

ON FARM DIVERSITY IN COCONUT -

Participatory analysis in two
coconut communities



Central Plantation Crops Research Institute

(Indian Council of Agricultural Research)

Kasaragod 671 124, Kerala, India



ON FARM DIVERSITY IN COCONUT - Participatory analysis in two coconut communities

**C. Thamban
K. Samsudeen
C.V. Sairam
S.J.D. Bosco
M.K. Rajesh
V. Arunachalam
S. Arulraj
V. Rajagopal**



Central Plantation Crops Research Institute
(Indian Council of Agricultural Research)
Kasaragod - 671 124 Kerala, India



Published by:

Dr. George V. Thomas

Director

Central Plantation Crops Research Institute

Kasaragod – 671 124, Kerala

Cover design & book layout :

Mr. C. H. Amarnath

Photographs :

Dr. K. Samsudeen

Mr. R. Rajasekharan

Mr. K. Shyama Prasad

January 2007

Printed at : Karavali Colour Cartons Ltd., Mangalore.



PREFACE

Coconut, an important plantation crop providing livelihood to millions of farm families, is one of the crops with rich diversity in India. The experiences of farmers in identifying and characterizing local coconut ecotypes will help scientists in utilizing these gene pool in breeding programmes. The present publication entitled “On Farm Diversity in Coconut - Participatory Analysis in Two Coconut Communities ” is part of the outcome of the participatory analysis of coconut situation by the local coconut growers in Pallikkara village in Kasaragod District, Kerala State and Ariyankuppam village in Pondichery and a team of scientists from Central Plantation Crops Research Institute (CPCRI). The analysis was conducted under COGENT/ IPGRI sponsored project on “Developing coconut - based income generating technologies in poor rural communities” in the above two localities. Farmer participatory methods were employed to understand the coconut cultivation scenario and to analyse the coconut diversity in farmers’ gardens. Altogether 12 diverse coconut types, six in Pallikkara and six in Ariyankuppam coconut communities were identified and their significant characteristics documented. The study revealed the rich genetic diversity present in farmers’ coconut gardens in the selected communities, which could be effectively used for sustainable development of coconut.

George V. Thomas
DIRECTOR

Contents

Sl.No.	Particulars	Page No.
1.	Introduction	1
2.	Methodology	1
3.	Pallikkara coconut community	2
	i. Basic information of the study area	2
	ii. Coconut cultivation scenario- problems and opportunities	3
	iii. Characterization of coconut varieties	7
	iv. Ranking of varieties	12
	v. Utilization of diversity	13
4.	Ariyankuppam coconut community	13
	i. Basic information of the study area	13
	ii. Coconut cultivation scenario- problems and opportunities	14
	iii. Characterization of coconut varieties	16
	iv. Ranking of varieties	21
	v. Utilization of diversity	21
5.	Conclusion	22



Introduction

Genetic diversity is very important to sustain the productivity of a crop. In coconut, diversity provides characters for yield, adaptation, disease resistance and high value uses. Rich diversity of coconut varieties exists in farmer's field, which are untouched by the research methods employed for the crop improvement in coconut. There exists a tremendous scope for utilizing the genetic diversity of coconut available in farmers' fields for providing various options and opportunities while formulating strategies for solving the problems of coconut farmers. A thorough understanding about the coconut diversity available in farmer's gardens would also enable the stakeholders to utilize the germplasm for the sustainable production of coconut and enhancing income of farmers.

The present publication is based on a study on participatory characterization of coconut varieties conducted in two coconut communities in India, *viz.*, Pallikkara in Kerala State in the West Coast and Ariyankuppam in Pondichery Union Territory in the East Coast. The study was taken up primarily to characterize and evaluate coconut varieties according to farmers' perception. It also aimed to understand the coconut cultivation

scenario, to analyse the problems experienced by coconut farmers and to identify the opportunities from coconut that can benefit farmers.

Methodology

The analysis and documentation of coconut cultivation scenario and coconut diversity in Pallikkara village of Kasaragod District, in the West Coast and Ariyankuppam village in Pondichery in the East Coast was carried out jointly by the team of scientists from Central Plantation Crops Research Institute and coconut farmers, who are members of the Community Based Organisations formed in each of the above villages in connection with the implementation of the COGENT/IPGRI sponsored project on "Developing sustainable coconut-based income generating technologies in poor rural communities in India".

Participatory Rural Appraisal (PRA) tools

PRA tools such as transect walk, resource mapping and seasonal calendar were employed to analyze the land use, local agro-ecology and problems and opportunities in the coconut community. Through matrix ranking, farmers were facilitated to characterize and evaluate the coconut varieties found in their community.



Fig-1. Transect walk to analyse the land use, local agro-ecology, problems and opportunities in the Pallikkara coconut community

Diversity Fair

Coconut Diversity Fair was organised in the communities to facilitate the coconut growers to gather in a common place, exhibit the different varieties of coconut grown in their gardens, study their preferences for varieties and analyze various criteria for characterizing and evaluating them.

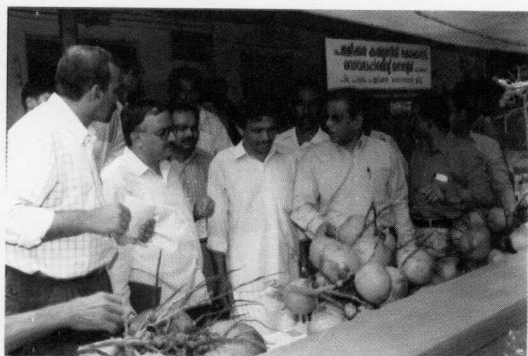


Fig-2. Coconut Diversity Fair organized at Pallikkara

1. Pallikkara coconut community

i. Basic information on the study area

Pallikkara grama panchayat is in Hosdurg taluk of Kasaragod district, the northern most district of Kerala State. It is located 20 km away from the Central Plantation Crops Research Institute (CPCRI). The geographical area of the panchayat is 39.09 sq. km. As per the 2001 census report, it has a population of 34,696 out of which 16,631 are males and 18,065 are females. Population density of the panchayat is 888 per sq. km. and literacy rate 77 per cent.

