1. INTRODUCTION
Fig. 1.1. Coconut growing areas of India
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Coconut palm (*Cocos nucifera* Linn.) is one of the valuable gifts of nature to mankind. It is considered as the tree of life and is eulogised as *Kalpavriksha*, the all giving tree or the Tree of Heaven. Coconut fruit is considered as *LakshmiPhal*, the Fruit of wealth. There are different views on the origin of coconut. According to the most generally acceptable one coconut was originated in the South Asia or in the Pacific from where it reached America. Some references indicate the antiquity of coconut in India.

Coconut is unique among all horticultural crops as a source of food, drink, shelter, fibre, medicine and a variety of raw materials for industrial exploitation. The crop assumes considerable significance in the national economy in view of its contribution to the rural employment and employment generation. The crop supports more than 10 million people for their sustenance. It contributes Rs.7000 crore to the country’s GDP and earns a foreign exchange of Rs.345 crore. Copra, the dried kernel of coconut is the richest source of edible oil. The palm contributes a large quantity of biomass to satisfy the fuel requirements of an average family. It is a renewable source of energy. Tender coconut is becoming more and more popular as a health drink replacing the artificial health hazardous soft drinks. Similarly the beneficial effects of coconut oil due to its medicinal properties is getting wider popularity. Thus, the crop is attaining more significance of late, due to
its unique qualities. Coconut is an eco-friendly crop too, and plays a major role in conserving the ecosystem.

The major coconut growing state in the country is Kerala. The other three southern states viz. Karnataka, Tamil Nadu and Andhra Pradesh are the other major contributors. These four states together contribute 90% of the total area and production in the country. Other traditional coconut growing states are Orissa, West Bengal, Assam and Union Territories of Andaman & Nicobar Islands, Pondicherry and Lakshadweep (Fig 1.1). The crop was once considered as a coastal crop which cannot be grown away from sea coast. However, of late the crop has been introduced in the Central, North and North-Eastern regions of the country like Madhya Pradesh, Bihar, Tripura, Nagaland, Manipur and Meghalaya. The growing demand for coconut and coconut products in the entire country irrespective of its confinement in cultivation is the reason for spreading the crop across the country.

Based on the stature, the coconut cultivars are broadly categorized into two groups, the Tall and the Dwarf. These two varieties are found to grow in all the coconut growing countries. Several variants of the two types have been recognized in the regions of their distribution. Because of heterozygous nature of coconut, the yield capacity due to its genetic make up varies from plant to plant even within the same cultivar or type (Dash et al.,
1995). Indigenous cultivars belonging to these types are being cultivated for coconut production and breeding purpose (Nampoothiri and Singh, 2000).

Tall palms are the most commonly cultivated varieties for commercial production. They are grown on a plantation scale for its copra, oil and fibre. It grows to a height of 20-30 m and may attain an age of 80-100 years. An adult bearing palm produces 13 or 14 bunches and 80-100 nuts per year. They are cross pollinated, highly heterozygous and may take 5-8 years for first flowering. The copra content is usually above 150 g nut\(^{-1}\) and oil content varies from 66 to 70 per cent. The indigenous talls cultivated in the different regions of the country are West Coast Tall, East Coast Tall, Tiptur Tall, Benaulim, Andaman Ordinary and Laccadive Ordinary (Anonymous, 1989). Komadan, a local popular type in Central Travancore area of Kerala, is superior to the West Coast Tall.

The Dwarf palms are grown mostly for ornamental purpose and for the sweet tender nut water. Dwarfs are grown to a limited extent for hybridization purpose in crop improvement programme. They grow to a height of 8-10 m and start flowering from the third year of planting. Compared to tall palms, the dwarf palms are more homozygous due to high degree of self pollination. The copra content ranges from 90-120 g nut\(^{-1}\) and oil content is about 65%. In general, they have short productive life of 30-35 years. The nuts have attractive colours varying from green, yellow to orange
and brown. The indigenous dwarf palms cultivated are Chowghat Green Dwarf (CGD), Chowghat Orange Dwarf (COD) and Gangabondam Green Dwarf. The tall are highly cross pollinated and the dwarf predominantly self pollinated (Satyabalan, 1997). Vegetative propagation has not been proved successful.

