RESEARCH AND DEVELOPMENT IN COCONUT– AN OVER VIEW

by
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SUMMARY

In the context of the fast reducing land-to-man ratio in the tropics, cropping systems which can integrate a variety of highly productive plant species and animals with human beings will have to be developed. Coconut having many favourable attributes is ideally suited for homestead farming under diverse situations. Its response to good management particularly fertilizer application and irrigation is indeed very good. Yield increases of the order of 84% due to manuring and 216% due to manuring and irrigation have been obtained in the native West Coast Tall. In coconut hybrids not only higher yields have been realised but better utilisation efficiency of native and applied nutrients observed, making them highly suited for improving the economic viability of small holdings. The potential that coconut offers for mixed cropping with a variety of crops, and mixed farming is very high. High density cropping in coconut plantations is also feasible. The cost benefit of some of the coconut based cropping systems have been presented, and the low productivity of coconut observed in majority of the coconut growing countries discussed keeping in view the remedial measures that can be thought of for the existing maladies.

Coconut palm is indispensible to the millions of inhabitants of more than 90 countries of tropics. The palm is a primary source of food, drink and shelter to a large proportion of the population in these countries. About 70 per cent of the crop area is in Asian and South-East Asian countries.

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Land-to-man ratios in the developing countries of the tropics are fast narrowing and per head availability of arable land has already been reduced to less than 0.20 ha in a number of countries like India, Indonesia, Philippines and Sri Lanka (Table I). The great majority of small farmers, therefore, have small sized holdings and proportionately little of the total land. Due to the rapid urbanisation that is taking place in all these countries as a consequence of population growth and the dire need for dwellings, a new dimension to land use has already been added and vast areas of both garden lands and even wet lands after levelling are becoming homesteads. Coconut with its fibrous root system, tall stem and crown with rosetted leaves has many features making it ideally suited for planting in a number of situations. It is the safest crop for planting near buildings and other masonary structures unlike other tree species. Due to its capability to bind soil it is best suited for planting on canal bunds. When once established it can stand inundation or even water logging for sufficiently long periods. Besides, its stature permits growing a number of crops in the interspaces of the palms and even permits use of the stem as a stand for vines. Due to these special features integration of coconut with animal husbandry, fishery and even forestry has become possible. Equally important is the role that it can play in urban areas where in the extremely limited space available coconut can still find a place. Coconut thus forms part and parcel of many homestead in addition to its being a commercial crop of a large proportion of small and marginal farmers.

Response of coconut to diffirent management practices.

Manuring and Irrigation.

The response of coconut to different management practices has been studied under a variety of situations (Table 2). While the yield of the palm is 15.8 nuts under totally neglected conditions, by cultivation and manuring, the yield can be increased to 58 nuts per year. A similar response to manuring has also been observed in farmers' fields. In homesteads palms planted around the houses have also been found to yield similarly because of the favourable conditions prevailing in such locations. In general the yield of coconut by application of manures alone under rainfed condition can help to almost double the existing productivity level. The

yielding ability and performance of coconut hybrids and varieties under similar conditions is still better. The Laccadive Ordinary and Chowghat Dwarf Orange x West Coast Tall (CDO x WCT) hybrid under the same rainfed conditions give about 50 per cent more yield compared to the local tall. The recent finding that the CDO x WCT hybrid can exploit the native fertility of the soil as well as the applied nutrients better than WCT (Table-3) is a further point in its favour. It has, however to be admitted that due to drought D x T hybrids do suffer more.[3] In spite of this, both the cumulative yield as well as the yield in the years of drought is considerably higher than the West Coast Tall.

It is interesting that the response of coconut to irrigation alone is even slightly better than manuring. Palms irrigated at 75 per cent of the IW/CPE ratio gave a yield of 69.3 nuts. These results are from the experimental palms where the existing nutrient level of the soil is relatively better. A similar response in farmers' field may not be realised. All the same, the role of moisture in enhancing coconut yield is very much apparent. When the palms are fertilized and irrigated, the yield increased to 94.8 nuts per palm per year. The enhanced coconut production due to the favourable interaction between these two inputs is indeed substantial. Similar data on high yielding varieties and hybrids are yet to be generated through appropriate field trials.