As per the agro-climatic classification of zones in Kerala State, the panchayat is coming under the sub humid laterite zone. Depending on the topography, the panchayat can be divided into upland, midland, lowland and coastal land, which comprise 25, 35, 30 and 10 per cent respectively of the total geographical area.

In the upland and midland, the soil type is predominantly laterite, while it is clayey in the low land. Sandy soil is found in the coastal land. Average annual rainfall in the panchayat is 3500 mm; a lion's share of which is received during three months viz., June, July and August. The North-East monsoon is very weak and as such there is a long dry spell from November to May.

Mostly, the crops are rainfed. Only 17 per cent of the area under coconut receive



irrigation. Open wells, ponds, small rivers and streams are the sources of water for irrigation. There is a predominance of small and marginal holdings in the agriculture sector. About 93 per cent of holdings are of less than one ha in size, and 5.5 per cent are small holdings of 1-2 ha, while only 1.5 per cent of the holdings have an area of more than 2 ha.

Coconut is the most important crop cultivated in the panchayat. It is mainly cultivated in the midland and upland. The area under coconut is about 1410 ha. Paddy, vegetables, cashew, and arecanut are the other important crops.

ii. Coconut cultivation scenario-problems and opportunities

- In Malayalam, the local language, the coconut palm is called as “Thengu” and coconuts are referred to as “Thenga”. The coconut cultivation in the panchayat is taken up mostly under rainfed conditions in small and marginal farms and partially under irrigated conditions in medium and large farms.
- The local West Coast Tall (WCT) variety is predominantly grown and the average yield is 30-38 nuts/palm/year. Regular production under average management, good kernel quality for household culinary use and copra production are some of the traits attributed to WCT by the farmers of the locality. Only a few farmers cultivate hybrids/improved cultivars and that too 4-5 trees only.
- Most of the farmers depend on their own source of planting material. Krishibhavan, the local office of Agriculture Department, is also being utilized as source of coconut seedlings. Systematic planting is adopted by only very few farmers. In majority of the gardens, the spacing adopted is less than the recommended spacing. Hence there is scope for restructuring coconut gardens for maintenance of optimum plant density especially when replacing the old and senile palms.
- Most of the farmers apply organic manures. The commonly used organic manures are farm yard manure, compost and green manure. On an average, coconut farmers apply 30-50 kg of organic manures per palm. Lack of availability of organic manures is one of the constraints experienced by coconut farmers. They opined that availability of green leaves for manuring coconut palms is steadily on the decline. Only a few farmers apply chemical fertilizers, and those who have adopted the practice apply chemical fertilizers below the level of recommendation.
- About one-fifth of the coconut growers in the community irrigate their coconut palms. Basin irrigation is the most common method of irrigation in



coconut gardens. Drip irrigation is adopted by some farmers by availing subsidy from the Department of Agriculture. Farmers perceive that irrigation is an important agronomic practice through which productivity of coconut can be enhanced considerably.

- Various pests and diseases affect the coconut gardens in the community. Stem bleeding and bud rot are the major diseases. According to farmers, eriophyid mite is the most serious pest causing yield loss in coconut in their locality. The farmers adopt plant protection measures mainly in the form of spraying chemical pesticides with the financial and technical assistance of Krishibhavan. However, they are apprehensive about the practical feasibility of the recommended plant protection measures, especially in the context of non-availability of skilled labourers. Rhinoceros beetle is also perceived as a common pest affecting coconut gardens. The level of adoption of recommended integrated pest and disease management methods is not at a satisfactory level. Lack of awareness/knowledge about the integrated pest/disease management, lack of availability of skilled labour for climbing coconut palms to undertake plant protection measures, high cost of plant protection chemicals were some

of the constraints experienced by farmers in the adoption of proper IPM/IDM practices.

- The extent of adoption of systematic coconut based cropping/farming system is very low. However, farmers grow miscellaneous crops in their homesteads. Banana, tapioca, jack, arecanut and pepper are some of the commonly raised crops in coconut holdings. Some farmers also grow vegetables like cow pea, pumpkin, bhendi and brinjal. Few farmers have adopted mixed farming by integrating cattle rearing with coconut farming. The farmers opined that as compared to monocropping, crop/farm intensification fetches them more income. According to them, the employment opportunities to farm women could also be considerably increased by adopting coconut-based farming systems. Non-availability of quality planting materials of subsidiary crops, lack of irrigation facilities, lack of market facilities for selling the produce and unsystematic planting of coconut are some of the constraints experienced by the coconut growers in adopting coconut based farming systems.
- In Pallikkara coconut community, coconut is an essential dietary ingredient in all the households. On an average 1-2 nuts are used for culinary purpose by a family per day. Coconut

is sold mainly as raw nuts. Marketing channel is predominated by middle men and the entire marketing process is unorganized. Only very few farmers make copra at farm level on a commercial basis. Farmers occasionally make copra in small quantities for getting coconut oil for household use. Farmers sell their produce mostly as coconuts and value addition in the form of copra/coconut oil production is carried out by medium and large farmers only. Farmers of the Pallikkara coconut community perceive that fall in price of coconut, as has been happening in periodic intervals, is the most important problem they experience in coconut cultivation. The impact of price crash of coconuts in the year 2001 was so severe that many of the farmers of the locality did not attend to the crop and carry out the routine cultural practices. Poor crop management affects the coconut yield. Hence the importance of product diversification in coconut assumes much significance. As a part of the ADB/IPGRI project, entrepreneurship development programmes on value addition in coconut was organised in the community. Many farmers and members of self help groups of women in the project area were trained on the preparation of products such as coconut chips, snow ball tender nut and kernel based food products.

