CHAPTER – II

REVIEW OF LITERATURE

2.1 Review of Literature

A review of research literature is necessary to understand the role of coconut production and marketing in the different aspects of socio-economic development. Such an attempt is useful to identify the existing research gaps. It also provides the basis for the conceptualized aspect of the problem. The present exercise is not exhaustive in its coverage, but provides an insight into the remarkable studies on the economic importance, uses, costs and cost of production, employment, marketing, returns, problems of coconut production.

2.1.1 Importance of Coconut Cultivation

The coconut palm is valued in the national economy as an important source of vegetable oil. Coconut oil contributes 6 to 7 percent of the total production of vegetable oil in the country. Coconut culture and processing industries provide income to growing states.

Rajkumar. S and Thamil Selvan. R in their study entitled "Importance of Coconut Cultivation" pointed out the significance of coconut as a source of edible oil and as an agro-based raw material for many industries such as manufacture of shell powder, and handicrafts. Fermented coconut toddy is an intoxicant used widely in the west coast of India. Vinegar and jaggery are important by-products of coconut toddy. The tree trunk is used as a building material and for making furniture. Fifty percent of the total coconut production is converted into copra. Coconut crop is raised in India under varying soil and climatic conditions in 17 states and 3 Union Territories. As the coconut tree is versatile in its adaptability to wide range of soil conditions, coconut cultivation
has begun to spread from the west coast of India to interior regions of Tamil Nadu especially to Erode District and Thanjavur District.\(^1\)

Thampan. P.K holds that the coconut palm, being a multi product crop, the small and marginal farmers who are involved in the production, depend mainly on the palm for satisfying their domestic needs such as food, fuel and shelter\(^2\).

Veerapouthiran. R suggests the following strategies to implement drip irrigation which will improve irrigation efficiency to 80 to 90 percent (1) Allocation of government subsidy for drip irrigation (2) simplified procedure for the disbursement of subsidy (3) reduction of gestation period to avail subsidy. He recommends fabrication for applying fertilizers under drip irrigation and fabrication as a new method of weed management. He concludes that drip irrigation system is highly suitable for adoption in growing trees and fruit trees, wide-spaced and commercial crops and that there is great prospect for rapid expansion of area under drip irrigation in the 21\textsuperscript{st} century.\(^3\)

Singh. H.P. highlights that the importance of coconut can be gauged from the fact that it is grown in more than 80 countries of the world and in 17 states and three union territories in India over an area of 1.795 M. hectares and a production of 13, 968 M. nuts. Coconut contributes over Rs. 7000 crore annually to the GDP (Gross Domestic Product) of the country. Copra, the dried coconut, is the richest source of edible oil pool in India. The raw material for coir industry is derived from coconut husk and coconut earns foreign exchange of Rs. 292 crore by way of export of coir and coir products. He also states that in the coastal tracts most of the people depend on coconut for their subsistence. Coconut gardens accommodate most of the fruits and vegetable crops besides animal husbandry. Coconut-based farming system satisfies the day to day needs of a family. It also


\(^3\)Veeraputhiran R "Drop Irrigation for Sustainable water management", \textit{Kisan World}, Vol.32. No 1, January 2005, pp.49-51
provides a large quantity of biomass to satisfy the fuel requirements of a family. It
is also highlighted that 30 to 40 coconut trees could be sufficient to satisfy the
requirements of a small family. It assumes greater significance since it is a
renewable energy source\(^4\).

Singh H.P also holds that as a result of diversification in the
utilization of coconut through the development of new products such as coconut
cream, spray dried coconut, milk powder preserved and packed, tender coconut
water, coconut -based vinegar, Coconut becomes an agro-based raw material
for many industries\(^5\).

Sivanappan. R.K points out the wastage of scarce water in surface
irrigation of coconut fields. In surface irrigation the entire field is flooded to a
depth of 5 to 7 cm once in 5 to 10 days depending upon the type of soil. The
quantity of water applied works out to more than 200 litres / day or about 1000-
1400 liters in 5-7 days. The conveyance loss is about 20-25%. In contrast to this
method is the Drip/Micro Sprinkler Method which has increased water use
efficiency and water saving is up to 40 to 60% and labour saving up to 90%.
Further Drip Method increases the yield by 30%. This method successfully meets
the problem of irrigating sandy tracts. Many progressive farmers of Tamil Nadu
and Karnataka have adopted this advanced method of irrigation. Sivanappan
feels that the time is not far away when the entire coconut farm in the country will
be irrigated by Drip System for its sustainability and to increase yield. \(^6\)

Rajagopal. V et al, of the central Plantation Crops research Institute,
Kasargod, Kerala dealt at length with the distinctive features of coconut, its
strength and weaknesses as a perennial crop. According to him in coconut large
number of germ plasm is available for effective utilization to increase productivity
and for breeding disease resistant varieties. Moreover, there is greater scope for
the adoption of new technologies and community level approach for augmenting

\(^4\) Singh, H.P. "Coconut Industry in India-Challenges and opportunities" - Indian Coconut Journal,
Annual number. IV, Vol.23, No.4, 1998, pp-4-5
\(^5\) Ibid, p.11
2004, pp.47-48
farm income. Coconut development is a potential source for women empowerment. Self-tested and proven technologies, for adoption at the farmers level provides scope for inter/multi/mixed crops in coconut farms. Coconut products and by products of high economic value are potentials for export and earnings in international markets. But decline in farm income imposed by factors such as fluctuating market price, pests and diseases, adverse climatic conditions, non-competitiveness at the global level and decline in general price level of coconut products at the international level are some of the threats faced by coconut industry. To overcome these threats, these researchers suggest certain macro and micro level strategies. At the macro level discouraging area expansion under coconut, increasing the productivity effect on production in the major coconut growing zones and checking the flow of imports by imposing rational import tariff rates will help to maintain a well stabilized price structure for coconut and its products. At the micro level emphasis should be on the theme ‘competitiveness through higher productivity in production, processing and marketing sectors’. Replanting of senile and unproductive plants through high yielding varieties and by birds, adoption of integrated nutrient management strategies, water management techniques and integrated pests and disease management strategies are some of the major technologies for realizing sustainable increase in productivity.

These researchers are of the view that coconut based cropping/farming systems assume great significance at present because coconut farmers are facing higher degree of production and price risks. Since coconut is a crop with wider spacing and ideal rooting pattern and canopy of coverage, coconut farming offers much scope for integrating a variety of crop combinations in the inter spaces. The study is concluded with the suggestion that in order to achieve economies of scale in coconut production it is advisable to venture into coconut farming on cooperative basis involving farm women. The research and development agencies should continue to strive for attaining excellence in their respective mandates for achieving sustainable development and improved
standard of living of small and marginal coconut farmers in the country.\textsuperscript{7}

Venkitaswamy, R and Hameed, H. Khan has dealt with Drought Management in coconut in Tamil Nadu and point out that drought management is the foremost requirement in the western districts of Tamil Nadu viz: Coimbatore, Erode and Dindigul. They suggest economic utilization of available irrigation water and adoption of the soil moisture conservation practices for containing drought. Methods recommended are: crop irrigation equal to 100% or 66% of pan evaporation of basin irrigation with 1W/CPW ratio of 1.0 at 4cm depth and adoption of soil moisture conservation method like surface mulching with raw coir pith, coconut leaves to husks and husk burial.\textsuperscript{8}

Surendira Kumar, P.S, et.al., have conducted experimental study on intercropping in coconut and point out its advantages. Though the contribution of Tamil Nadu to the total area under coconut in the country steadily increased, productivity of coconut plantation on monocrop in the state is not so remunerative. Since the coconut trees are spaced at 7.5 x 7.5 meters and the active root zone of a palm is confined to a radius of 2 meters i.e 25% of the land surface laterally, the remaining 75% of the land area can be used efficiently by raising intercrop such as food crops like banana, cereals, legumes and fruits, cash crops like black pepper, cocoa, cinnamon, cloves, coffee and nutmeg, cut flowers like anthodium and orchids as well as pasture crops, spices and condiments. The spices preferred are banana, pepper, coffee, ginger, turmeric, vegetables and pineapple, as these can be grown successfully under shade and they provide a good income to the farmers. Mixed farming in coconut gardens creates congenial conditions for the rapid multiplication of micro organisms in the soil. Continuous additions of plant residues by the component crops and the organic recycling facilitated by intercropping exert a facilitated development influence on the microbial population in the universe and it might influence the nutrition uptake of different crops. Surendirakumar, et.al, conclude with an

\textsuperscript{7} Rajagopal, V, Arual Raj, S and Sairam, C.V “Coconut Industry – Improving Genetic Produce” \textit{The Hindu Survey of Indian Agriculture}, 2004, pp. 67-69
\textsuperscript{8} Venkitaswamy, R and Hameed Khan, H “Drought Management in coconut Tamil Nadu”, \textit{Indian Coconut Journal}, Vol XXXIV, No.10. February 2004, pp. 16-18
emphasis that coconut + yam increases the return by 35 percent and hence it is a viable agro technique to improve the farm productivity.\footnote{Surendirakumar P.S, Kalayanasundaram D, Kavitha S. and Sampathkumar G. “Inter Cropping in Coconut to Improve the Farm Productivity”, \textit{Indian Coconut Journal}, Vol. XXXIII, No 5, September 2005, pp.13-14}

