns from the holdings and the reduced input-output realization especially in the traditional coconut growing states due to the depletion of soil on account of continuous growing of coconut. The continuous growing of a single crop without enrichment of the soil through organic recycling and crop rotation is considered the root cause for the poor performance of most of the coconut gardens in the country. Hence enrichment of such soil is possible only through balanced application of organic and inorganic fertilizers along with the recycling of biomass. Unlike other commercial plantation crops like rubber, tea etc where stabilized nature of plantation managements are followed in most of the gardens, coconut gardens are characterized by varying nature of cropping system management resulting considerable fluctuations in the production from garden to garden and state to states. The coconut cultivated in traditional areas is more vulnerable to this exceptional nature of management. The recurring nature of price fluctuation further aggravates the situation. Every crest in the price movement always offers better management of the gardens whereas a trough results in the negligence of the garden. Similarly, an unprecedented onset of drought resulted in total negligence of garden some time for more than a year. Therefore majority of the coconut gardens in the traditional coconut growing states are being maintained partially through scientific management and some times without application of any inputs. Comparing to traditional places, the cultivation of coconut in non traditional places satisfy the scientific requirements and hence its productivity in places of recent introduction particularly after 1980s is significantly high. Such gardens are laid out scientifically and maintained under proper care and managements with regular application of fertilizers and other plant protection chemicals. Hence the perspective for practicing organic agriculture in coconut needs re-look and refinements. The coconut gardens in North East, the UTs of A&N Islands, Lakshadweep and Puducherry and selected areas in the traditional states can be earmarked for practicing organic farming. In fact the continued coconut growing on the same land without recycling the residual bio-mass depleted the soil biodynamic properties and hence considerably reduced the input use efficiency. Therefore appropriate package of practices have to be evolved to convert the small and uneconomic holdings into 100 per cent organic and to make them economically viable units through integrated cropping system managements. The scheme "Integrated farming in coconut holdings for productivity improvement" implemented by the Coconut Development Board in the country during the past couple of decades has helped in the creation of adequate infrastructure facilities at farm level for the continuous production of organic manure particularly vermi compost which has made some dent for transforming the present cropping system management into organic agriculture.

The Constraints:

At present there is no reliable data available in the country on the extent of coconut cultivation which are fully maintained under organic farming. The resurgence of traditional organic farming prompted many innovative coconut farmers in different parts of the country to go in for the new venture

with the expectation of getting more leverage for the marketing of their products. However, their initiation of converting their coconut gardens which were hitherto nourished under modern agricultural practices, into total organic have beset with varied problems like deterioration of plant health and sudden decline in yield and income loss. A few coconut farmers in Tamil Nadu and Andhra Pradesh who practice organic farming with their acquired knowledge have been reported to fall into perils, dismays and irreparable damages to plantations due to the sudden shock. It was reported that a farmer in Tamil Nadu who had changed to organic farming without using inorganic fertilizer, worth rupees two lakhs, had to suffer a decline in the income by 4 times which had prompted him to resort to the original modern farming immediately and thereby regained the income loss. Similarly a coconut grower in Andhra Pradesh was forced to substitute his entire area of coconut gardens into oil palm cultivation because his entire investment for converting his coconut garden was ruined on account of practicing organic farming. The multiplicity of emerging problems associated with the introduction of organic farming warrant the need for strategic reforms and development of appropriate and cost effective proven technologies for advocating the organic farming in coconut based farming systems. Contrary to the recommended dose of inorganic fertilizer the quantity of the nutrients replenished through organic sources was inadequate to retain the production and production capacity of the palms.

A healthy coconut palm, maintained under average management, annually requires 500 g of Nitrogen, 320 grams of phosphate and 1200 g of potash supplemented with 25-50 kg of organic manure and 5 kg neem cake for the maintenance of the plant health and its sustained production. With this nutrient recommendation, an area of 1 ha of coconut garden annually requires about 100 kg nitrogen, 65 kg phosphorus, 2400 kg potash and 10 MT of organic manure besides the requirements of 875 kg of neem cake. The major sources of these inputs are currently met through organic and inorganic base. The organic requirements of the palms have been mainly supplied through cow dung. The dwindling growth in the livestock population has now become a constraint for the easy availability of adequate quantity of quality organic manure. The absence of necessary enactments for the imposition of quality control of organic manure encourages the distribution of spurious materials to the farmers. Among the organic manures which are currently supplied through co-operatives and other organized delivery systems are bone meal, neem cake and the bio-fertilizers. At present there is no mechanism to test these products and ensure the quality before it is applied to the plants. For example, the supply and distribution of quality neemcake which is composed of the minimum levels of N: P:K and oil content with the threshold level of moisture, sand and silica is facing problems . The neem cake mixed with coffee husks, coir pith, sands and common salt is seen available in plenty in the market with cheap price. Such materials, instead of giving expected result on the crop growth and yield some times damages the crop on account of high concentration of salt and hard metals. Similarly in case of bio-fertilizers, the absence of necessary mechanism to test the active micro organisms at the desired level of population pause serious problems on the bio-efficacy of these products on improving the crop yield. Hence the inadequacy of facilities for quality assurance and supply of adequate quantity organic manures pause problems and concern for the introduction of 100 per cent organic cultivation in coconut and coconut based farming systems. The tiny and scattered nature of distribution of coconut gardens in the country is another major hurdle for the implementation of a certification program in organic farming. The unorganized method of coconut cultivation is another serious problem pausing the introduction of organic farming as the gardens are being maintained under varied cultivation practices which are different from garden to garden. For example, a coconut garden integrated with seasonal intercrops or vegetable necessitates the application of inorganic fertilizers and pesticides at frequent intervals for getting more yield and reducing the crop loss due to pest and diseases.