- Tendernuts are not harvested for sale. There is no stable market for tendernuts. Traditional toddy tapping is being done in few coconut holdings. Farmers believe that toddy tapping enhances the yield of coconut. The extent of product diversification of coconut for value addition is very low in the community. Coconut leaves are mainly used for mulching and rarely for thatching houses. The technology for using coconut leaves for the preparation of vermicompost is gradually getting the attention of farmers. Coconut trunk is used for construction and furniture making. Husk is mainly used as fuel. Few farmers use it for mulching coconut palm basins. Coconut shells are also mainly used as fuel. A small quantity of shell is used by the goldsmiths as charcoal. Farmers of the community are not aware of the coconut kernel-based value-added food products. However they agree that on-farm income would be considerably enhanced if coconut value-added products are prepared and marketed. Further, women in their households would be highly benefitted if units based on coconut product diversification are established and run profitably, especially in the current scenario of many women engaged in *beedi* rolling are steadily losing their jobs.



- The participatory rural analysis revealed that agriculture is the main source of income, which provides livelihood to 55 per cent of the population. 15 per cent of the population are engaged in the agriculture labour sector. There is a decline in the number of agricultural labourers over the years mainly because of the fact that there is reduction in paddy area and that they do not get employment throughout the year. A sizeable segment, i.e., 20 per cent of the population, depend on service sector for their livelihood. Also a large number of families in the panchayat depend on their NRI relatives in the Middle East countries as the major source of income.
- There is a general feeling among the farmers that income from farming sector is on the decline in the last few years as there is a wide fluctuation in prices of agricultural produces especially coconut, which is the major crop of the area. Participants of the wealth ranking exercise conducted as part of the PRA in the study area opined that size of holding, cropping pattern, availability of irrigation facility, on and off- farm income were the criteria to be considered for categorizing the farmers. Accordingly, it was revealed that a majority (60 per cent) of the farmers belonged to poor category. Lower middle class and middle class farmers were 30 per cent and 10 per cent respectively. The expenditure analysis showed that farmers spend 50 per cent of their income for food, 25 per cent for non-food essential items, 10 per cent each for health care and education and the remaining 5 per cent for other miscellaneous items. It was generally observed that the coconut holdings belonging to poor farm families fetch them a per capita income of only Rupees 18,000 or less per year. There is scope for enhancing their income level by intervening with appropriate coconut technologies.
- The level of technology use by the coconut growers and the availability of technologies for increasing coconut productivity clearly indicate the potential for improving the coconut scenario in the selected village. Poor coconut farmers, who mainly constitute the small and marginal category, have the option of choosing appropriate technologies for enhancing their income from coconut farming and thereby improving their standard of living. The technological interventions include cultivating high yielding cultivars of coconut to enhance the yield and income, adoption of integrated nutrient management and integrated pest/disease management, growing suitable inter/mixed crops in coconut gardens and integrating animal

husbandry and other subsidiary enterprises with coconut farming and promoting the diversification of coconut products.

iii. *Characterization of coconut varieties*

Through participatory methods, farmers characterized and ranked the varieties of coconut available in the community. Transect walk by a team of scientists and farmers, to identify the agro-ecological situations and problems and opportunities, also yielded information pertaining to the nature and distribution of diversity in coconut available in the community. Features such as stature of the palm, colour, size and shape of nuts, response to management practices, tolerance to stress situations, suitability to various uses etc were considered by the farmers for characterizing the varietal diversity in coconut. A Coconut Diversity Fair organised at Pallikkara on 10th June, 2003 as part of the study on farmer characterization of coconut varieties, attracted the participating farmers. The primary objective of the programme was to characterize the existing coconut varieties in the local community from the point of view of the local farmers, ecology and uses. Coconut bunches of diverse features existing in their garden were brought and exhibited in the fair by the farmers. Prizes were given to farmers who brought coconut bunches of rich diversity.

In the participatory characterisation process, a total of six distinct types of coconut were identified and evaluated in the community in addition to the most common variety i.e., West Coast Tall. Most of the other identified types might have evolved from this popular variety. The details of the varieties are furnished in the following pages.

iii.a. *Pallikkara Ordinary Tall*

This is the typical West Coast Tall cultivar and most widely distributed coconut cultivar in the locality, adapted to the rainfed situation and average management conditions. More than 70 per cent of coconut palms cultivated in the locality are of this type. The palms are tall and produce medium to large sized, light green coloured nuts. The origin of this cultivar is in the West Coast of Kerala. Under rainfed situations, the palms start bearing 6-7 years after planting. Farmers



Fig-3. Pallikkara Ordinary Tall

are of the opinion that this cultivar is relatively tolerant to pests and diseases. The nuts are suitable for the production of copra and oil. Farmers also opined that these palms are ideal for toddy tapping. In earlier days, trunk from mature grown up palms of this tall cultivar was widely used for house construction in the locality.



Fig-4. Nuts of Pallikkara Ordinary Tall

iii.b. Alakode Tall

This is also a West Coast Tall cultivar. But compared to the local tall type this is a better yielder. Distribution is limited to about five per cent of the population of coconut palms cultivated in the locality. This ecotype is well adapted to the irrigated local environment with good management conditions. The palms are tall and have spherical crown with 30-40 leaves with strong petioles. The cultivar produces medium to large sized, light green coloured and elongated nuts. Farmers opined that



Fig-5. Alakode Tall

Yield and yield components

No. of nuts/bunch	: 8
No. of nuts harvested/year	: 60 nuts/palm
Weight of nut	: 850 g
Percentage of husk (fresh)	: 65
Endosperm thickness	: 1.20 cm
Estimated copra content/nut	: 140 g

these palms are regular bearers, usually coming to bearing by 6-7 years after planting. The nuts are suitable for the production of copra and oil.