Mohan Rajesh attributes poor yield of coconut and the consequent frustration of the coconut farmers to lack of proper agricultural management practices. He suggests the following steps to increase the income from coconut plantation:

a) Removal of unwanted trees which interfere with the main crop of coconut.
b) Keep only the healthy and vigorous potential palms.
c) Collect and burn all decaying matters to get rid of black beetles and red weevils which are the most harmful coconut pests.
d) Conserve soil and build it up with bunds and required drains with silt pits along the leader drains so as to avoid soil erosion.
e) Conserve moisture by avoiding outflow of rain water from the coconut farm as far as possible without water logging. This will increase nut formation and reduce premature nut fall.
f) In order to conserve moisture and thereby avoid stresses to the palms during dry periods, coconut husk can be buried, in the field itself.
g) Grow green manure trees like Gliricidia along the borders, sides of internal roads and if possible between coconut rows. Further, creepers such as puraria and vitiver grass can be grown on bunds. Prune these before hardening and put at palm base. This practice helps to loosen the soil to absorb more water during rains and increase the bio-mass content, microbes and earth worm population and thereby enhances soil fertility and reduces costly artificial fertilizers.
h) Since coconut does not perish in short periods and can be kept for about two months, producers have some staying power and so they can afford to wait for higher prices.
i) Coconuts can be offered for sale in different markets as curry nuts, copra and for fresh nut export. Hence the farmers should choose the market in accordance with the possibilities for getting higher prices for their produce.10

George V. Thomas, et al, of the Central Plantation Crops Research Institute, Kasargod have dealt with production technology for sustainable coconut cultivation. Pointing out the fact that the low production of coconut in India i.e. around 40 nuts/palm/year can enhance productivity, they hold that application of low cost production technologies in the right combination suitable for coconut cultivation can help to enhance productivity. Integrated approach in nutrient management by way of recycling crop biomass, raising green manure legumes and green leaf manure plants and their incorporation and the use of bio fertilizers are some of the efficient low cost production technologies. Biological management of soil fertility in coconut plantation is cost effective, environment friendly, easily adoptable and makes efficient utilization of local resources. Soil and water conservation structures are vital to conserve natural resources for enhanced productivity.11

Lathika.M and Ajithkumar C.E. examined the growth trends in coconut area, production and productivity for five years (2000-2005) in the different coconut producing states of India and came to the conclusion that area effect assumes greater role in output growth in almost all coconut regions of the country, though some states like Kerala and Orissa recently showed signs of a productivity based output growth. States like Andhra Pradesh and Karnataka are already on the path of vast area expansion. But with severe pressures on land, the states of Kerala, Tamilnadu, Andamans and Nicobar Islands have registered only retarded growth in area. According to these researchers, avenues of replanting or dense-planting of coconut palms should be explored vigorously in

some of the traditionally coconut growing states like Goa, Andaman and Nicobar Islands where the current yield level is abysmally low with practically no growth in the second phase i.e. 1996 to 2002. They conclude that area expansion of the crop is still a viable option for certain regions of the country. Yet the problem of growth stability in yield had been trickier to tackle with than the problem of stability in area growth and it warrants urgent attention.\textsuperscript{12}

Rethinam, P. Executive Director, Asia and Pacific Coconut Community (APCC), in his study on “Steps for Yield Increase” says that nearly 50 products of coconut are being traded from the producing countries. Of them coconut oil is the largest coconut product. A critical look at the international trade reveals the fact that India has been an importer of all the major coconut products like copra, coconut oil, copra meal, desiccated coconut meta de coco and the like for meeting the domestic requirements. India is the largest single market for coconut. In 2003 India consumed more than her entire production of 12.9 billion nuts and domestic consumption exceeded production by 2.5 percent. The price trend of copra, and coconut oil in India, Indonesia, the Philippines and Sri Lanka during 2001-2005 reveals that domestic prices are the highest in India and Sri Lanka and the lowest in Indonesia. Hence it is difficult for India to compete with other countries in the international market. This necessitates reduction in unit cost of production. However in view of the fact that every country is looking forward to India for marketing their product, the Indian Coconut farmer can definitely play a competitive role only if he takes up integrated coconut development with proper replanting and under planting, farm level processing linked with market and for a partnership with the private and public sectors.\textsuperscript{13}

According to Rethinam, P India's share in the export of coir and coir products is sizeable whereas the export of other coconut based products is very negligible. Increasing global population and demand for coconut products, changing consumer preferences, intensifying safety and security concerns and

\textsuperscript{12} Lathika and Ajithkumar. C.E. “Growth Trend in Area, Production and Productivity of Coconut in India”, Indian Journal of Agricultural Economics, Vol 60, No.4, October – December, 2005, pp. 686 - 696
\textsuperscript{13} Rethinam, P. “Coconut – Steps for Yield Increase”, The Hindu Survey of Indian Agriculture, 2005 pp 89-92
shifting marketing networks have significant impact on the character and shape of the global market for coconut products.

At the same time critical developments like substitutes and increasing volatility of prices are a threat to the future of the coconut industry. Still increasing population world over and decreasing demand for coconut products widens the scope for increasing India's competitiveness provided productivity is increased and production cost is reduced, besides maintaining quality standards at international standard. According to Rethinam, of all the coconut based industries like copra making, oil making, cream making, milk powder making, desiccated coconut making, making coconut water concentrate and jam, vinegar, coconut water packing etc only oil and copra making dominate and their marketing only decides the price of the coconut.

The researcher concludes his study by pointing out the need for a more intensified approach in marketing strategy. Besides the efforts of the Coconut Development Board and the Government of India to popularize coconut water as a health drink, it is necessary that India should participate in international exhibitions and exhibit Indian coconut products for which the Gulf countries offer great opportunities.\(^\text{14}\)

Namasivayam.N and Richard Paul's.V, study highlights price spread in the marketing of coconut in the Theni District of Tamil Nadu. As per their analysis the marketing cost incurred by producers per thousand nuts was maximum (Rs. 630.18) in Channel II consisting of Producer Commission Agents –whole sellers –Retailers – consumers, followed by Rs. 610.00 in Channal III i.e Producer–Wholesaler–Retailers–Consumers. No marketing cost was incurred by producers in channel I consisting of Producers–harvest Contractors. Commission Agents–Wholesalers–Retailers– Consumers, because the marketing cost was met by the Pre-harvest Contractors. Commission Agents incurred no marketing cost because of their non-performance in the field of cutting, loading, counting, grading and transportation. It was also found that under Channel III, the

\(^{14}\) Rethinam P. "Coconut – Making Industry Competitive", *The Hindu Survey of Indian Agriculture*, 2004, pp.70-72
producers realized the maximum share of 58.73 per cent in consumer's price. Their share in channel II and Channel I was 58.32 percent and 50.20 percent respectively. Commission Agents got very meager margin with a small effort. Wholesalers got 6.02 per cent in Channel III, 4.57 percent in Channels I, and II respectively. The share of the retailers worked out to equal the cost off all channels. The study also revealed that the marketing efficiency was higher in Channel III followed by Channel II and Channel I.15

2.1.2 Medicinal Importance of Coconut

Balakrishnan Vaidyar have summarized the following medicinal uses of coconut,
1. Coconut cabbage: the meristematic shoot in the heart of the crown is known as cabbage. It is good for ‘vatha’ and ‘pitha’.
2. Coconut inflorescence: used for curing urinary complaints, back pain and headache.
3. Tender coconut: highly effective for dehydration due to cholera and dysentery.
5. Coconut water: recommended for curing impotency.
6. Coconut kernel: to increase body weight and also as an internal body cleaner.
7. Coconut milk: an ingredient of several ayurvedic preparations for skin and head diseases.
8. Oil: a variety of ayurvedic medicines are prepared.
9. Sweet toddy: it is effective for typhoid.

Sujatha. A. Nair rightly pointed out that the water of tender coconut is the finest drink in the world and it is a valuable gift of nature to mankind. It not only quenches thirst but also cures man’s most of the diseases and helps him regain his lost health. It contains glucose, fructose and carbohydrate contents. It

is easily digestible. It helps to purify urinary bladder. It contains a number of nutrients including protein, fats, minerals, chlorine, and vitamins B and C\textsuperscript{17}.

Srinivatsa highlights that coconut water at six months maturity possesses optimum taste, flavor of water. Due to the presence of sugar and various other enzymes, tender coconut water has a strong tendency to undergo biochemical changes and spoilage once nuts are harvested from trees\textsuperscript{18}. These complex biochemical reactions take place even when are kept together with the husk. Hence heat stabilization method is a popular method of preservation of different food and beverages for a long time.