A cultivar is a botanical variety, characteristic of a particular region where it has been under cultivation since long. West Coast Tall, East Coast Tall, Tiptur Tall etc., in India, Ceylon Tall, Malayan Tall, Fiji Tall, Jamaica Tall, West African Tall are some of the cultivars among the Talls and Chowghat Dwarf in India, Malayan Dwarf, Fiji Dwarf are some of the cultivars among the dwarf grown in the respective countries. In a cultivar certain members differ from other in a single or a constellation of characters (Satyabalan, 1997). Ecotypes are such cultivars which are grown for a longer period in a particular region and are valued superior to other local cultivars by the farmers.

In a population of coconut palms all the phenotypically high yielding palms need not necessarily be genetically superior (Iyer et al., 1981). According to Harland (1957) those high yielding palms which are genetically superior are of two types. The first may be hybrids which may have a favourable combination of genes in the heterozygous condition and hence are high yielding. In the crop improvement studies available tall and
dwarfs are used for the production of hybrids through artificial pollination. In the progenies of dwarf cultivars where a high degree of self pollination occurs, Natural Cross Dwarfs (NCD) are recovered to a lesser percentage. The other category of high yielding palms may be inherently superior because they possess sufficient yield genes to ensure that their progenies are of high yielding nature irrespective of the male parent. They are considered to have the best breeding values with capacity to maintain significantly high progeny values. Such palms are likely to be few in a population and are referred to as prepotent palms. Identification and propagation of such genetically superior palms among the high yielders seems to be the only method to breed palms of uniformly high yield (Iyer and Dhamodaran, 1994). According to Purseglove (1975) those prepotent palms which can transmit high yield to their offspring in spite of open pollination have an important role to play in future breeding programme of coconut.

Similar to other countries, in India also poor genetic make up is one of the causes attributed for low productivity of coconut. In Kerala where coconut is the main crop a more or less continuous programme of selection for yield has been in progress ever since coconut improvement work by selection and breeding was started. This should have registered considerable improvement in the production of coconut. But the situation seems to be different as the yield palm\(^{-1}\) is reported to be about 38 nuts per year
indicating that there has been no substantial genetic improvement in yield. The selection methods recommended for the genetic improvement of the palm have not helped to effect yield improvement of the population (Satyabalan, 1993).

The reasons for the poor genetic make up of the planting material in spite of the rigorous selection methods adopted have been critically studied by several workers. Harland (1957) studied the result of Ceylon experiments and reported the failure of all the high yielding palms to transmit their high yields to their progenies and advocated identification of genetically superior (prepotent) palms among the high yielders based on comparison of their open pollinated progenies, for propagation. Purseglove (1975) reported that prepotent palms can have an important role in the future breeding programme. Phenotypic selection of mother palms for high yield is ineffective as a means of genetic improvement. Therefore identification and propagation of genetically superior (prepotent) palms among the high yielders seem to be the only method for population improvement in coconut.

Varietal improvement in coconut for achieving higher production and productivity is of paramount importance. In coconut research in India varietal improvement has been the priority area from the very beginning. A range of germplasm with 241 accessions, comprising of 101 exotic and 140 indigenous, is now available in the country and the accessions are being
utilized for varietal improvement through intra-varietal and inter-varietal crossing (Rajagopal, 2001). Rajagopal and Arul Raj (2002) observed opportunities of evaluation of large number of germplasm for a given purpose / utilization, excellent scope for product diversification and value addition in coconut industry.

The occurrence of high yielding palms among the heavily diseased palms was reported by Davis (1953). In the holdings in Kerala apart from the distinctive varieties of talls and dwarfs, different high yielding genetically superior palms of different ecotypes are available (Thampan, 1999). These eco-types are especially of the tall variety. The local farmers value them for their high yielding potential and multiple uses. Many progressive farmers believe that nearly five percent of the high yielding palms are distinctly different from the rest of the palms in productivity, nut qualities and resistance to pest and diseases and hence, these eco-types are considered as unique category or improved eco-types and the farmers value them for their preferential characteristics.