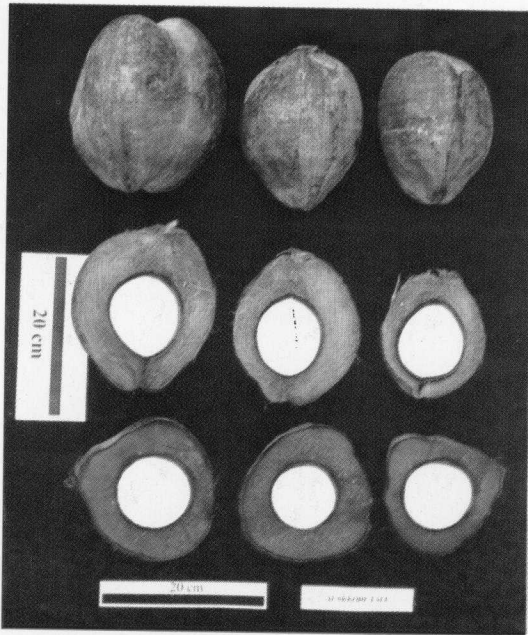


Fig-6. Nuts of Alakode Tall



Fig-7. Pallikkara Red Tall

Yield and yield components

No. of nuts/bunch	: 15
No. of nuts harvested/year	: 120 nuts/palm
Weight of nut	: 720 g
Percentage of husk (fresh)	: 61
Endosperm thickness	: 1.20 cm
Estimated copra content/nut	: 140 g

iii.c. *Pallikkara Red Tall*

The characteristic feature of this West Coast Tall ecotype is its red coloured nuts. According to the framers' experience it is slightly a better yielder compared to the

local tall type. About ten per cent of the coconut palms cultivated in the locality are of this ecotype. This ecotype is well adapted to the rainfed condition and low input use. These tall palms have less number of leaves, of which the leaves of the lower whorl are drooping compared to the local predominant type. The palms produce medium to large sized, red coloured and elongated nuts. The palms usually comes to bearing 6-7 years after planting. The nuts are suitable for the production of copra and oil.



Fig-8. Nuts of Pallikkara Red Tall

Yield and yield components

No. of nuts/bunch	: 10
No. of nuts harvested/year	: 70 nuts/palm
Weight of nut	: 810 g
Percentage of husk (fresh)	: 58
Endosperm thickness	: 1.20 cm
Estimated copra content/nut	: 130 g

iii.d. *Koottakkani Round Tall*

This particular ecotype is seen sparsely distributed, only in about one per cent of the population of coconut palms cultivated in the locality. This is a high yielding ecotype with palms of semi-tall stature. Alternate bearing tendency is an



Fig-9. *Koottakkani Round Tall*

undesirable trait of the ecotype as perceived by the farmers. The palms produce medium sized, round, light green coloured nuts which are compactly arranged. Palms of this cultivar perform well under irrigation and good management condition. The palms have more than 30 leaves arranged in spherical fashion on the crown. They come to bearing by 6-7 years after planting. According to farmers, the nuts are suitable for the production of copra and oil.



Fig-10. Nuts of Kottakkani Round Tall

Yield and yield components

No. of nuts/bunch	: 20
No. of nuts harvested/year	: 150 nuts/palm
Weight of nut	: 650 g
Percentage of husk (fresh)	: 55
Endosperm thickness	: 1.10 cm
Estimated copra content/nut	: 105 g

iii.e. Pallikkara Orange Dwarf

Palms of this dwarf ecotype are seen very sparsely distributed in the locality, only in less than one per cent of the population of coconut palms. In a garden, approximately 90 years old palms showing dwarf characters with orange nuts, currently growing to an average height of 15 m, are seen. The fronds are also orange in colour. The progenies raised from these palms are all dwarf orange. This local



Fig-11. Pallikkara Orange Dwarf ecotype is perceived to be very much adapted to moisture stress situation. The nuts are suitable for tender nut purpose.

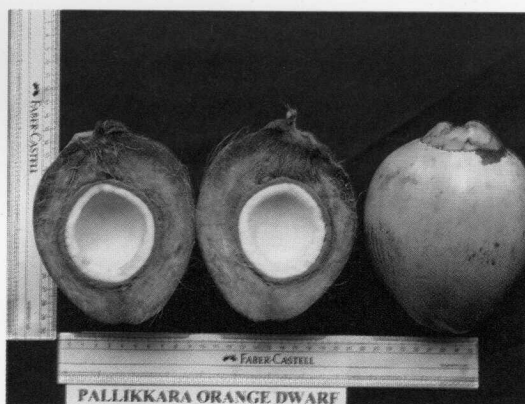


Fig-12. Nuts of Pallikkara Orange Dwarf

Yield and yield components

No. of nuts/bunch	: 7
No. of nuts harvested/year	: 60 nuts/palm
Weight of nut	: 720 g
Percentage of husk (fresh)	: 63.0
Endosperm thickness	: 1.10 cm
Estimated copra content/nut	: 78 g

iii.f. Pallikkara Green Dwarf

Similar to Pallikkara Orange Dwarf, palms of this dwarf ecotype are seen very

sparingly distributed in the locality, consisting less than one per cent of the population of coconut palms. In the garden mentioned while describing dwarf orange, approximately 90 years old palms showing dwarf characters with green nuts, currently growing to an average height of 15 m are also seen. The leaves and trunk of the



Fig-13. Pallikkara Green Dwarf

palms resemble that of the dwarf. This local ecotype is perceived to be very much adapted to moisture stress situation.