Chattopadhyay pinpoints that tender coconut water is a very popular natural drink in west in Karnataka, Andhra Pradesh and Tamil Nadu it accounts for 25 to 40 percent of the total production\textsuperscript{19}. Thus coconut cultivation is augmented due to its medical importance.

Sathyanaryana Bhat has listed the medicinal properties of coconut and its application in ayurvedic and traditional treatment. According to him all the parts of the coconut ranging from root to crown have been utilized as an ingredient in the classical and traditional medicinal preparation. He mentions that the obtained product from boiling coconut water is very good for curing all wounds including burns on skin, skin diseases and joint pains. Vishwamitra Kalpa sneha coconut shell oil, an ayurvedic preparation, is an effective resayana for treating chronic skin diseases and joint pains. He also mentions his rich experience in the successful treatment of chronic cases of jaundice with a tonic (Kashaya) prepared from roots of coconut, arecanut pandanus (Kedige).

Coconut inflorescence is used for preparing a drink mixed with milk for three to four month pregnant ladies in order in to get a fair complexioned and healthy child as well to protect the child from infection and injuries due to external

\textsuperscript{17} Sujatha A. Nair, “Tender Nut Water A Floral Preservative”, Central Agricultural Research Institute, Port Blair, Indian Coconut Journal, Vol.29 No.12, 1999, p.5
\textsuperscript{18} Srivatsa, “Preservation of Tender Coconut Water in Pouches and cans”, Defense Food Research Laboratory, Sidharthanagar, Mysore, Indian Coconut Journal, Vol.29 No.12, 1999, p.7
\textsuperscript{19} Chattopadhyay, P K. “Coconut Situation in West Bengal” Indian Coconut Journal, Vol.29 No.12, 1999, p.9
shock. Coconut milk is also prescribed in ayurveda for alleviation of constipation, to ease movement of bowel and it also acts as a good antacid. Application of coconut milk on the scalp reduces body heat and provides cooling effect to the head, which also nourishes the hair. Jaggery made out of coconut todday (Neera) is a good source of sugar for diabetic patients. It is also given as a medicine in post natal care. A mixture of two spoons of coconut oil and a spoon of ghee is an ideal remedy for head ache, if the warm mixture is applied to the scalp for 15 to 20 minutes and then removed through bathing.

Inflorescence of coconut is used as an effective medicine for removing and preventing urinary stone and urine -genital bleeding. Wine made out of coconut water is a good tonic for easy digestion. Nalikera rasayana is an ideal tonic for human beings for enjoying a prolonged healthy life, which was used for centuries. Kajal, the narikalanchajan is an important ophtalmic preparation used in eye care. Lauric acid containing oil has anti-viral property. Sathyanarayana also informs that coconut is the tender food for heart, eye and diabetic patients.

Rajmohan points out that amino acid argentine present in coconut is heart protective and helps to increase blood flow in the circulatory system. He also says that coconut oil is not only a safe dietary fat but also it has beneficial effects if consumed as a part of normal diet.

According to Mali, P.C. et al., tender coconut for body tissues, increases blood circulation in kidneys in cases of profuse dialysis. According to ayurveda tender coconut water “is unctuous, sweet, digestion promoting and clear the urinary path”. It is a natural isotonic beverage with the same level of electrolytic balance identical to the balance in human blood. Morton Singh, chief of FAO’s agricultural industries and post harvest management services, says “Tender coconut water is the fluid of life”.

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2.1.3 Uses of Tender Coconut Water

Shiva has listed the uses of coconut water. It is an essential component in various ayurvedic preparations for its vast medical properties.

1. Recommended for gastro-enteritis.
2. Substitute for saline glucose in intravenous infusions.
3. Very effective against dehydration due to cholera, dysentery and vomiting.
4. Increases blood circulation in the kidneys and causes profuse dialysis.
5. Recommended for patients suffering from measles, mumps, chicken pox, etc.
6. Tender coconut leaves crushed in tender coconut water is given to jaundice patients.
7. Have ingredients capable of inducing rapid proliferation of plant tissues.
8. Used as bacterial and plant tissue culture medium.
9. Utilized for the development of various products as bottled coconut water.
   Coconut honey, coco sauce, and coconut lemonade and nata de coco.
10. Used as floral preservative for increasing the vase life of flower and foliages as well as in flower arrangements.
11. Eco-friendly in nature, it is low cost alternative to chemical preservatives such as Silver Thiosulphate, silver Nitrate, Nickel Chloride, which are hazardous to the environment. It contains of the constituents essential for floral preservatives. It can be stored under refrigeration to a certain extent i.e. 2 to 3 weeks.23

2.1.4 Cost and Cost of Production

Production of any form is a result of prudent and efficient utilization of different quantities of inputs. Cost of production is defined as the costs of all inputs aided for production. The farmer's profit depends on his cost of production.

Cost of production in general comprises four concepts, namely cost A1, cost B and cost C. The Directorate of Economics ad statistics used this concept in many of the cost of production studies and farm management studies. These four concepts are discussed below,

COST A1: It approximates the actual expenditure incurred in cash and kind. It includes of value of used human labour, value of bullock labour (owned and hired), machine labours, value of seed, manures and fertilizers, plant protection chemicals, irrigation charges, land revenue and less water rates, etc. interest paid on working capital and depreciation on implements, machinery, etc.

COST A2: Comprises cost A1, plus rent paid for leased land.

COST B: Includes cost A2 plus rental value of owned land plus interest on fixed capital, excluding land.

COST C: Includes cost B plus imputed value of family.

George and Joseph estimated cost of production of coconut taking into account all the capital as well as current expenditure with the rental value of land to represent the opportunity cost of land in raising some annual crop.24

A cost accounting study estimated to Madinan, arrive at explaining cost structure at levels of optimum combinations of factors of production.25

Singh investigated the economics of guava plantation in Alahabad District. They found that in investment cost on establishment of guava orchard up to the age of three years was higher than the rest of the period.\(^{26}\)

Alikhan Sadath and Raja Gopalan have worked out the establishment cost and maintenance cost of coconut production. They found that the annual share of establishment cost constituted 3.04 percent and 2.46 percent of the total cost of production in small and large farms respectively\(^{27}\). The cost of perennial crops like coconut is complicated and no uniform standard has been worked and followed in the earlier studies.

The above studies on cost include cost of bringing the palms up to bearing, which includes cost of land, land tax, land of seedlings, digging of pits, ploughing fencing, watering, maturing, cleaning, canals and tanks, leveling etc, and maintenance cost which includes cultivation operations, manuring, harvesting and collection of nuts and other. The above studies take into account the direct cost of cultivation. There are some indirect costs also in cultivation and marketing that is not focused by the above studies.

According to Haridoss and Muthuraj, the economic viability of the investments on coconut crop has to be evaluated, taking into consideration the life span of the crop. In order to measure the Productivity of capital, the present the Net present Value, the Benefit cost Ratio, the Internal Return and pay Back Period are applied\(^{28}\).


\(^{27}\)Alikhan Sadath, HA and Rajagopalan V, "An Economic Analysis of Coconut Production in Tiptur Taluk of Tumbar District, Karnataka (Mysore), The Madras Agricultural Journal*, 66(9), 1979, pp.582-586.

2.1.5 Employment Potential

Adoption of any cropping system by the farming community will be decided by its economic advantages. Singh and other say that the micro cropping of coconut provides employment opportunities for only around 150 man days per hectare per year and gives a net income of Rs.10, 400. The coconut – bases High Density Multi cropping systems have been enabled to generate additional employment to the tune of 130 to 606 man days per hectare per year and the net returns from Rs 18670 to Rs 50,000 per hectare29.

Singh also observes that about 10 million people are in the trade activities30.This Multi Stage High Density Cropping System increases employment opportunities of family labour and hired labour.

According to Nampoothri and others, the coconut palm is mainly a small holder’s crop that is ecologically sound offering a broad range of products and providing income and employment opportunities. More than 10 Million families are directly or indirectly depended upon it for their livelihood”.

Coconut cultivation increases employment opportunities. High Density Multi Cropping System generates additional employment to the tune of 130 to 606 man days per hectare per year. Thus coconut cultivation offers a wide employment potential to family and hired labourers.

2.1.6 Agricultural Marketing

Agricultural marketing is the application of all marketing activities in the movement of agricultural products from the producer to the consumer. According to Thambi, agricultural marketing is not mere selling or distribution but it embraces all the activities that begin with ascertaining the needs of the consumer and the market opportunity setting up production to meet the

30Singh, H.P. op.cit.p.5
anticipated demand, pricing, distribution advertising and cultivation in the scale of product, hopefully a small profit.\textsuperscript{31}

The above studies on agricultural marketing embrace all the activities that begin with ascertaining the needs of the consumer, to meeting the anticipated demand, pricing, distribution and advertising of the products.