The ecotype is defined by a group of individuals from the same environment showing morphological similarities (Ohler, 1999). The most popular coconut variety grown by the farmers of Kerala is Tall and the cultivar West Coast Tall (WCT) occupies over 95 % of the area under coconut. The other tall types grown are ‘Laccadive Ordinary’, ‘Laccadive
Micro’, ‘Kappadam’ and the ecotypes ‘Komadan’, ‘Kuttiyadi Tall’ and ‘Jappanan’. In addition to these, Chowghat Green Dwarf, Chowghat Orange Dwarf, King Coconut and TxD and DxT hybrids and Natural Cross progenies of Dwarf (NCD) are also grown but are sparsely distributed (Thampan, 1999)

However, the eco-types viz. Kuttiyadi Tall, Komadan, Jappanan, King Coconut etc have not yet been utilized for the crop improvement studies by the researchers. Dependable information on such eco-types are very scanty. In order to make use of these eco-types as major resource base in the crop improvement studies in the country, it is felt imperative to identify the known and less known eco-types of coconut grown in Kerala and to assess their economic traits in comparison with that of the West Coast Tall cultivar locally grown in respective areas.

In Ceylon, Seeman (1856) has recorded five indigenous varieties of the coconut palm. Thembili, Navasi, Dwarf, another Thembili with large nuts and the common tall type. Trimen (1898) recorded that several varieties of coconut are recognized by growers, but mention has been made only on two types – King Coconut and a very small-fruited dwarf sort (Cocos mana Griff.). King Coconut is probably endemic to Ceylon. It is characterized by orange coloured inflorescence and fruits, orange red coloured husk and spike and sweet tender nut water. A study was conducted under an International
Fund for Agriculture Development (IFAD) funded project in Sri Lanka in 1998 on sustainable use of coconut genetic resources with the project title “Enhancing income and employment opportunities in coconut sector through conservation and sustainable use of special coconut ecotypes”. The study included various aspects like identification, multiplication, collection and in-situ conservation of Thembili (King Coconut) germplasm showing uniform bearing and favourable bio-chemical constituents for industrial exploitation and development of technology to improve the shelf-life of Thembili to cater to the overseas market (Fernando, 1998).

Komadan is a local coconut off-type from the progeny of Chowghat Orange Dwarf (COD) open pollinated by the WCT, popular in the erstwhile central Travancore area of Kerala associated with the family history of an old ‘Tharavadu’ called ‘Komattu house’ in the Thottappuzhassery area of Aranmula village of Thiruvalla taluk (Gopimony, 1982). Komadan showed superiority in nut and copra yield (Vanaja and Sreekumariamamma, 1997). Komadan type showed superior mother palm characteristics especially in number of bunches and number of nuts per palm/year (Shylaraj, et al. 1991).

All Komadan nuts were of different shades of brown (bronze). Thirty three per cent of the Komadan palms showed self-pollinating nature thereby showing that they occupy a position in between NCD and WCT regarding pollination system. Alternate bearing habit was found to exist in Komadan
palms but at a very low frequency when compared to dwarf and TxD palms. Thickness of meat, weight of copra and oil content were high in Komadan. The seedlings of Komadan were more vigorous with high seedling vigour index and they showed early splitting of leaves. About 71 to 82% of seedlings showed moderate brown colour (bronze) in the petiole. Seedling selection for this character is essential to maintain the purity of Komadan. Komadan types occupied an area mid-way between NCD and WCT with a clear progression through generations towards better weight of un husked nut. This indicates the origin of Komadan from the natural cross between WCT and yellow dwarf and its stabilized genetic position in between NCD & WCT. Komadan has been treated as good as or even better than the WCT cultivar in productivity, kernel quality, toddy yield and fibre output (Shylaraj et al., 1991).

Unusual early flowering was observed in Komadan in the Demonstration - cum - Seed Production Farm of the Coconut Development Board at Vellanikkara, Thrissur in 1999. (Nandi and Sugata Ghose, 2000). Manju (1992) observed significant superiority in Komadan in majority of the mother palm characteristics especially number of bunches and spadices and number of nuts per palm per year. High heritability combined with moderate to high genetic advance were recorded for nut yield per palm per year and number of female flowers per bunch indicating the predominance
of additive genes for these characters. The brown colour of Komadan nuts observed in the study indicated the distinction of this ecotype as a separate group from WCT and NCD. The Komadan types were significantly superior to WCT in all seednut characters except in oil content, thickness of husk and husk / nut ratio (Manju, 1992). This ecotype has stabilized its genetic position in between the natural cross progenies of dwarf and the WCT (Thampan, 1999).