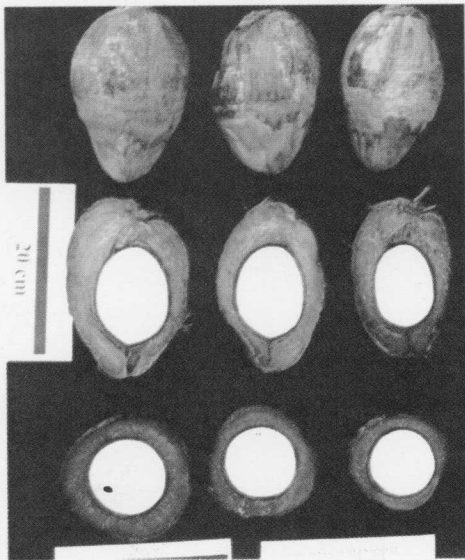


Fig-14. Nuts of Pallikkara Green Dwarf

Yield and yield components

No. of nuts/bunch	: 8
No. of nuts harvested/year	: 60 nuts/palm
Weight of nut	: 720 g
Percentage of husk (fresh)	: 60
Endosperm thickness	: 1.10 cm
Estimated copra content/nut	: 126 g

iv. Ranking of varieties

Matrix scoring was employed by the farmers for analyzing the varieties of coconut available in Pallikkara coconut community. The varieties were assigned scores of 1 to 10 on each of the attribute considered for ranking. A total of 10 attributes were considered for ranking the varieties. The results are furnished below:

Sl. No.	Common name of the variety	Attributes considered for ranking										Total score
		A	B	C	D	E	F	G	H	I	J	
01	Pallikkara Ordinary Tall	5	5	8	8	6	8	8	8	7	8	70
02	Koottakkani Round Tall	5	9	7	8	5	9	7	6	6	7	69
03	Pallikkara Red Tall	5	4	7	8	6	6	6	7	6	7	62
04	Alakode Tall	5	8	8	9	5	8	7	6	5	7	68
05	Pallikkara Orange Dwarf	7	5	5	5	8	6	7	7	9	7	63
06	Pallikkara Green Dwarf	7	5	5	5	8	6	7	7	9	7	63

A - Early bearing; B - More number of nuts; C - Good quality kernel for culinary use; D - Good quality copra; E - Better quality tendernut; F - Better response to manures and fertilizers; G - Better response to low input management; H - Better performance under rainfed situation; I - Better tolerance to soil moisture stress; J - Low incidence of pests and diseases

The results of the matrix scoring exercise revealed that Pallikkara Ordinary Tall, Koottakkani Round Tall and Alakode Tall were the most preferred varieties by the farmers in Pallikkara Community, while Pallikkara Red Tall was the least preferred variety.

v. Utilization of diversity

The local tall is the most popular coconut variety grown in Pallikkara community. Farmers perceived that the local tall is well adapted to the local environment and the average management conditions. For culinary purpose also the nuts of tall types were preferred by the farmers. The tall types were responsive to the application of manures and fertilizers. It shows that there is scope for enhancing the production of coconut in the community by adopting integrated nutrient management of the local tall coconut palms which are predominant in the community. When the earliness in bearing and tendernut quality were considered, the dwarf varieties scored over the tall types. Utilizing the dwarf varieties available in the community for tendernut purpose can be an income generation activity for the coconut farmers. More

gardens with the local dwarf varieties are to be established. For this, quality planting materials of local dwarf varieties of coconut are to be made available to the farmers. It was revealed that the two local dwarf varieties characterized by the farmers exhibit fairly high tolerance to soil moisture stress. It is hence imperative that the available germplasm of these local types are utilized in breeding programmes for stress tolerance in coconut. *In situ* conservation of the germplasm of these palms assumes much significance for preventing the genetic erosion and for further adaptation of the material to the local environment. The Alakode Tall type available in the community having higher content of endosperm, can be exploited for preparation of value-added products like chips. The Koottakani Round Tall type having compact bunches and high yield can be used in the breeding programmes.

2. Ariyankuppam coconut community

i. Basic information on the study area

Ariyankuppam Commune Panchayat is a traditional coconut belt in the East Coast of India. The site, located 10 kms away from Pondicherry city, receives more than 75 percent of the rainfall from the North East Monsoon from October to December. The mean annual rainfall of the region is 1060 mm. The farmers in this region are well known for their hard work and they are highly rational in adopting or rejecting



a particular farm technology. One of the most important characteristic features of coconut in this region is that 99 per cent of the coconut farming is undertaken under irrigated condition and availability of water is not a constraint as far as coconut farming is concerned. The soil varies from coastal sandy to sandy loam to loamy. About seven decades ago, coconut farmers in the region were blending the soil with the cotton waste from the century old Anglo French Textiles Mills located near the site. Coconut farmers opined that such long term soil development factors coupled with irrigation and good quality planting materials are the major reasons for high level of coconut productivity in this region.

The farmers speak Tamil in this region and they name coconut palm as “Thennai” and coconut as “Thengaai” and they grow coconut as a commercial crop. The major coconut variety cultivated in this region is the East Coast Tall. Other major varieties are Aayiramkachi, Sevvelanir, Tall x Dwarf hybrid and dwarf varieties from Malaysia and Andhra Pradesh. The farmers in the region traditionally aim for highest per palm productivity and based on these criteria they select, collect and raise the seedlings even from other parts of the country.

ii. *Coconut cultivation scenario-problems and opportunities*

The general management practices adopted for coconut, problems experienced and opportunities available for sustainable development in the coconut community include the following:

- Planting of seedlings is undertaken in the optimum season of April/July/November.
- The adopted inter spaces between the palms in the main field varies from 6.5 x 6.5 m to 7.5 x 7.5 m, consequently planting density varies from 175 to 230 palms/ha.
- On an average an adult palm receives 10-15 kg of green leaf manure, 30-40 kg of organic manures consisting of cow dung/poultry manure/goat manure and 3-5 kg of nutrient mixture
- Irrigation is provided once in 6 days from January to October or till the on set of North East monsoon. Flood irrigation is the commonly adopted method. Since water is not a constraint, farmers are not giving attention to improved water saving irrigation methods such as drip or sprinkler systems.
- The average yield varies from 80 nuts to 150 nuts/palm/year depending upon the incidence of pests and diseases, adoption of management practices and prevalence of risk factors such as cyclones.