According to Subburaj and Singh, coconut farmers adopt two modes for disposal of their coconuts. One is the direct method and the other the indirect method. Under direct method coconut farmers sell their products directly to the consumers, either in or outside their village. In the indirect method, there exists a number of intermediaries. They include inherent traders, brokers, and agents of whole sale traders, agents of processing units, traders-cum-lease holders, big farmers-cum-traders, big farmers-cum-leaseholders, whole sale sellers and retailers. They also point out that direct mode is popular among farmers possessing a few coconuts. Two third of coconut farmers have adopted the indirect mode of disposal.\textsuperscript{32}

2.1.7 Marketing Conditions of Coconut

Market as defined by economists does not refer to any particular place in which things are bought and sold, but the whole region in which buyers and sellers are in such free interaction with one another, that the price of some goods tends to equality and quickly to another.

Clark has defined market as a centre about which or an area in which forces leading to exchange of title to a particular product operated and towards which and from which actual goods tended to travel.\textsuperscript{33}

\begin{itemize}
  \item \textsuperscript{31}Nampoothri K.V.K., "Milestones in Coconut Research", \textit{Indian Coconut Journal}, vol. 29 No4, 1998, p.28
  \item \textsuperscript{32}Subburaj B and Singh R.K., "Marketing of coconuts: disposal Strategies of Farmers", \textit{Indian Coconut Journal}, Vol. 33 No. 2003, p.1
  \item \textsuperscript{33}Trousely Clark and Clark E., "Principles of Marketing Rubber", London: The Macmillan Company 1962, p.20
\end{itemize}
Philip Kotler considers market as the set of actual and potential buyers of a product. The market could grow around a product or service or anything else of value. Market is some sphere or space where the forces of demand and supply are at work to determine or modify price as the ownership of some quality of good or service transferred and certain physical and institutional arrangements may be in evidence.\textsuperscript{34}

Kohle and Joseph have defined marketing as the performance of all business activities involved in the flow of goods and service from the point of initial production until they reached the hands of ultimate customers.\textsuperscript{35}

### 2.1.8 Returns of Coconut Cultivation

Returns in farm enterprises are used as an indicator of efficiency of business and efficiency of resource used in farms. Return from farm business is computed in the form of gross income and net income. Farm business income and net income as used by different authors in their studies are given below.

Kaul and Mehta have defined gross income as the value of farm products that consisted of cash value of produce actually sold and the value of the remaining produce evaluated at the prevailing rate in the village.\textsuperscript{36}

Singh and Jha have defined net income of the farms as the gross income less variable costs of farm business as a whole.\textsuperscript{37}

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2.1.9 Problems of Coconut Cultivation

The earliest record of the outbreak of the root (wilt) disease was from Era Hupeta area of the Meenachil Thaluk, Kottayam District in 1874. Later this was reported from Kaviyoor and Kalloopa of Thiruvalla Thaluk. Now it has spread to an area of 4.68 lakh hectares which is about 50 percent area under coconut in Kerala. This disease occurs in a continuous manner in eight out of the fourteen districts in Kerala and sporadically in the northern districts of the state.

Mathew Kutty also observes that the most consistent and diagnostic symptom of the root (wilt) disease is the characteristic bending of the leaflets named 'flaccidity'. Foliar yellowing and marginal necrosis are the other associated symptoms. Rotting of root system, drying up of spathe and necrosis of spolcelets are also observed.

Delayed flowering and even non-flowering are observed in palms in pre bearing age. There is reduction in yield in the affected bearing palms. The disease is prevalent in all soil types. The nuts from diseased palms have thinner husks and fibers which are weaker and less firm. The kernel is thinner and never dries into hard copra, but remains soft and flexible. The oil content is very much reduced and oil loses its flavour

Srinivasan reports that the productivity of the coconut crop is constrained by various stresses. Among them the root (wilt) disease is the major problem in southern districts of Kerala and Tamil Nadu and also in Goa.

Srinivasan also reports that the root (wilt) affected palms are also affected by leaf rot. Incidence of leaf rot increases with an increase in the incidence of root (wilt).

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40Srinivasan N, "op.cit.p.10
Mathew Kutty reports that the leaf rot is another disease normally found super imposed on the coconut root (wilt) affected palms, which will reduce the growth and yield of the palms.41

Srinivasan and Gunasekaran have assessed the nature of the leaf rot disease. Leaf rot disease is considered as one of the devastating problems. They have assessed the quantitative pattern of fungal association and species composition of the disease42.

Karthiheyan pointed out that leaf blight disease causes serious damage in nursery plants and adult plants. The vigour and growth of coconut seedlings are affected by the disease in the nursery. Coconut seedlings of above four months ago are susceptible to the disease. Height of seedlings, leaf production and girthed at collar were reduced by 10.4, 20.1 and 12.5 percent respectively in diseased seedlings as compared to healthy seedlings. The nut yield of adult coconut palms was reduced to the extent of 10.0 to 23.6 percent due to this disease43.

Srinivasan also quotes that the black rat, Rattus Linn, is an important rodent pest of coconut in most of Lakshadweep islands. It damages 35-50 percent of the standing crops44.

Sathiamma says that mites on coconut palm are world wide in distribution. They were recorded from 31 countries of the world. She also states that the presence of colonies of eriphyid mites in perianth region of the immature nuts affect the coconut by sucking the sap from the tender meristematic tissues45.

44Srinivasan N., op. cit p.2
Kamalakshimma and others quote that boron is considered to be one of the essential micro nutrient elements for plant growth. It was reported in Assam, West Bengal, Kerala and other parts of the world. They concluded that deficiency of boron causes malformation of various types and shapes in the leaves as well as in the nuts resulting in shunted growth and low productivity in coconut\textsuperscript{46}.

P.S Surendrakumar conducted a study in a coconut garden at Gobichettipalayam in Erode District and found that red palm weevil causes yellowing and wilting of leaves of the inner whorls and presence of circular hole on the stem with the brownish black viscous fluid oozing out, longitudinal splitting of petioles and emission of an odour from the damaged portion of the crown indicate the infestation of the pest\textsuperscript{47}.

Sadakadulla points out that adult weevil are attracted towards wounded palms where they lay eggs and all stages of life cycles are completed inside the palm. Large number of groups tunnel into the internal tissues and feed on the terminal bud or trunk of the palm leading directly to death of the palm\textsuperscript{48}.

According to Vijayan and Natarajan, Thanjavur wilt or ganoderma wilt disease is the most destructive one in Tamil Nadu. It was first noticed among coconut palms in Thanjavur District of Tamil after the cyclone of 1952 and hence the name Thanjavur wilt. A disease of coconut almost similar to ganoderma wilt is symptom logy and etiology which is prevalent in Andhra Pradesh, Karnataka, Maharadhtra and Gujarat.\textsuperscript{49}

\textsuperscript{47}Surendra Kumar P. S, “Effective ways for Management of Red Palm Weevil by Pheromone Trap”, \textit{Indian Coconut Journal}, Vol. 33 No 1, 2002, p.6
Nambiar and Rethinam refer to this stem rot or ganoderma root rot or basal stem rot or ganoderma wilt or ganoderma disease or anabe. Wilson reported the occurrence of a basal stem rot disease in coconut in Kerala. Baskaran and Ramanathan report that in 1978 the ganoderma disease was first noticed all over districts of Tamil Nadu and incidence ranged from 0.6 to 4.9 percent. Maximum incidence was recorded in Thanjavur District with a mean of 4.9 percent, followed by Chengalpattu District with 4.5 percent incidence. In Thechittur the incidence was 8.0 percent, Arthanaripalayam 5.45 percent, Chethalalpalyam 3.5 percent, and Nadupuni 3.33 percent.

Apuurba Bandyopadhyay and Khan reports the status of mite infestations in West Bengal. In earlier years there were no serious pest and disease problems of coconut in West Bengal. But recently atrophied mite infestation in coconut has been suspected based on the symptoms observed in tender coconut nut. The symptoms are characteristics of atrophied mite injury on coconut. The first infestation of atrophied mite was seen in Kerala in 1998, Karnataka 1999-2000, lakshadweep 1999-2000, Andhra Pradesh 2000, Orissa 2001, Maharashtra A and GAO 2002 and west Bengal 2002.

According to Mathew Kitty, leaf rot is another disease normally found super imposed on the coconut root wilt affected palms which can drastically reduce the growth and yield of the palms.

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50 Nambiar K.K.N. and Rethinam, “Tanjavur wilt Ganoderma disease of coconut” Pamphlet No.30, CPCRI, Kasaragod, Kerala, p.10
According to Sesame, coconut palms under homestead and plantation situation suffer considerable damage due to the infestation by nematodes right from the seedling stage. Of the 78 nematode species reported on coconut, the most important enoparrasites are red raring nematode and the burrowing nematode which cause considerable damage to the nuts. It is the major problem faced by the coconut industry in Caribbean, Central and South America.55

Desai points out that coconut palm is attacked by 107 pests among them the leaf eating caterpillar is one of the major pests. It infests the coconut palm throughout the year with varying intensities. Under varying conditions sporadic outbreaks lead to severe damage. A peak infestation occurs during the months of February to May which may even prolong to June in case of delayed monsoons.