Kuttiyadi tall is not much different from WCT and the name denotes the place where this ecotype is available in large numbers and is served as the original source of planting material for other places. The performance of this ecotype is reportedly better than WCT in rainy season. Thampan (1999) reported that though the nuts of WCT and Kuttiyadi are similar in size, the final copra yield of Kuttiyadi nuts is not as much as that of WCT nuts because the drainage loss is comparatively more. The productivity under rainfed conditions ranges between 60 and 80 nuts palm\(^{-1}\) year\(^{-1}\) with a copra yield of 160 g per nut.

The ecotype Jappanan is confined to a few gardens in Pathiyoor Panchayat, Alappuzha district. This is believed to have been introduced from Sri Lanka by the earlier generation of farmers. Tall in stature, the palms have sturdier stem and bigger crown than that of the WCT. The nuts are bigger in size, but the number is less. The kernel is thick, firm and tasty
and is suitable for both copra production and dietary uses. The copra out-
turn nut$^1$ varies between 180 g and 200 g which is higher than that of WCT
(Thampan, 1999).

The Chowghat Dwarf Green (CGD) cultivar was reported from the
Chowghat area of Thrissur District in Kerala. This is the earliest flowering
cultivar. The first inflorescence emerges from the 18$^{th}$ leaf axil and hence
popularly known as 'Pathinettam patta' in Kerala as well as in Tamil Nadu.
The leaf petioles, leaves and nuts are dark green in colour. The nuts have a
characteristic ‘beak’ when fully mature. Retention of unfertilized female
flowers and distribution of large number of female flowers per spike are the
characteristic features associated with this cultivar. These palms have been
found to have a good degree of field tolerance to root wilt disease and hence
healthy palms located in the root wilt hotspots have been extensively used in
breeding for disease tolerance in combination with the disease resistant
WCT palms occurring in similar areas. The mean annual yield is 66 nuts per
ha with a range of 30 to 107 nuts. The copra content is low with a mean of
60 g nut$^{-1}$ with 66 percent oil. The copra is of poor quality as it is leathery
and has no demand in the market. The Tender Coconut Water is sweet, but
the quantity of water is less (approximately 80 ml / nut). This cultivar
exhibits alternate bearing habit.
Despite the apparent phenotypic uniformity of dwarf palms, varying degrees of genetic diversity are concealed in individual trees. The Dwarf Green though uneconomical for commercial cultivation show maximum field tolerance to Kerala wilt (Ninan, 1976). Studies have indicated that typical CGD palms are comparatively disease free (Nair, et al., 2000)

Nampoothiri et al. (1998) viewed that the physiological evaluation of yield and all related production processes like photosynthesis, dry matter partitioning and harvest index play a major role in identifying the desirable genotypes with stable and high yield. This approach has to be made applicable in coconut, oil palm, rubber, coffee, tea etc which help the breeders for selection of suitable materials for breeding for high yield.

According to Rajagopal and Kasturi Bai et al. (1990), the coconut palm exhibits wide variability in the production of nuts, ranging from 30 to 200 nuts per palm per year, with elite palms yielding even up to 470 nuts per palm per year. This variability is due to the genotypes and their response to water and nutrient management.

Research was carried out since 1960s to identify prepotent palms based on the early stages of growth of progeny in the nursery. Observations made by Satyabalan and Jacob Mathew (1976) on growth rate and seedling vigour in seedlings of 16 selected high yielding families (WCT) indicated significant differences in growth rate of progenies between families.
Correlation of these growth characters from the first to the ninth month from the time of germination with those of the tenth month showed that it was high and positive from the fifth month. This shows that it may be possible to identify palm of superior genetic value even from the eighth month onwards based on the growth characteristics of the progeny.