- The major pest prevalent in the region is eriophyid mite and the diseases are stem bleeding as well as Thanjavur wilt. Bud rot is also present in few palms.
- Majority of the farmers sell their coconut as tender nut. It is interesting to observe that tender nuts plucked from the coconut gardens of this site have good taste and good market demand at Chennai metro city and hence pre-harvest contract system of future trading is the common marketing strategy widely followed for tender nut marketing. Toddy tapping also is followed by few farmers. Farmers also dry coconuts and make copra and extract oil mainly for domestic consumption. Raw nut is also sold through contractors, who in turn sell this to other parts of Tamil Nadu State as well as Kerala.
- During the early years of planting (upto three years) coconut farmers cultivate vegetable crops like bhendi, brinjal, tomato, chillies and gourds, oil seeds such as groundnut, food crops like tapioca as intercrops in coconut garden. They could realize an additional net return of Rs.10,000/ha from these crops. In the main field too, after the palms are more than 20 years old, they cultivate intercrops on a limited scale. Dairy is a major animal husbandry component well integrated with the coconut farming in Ariyankuppam site. Some of the farmers adopt deep litter system of poultry rearing.
- Most of the farmers cultivate inter/mixed crops in their coconut gardens mainly in the first three years of planting in the main field. They also cultivate inter/mixed crops like tapioca, bhendi, brinjal, tomato, chillies, bitter gourd, snake gourd, mango, banana, groundnut etc. Most of the coconut farmers have dairy as a component of the farming system and some of them integrate the same with other animal husbandry enterprises such as poultry, rabbitry etc.
- Coconut palm as such is used in various ways and means by the farmers of the region. A major share of nuts is sold as tender nuts. Farmers feels that since the taste and water content of tender nuts fetches better price in Chennai as well as in the tourist places such as Mammallapuram in Chengelpet district of Tamil Nadu, pre-harvest contract exists for tender nut with more than 50 percent of the coconut gardens. The farm gate price of these nuts varies from Rs.3 during North East Monsoon period to Rs.4.5 during summer months. Another major share is used as raw nuts for direct sale as well as for copra conversion for oil extraction mostly for domestic consumption. The husks of the nut are used as fuel in the case of



small and marginal farms, whereas the same is used as mulching materials. In addition a major share of the husk is collected and sold for coir manufacturing units.

iii. *Characterization of coconut varieties*

Similar to the analysis done in Pallikkara coconut community, through participatory methods, farmers characterized and ranked the varieties of coconut available in Ariyankuppam community also. Transect walk by a team of scientists and farmers to identify the agro-ecological situation and to identify the problems and opportunities also yielded information pertaining to the nature and distribution of diversity in coconut available in the community. Features such as stature of the palm, colour, size and shape of nuts, response to management practices, tolerance to stress situations, suitability to various uses etc were considered by the farmers for characterizing the varietal diversity in coconut. A Coconut Diversity Fair organised at Pooranankuppam village on 6th June, 2003 as part of the study on farmer characterization of coconut varieties, attracted the participating farmers. The primary objective of the programme was to characterize the existing coconut varieties in the local community from the point of view of the local farmers, ecology and uses. Coconut bunches of diverse features existing in their garden were brought and exhibited in the fair by

the farmers. Prizes were given to farmers who brought coconut bunches of rich diversity. In the participatory characterisation process, a total of six distinct types of coconut were identified and evaluated in the community. The details of the varieties are furnished in the following pages.

iii.a. *East Coast Tall (Spicata)*

This variety is locally known as *Panaithennai*. These are tall palms producing medium sized, oblong shaped nuts. The unique feature is that bunches are spikeless. The palms are usually heavy



Fig-15. East Coast Tall (Spicata)

bearing under optimum input use situation. Palms of this ecotype are present in the locality to the tune of about less than five per cent of the total coconut palm population only. Some farmers prefer the nuts of this type for culinary purpose. Further, according to farmers, the incidence of stem bleeding disease, which is a common disease of coconut in the locality, is much less in this type.

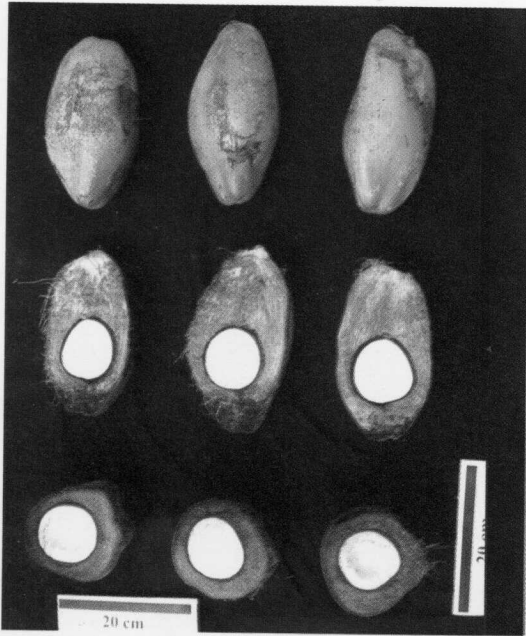


Fig-16. Nuts of East Coast Tall (Spicata)



Fig-17. East Coast Tall (Yellow)

is present only in very few gardens (less than one per cent of the total population of coconut palms) in the locality and as such farmers do not have any preference for this type because of low yield.