Caterpillar lies on the lower surface of leaflets in galleries and feeds on chlorophyll. Dry and green patches which appear on the lower surface of leaves are major symptoms of infestation. Palms of all ages are susceptible to infestation by black headed caterpillar.56

The coconut palm is severely affected by number of diseases. The above studies focus their attention on root (wilt) disease, leaf rot black rat (a rodent pest of coconut), mites deficiency of boron leaf blight disease, red palm weevil, Thanjavur wilt of ganoderma wilt, ganoderma root wilt, or basal stem rot, mite infestation, infestation by nematodes, black headed caterpillar, etc. These studies explain the diseases of coconut palms. A number of other problems are also faced by cultivators.

56 Dasai V S, “Biological control of coconut, Block headed caterpillar, opisina are nosella W/K”, Indian Coconut Journal, Vol 34, No.7, 2003, p.6
Chowdry pinpoints the following problems of coconut cultivation in Assam. First, there is lack of awareness of the farmers on recent developments related to crop improvement, crop protection production and cropping system; Secondly, there is a lack of Quality planting materials to the farmer; Thirdly, lack of proper management practices, as coconut is grown in a very uncared condition without applying fertilizer and irrigation; Fourthly, pest problems and finally, diseases. The coconut palm is affected by a number of diseases caused by fungi and phytoplasma resulting in different degrees of crop loss.57

Nagarajan S.S has found from a study of coconut productivity in the Rangasamudram Village of the Coimbatore district of Tamil Nadu, that 75 West Coast tall variety palms per acre receiving regularly both organic and inorganic manures at the rate of 30 kgs of farm yard manure 1 kg of urea, 2 kgs each of super phosphate and muriate of potash, 1 kg of micro-nutrient mixture and 2 kgs of powdered neem cake per palm per year has resulted in a yield of 100 nut per tree per year. The nuts are sold locally at an average price of Rs.4/- per nut. The annual cultivation cost per acre is Rs. 12,000/- Gross revenue is around Rs. 30,000/- and the net income is Rs.18,000/-. But after application of silt over the entire extent of the garden prior to the onset of monsoon every year, productivity per year increased to 120/- nuts per year raising the total revenue per acre to Rs.36, 000/- at an additional cost of Rs.3000/-. Net income per acre rose from Rs.18, 000/- to Rs.21, 000/-. Nagaranan concludes that regular application of silt containing organic matter stimulates soil life, helps multiplication of earth-worms and improvement of physical properties of soil. Ultimately use of synthetic fertilizers can be minimized or even dispensed with as this system depends on the primary production capacity of the soil and positive biotic interactions. It also suggested that raising intercrops like banana and turmeric will fetch more income for the coconut former58.

Sugata Ghose gives a brief sketch of the different stages in the progress of coconut production in India since independence and points out the encouraging trend after the formation of the Coconut Development Board in 1981. The efforts of the Board resulted in increase in production and productivity and by 1996 total production were 13.9 billion nuts with the index reaching the all time high of 425.6 points. Productivity increased to 7779 nuts per hectare. Even though a slight decrease occurred during 1996 to 98 total production was maintained at the level of 13 billion nuts and India becomes the highest producer of coconut in the world.\(^59\)

Jose Mathew advocates the advantages of drip fertigation as successful technology for integrating irrigation and fertilization. According to him irrigation and fertilization are the two most critical management factors that influence growth, yield and quality of agricultural crops. The use efficiency of these inputs is very low in India i.e. 30 to 40 per cent. This leads to low crop productivity, degradation of soil health, and increased environmental pollution apart from the wastage of substantial quantity of these costly and scarce inputs. Adoption of Drip Fertigation technology has opened up new possibilities to optimize and integrate the use of water and fertilizer enabling to harness high crop yield and ensuring a healthy soil and environment.\(^60\)

Christopher Lourduraj et. al., point out the decline in coconut production in Kerala and the increasing trend in area and production in Tamil Nadu. According to them the increasing trend in Tamil Nadu is due to changing trends in agriculture, non availability of labour, escalation of wages, conversion of area under annual crops into coconut plantations, higher profits from coconut etc. Based on the survey conducted in the Pollachi Tract in 1991, these researchers attribute decline in productivity to lack of interest on the part of the small and medium farm holders in irrigating or fertilizing the plantations and negligence in

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taking timely plant protection measures. These researchers suggest regular fertilization and plant protection are a must to increase productivity. According to them the possibility of utilizing coconut by-product and land use efficiency by planned intercropping have contributed to the increase in coconut area\textsuperscript{61}.

Halli.R is optimistic about the scope for India to improve and increase her coconut production. Coconut research concept initiated in the Nileswar Coconut farm in Kerala as far back as 1916\textsuperscript{6} became a centre of global attraction during 1934-1936. In this farm the first hybrid coconut seedlings were produced under the guidance of J.S. Patel of the Department of Agriculture of the Madras State. But the coveted discovery only remained as an achievement of the researchers for some time. The credit of effecting a break through by giving shape to the largest Hybrid Coconut Seed Garden on the picturesque plains of Kodimangalam near Nagamalai, 17 miles away from the temple city of Madurai, goes to the large hearted scientists of the Central Plantation Crop Research Institute and the Coconut Development board of India. In this farm seed nuts are collected every month from about 4000 tall and 7500 parent palms once the nuts attains 12 months maturity. Seed nuts, thus collected give over 90 per cent true seedlings. The D and T hybrid seedlings produced by crossing Malayan Dwarf X Tiptur Tall, Malayan X Andaman Ordinary, Malayan Dwarf X West Coast Tall, and Malayan Dwarf X East Coast Tall have excellent performance. They start flowering from the third year. The genetic potentiality of hybrids and their high yielding capacity have revolutionized coconut production. The commercial production of coconut seedlings will certainly lead India to greater heights in the global coconut production front and even open opportunities to export labeled hybrid seedlings to the other coconut producing countries.\textsuperscript{62}

\textsuperscript{61}Christopher Lourduraj, A and Mylswamy. V, “Coconut to Increase Productivity”, \textit{Kisan world}, Vol. 24, No 1, January 1997, p 54
Iyer R.P Bhaskara Rao E.V.V and Govinda Kutty M.P are of the opinion that the rural economy of the state is very much dependent upon coconut production, processing and marketing. Even though it is very difficult to ensure information on productivity of a crop like coconut, there is evidently a decline in yield. However, they are optimistic that the present efforts to preserve the high yield potential in subsequent generation of non-proponent elite palms through tissue culture will be rewarding if only growers extend their cooperation for carrying out scientific investigation for taking coconut to new levels of productivity.63

Dealing at length with varied uses of coconut palm products Markose V.T., Chief coconut Development Officer of the Coconut Development Board, Kochi says that coconut contributes more than Rs.7000 crores annually to the GDP. The importance of coconut as a food item may be gauged from the fact that 60 per cent of its production is consumed in households as raw nut. Its by products are utilized for making value added products. Although coconut has assumed considerable significance in our national economy, proper technology needs to develop for utilizing coconut and other palm products like husk, timber, shell and leaves. Being an environmentally friendly tree, which can adapt to wide range of soil types it offers employment opportunities to about 10 million people. With the development of value added products like coconut cream, coconut honey, coconut skimmed milk, tender coconut water, etc., coconut offers ample investment opportunities also. The researcher says that the mineral water boom in the country is an indication of the scope for increasing the use of tender coconut water as a natural soft drink. Since the coconut products are in great demand in the domestic and international market, there arises the urgent need to develop the technology of quality improvement and exploit the vast potential to earn valuable foreign exchange through exports. He is optimistic that with the advancement in technology, product diversification and byproduct utilization, the coconut industry in India has a ruminant future. Markose suggests that with the

change in planting system and a reduction of planting density, different food crops and spices can be successfully introduced under a coconut based farming system so as to augment the production of food and spices crops along with coconut.64

Sri kumar Poduval gives out a list of technologies available with the Coconut Development Board for assisting the entrepreneurs in the preparation of project reports for promoting coconut based industries. The Board’s special attention is to develop small scale cottage industries in the coconut processing sector by providing technical and financial assistance in the form of subsidies and soft loans under the buy-back arrangements. Sri kumar emphasizes that the medium and large industries should come forward to encourage small scale units and assist them in areas like technology transfer, finance and expertise. Further the Research and Development in the coconut processing sector should concentrate its attention on the development of appropriate technology in coconut processing to the advantage of farmers, small scale processors and for regional development. More over research collaboration between coconut researchers both within India and other coconut producing countries should be maintained and the possibility of establishing a network within the county and among the coconut producing countries should be explored so as to exchange information on various technologies for mutual benefit.65

Nair M.K and Rajesh M.K give a clear exposition of coconut area, production and productivity in the country and attribute the following factors for increasing production and productivity. (1) High Yielding varieties and hybrids, (2) Manures and fertilizers, (3) Irrigation, (4) Inter cultivation, (5) Pest and disease management. They also point out the major production constraints viz; (1) The wide gap between the demand and supply of quality of seedlings, (2) Smallness

64Markose. V T. “Coconut Assured Bright Future”, The Hindu Survey of Indian Agriculture, 2000, pp. 89-
of holdings where the farmer raises other crops for meeting his requirements viz: nuts, fruits, vegetables, tubers and even fuel and the consequent neglect of coconut (3) Over crowding of palms (4) Insufficient and improper application of manure (5) Irrigation constraints.