Conclusion

The increasing concern on healthy living coupled with the consumer behaviour towards utilizing safety food created a new demand for organically grown goods across the world. The change in

consumer behaviour coupled with the increase in demand for such products in turn offer premium prices for those products certified as organic products. The absence of an appropriate package of practices based on scientific studies is another bottleneck for the introduction of organic farming in coconut. Until a technology for 100 per cent organic cultivation of coconut based farming system is standardized, it may be difficult to promote organic farming in coconut cultivation without affecting the current level of production. In the absence of a proven technology for coconut cultivation practices probably a strategic plan need to be drawn by proper segmentation of existing coconut area before introducing certification. There are many areas where farmers are still practicing traditional farming without the application of any inorganic fertilizers. Such areas need to be identified and earmarked as the benchmark for promoting organic farming. For example, the entire coconut gardens in Lakshadweep can very well be declared as organically grown coconut as the application of inorganic fertilizers is banned through government orders. Similarly there are many states in North-Eastern region which are also maintained under pure organic cultivation. The areas which are already maintained under traditional cultivations are therefore the ideal places for introducing the organic certification. The Coconut Development Board (CDB), through its cluster approach, may assist farmers and act as a catalytic agent for their empowerment to jointly go in for certification. Similarly the CDB can assist entrepreneurs to set up processing units for the production of organic certified coconut products and their marketing, both in domestic and international markets.

References

Purushothaman Namboothiri,P.S.(1954) "Brahatsammeetha" Sree Rama Vilasam Press Book Depot, Kollam.

Randhava,M.S. (1958) "Agriculture and Animal Husbandry in India" ICAR, New Delhi.

Thomas Mathew(2008) Coconut : "Paradigm change in the consumption pattern". The Hindu Survey of Indian Agriculture 2008.

Thampan, P.K.(1987) "Hand book on coconut palm" Oxford & IBH Publishing Co.Pvt Ltd, New Delhi.

Sairam C V *et al* (2004) " Economics of Palm based farming systems "Central Plantation Crops Research institute , Kasargod, Kerala

Singh H P (2007) "Organic Horticulture-retrospect and prospect" Proceedings of National Workshop on Organic Horticulture. Bidhan Chandra Krishi Viswavidyalaya, West Bengal

Thampan, P.K.(1996) "Coconut for Prosperity" Peekay Tree Crops Development Foundation, Cochin-20.

Thampan P.K. (1993) "Organic in Soil health and Crop Production" Peekay Tree Crops Development Foundation, Cochin-20.

Thampan P.K. (1995) "Organic Agriculture" Peekay Tree Crops Development Foundation, Cochin-20.

Rethinam P *et al* (2001) " Organic Farming in Coconut" Asian and Pacific Coconut Community, Jakartha.

Coconut Variety- West Coast Tall

This is the commonly grown variety and is widely known as West Coast Tall (WCT). It grows well in all soil types and is amenable to rainfed farming. The palms normally start flowering in about 5-6 years after planting and reach steady bearing in another 3 years. In properly managed gardens the productivity is 60-80 nuts per palm per year without irrigation and and 80-100 nuts with irrigation. In many gardens where the palms are regularly manured and irrigated the average productivity exceeds 150 nuts.The palms of this variety show comparatively better tolerance to pests and diseases. The nuts are valued both for copra making and household edible uses. The kernel is firm and amenable to easy grinding and also squeezing by hand for milk in households.

Depending on the quality of management and season the out turn of copra per nut varies between 140-180 g. The out turn is more in summer months than in other months. On an average 6250 nuts make one tonne of copra. The oil content in copra is about 72 per cent by weight. The husk is thick and it constitutes 45-55 per cent of the weight of whole nut. It is good for fibre extraction and the recovery from 1000 husks is about 80-100 kg.

The palms also yield good quantity of sweet toddy on tapping with the daily yield ranging from 1.5 to 5 liters over a tapping period of 6 months. Those having hard and thick bark, stout and long spathes, dark green leaves and producing green coloured nuts yield large quantity of sweet toddy.

The quality of tender coconut is also regarded good. There are palms which produce nuts with a green coloured exocarp but with a reddish mesocarp. The tender nuts of such palms contain large volume of sweet water and tasty kernel and are valued as having medicinal properties. There are also palms producing nuts which retain the greenish colour instead of turning into brown when mature. Tender nuts of such palms have very sweet water. These are vigorous in growth and high yielding with the fronds and nuts exhibiting the characteristic of orange colour.