Yield and yield components

No. of nuts/bunch	: 12-14
No. of nuts harvested/year	: 110 nuts/palm
Weight of nut	: 800 g
Percentage of husk (fresh)	: 70
Endosperm thickness	: 1.20 cm
Estimated copra content/nut	: 120 g

iii.b. *East Coast Tall (Yellow)*

This variety is locally known as Narimedu Yellow. Farmers note this tall ecotype as a very poor yielder. The palms produce yellow coloured, round to oblong shaped nuts. According to farmers, the average yield is only less than ten nuts per palm. Palms of Narimedu Yellow Tall type

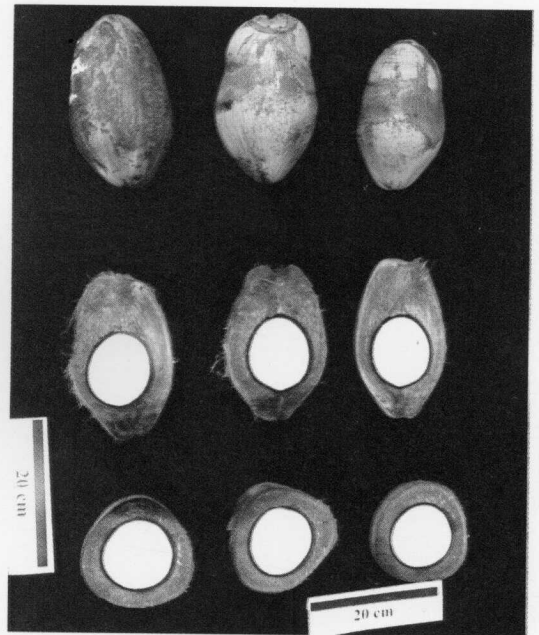


Fig-18. Nuts of East Coast Tall (Yellow)



Yield and yield components

No. of nuts/bunch	: 3-4
No. of nuts harvested/year palm	: 10-25 nuts/ palm
Weight of nut	: 590 g
Percentage of husk (fresh)	: 70
Endosperm thickness	: 0.7 cm
Estimated copra content/nut	: 105 g

iii.c. *Sevvelanir Tall*

'Sevvelanir' in Tamil language means red tender nut. This is a special ecotype present in the locality, the tender nut of which when cut open at the top portion

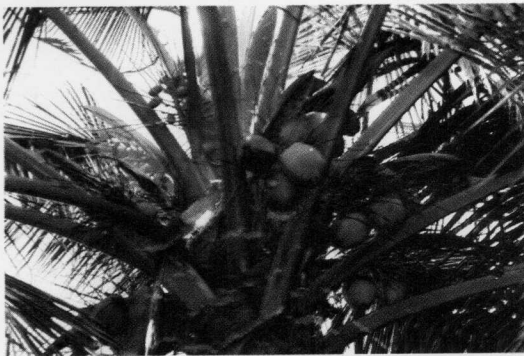


Fig-19. *Sevvelanir*

shows a unique pink colour, and hence the local people call it 'Sevvelanir'. The tender nut water is very sweet and local people believe that the tender nut water has the medicinal property to cure jaundice and asthma. The palms are tall and produce medium sized light green nuts. Only very few palms of *Sevvelanir tall* are present in the locality.



Fig-20. Nuts of *Sevvelanir*

Yield and yield components

No. of nuts/bunch	: 11-15
No. of nuts harvested/year	: 80 nuts/palm
Weight of nut	: 750 g
Percentage of husk (fresh)	: 75
Endosperm thickness	: 0.9 cm
Estimated copra content/nut	: 115 g

iii.d. *Ariyankuppam Orange Dwarf*

These are dwarf palms producing small to medium sized orange coloured, round to oblong shaped nuts which are good for tender nut purpose. Farmers perceive this type as a regular bearer, but with a medium yield level of about 100 nuts per palm per year. Palms of this orange dwarf type are present only in very few gardens (about



Fig-21. Ariyankuppam Orange Dwarf

one per cent of the total population of coconut palms) in the locality.



Fig-22. Nuts of Ariyankuppam Orange Dwarf

Yield and yield components

No. of nuts/bunch	: 10-12
No. of nuts harvested/year	: 75 nuts/palm
Weight of nut	: 630 g

Percentage of husk (fresh)	: 55
Quantity of tender nut water	: 300 ml
Endosperm thickness	: 1.0 cm
Estimated copra content/nut	: 105 g

iii.e. *East Coast Tall (Ordinary)*

This is the typical local East Coast Tall cultivar and most widely distributed coconut cultivar in the locality, well adapted to the local conditions. More than 70 per cent of the population of coconut palms cultivated in the locality is of this type. The palms are tall, produce medium to large sized, light green coloured, round



Fig-23. East Coast Tall (Ordinary)

to oblong shaped nuts. The origin of this cultivar is in the East Coast of Tamil Nadu. Under the irrigated condition with good management practices, this type gives an average yield of 140 nuts per palm per year. The palms start bearing by 6-7 years after planting.

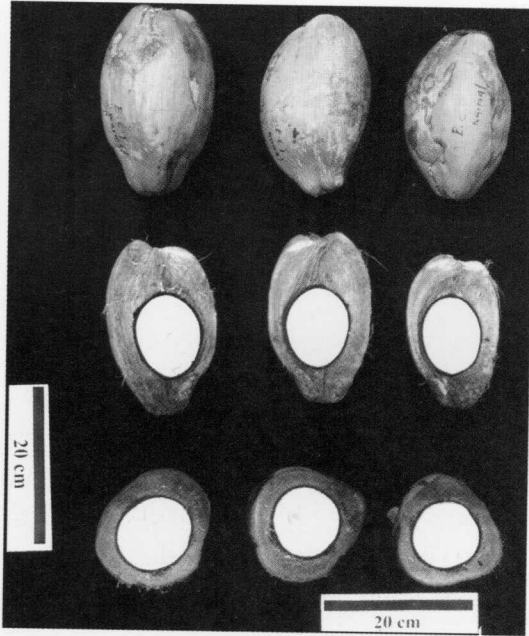


Fig-24. Nuts of East Coast Tall (Ordinary)