These researchers suggest that following strategies for improving production and productivity. (1) Establishing seeds garden to produce seedlings of already proven high-yielding varieties (2) Identifying varieties suitable for different agro climatic conditions (3) Evolving hybrids and varieties tolerant to important diseases (4) Developing location specific fertilizer and irrigation taking into consideration soil characteristics, rainfall, distribution, temperature, relative humidity, nutrient status, ground water level etc. (5) Effort should be continued to design the already developed pest management technologies to reduce crop loss.

According to Nadarajan. C, et.al, all the hybrids developed in the Coconut Research Station at Veppankulam in Tamil Nadu is superior in yield performance. This variety has been developed through cross pollination between well adopted local ecotypes East Coast Tall as ovule parent and Malaysian Orange Dwarf as pollen parent. The Performance of ECTXMOD in comparison with VHC2 on hectare basis shows that the former recorded 22570 nuts hectare as against 20950 nuts in VHC2. The analysis of nut components indicated that the copra content VHC 3 is 162g/ nut as against 146g in VHC 2. The new hybrid also gave a high oil yield of 2.55 tones per hectare.

Pandalai K.M describes the wide adaptability of the coconut palm which can tolerate a very wide range of soil and climatic conditions. Though the palm is described as essentially a native of the tropics, thriving well within 23 North and south latitudes and up to an altitude of about 3000 feet above sea

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level; it is a sea-side palm flourishing in a sea washed well drained coast with constant moving water in the soil in an atmosphere of saline moisture. The palm has been found to grow in a variety of soil types-white or gravelly sand, alluvial soils, literate soils, peaty or kary soils, estuarine deposits, lime-stone derived soils, volcanic pumice soils, marine, granite and coral soils. The best soil, however, appears to be a rich alluvium or loam having proper soil moisture and drainage as found in the backwater areas of Travancore, Cochin, Malabar and the deltaic tracks of the Godavari. Coconut palms come up well in sandy soils especially of the littoral type, provided there is an assured supply of good underground water within easy reach of the roots and proper manuring.68

Ganesan. K.P points out that after the removal of restriction on the import of 715 items, India faces stiff competition in coconut and coconut oil from the Philippines and Indonesia.69

Maheswari. P.C, et-al, in their study on 'Marketing Strategies for Coconut' point out that, in spite of the fact India accounts for 25.57 per cent of the world production of coconut, the present system of marketing of coconut and its products is by and large unscientific and unorganized and is almost lacking in vertical integration. Coconut is a notified commodity. Still the absence of an efficient marketing system provides sufficient opportunities for middlemen to exploit the market. In almost all primary markets, they normally dictate the prices. Further there are several malpractices in the coconut market. Apart from this, during the past two decades there had been abnormal price fluctuation-both seasonal and cyclical. According to these researchers the chief marketing problems are: (1) Farmers are unaware of the current market price of coconut. They are unable to understand the methodology involved in fixing the price based on recovery percentage. (2) Farmers do not have proper storing facilities.

to keep their produce until; higher prices prevail in the market during lean seasons. (3) Import of palm oil and vegetable oil form abroad tells heavily on the prospects of coconut cultivators and oil millers. (4) Credit purchase of coconut by merchants from the garden itself and irregular and delayed payments of the low prices also ready fixed deprive the producer of his right to get fair prices. (5) Though coconut is a notified product, it is not marketed through regulated markets.

These researchers suggest the following promotional activities: (1) Improving quality for export promotion (2) Reduction of cost of production (3) Product diversification and by product utilization. Diversification should be done at the farm level itself (4) Formation of Coconut Committees in each Block considering of representatives from the Agricultural Department, Coconut Board and growers to discuss coconut production and marketing problems (5) To achieve market promotion and consumer awareness, extension programmes should be carried out by conducting trade fairs and exhibitions (6) Cooperative marketing (7) Restriction of import of copra and edible oils (8) Revival of future trading (9) Integrated multi-cropping (10) Establishment of display and sales outlets for the processed products (11) Establishment of Coconut Technological Development Centers in the main coconut growing areas.

Chandran.C in his intensive study on 'Coconut Marketing in Tamil Nadu' explains the marketing practices such as harvests, grading, packing, marketing channel and the like and throws much light on the marketing cost, margins, price spread, effect of variations in the consumer's price on the share of the producer, seller and the retailer as well as in the efficiency of the market system. Besides analyzing the problem faced by the traders in coconut marketing, the researcher concludes his study saying that marketing efficiency is high due to fewer

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middlemen and low marketing margin and the producer's share is inversely related to consumer's price while the retailer's share is positively related to consumer's price.\textsuperscript{71}

Kameswara Rao.P points out that coconut in Andhra Pradesh is marketed in three major forms viz: dry coconut, copra and coconut oil. The only market for these items in the state is Ambajipeta. Palakol in West Godavari is the centre for water coconut marketing. Nearly 2 percent of the coconut produced is marketed as water coconut and 30 per cent as dry coconut. The rest is marketed either as copra or oil or as both based on market demand. But coconut trade is facing certain problems including high degree of price fluctuations. All types of marketing channels viz: farmer, middle men, wholesaler and retailer exist. The existing market committees are not working properly. Most of them lack minimum facilities like sufficient yards and godowns. They collect market cess without providing required facilities. The dry coconut is mostly exported to Rajasthan, Madhya Pradesh and Maharashtra. Even transport has become a major constraint. Upto the 80's 99 per cent of the trade utilized rail wagons for transport. Thereafter the railways stopped allotting wagons. Instead rackes were allotted. It is highly impossible to avail this facility because quantities have to be polled over long period to load one racke, which causes spoilage of the commodity. Therefore road transport is resorted to. It is not only costly but also causes hardships to the traders.\textsuperscript{72}

Kaul G.L has dealt with the global competitiveness of coconut industry. He points out that coconut as a traditional crop, particularly in the third world, has not received the benefit of improved management technologies and market promotion. He has analyzed the magnitude of threats facing the coconut industry such as competition from other oil-seed crops, low profitability,

fluctuating prices, misconceptions about coconut oil as edible oil and inconsistent supplies of coconut products. He suggests the following strategies for ensuring a better future for the coconut farmers: (1) major effort should be made to improve productivity in all the countries including the coconut producing states of India (2) productivity improvement requires greater research efforts to develop high-yielding varieties with large nut size and resistant to major maladies, besides being drought tolerant. (3) Intensification of land-use in the coconut gardens (4) Bringing down the cost of production which needs urgent consideration (5) Steps to reduce dependence on coconut oil as an edible oil and intensified efforts towards diversification for developing different products which are more profitable (6) Product development strategy would have to be supported by strong marketing support for expanding the demand through identification of new markets and undertaking a vigorous promotional campaign to counter the propaganda against consumption of coconut oil and product on health grounds. Kaul concludes that avenues are available to reduce the impact of the threat to the coconut industry. What is required is a strong political will, supported by major Research and Development efforts with a more open and strong global coordination to ensure a bright future for the coconut industry.73

In an exhaustive study of the current status of the coconut industry Punchideva. P.G says that one of the fears expressed in the sixties regarding the future of the coconut industry, apart from stagnation in production, was the restrictive nature of the market. However, product diversification and value addition brought in its train diversification of international coconut market too. Today more than 100 countries import coconut oil in big or small quantities. America and Europe still dominate the trade. Asian countries are increasingly getting into it and they emerge as key importer of desiccated coconut. Apart from the traditional products, new products are finding their way to new markets. Coconut shell charcoal is bought by more than thirty countries in the form of

activated carbon, chief among them being U.K., France, Belgium, Holland, Japan, Korea, Taiwan, South Africa and Australia. There cannot be any country in the world where some part or derivative of coconut is not used in the daily life today, in the form of vegetable oil, margarine, beverage, bakery item, sweets, soap, shampoo, cosmetic, pharmaceuticals, carpets, rugs, hand crafts, brushes, mattresses furniture or as peat. Still competing substitutes pose a threat to coconut industry.  

Choudhury, D in his study "Problems and Prospects of Coconut Cultivation in Assam" pinpoints the following problems of coconut cultivation in Assam. First, there is lack of awareness of the farmers on recent developments related to crop improvement, crop protection, production and cropping system. Secondly, there is a lack of quality planting materials to the farmers. Thirdly, lack of proper management practices, as coconut is grown in a very uncared condition without applying fertilizer and irrigation. Fourthly, pest problems and diseases caused by fungi and phytoplasma result in different degrees of crop loss.  

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2.2 Socio-Economic Conditions of Sample Respondents

The socio economic conditions of the sample farmers are analysed on the basis of age, sex, education, experience, family size, size of operational landholdings and the like. These are the main criteria which will highlight the economic aspect of coconut cultivation in the study area.