The monocrop of coconut exploits only about 22 per cent of the soil profile and about 40 per cent of the air space thus permitting the cultivation of a variety of crops under its canopy 6,1. The yield of coconut under a few of the mixed cropping situations (Table 4) has shown that the palm responds for mixed cropping with crops such as cocoa, pepper, pineapple and various tubers in different combinations. The yield increase of cultivars and hybrids due to good management alone was over 50 per cent. However, when mixcropped with pepper, cocoa and pineapple this increased to about 120 per cent. While the yield of coconut is not adversely affected by growing annual crops (tubers) year after year, a marginal increase in coconut yield is observed when the tubers are grown in rotation.

Mixed Farming.

Coconut is one of the ideal crops for raising grass such as

hybrid napier and legumes like Subabul and Stylasanthes in the interspace and rearing animals. In an area of one hectare of experimental coconut plot of the institute four to five animals could be maintained and the manure from these animals used for generating biogas, which is adequate to meet the full energy needs of the farm family and the animal shed (Figure I).

Economic viablity

The economic viability of different management practices and cropping systems in coconut is indeed encouraging (Table 5). The net profit has been more than doubled by manuring and irrigation as well as by mixed cropping. In addition, the employment generation of these systems also is a point in favour of coconut based farming system. While I ha of coconut needs only 150 man days for its annual maintenance, in mixed farming with animals it is about 1000 and in the other cropping systems it is about 350[5].

A high density cropping model

Since coconut to a great extent is a small holder crop, keeping in view the family needs for food, fuel and income a high density model has been laid out at CPCRI, Kasaragod. In this planting programme in 1 ha of the plantation in additon to 175 coconut palms there are 13,000 plants; the crops being mango, jack, bread fruit, nutmeng, suppota, acidlime, guava, clove, pepper, subabul, banana, papaya, coffee, pineapple, elephant foot yam, colocasia and tapioca (Figure 2)[2]. The long term effect of such crop community on soil health, biomas production, crop interactions, pests and disease occurrence and various other parameters are being studied on a highly inter-disciplinary basis.

Malady – Remedy Analysis.

In spite of the capability of coconut to give high yields, the present level of productivity in all the major coconut producing countries of the world excepting that of Indonesia continues to be low (Table 6). While the factors responsible for such a situation can be diverse and specific to individual countries there are some factors in common which merit consideration. The very fact that coconut palm even under total neglect, yields

a few nuts, makes it a "lazy man's crop", prompting farmers to keep it under very low levels of management. Coconut popularly known in India as 'Kalpavriksha' has some sentiments also attached to it. Generally no coconut tree is cut down till it dies on its own. This has resulted in large proportion of senile and unproductive palms in almost all the plantations, resulting in low level of productivity even under good management. Though great strides have been made in developing the technology for higher production in coconut, this has not yet reached the farmers due to various reasons of which the primary one is the extremely large number of farmers who have to be contacted by extension workers, whose number are far less compared to the number of coconut farmers. The extension gap, therefore, remains as a major problem in the transfer of technology. Inadequate availability of quality planting materials, particularly the hybrids, is yet another major factor that limits coconut development in many countries. The need to establish seed gardens to generate both high yielding locally adopted talls and hybrids, though has been recognised as an important factor, is yet to gain momentum.

In coconut while the average yield of WCT is about 60 nuts/palm/year, elite single palms yielding 470 nuts and single CDO x WCT hybrid palm giving 180 nuts/year under rainfed conditions are available[4]. There is no better method immediately available for breaking the yield barrier than adopting tissue culture technique (Figure 3). However, under such situations adequate care is to be taken to include a wider genetic base in materials used for multiplication.

In homestead the crop has to compete with a variety of other perennial crops. Under such a situation, whatever may be the management input, the yield of coconut will continue to be low. Restructuring of home garden stand by eliminating some of the tree species, shade regulation by canopy prooning etc. is required to make large proportion of coconuts productive.

The coconut is prone to a number of lethal diseases. The Root (wilt) Thatipakka and Tanjuwur wilt and Stem bleeding complex diseases of India, Cadang-Cadang disease of Philippines, Leaf Scorch Decline of Sri Lanka etc. are some of the maladies limiting the production of coconut in South East Asian countries. Research efforts in Root (wilt) have shown that the disease can be contained and better yield could be obtained by appropriate

management. However, a lasting remedy for all such diseases will be possible only through resistant varieties. The success obtained in the tissue culturing of coconut holds out considerable promise in developing adequate quantity of resistant planting material for any large scale replanting if even one resistant plant could be identified. Even novel techniques of in-vitro screening for resistance using callus and pathogens like MLO brought into culture will have to be developed. It is also a fact that no well planned developmental efforts to revive the industry through partial/total replanting programmes has ever been undertaken in many countries. Compared to other plantation crops like Tea, Coffee and Rubber the incentives given for coconut farmer is far inadequate at least in India. Another major constraint has been the high variation in the price of the commodity. In India, during the years 1980 to 1984 the price of copra fluctuated from US$ 765 per ton to US$ 1841. The economy of millions of small farmers who depend mainly on this crop for their livelihood is adversely affected by such violent market fluctuations. A support price for coconut, therefore, is a must. In general, it has to be admitted that keeping in view the role that coconut is at present playing and what it can play in the future in the economy of millions of small and marginal farmers, the developmental efforts have not kept pace which has resulted in the poor exploitation of this crop.