Yield and yield components

No. of nuts/bunch	: 15-20
No. of nuts harvested/year	: 140 nuts/palm
Weight of nut	: 600 g
Percentage of husk (fresh)	: 65
Endosperm thickness	: 1.10 cm
Estimated copra content/nut	: 120g

iii.f. East Coast Tall (Round)

This is another typical local East Coast Tall cultivar variety, in which nuts are slightly round and most widely distributed coconut cultivar in the locality, well adapted to the local conditions. More than 30 per cent of the population of coconut palms cultivated in the locality is of this type. The palms are tall, produce medium



Fig-25. East Coast Tall (Round)

to large sized, light green coloured, round to oblong shaped nuts. The origin of this cultivar is in the East Coast of Tamil Nadu. Under the irrigated conditions with good management practices, this type gives an average yield of 140 nuts per palm per year. The palms start bearing by 6-7 years after planting.

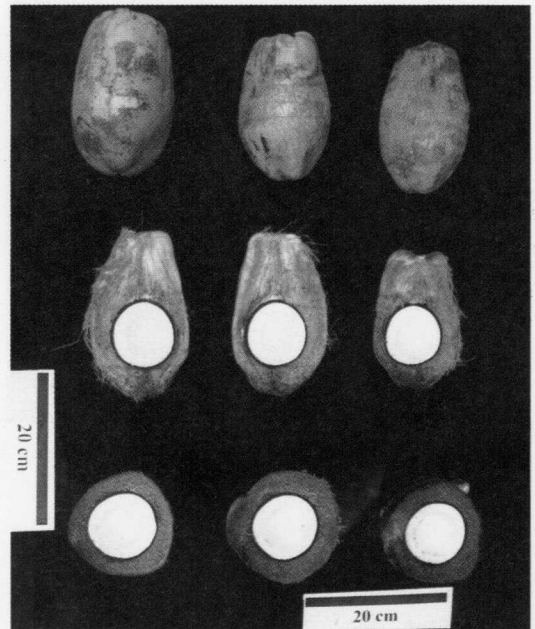


Fig-26. Nuts of East Coast Tall (Round)

Yield and yield components

No. of nuts/bunch	: 20-24
No. of nuts harvested/year	: 180 nuts/palm
Weight of nut	: 650g
Percentage of husk (fresh)	: 60
Endosperm thickness	: 1.2 cm
Estimated copra content/nut	: 120g

iv. Ranking of varieties

Sl. No.	Common name of the variety	Attributes considered for ranking									Total score
		A	B	C	D	E	F	G	H	I	
01	East Coast Tall (Ordinary)	10	7	8	7	7	8	7	8	5	67
02	Sevvelanir	3	8	8	7	6	7	7	5	6	57
03	Orange Dwarf	5	9	8	7	6	8	7	5	5	60
04	ECT Spicata	4	7	8	7	7	8	7	5	5	58
05	East Coast Tall (Yellow)	1	6	8	7	1	2	7	1	1	34
06	East Coast Tall (Round)	9	7	8	7	7	7	7	8	5	65

A - Easy availability of the seedlings; B - Early bearing nature; C - Field establishment; D - Balanced growth in the bearing stage; E - Yield in the regular bearing period; F - Response to organic fertilizers and inorganic fertilizers; G - Response to low input management; H - Dual purpose variety (for nut as well as tender nut); I - Less incidence of pests and diseases

Based on the results from the above table it could be inferred that the farmers' most preferred variety is the East Coast Tall (Ordinary) as well as East Coast Tall (Round) which have scored better as compared to other types. The least preferred variety is Yellow Tall for its poor performance on most of the attributes considered for ranking.

v. Utilization of diversity

Coconut cultivation at Aryiankuppam coconut community is predominant with palms of East Coast Tall type. The genetic diversity observed in the coconut community and as characterised by the local farmers certainly helps in maintaining the sustained growth of production and productivity in the region. The tall types were responsive to the application of manures and fertilizers. This shows that there is scope for enhancing the production of coconut in the community by adopting integrated nutrient management of the local tall coconut palms which are predominant in the community. Most of the ecotypes in the locality are having the potential yield of more than 100 nuts per palm per year which is one of the highest productivity in the world under farmers' field conditions. During early seventies, medium term soil amendment practices were undertaken in the sandy to sandy loam belt of this region, which is continued for sustaining higher productivity levels under irrigated conditions. Sevvelanir type is a high yielding variety mainly used for tender nut purposes, the water of which is used for curing diseases like jaundice and asthma. This special ecotype can be exploited for the tender nut water with medicinal properties which would be an income generation activity for the coconut farmers. More gardens with this unique



local cultivar are to be established. For this, quality planting materials of the same are to be made available to the farmers. Further, it can also be used in breeding programme for evolving a good tender nut variety. The East Coast Tall (Spicata) type, locally known as 'Panaithenai', possess some tolerance to the incidence of stem bleeding disease which can be used in breeding programme for disease tolerance.

Conclusion

The farmer participatory characterization of coconut varieties in two coconut communities, one in the West Coast and the other in the East Coast in India, revealed the rich genetic diversity of

coconut present in farmers' gardens. Further, the analysis also yielded information on the preference of farmers about the desirable traits of the coconut varieties. The importance of utilizing the unique coconut ecotypes present in the farmers' gardens suitable for diverse uses and growing under varying agro-climatic and management situations in the breeding programmes has also been highlighted through the analysis made through participatory approach. The genetic diversity existing in farmers' coconut gardens thus requires to be effectively utilized for sustainable development of coconut.