2.2.1 Age-Wise Classification

Age is an important factor to determine the socio-economic conditions of the sample respondents. The age wise distribution of the sample respondents is clearly shown in the table 2.1

<table>
<thead>
<tr>
<th>Age wise categories</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Below - 25</td>
<td>5</td>
<td>4.13</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>26-30</td>
<td>8</td>
<td>6.61</td>
<td>2</td>
<td>6.06</td>
</tr>
<tr>
<td>31-35</td>
<td>28</td>
<td>23.15</td>
<td>9</td>
<td>27.27</td>
</tr>
<tr>
<td>Above 36</td>
<td>80</td>
<td>66.11</td>
<td>22</td>
<td>66.67</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is revealed from the table 2.1 the highest percentage of the coconut farmers come within the age group of above 36. Their percentage is 66.11 for marginal farmers, 66.67 are small farmers, 63.63 percent for medium farmers and 50 percent for large farmers. The second place goes to the age group of 31-35 years which constitutes 23.15 percent for small farmers, 27.27 percent for small farmers and medium farmers and 33.33 percent for large farmers. 6.61 percent of the marginal farmers, 6.06 percent of small farmers, 9.10 percent of
medium farmers and 12.50 per cent of large farmers are of the age group of 26-30 years. Very negligible of coconut farmers are of the age group of below 25 years and their percentage is 4.13 for small farmers and 4.17 for large farmers of the sample respondents interviewed in the study area.

2.2.2 Sex-Wise Classification

The sex wise classification of the sample respondents are analysed in the table 2.2

Table 2.2 Sex-wise distribution of the sample respondents

<table>
<thead>
<tr>
<th>Sex-wise categories</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>97</td>
<td>80.17</td>
<td>26</td>
<td>78.79</td>
</tr>
<tr>
<td>Female</td>
<td>24</td>
<td>19.83</td>
<td>7</td>
<td>21.21</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

Out of 200 farmers who were interviewed in different categories of sample farmers 87.50 percent were male and 12.50 were female. This shows that proper representation was not given to females in the study area.

2.2.3 Educational Wise Distribution

Kanyakumari district is a highly educated district in Tamil Nadu. In the study area all the sample respondents are educated. The educational status of the sample respondents are shown in the table 2.3
Table 2.3 Educational wise distribution of the sample respondents

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Primary</td>
<td>13</td>
<td>4</td>
<td>12.12</td>
<td>1</td>
</tr>
<tr>
<td>Secondary</td>
<td>52</td>
<td>10</td>
<td>30.30</td>
<td>10</td>
</tr>
<tr>
<td>Higher Secondary</td>
<td>33</td>
<td>12</td>
<td>36.37</td>
<td>8</td>
</tr>
<tr>
<td>College &amp; others</td>
<td>23</td>
<td>7</td>
<td>21.21</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>33</td>
<td>100.00</td>
<td>22</td>
</tr>
</tbody>
</table>

Source: Primary data

The above table shows the educational status of the sample coconut respondents. It is known that all the respondents are literates. Among the total of 121 marginal farmers 10.74 percent completed their primary education, 42.98 percent completed their secondary education, 27.27 percent completed their higher secondary education and 19.01 percent completed their higher studies. Out of the 33 small farmers 12.12 percent completed primary education, 30.30 percent completed secondary education, 36.37 percent completed higher secondary education and 21.21 percent completed college and other education. Among the 22 medium farmers 4.55 percent completed primary education, 45.45 percent secondary, 36.37 percent higher secondary and 13.63 percent other higher education. Out of the 24 large farmers in the study area 8.33 percent completed primary education, 33.33 percent secondary, 29.17 higher secondary and 29.17 higher education.
2.2.4 Occupational Wise Distribution

The occupational status indicates the socio-economic atmosphere of the sample respondents in the study area. It is shown in the table 2.4.

Table 2.4 Occupational wise distribution of the sample respondents

<table>
<thead>
<tr>
<th>Occupational Level</th>
<th>Marginal Farmers</th>
<th></th>
<th>Small Farmers</th>
<th></th>
<th>Medium Farmers</th>
<th></th>
<th>Large Farmers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Government job</td>
<td>13</td>
<td>10.74</td>
<td>4</td>
<td>12.12</td>
<td>2</td>
<td>9.09</td>
<td>5</td>
<td>20.83</td>
</tr>
<tr>
<td>Agriculture</td>
<td>48</td>
<td>39.67</td>
<td>13</td>
<td>39.40</td>
<td>9</td>
<td>40.91</td>
<td>10</td>
<td>41.67</td>
</tr>
<tr>
<td>Private job</td>
<td>28</td>
<td>23.14</td>
<td>9</td>
<td>27.27</td>
<td>7</td>
<td>31.82</td>
<td>6</td>
<td>25.00</td>
</tr>
<tr>
<td>Wage earners</td>
<td>1</td>
<td>0.83</td>
<td>-</td>
<td>0.00</td>
<td>2</td>
<td>9.09</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>Others</td>
<td>31</td>
<td>25.62</td>
<td>7</td>
<td>21.21</td>
<td>2</td>
<td>9.09</td>
<td>3</td>
<td>12.50</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
<td>22</td>
<td>100.00</td>
<td>24</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is observed from the table majority of the sample farmers main occupation is agriculture and allied activities, they are 39.67 percent of marginal, 37.40 small farmers, 40.91 percent medium and 41.67 percent large in the study area. Next to agriculture private jobs occupy a dominant role in the study area which contributes 23.14 percent marginal, 27.27 percent small farmers, 31.82 per cent medium and 25 per cent large farmers. Government employees also play a vital role in coconut production in the study area they are 10.74 per cent marginal, 12.12 per cent small, 9.09 percent medium and 20.83 per cent large. Wage earners and other workers also cultivate coconut in the study area they are 26.45 per cent medium farmers, 21.21 per cent small farmers, 18.18 per cent,
medium farmers, and 12.50 per cent large farmers in the study area. Further it is pointed out by the table wage earners are small in numbers in the study area.

2.2.5 SIZE OF FAMILIES

The size of family of the sample cultivators in the study area are presented in the table 2.5

Table 2.5 Family size of the sample respondents

<table>
<thead>
<tr>
<th>No.of family members</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>5.79</td>
<td>3</td>
<td>3.03</td>
</tr>
<tr>
<td>3</td>
<td>41</td>
<td>33.88</td>
<td>12</td>
<td>36.37</td>
</tr>
<tr>
<td>4</td>
<td>34</td>
<td>28.10</td>
<td>5</td>
<td>15.15</td>
</tr>
<tr>
<td>Above 5</td>
<td>39</td>
<td>32.23</td>
<td>15</td>
<td>45.45</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

The above table points out that majority of the families in the study area is above 5 members that is 32.23 per cent are marginal farmers, 45.45 percent small, medium farmers and 54.17 per cent are large farmers. 28.10 per cent of marginal farmers, 15.15 per cent small farmers, 18.18 per cent medium farmers and 8.33 percent large farmers are having the total of 4 family members. 33.88 per cent of marginal farmers, 36.37 per cent of small farmers 27.27 per cent of medium farmers and 37.50 per cent large farmers are having the family size of 3 members the main reason is high family planning awareness among the respondents. 17.92 per cent of marginal, small, medium and large are only two family members in the study area.
2.2.6 Opinion about Yield of Coconut Production

Opinions about the yield of coconut production were gathered from the different categories of coconut cultivators in the study area and presented in the table 2.6.

**Table 2.6 Opinion about yield of coconut production**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Below Average</td>
<td>59</td>
<td>48.76</td>
<td>12</td>
<td>36.37</td>
</tr>
<tr>
<td>Average</td>
<td>40</td>
<td>33.06</td>
<td>14</td>
<td>42.42</td>
</tr>
<tr>
<td>Normal</td>
<td>22</td>
<td>18.18</td>
<td>7</td>
<td>21.21</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is revealed from the table 48.76 per cent marginal farmers, 36.37 percent small farmers, 45.46 percent medium farmers, and 41.66 percent large farmers opined that the coconut production in the study area is poor and below average due to high cost of production and less yield per hectares. 33.06 per cent marginal farmers, 42.42 small farmers 27.27 per cent medium farmers and 21.17 per cent large farmers opined that the coconut production in the study area is average and less profitability due to high cultivation charges. 18.18 per cent of marginal farmers, 21.21 percent small farmers, 27.27 per cent medium farmers and 29.17 large farmers pointed out that the coconut production is normal and it gives sizeable income to the cultivators.
2.2.7 Opinion about Water Facility

Timely water is necessary for coconut cultivation. The investigator asked the respondents whether adequate water facilities are available or not. The result is presented in the table 2.7

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>More</td>
<td>39</td>
<td>32.23</td>
<td>16</td>
<td>48.48</td>
</tr>
<tr>
<td>Normal</td>
<td>57</td>
<td>47.11</td>
<td>13</td>
<td>39.40</td>
</tr>
<tr>
<td>Less</td>
<td>25</td>
<td>20.66</td>
<td>4</td>
<td>12.12</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

The above table shows the distribution of the respondents on the basis of their opinion about the available water facilities of the coconut producers in the study area. Majority of the cultivators i.e, 47.11 per cent marginal, 39.40 per cent small, 59.09 medium and 41.66 per cent large pointed out that the available water facility is normal and it is enough for coconut cultivation in the study area. 32.23 per cent marginal, 48.48 per cent small, 22.73 per cent medium and 41.66 per cent large are of the opinion that the availability of water in the study area is more because Kanyakumari district is highly irrigated area and got two monsoons in a year. 20.66 per cent marginal, 12.12 per cent small, 18.18 per cent medium and 16.67 per cent of large cultivators opined that the availability of water in the study area is less due to frequent failure of monsoon in the district.
2.2.8 Sources of Irrigation

In Kanyakumari district the coconut cultivators use different sources of irrigation for their coconut fields. It is depicted in the table 2.8.

