

Economic Significance and Productivity of Coconut Based High Density Multi-Species Cropping System (HDMSCS) in Root (wilt) Affected Area

Nadu bordering Kerala. There are no therapeutic control measures for the disease, however research efforts have resulted in evolving viable technologies to increase the productivity of the diseased palms.

Sustaining productivity over long run due to depletion and degradation of environmental resources is true for coconut. The swindling yields, increase in production costs, lack of remunerative price, global competition etc. has forced the planners to look into the issue of coconut productivity seriously. Studies have revealed that, sole crop of coconut spaced at 7.5 x 7.5m, use only 22.3 per cent of land area effectively while the average air space utilization by the canopy is about 30 per cent and solar radiation interception is 45-50 per cent. Adoption of coconut based intercropping/mixed cropping systems is one of the ways to utilize the natural resources effectively. The potential for increasing the productivity per unit area of land, time and inputs through high density multi species cropping system (HDMSCS) is considerably higher in perennial crops and HDMSCS involving compatible crops in coconut has advantages of the

HDMSCS model is one of the best methods to increase the productivity of coconut in root wilt affected garden by adopting coconut based inter cropping /mixed cropping system. A study was conducted at CPCRI, Kayamkulam in 1993-94 to evolve a suitable HDMSCS model in one hectare of root wilt affected coconut garden by planting suitable intercrops to achieve economic viability. The package of integrated root wilt management practices recommended by CPCRI were practiced in the coconut garden having the palms of different age groups with disease intensity in various stages. For the component crops the package of practices of KAU was adopted. Irrigation was also provided during summer months. Over the years there was increase in yield of crop. During 2000-2001 the author Shri. Maheswarappa found that compared to the pre experimental period, yield was increasing to the extent of 100 per cent; 110 per cent 105 per cent and 67 per cent under apparently healthy, disease early and disease advanced palms respectively. Performance of component crops viz. banana, pineapple, pepper, nutmeg and tuber crops such as amorphophallus, dioscorea and colocasia were also found satisfactory.

Coconut is one of the high value commercial crops providing enormous employment in the country. Kerala stands first with respect to area (51.1%) and production (43.6%) of coconut in our country (2000-2001). But the productivity is as low as 5870 nuts per hectare mainly because of the prevalence of root (wilt) disease and unscientific agro-techniques coupled with the growing of crop as rainfed crop. Coconut root (wilt) disease is a non-lethal, debilitating malady that affects the production potential of palm. The disease is caused by phytoplasma, a vascular limited pathogen. The disease is prevalent in all districts of Kerala in varying intensity and in the districts of Tamil

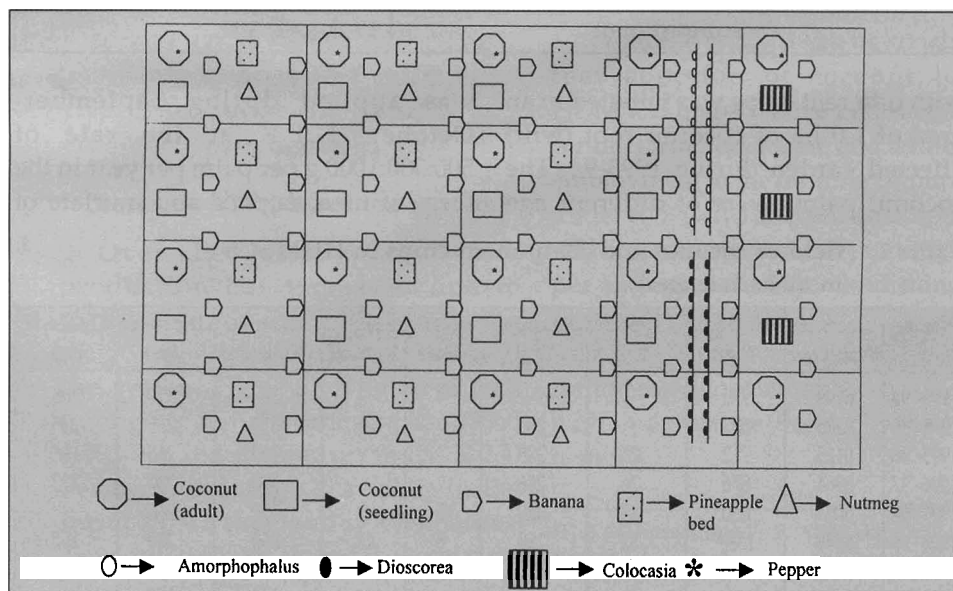


Fig. 1. Plan and layout of Coconut Based HDMSCS Model



increase in yield, additional employment and income.