It was generally assumed that the primary aim of coconut breeding was to increase the yield of copra. But in regions affected by serious diseases like root wilt in India, Cadang Cadang in the Philippines, lethal yellowing in Jamaica etc. breeding for disease resistance had become as important as yield improvement (Bavappa and Subramanian, 1976).

The studies made on identification of parents in MYD and tall cultivars for the production of promising Dwarf female x Tall male hybrids indicate the possibility to identify palms from the different Dwarf forms and Tall cultivars as pistillate & pollen parents respectively for their better combining ability. Such identified palms should be utilised for the production of promising hybrids in a short time and in large number which when planted will go a long way to improve the yield of future plantations. Research workers should study the palms among the dwarf and tall cultivars available in their countries and identify parental combinations for producing promising hybrids for their countries (Satyabalan, 1993)
The coconut palm exhibits wide variability in productivity ranging from 30 nuts to 400 nuts palm\(^{-1}\) year\(^{-1}\). This is mainly due to the efficiency of the palms in the dry matter production and partitioning towards yield. Patel (1938) was the first to report this aspect in coconut. The relationship between height of the palm, number of leaves and the annual yield was highlighted by him. This reveals that leaf area (LA) and leaf dry matter (LDM) production are important parameters regulating the production potential of coconut palm.

Coconut genotypes growing under rainfed and irrigated conditions were analysed for leaf polyphenol oxidase (PPS) activity during the development of water stress. The rainfed palms showed increased PPO activity with increasing levels of stress, while the activity in irrigated palms remained constant, the extent of increase being more in COD x WCT and WCT x COD hybrids than WCT (Shivasanker, 1990, Shivashanker et al., 1991)

Pillai et al. (1991) prepared a model descriptor for characterization of 18 genotypes based on fruit component analysis and other measurable phenotypic characters. Five major groups of characters were taken into consideration viz. age at flowering, leaf characters, inflorescence characters, breeding behaviour, nut characters and its ratios. Retnambal et al. (1995)
published an exhaustive descriptor using 14 vegetative, 21 reproductive, 24 fruit and 2 biochemical characters for 48 accessions.

The water of tender coconut is the finest natural drink and is a valuable gift to mankind. It is not merely used as a thirst quenching drink but as a mineral drink that cures most of the diseases and helps to regain health (Anonymous, 1961). In addition to sugar, the important constituents are protein, fat, minerals like sodium, potassium, calcium, magnesium, iron, copper, phosphorus, sulphur and chlorine along with vitamins of B-Group and vitamin C. The pleasant taste of tender coconut water is attributed mainly due to these sugars and mineral constituents (Jayalekshmi et al., 1988)

Among three prominent cultivar groups, dwarf varieties are suitable for tender coconut. Davis (1962) suggested that dwarf cultivars were ideal for tender coconut. Dhamodaran, et al. (1993) pointed out that Chowghat Orange Dwarf performed well with high sugar content (7 g/100 ml) and low sodium (22 ppm) and potassium (2000 ppm). Also, a high acceptability in organoleptic scoring made it to be recommended as a variety suitable for tender coconut followed by Malayan Orange Dwarf.

Balasubramaniam (1983) opined that the reducing sugars of liquid endosperm decreased in coconut bunches of 10-12 months age. He also observed that the peak content of reducing sugar was at sixth month old.
Jayalekshmi et al. (1988) reported that the sugar content of nut water was about 4-7 per cent which varied with variety. The highest sugar content was noted to be 5.8 per cent. The total sugars and reducing sugars decreased on maturity and the rate of reduction was much high in reducing sugars. Shivashankar (1991) reported that polysaccharides of mature water have galactose and arabinose with minor amounts of mannose. Dhamodaran, et al. (1993) noted highest sugar content (7 g/100 ml) in variety Chowghat Dwarf Orange along with protein, fat and minerals like sodium, potassium, calcium, magnesium, iron, copper, phosphorus, sulphur, and chlorine and vitamins B-group and C.