Table 2.8 Sources of irrigation of the coconut cultivators

<table>
<thead>
<tr>
<th>Sources</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Well</td>
<td>73</td>
<td>60.33</td>
<td>20</td>
<td>60.61</td>
</tr>
<tr>
<td>River</td>
<td>15</td>
<td>12.40</td>
<td>6</td>
<td>18.18</td>
</tr>
<tr>
<td>Cannal</td>
<td>25</td>
<td>20.66</td>
<td>6</td>
<td>18.18</td>
</tr>
<tr>
<td>Drip irrigation</td>
<td>8</td>
<td>6.61</td>
<td>1</td>
<td>3.03</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is clear from the table that majority of the respondents used well irrigation including bore well for their coconut gardens. 60.33 per cent marginal farmers, 60.61 per cent small farmers, 50 per cent medium farmers and 66.67 per cent large farmers used well irrigation for their gardens. 12.40 per cent marginal farmers, 18.18 percent small farmers, 22.73 per cent medium farmers and 16.67 large farmers depend on river irrigation in the study area. 20.66 per cent marginal farmers, 18.18 per cent small farmers, 22.73 per cent medium farmers and 12.50 per cent large farmers used canal irrigation in the district. 6.61 per cent of marginal farmers, 3.03 per cent small farmers, 4.54 per cent medium farmers and 4.17 per cent large farmers used drip irrigation which connected with their own wells.
2.2.9 Sources of Finance

The different sources of getting finance for coconut cultivation of the sample farmers are presented in the table 2.9.

Table 2.9 Sources of finance for coconut production

<table>
<thead>
<tr>
<th>Sources</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Own money</td>
<td>98</td>
<td>80.99</td>
<td>24</td>
<td>72.72</td>
</tr>
<tr>
<td>Borrowed money</td>
<td>23</td>
<td>19.01</td>
<td>9</td>
<td>27.28</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is evident from the table, the distribution of the respondents on the basis of their source of finance for coconut production. It is revealed from the table majority of the sample respondents used their own money for coconut cultivation in the study area. Among the 121 sample marginal farmers in the study area 98 (80.99 per cent) used own money and 23 (19.01) per cent used borrowed money. Among the small farmers 24(72.72 percent) used own money and 9 (27.28 per cent) used borrowed money for coconut cultivation. Among the medium farmers 16 (72.73 Per cent) are used own money and 6 (27.27 per ent ) used for borrowed money for coconut cultivation in the study area. It shows the economic betterment of the coconut cultivators in the district.

2.2.10 Sources of Borrowed Funds

The coconut cultivators who borrowed funds from different sources they are presented in the table 2.10.
Table 2.10 Different sources of borrowed funds

<table>
<thead>
<tr>
<th>Sources</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Nationalized Bank</td>
<td>6</td>
<td>26.08</td>
<td>1</td>
<td>11.11</td>
</tr>
<tr>
<td>Private Agency</td>
<td>3</td>
<td>13.05</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>Co-operatives</td>
<td>13</td>
<td>56.52</td>
<td>8</td>
<td>88.99</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>4.35</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>100.00</td>
<td>9</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is clear from the table, the marginal farmer category 26.08 percent borrowed money from nationalized banks, 13.05 per cent from private agencies, 56.52 per cent from co-operative agencies and 4.35 per cent from other sources. Among the small farmer category 11.11 per cent borrowed from nationalized banks and 88.99 per cent from cooperative agencies. Among the medium farmers category 16.67 per cent borrowed money from nationalized banks and private agencies. 66.66 percent borrowed money from co-operatives. Among the large farmer group 33.33 per cent borrowed money from nationalized banks, 16.67 per cent borrowed from private and co-operative agencies and 33.33 per cent from other sources. It is inferred from the table majority of the farmers in the study area are getting loan from co-operatives.
2.2.11 Utilization of Fertilizers

In the study area the sample farmers are used different types of fertilizers in their coconut farms. They are presented in the table 2.11.

Table 2.11. Varieties of fertilizers used by the sample farmers

<table>
<thead>
<tr>
<th>Type of fertilizers</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Natural</td>
<td>40</td>
<td>33.06</td>
<td>13</td>
<td>39.40</td>
</tr>
<tr>
<td>Chemical</td>
<td>17</td>
<td>14.05</td>
<td>3</td>
<td>9.09</td>
</tr>
<tr>
<td>Both</td>
<td>9</td>
<td>7.44</td>
<td>1</td>
<td>3.03</td>
</tr>
<tr>
<td>None</td>
<td>55</td>
<td>45.45</td>
<td>16</td>
<td>48.48</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is observed from the table, 33.06 per cent marginal farmers, 39.40 per cent small farmers, 36.36 percent medium farmers and 37.50 per cent large farmers used natural fertilizers for their farms. 14.05 per cent marginal farmers, 9.09 per cent small farmers, 4.55 per cent medium farmers used chemical fertilizers for their groves. 7.44 per marginal farmers 3.03 per cent small farmers and 16.67 per cent large farmers used both natural and chemical fertilizers for their farms. 45.45 per cent marginal farmers, 48.48 per cent small farmers 59.09 per cent medium farmers and 45.83 per cent large farmers did not use any fertilizer for their farms. The reason is poor prices of coconut and high labour cost for coconut cultivation in the study area.
2.2.12 Yield per Acre

The investigator asked the respondents about the yield per acre of coconut producers in the study area and the results are presented in the table 2.12.

Table 2.12. Opinion about yields per acre of coconuts

<table>
<thead>
<tr>
<th>Yield per acre (in Rs.)</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>1000-5000</td>
<td>25</td>
<td>20.66</td>
<td>6</td>
<td>18.18</td>
</tr>
<tr>
<td>5000-10000</td>
<td>75</td>
<td>61.98</td>
<td>23</td>
<td>69.70</td>
</tr>
<tr>
<td>10000-&amp; Above</td>
<td>21</td>
<td>17.36</td>
<td>4</td>
<td>12.12</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

The table explains the opinion of sample farmers about the yield per acre of coconuts in the study area. Majority of the sample farmers opined that the yield per acre of coconut farms per year is Rs.5,000 to Rs.10,000. Their percentage is 61.98 per cent for marginal 69.70 per cent of small, 63.64 per cent of medium and 58.24 per cent of larger farmers. 20.66 per cent marginal , 18.18 per cent small, 18.18 per cent medium and 20.83 per cent large farmers are opined that the income of coconut farms are Rs.1000 to Rs.5,000 per year. 17.36 per cent marginal, 12.12 per cent small, 18.18 per cent medium and 20.83 per cent large farmers are opined that the income from coconut farms are Rs.10,100 and above.
2.2.13 Intercrops Cultivation

A number of inter crops have been successfully tried in the coconut garden and their economics worked out for enabling transfer of technology to the farming community in the study area. This is depicted in table 2.13.

Table 4.13. Economics of inter crops cultivation

<table>
<thead>
<tr>
<th>Inter crops</th>
<th>Marginal Farmers</th>
<th>Small Farmers</th>
<th>Medium Farmers</th>
<th>Large Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Fruits</td>
<td>22</td>
<td>18.18</td>
<td>5</td>
<td>15.15</td>
</tr>
<tr>
<td>Tapioca</td>
<td>29</td>
<td>23.97</td>
<td>7</td>
<td>21.21</td>
</tr>
<tr>
<td>Vegetables</td>
<td>8</td>
<td>6.61</td>
<td>5</td>
<td>15.15</td>
</tr>
<tr>
<td>Medical plants</td>
<td>3</td>
<td>2.48</td>
<td>3</td>
<td>9.09</td>
</tr>
<tr>
<td>Others</td>
<td>8</td>
<td>6.61</td>
<td>1</td>
<td>3.03</td>
</tr>
<tr>
<td>Banana</td>
<td>51</td>
<td>42.15</td>
<td>12</td>
<td>36.37</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.00</td>
<td>33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Primary data

It is observed from the table that majority of the sample farmers that is 42.15 per cent marginal, 36.37 per cent small, 31.82 per cent medium and 37.50 per cent large farmers in the study area are cultivating banana for their coconut gardens. Further it is inferred that all other category of farmers are also cultivating inter crops for their gardens. Thus intercropping in the groves can greatly enhance the income, employment and standard of living of the growers of the study area.