With the above background, work on HDMSCS under root (wilt) affected garden with crops having different root and canopy architecture and considering the local needs of the market and farmers preference, a study was initiated at Central Plantation Crops Research Institute, Regional Station, Kayamkulam to evolve a suitable HDMSCS model in one hectare garden. In this article its impact on productivity of the system and its economic viability over the periods are presented.

HDMSCS Model

A high density multi-species cropping system (HDMSCS) model

Table 1. Crop combination in HDMSCS in coconut root (wilt) affected garden (1.0 ha area)

Crops	Population (in numbers)
Coconut : Adult (West Coast Tall)	125 (1995-1998)
	112 (1998-2001)
Seedlings	152
Nutmeg (local) :	45
Pepper (Karimunda)	30
Banana : (Poovan, Njalipoovan, Robusta, Nendran, Palayankodan, Karpooravalli):	500
Pineapple (Kew) :	3600
Tuber crops : Amorphophallus (Local):	100
Colocasia (Local):	100
Dioscorea (Local) :	100

with different crops was initiated in an area of 1.0 ha of coconut root (wilt) affected garden during 1993-94. The coconut palms were of different age

group, ie. 10 palms : 10-15 years; 36 palms : 16-20 years; 19 palms : 21-30 years and 60 palms : above 31 years. Of the total palms, 15 per cent was Apparently Healthy, 23 per cent - Disease Early, 52 per cent - Disease Middle and 10 per cent - Disease Advanced. The disease advanced palms yielding less than 10 nuts per palm per year were removed and under planted with seedlings. The crop population is given in the Table 1 and plan and layout is depicted in Fig.1.

The package of integrated root (wilt) management practices recommended by CPCRI were adopted for coconut. Organic manure in the form of composted coir pith (50 kg/palm/year)

potash was applied in two splits (1/3rd during May-June and 2/3rd during September-October) and MgSo₄ at the rate of 1 kg per palm was applied. Green manure crop, cowpea was grown in the coconut basins during monsoon period and incorporated during September-October months. For effective control of leaf rot disease of coconut, pouring of Dithane M-45 (@3 g in 300 ml of water) was carried out during May and pouring with Contaf (@ 2 ml in 300 ml of water) during October. For component crops, the package of practices recommended by Kerala Agricultural University was adopted. Recommended pest and disease control practices were adopted as per the schedule for other crops also as and when needed. Irrigation was provided during summer months with hose irrigation during initial years and perfo irrigation at later stage and water to a depth of 20 mm was provided at the IW/CPE ratio of 1.0.

Inputs and Outputs from the System

A record of the quantities of the input such as manures, fertilizers, plant protection chemicals and labour used for establishing and sustaining the model was maintained. Harvesting of the economic produce was done at appropriate stages and the yield recorded from 1.0 ha area. The market rate of both inputs and outputs for the corresponding years was considered to workout the economics of the system for 1 ha area. Tabular analysis was performed to identify the individual share of factors of production in the total cost including the annuity value. Based on the total returns and total cost, the net return obtained from the system was worked out.

Yield of Different Crops

The yield of coconut and other component crops in the system is given in Table 2. Over the years, there was

was applied during September-October. N:P:K at the rate of 500:300:1000 g per palm per year in the form of urea, rajphos and muriate of

Table 2. Yield of coconut and component crops in HDMSCS (in 1.0 hectare area)

Year	Coconut (Nuts/year)	Banana (kg)	Pepper (kg)	Pineapple (kg)	Nutmeg (kg)		Amorphophallus (kg)	Dioscorea (kg)	Colocasia (kg)
					Mace	Nutmeg			
1993-'94	6149	975		-			280	310	205
1994-'95	6225	823		280			310	285	235
1995-'96	6115	912	25	385			230	260	
1996-'97	6364	876	26	288			390	237	230
1997-'98	6053	660	28	320	5	8	350	260	
1998-'99	4848	1339	32	298	8	13	360	289	187
1999-'00	6042	1102	28	315	12	20	355	305	
2000-'01	8486	1030	26	268	14	23	302	387	

Table 3. Returns from component crops and economic analysis of coconut based HDMSCS (Rs/ha)