Vijayan, et al. (1977) stated that the potassium content was high in talls compared to the hybrids and dwarf varieties. Kamaladevi and Velayutham (1978) observed an increase in P, K, Ca and Mg upto eighth month. The highest concentration of nutrients except sulphur was recorded at the eighth month. Jayalekshmi et al. (1988) found that potassium decreased on maturation, sodium showed increase, calcium, magnesium, chloride, iron and copper were constant in coconut water exhibiting no particular trend during maturation. Dhamodaran et al. (1993) reported that the lower content of potassium and sodium attribute the pleasant taste of the tender coconut. The Dwarf varieties recorded lower potassium content and the tall cultivars recorded lower sodium content.
Chinnaraj (1997) recorded higher volume of water in East Coast Tall (314.34 ml) and Andaman Ordinary (314.14 ml) among Tall types, VHC-1 (288 ml) in hybrids and, MDG and MDY (260 ml) in dwarf. Total sugar content reported was higher in dwarf varieties like MDY (6.81 g) and MDG (6.68 g) followed by hybrids and talls. Reducing sugars, the major constituent of total sugar was higher in dwarf, MDY (4.61 g) and MDG (4.48 g) followed by hybrids, MDY x GB and MDG x PHY. Among tall types, ECT registered higher reducing sugar. The lowest level of potassium, an attributing character at lower level, was also recorded in dwarfs viz. MDY (2054 ppm) and MDG, (2164 ppm) followed by the hybrid MDG x PHY (2290 ppm).

Maximum quantity of nut water was observed in six month old nuts. The sugar content of the nut water and kernel were maximum in eight month old nuts irrespective of the genotype. Potassium was the predominating factor. Oil content increased with a corresponding decrease in nut water acidity and sugar content in water and kernel (Kamaladevi and Velayutham 1978).

The developing fruit contains a variety of nitrogenous substances, of which free amino acids constitute a major part (Tulecke et al., 1961). During fruit ripening, the total nitrogen and non-protein nitrogen (NPN) show a progressive increase although their levels decrease marginally on
whole nut basis. The NPN content remains more than 60% at any stage of maturity (Jayalekshmi et al., 1988). Pillai (1964) showed that in the ripening nut the free amino acid (FAA) content in coconut water increases from 4 mg 100 ml⁻¹ to 16 mg 100 ml⁻¹, whereas its concentration of amino acids however, does not show any marked change.

Ramadasan and Jacob Mathew (1987) after destructive sampling of five palms developed a method to estimate the area and dry weight of the leaf non-destructively. They measured the area of 18 leaflets—three leaflets collected from each side of the rachis from the top, middle and basal portions, using Li-Cor 3000 leaf area meter. The leaflets were dried in a hot air oven at 80°C and the dry weights determined. Ramadasan and Jacob Mathew (1987) estimated the DM production of the apical portion of the trunk just below the crown, as it is this portion which contributes to the growth of the stem.

The dry weights of stem and leaf together constitute the VDM of the palms and is a useful character for selection. Low VDM is associated with high harvest index (HI). Significant variation exists in the VDM between the tall, dwarf and hybrid. Dwarfs exhibited lower VDM production (18.3 kg) mainly due to the short stature of the trunks and lower stem height increment (25 cm) and small size of the leaves (3.4 m), whereas due to higher increment in stem height (36 cm) long leaves (4.0 m) as well as large
production of leaves (12 per year) VDM production is higher in tall palms. The hybrids represent both the dwarf and tall parents. Similar conclusions were drawn from the evaluation trial of Rennel Tall, Malayan red dwarf and the hybrid between them (Friend and Corley 1994).

Nut production per palm per year shows great variation among the cultivars / hybrids, but bunch production or spikelet per bunch do not vary significantly among the cultivars / hybrids (range 100 to 400). Higher female flower production is observed in the hybrids than the cultivars.

The total of dry weights of spathes, bunches and nuts determined by drying the samples to constant weight constitute the reproductive dry matter production (RDM). Dry weights of the spadices and the spathes constitute about five percent of the total RDM production. This shows that RDM production depends mainly on the nut production and partitioning of nut dry matter towards its components, viz. husk, shell and copra. Friend and Corley (1994) eliminated the dry weights of spathes and bunches while calculating the RDM production.