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Table 1.
Per capita land availability in selected coconut growing countries during 1981.

Country	Per Capita land (ha)
India	0.175
Indonesia	0.129
Malaysia	0.300
Papua New Guinea	0.111
Philippines	0.196
Sri Lanka	0.142
Solomon Islands	0.217
Thailand	0.380

FAO Production, Year Book, 1982.

Table 2.
Response of Coconut to different management practices (Kerala, India)

Management	Yield (No. of nuts/ palm / year)	Per cent increase over national average
al average	30	
ed		
) West Coast Tall		
a) Total neglect from the time of planting	15.8	–47.3
b) Cultivated and Manured	58.0	93.3
c) Farmers field (Manured)	57.1	90.3
d) Manuring alone	55.3	84.3
e) Palms around homes	56.0	86.6
i) Laccadive Ordinary	73.3	144.3
ii) CDO x WCT hybrid	75.9	153.0
ted – West Coast Tall		
a) Irrigation alone at IW/CPE ratio of 0.75	69.3	131.0
b) Manuring & Irrigation	94.8	216.0

Table 3.
Utilisation efficiency of nutrients

Nutrient levels g/palm/year		Annual nuts yield/palm		
		WCT	CDO x WCT	WCT x CDO
M0 (No fertilizer)		12.3	21.8	9.3
M1 (500 N, 500 P_2O_5, 1000 K_2O)		48.8	75.7	53.1
M2 (1000 N, 1000 P_2O_5, 2000 K_2O)		64.5	78.0	57.1
			Nutrients (g)	
Qty.of fertilizers to be applied to get 75% of realisable maximum yield	N	851	214	333
	P	851	214	333
	K	1703	427	666

Crop combination	Yield of nuts/palm/year			
	Before planting of mixed crop	After planting of mixed crop	Response	
			Absolute	Persentage
Irrigated				
Cultivars and hybrids				
1. Coconut alone – control	68.0	103.9	+ 35.9	+ 52.8
2. Coconut + Cacao SH*	56.7	107.5	+ 50.8	+ 89.6
3. Coconut + Pepper + Cacao SH + Pineapple	45.3	99.5	+ 54.2	+ 119.6
Rainfed				
West Coast Tall				
4. Coconut – control	48.2	45.2	– 3.0	– 6.2
5. Coconut + Tapioca every year	54.8	51.2	– 3.6	– 6.6
6. Coconut + Elephant foot yam every year	68.3	59.3	– 9.0	– 13.2
7. Coconut + Tapioca, Elephant foot yam, Sweet potato, Ginger and Turmeric in five year rotation.	49.7	52.1	+ 2.4	+ 4.8
8. Coconut + Greater yam, Lesser yam, Colocasia and coleus in four year rotation.	60.8	69.8	+ 9.0	+ 14.8

* NH : Single Hedge

Note : Palms under treatments 1 to 3 received double the recommended level of fertilizers after planting of mixed crop.

Tabel 5.
Estimated net returns from coconut monoculture and certain coconut based farming systems (US $/ha/yr)

	Annual cost	Annual return	Net Return
Rainfed			
Coconut – Manured – Control	463	1140	677
Coconut + Elephant foot jam	1175	2133	958
Coconut + Tapioca	888	1683	795
Irrigated			
Coconut – Irrigated – Control	326	1409	1083
Coconut – Irrigated and Manured	526	1900	1374
Coconut + Pepper + Cocoa + Pineapple	1450	2942	1492

1 US $ = Rs. 12, Coconut price = Rs. 1. 32/per nut Labour charges = Rs. 20/day, Other input costs = 1983–84 price.

Table 6.
Yield of coconut in selected countries (kg/ha)

Countries	Average of 1978–82
India	3893
Indonesia	6025
Philippines	3027
Sri Lanka	3839
Thailand	3256
Malaysia	3665
Papua New Guinea	3483

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