Year	Coconut [†]	Banana	Pepper	Pine-apple	Nut-meg	Tuber crops	Miscellaneous	Total returns*	Total Costs*	Net returns*
1993-94	36587	9750			-	5080	3500	54920	28950	25970
1994-95	37038	8230	-	2867	-	4922	3500	56560	20000	36560
1995-96	38509	10032	3750	3850	-	3810	3800	63750	21600	42150
1996-97	40163	9636	3900	3168	-	5325	3800	65990	27300	38690
1997-98	42350	7260	3500	3520	2450	4726	3950	67760	34800	32960
1998-99	31609	14729	4000	3278	4475	5112	4000	67200	32375	34830
1999-00	37730	12122	3500	3465	7280	4810	4200	73110	33800	39310
2000-01	49744	11330	3120	2948	7875	4908	4500	84430	37250	47180

[†]Coconut return was worked out for 175 adult palms

*Rounded figures

increase in the yield of different crops in the system.

Coconut : There was an increase in the nut yield of coconut over the years. During 2000-2001, increase in yield was to the extent of 100 per cent, 110 per cent, 105 per cent and 67 per cent under apparently healthy, disease early, disease middle and disease advanced palms respectively compared to pre-experimental yield. The average yield obtained during 2000-2001 in the garden was 75.8 nuts per palm per year compared to pre-experimental yield of 30 nuts per palm per year. Increase in yield of coconut was mainly attributed to improvement in soil characteristics, which enhanced growth and yield of coconut coupled with effective control of leaf rot disease. Overall there was reduction in yellowing and flaccidity of the palms.

Performance of component crops : Average per plant yield of different crops grown in the system was satisfactory. Among banana varieties studied, palayankodan (20-24 kg/bunch) and karpooravalli (22-25kg/bunch) varieties produced highest per plant yield. Other varieties like poovan (15-20) kg/bunches), njalipoovan (14-19 kg/bunch), robusta (12-17 kg/bunch) and nendran (13-18 kg/bunch) also performed very well. Pineapple crop also produced on an average 1.2

to 2.0 kg fruit yield. Tuber crops such as amorphophallus (7.5-10.0 kg/plant), dioscorea (5.5-7.0 kg/plant) and colocasia (3.0-4.0 kg/plant) also performed very well in the system and provided additional yield. Pepper and nutmeg started yielding and the yield was very good. Nutmeg yielded on an average 300 to 500 fruits per tree and pepper yielded 1 to 1.5 kg dry pepper per vine per year.

From the study it can be concluded that adoption of coconut based HDMSCS helps realize better stability for the farm net income and additional employment to the farming community under root (wilt) affected area, coupled with improvement in soil properties.

Economic Viability of the System

Over the years, total cost of production has increased due to increase in labour cost which is the major constituent of cost of inputs in the system (Table 3). The total cost during the initial years was Rs. 28950 (1993-94) and it went up to Rs. 37250 per hectare during 2000-2001. In the input cost, the labour cost alone constituted 56 per cent of the total cost, which indicates that the labour requirement was more in high density

multi species cropping system where in planting, replanting operations need to be taken up in addition to normal operations. Hence adoption of coconut based HDMSCS provides additional employment for the farming family. In the system, crops like pineapple requires more labour for weeding operation and fertilizer application compared to other component crops.

The total returns from the system is furnished in Table 3. From the data it can be clearly seen that, the total returns from the system was Rs. 54920 during 1993-94 and increased to Rs. 84430 during 2000-2001 from per ha. During the period*of 1999-2000 and 2000-2001 the price of coconut was very low and resulted in lower returns from coconut, where as returns realized from intercrops was Rs. 31180 and Rs. 30180 respectively which indicated growing different crops provide a cushion for future drop in price of copra. This indicates that, the system was able to provide more stabilized income to coconut farmers. The net return obtained from the system was Rs. 25970 during 1993-94 and Rs. 47180 during 2000-2001.

From the study it can be concluded that adoption of coconut based HDMSCS helps realize better stability for the farm net income and additional employment to the farming community under root (wilt) affected area, coupled with improvement in soil properties. As per the agro climatic condition, soil type, farmers choice, and other aspects taken into consideration, coconut farmer can adopt suitable crops in their garden to realize the socio-economic benefits.

H. P. Maheswarappa¹, P. Arithakumari² and S. Remabai³

Central Plantation Crops Research Institute, Regional Station, Kayamkulam - 690 533, Kerala, India