For determining the dry weights of nut and its components, nuts at a constant stage of ripeness have to be harvested. Jacob Mathew et al. (1988) observed that the month of February to April when variation is the least, is the critical period for collection of nuts. They reported that a minimum of 16 nuts/ variety is required for minimizing the error. Friend and Corley...
(1994) harvested the nuts by shaking the palms and collected those nuts which have fallen, for the dry matter determination.

Nut composition shows significant variation between the cultivars and the hybrids which reflect in the partitioning of nut dry matter towards its components viz. husk (43-58%) shell (20-27%) and copra (27-34%). Satyabalan and Rajagopal (1987) reported the need for selection of parents based on the husk and shell content for hybridization and higher hybrid recovery. They indicated that for obtaining maximum number of hybrid seedlings (Dwarf x Tall) it is preferable to use pistillate parents which yield nuts having low shell content and a high copra content. Corley (1983) stressed the importance of increased partitioning of the total dry matter towards the copra at the expense of other nut components for yield improvement. He calculated maximum values for the partitioning of dry matter in the whole nut as 62% and the endosperm (copra) 26% which contained 38% of the total energy fixed. Selection of parents should be based on nut composition rather than the total dry weight of the nut. While the total dry weight of the nut remains the same for COD x WCT and PO, there is 32% more copra output in COD x WCT than PO. This indicates better nut composition in COD x WCT hybrid than PO. Similarly, Green and Foale (1961) observed that while Maren hybrid and Solomon island populations had similar fruit weights, there was 32% more kernel in the
hybrid which corresponded to the estimated difference in the yield capacity of the two populations.

Vegetative dry matter (VDM) and reproductive dry matter (RDM) together constitute total dry matter (TDM). Based on the dry matter accumulation in the vegetative and reproductive parts, TDM production also shows great variation between the cultivars and hybrids. The highest TDM production from the evaluation trial is 17 t ha\(^{-1}\) year\(^{-1}\) in Dwarf x West African Tall hybrid in the Ivory Coast (Corley, 1983). This indicates that there is a big gap in the yield realization and the full production potential of the palms.

The harvest index (HI) has been considered as an important criterion in biological and economic yield (Donald and Hamblin, 1976). Ramadasan and Jacob Mathew (1987) worked out HI in coconut by taking into account annual increment in DM production. Because of the limitation in estimating the total biomass including the roots, they have coined the term Annual Productivity Index (API) and is expressed as the ratio of the dry weight of the economic product to total dry matter production. Being a crop of continuous productivity API is an appropriate criterion comparable to the harvest index of annual crops. In coconut, since all the parts are economically important several values of HI could be calculated. They have considered total nut yield itself as the economic produce and calculated the
HI by dividing the total nut production by total DM production. The total DM production palm\(^{-1}\) year\(^{-1}\) ranged from 65 kg to 85 kg palm\(^{-1}\). The values of API estimated ranged from 0.4 to 0.5 in a group of palms in which the annual yield of nuts ranged from 45 to 91 nuts. Kasturi Bai (1993) calculated the harvest indices based on the total DM production and its partitioning towards the annual copra out turn. The local Tall variety as well as the hybrids gave higher harvest indices. The HI based on the copra out turn ranged from 0.13 to 0.23. The highest HI is observed in the hybrids indicating better nut composition in the hybrids than the varieties.

It has been widely accepted that farmer's perception of coconut varieties provides the basis for conserving the bio-diversity. Similarly farmers are the best informed of the varietal characteristics that are suitable for utilizing in the genetic improvement studies. It is important to explore the indigenous knowledge on such ecotypes/varieties through detailed studies. First hand knowledge on the varieties can be had from the interaction with farmers, extension specialists, social scientists and so on.

With this background, this study has been undertaken with following objectives.

- To explore the availability of coconut ecotypes in the major agro climatic regions of the state through interaction with farmers and their groups;
• To observe and record the distinctive features of the ecotypes following the parameters adopted by the Central Plantation Crops Research Institute (CPCRI) in describing the coconut cultivars included in the coconut descriptors;

• To evaluate the yield in terms of the number of nuts and copra equivalent;

• To determine the pattern of partitioning of photosynthates to the nut components;

• To estimate the biochemical composition of tender coconut water, coconut oil, leaf polyphenol etc and

• To examine the comparative tolerance to pests and diseases and other stress conditions.