

INTENSIVE CROPPING IN COCONUT GARDENS

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WITH a view to utilizing more effectively the basic natural resources, namely solar energy, soil and water, the scientific principles and techniques of raising inter and mixed-crops in coconut plantations have been worked out at the Central Plantation Crops Research Institute (CPCRI), Kasaragod since a large majority of the plantations are less than one hectare in extent, in developing such practices the feasibility and economics including employment opportunities that may be generated and credit requirements for such intensive cropping systems and the size of the holdings have been taken into account. A few farm plan models for one hectare plantations are described below.

Farm Plans

Growing diverse crops may enable staggering or cultivation expenses, labour employment (field operations) and monetary returns.

The choice of inter/mixed crop primarily depends on its acceptability to the grower. A crop that is a staple food for the family would always get preference. Tapioca in Kerala is a typical example. A rational cropping pattern should include a few crops rather than a single crop over the entire holding.

The cost of cultivation, net returns, labour requirement and crop production of some of the profitable intercrops in coconut garden are furnished in Table 1. A few farm plan models for one ha holding of coconut garden is worked in Table 1 A to E. Under rainfed conditions tuber crops, pineapple and banana are suggested. Where summer irrigation facilities exist mixed cropping with perennials like cacao, pineapple and pepper can be adopted with advantage (Table 1-B). A model for partially irrigated and partially rainfed farm is also given in Table 1-C.

The Tables were prepared based on the data collected for several years at the Institute, from experimental plots of size ranging from 0.1 ha to 0.4 ha and hence should be valid for most purpose of small and marginal



Elephant-foot yam as intercrop



Turmeric as intercrop

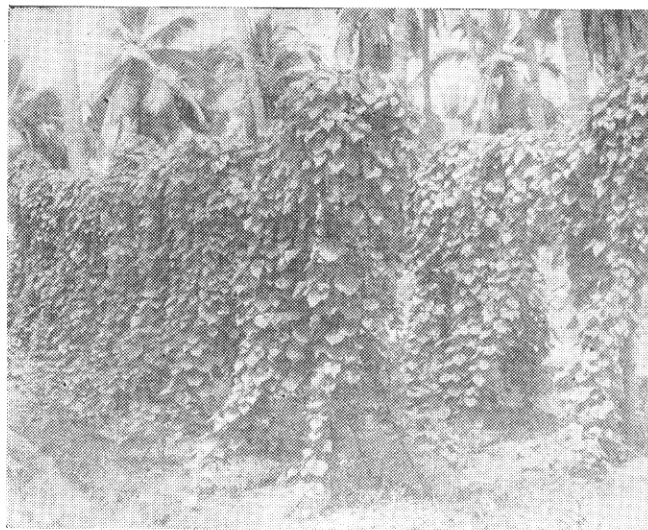
holdings. The projections, when made for larger holdings, should deviate only within reasonable limits of the actuals, as the data collection was made on the experimental farm. In the case of holdings of 0.1 ha and less size, the input strategy can be adjusted to take advantage of the idle labour. The owners in this case, will be mostly agricultural labourers and as such may have quite a few partially employed and idle days which can be most profitably utilised on their farms. For such farms the stress should be on human energy and organic manures, with corresponding reduction in chemical energy and cash input. The cash input can thus be brought down considerably.

It is preferable to have a fairly large sized plot under model 1B where cacao is raised as a mixed crop. Since rodent damage will be more severe when cacao is raised in isolated small pockets and marketing opportunities more if the produce is more. Also under conditions prevailing in most parts of Kerala, irrigation is a must for cacao and it may not be economical to put up irrigation installations for small plots.

Ginger is the most remunerative intercrop as seen from Table 1. However, it is highly susceptible to the disease 'Soft rot' which can devastate the entire crop. The incidence is more than the crop is raised consecutively in the same area. Hence ginger is not included in the farm plan models. Sweet potato can be followed by a pulse crop like horse gram, black gram, green gram or cowpea in years when the north-east monsoon rains are favourable; this feasibility is not shown in the models.

Under rainfed conditions and good management coconut is expected to give a mean annual yield of 60 nuts per palm while the cost of cultivation would amount to Rs 2,233 per ha. Under irrigated conditions, the yield of coconut is expected to go up to 100 nuts per palm giving a net return of Rs 7,840 per ha. The response to good management in coconut accrues from the third year onwards. However, the data given in Table 1 presuppose that it is a well maintained garden. The net return per ha under multistoreyed cropping consisting of coconut, cacao, pepper and pineapple is around Rs 15,600 per annum which is the highest. As the most remunerative intercrop under rainfed conditions ginger gives a combined net return of nearly Rs 13,700. Tubers and banana give net returns between Rs 6,000 and Rs 8,000 per ha per year (including that from coconut). Thus one ha of coconut garden with adult bearing palms under intensive cropping programme can sustain a medium-sized family on average standards, while under high intensity cropping programme with irrigation facilities half a hectare would be sufficient for the purpose.

The monthly break-up of expenditure and income from a one ha coconut garden under different cropping patterns is given in Table 2. When family labour is employed, there will be proportionate reduction in



Dioscorea esculentis as intercrop

expenses. It may be noted that in August, September and October, the margin of net income is low or the expenses are more than receipts. This undesirable tendency can be checked by suitable adjustment of sowing/planting of inter crops, so as to have the harvest to these crops during the above months and thus bridge the gap.



Banana as intercrop

TABLE 1. NET RETURNS PER ANNUM FROM ONE HECTARE OF GARDEN LAND UNDER [OPTIMAL CONDITIONS OF SPACING (FOR PLANTATIONS ABOVE 20 YEARS IN AGE)

Intercrop	Cost of cultivation of intercropped and mixed crops	Value of intercrop output	Net returns		Additional Employment		Additional output of intercropped (tonnes)
			from inter-crops or mixed crop.	Total including coconuts	Man days	Woman days	
1. Elephant yam	3246	6425	3179	7246	123	8	12.85
2. Tapioca	2122	4204	2082	6149	93	12	10.51
3. Sweet potato	2055	3335	1280	5347	56	26	9.53
4. Ginger (Rio-de-Janeiro)	4730	14420	9690	13757	108	24	11.57
5. Turmeric (Armour)	4568	5162	594	4661	108	24	12.93
6. Chinese potato Coleus	2035	4800	2765	6832	92	23	6.00
7. Yams (<i>Dioscorea alata</i>)	2827	6360	3533	7600	64	12	12.72
8. Lesser Yam (<i>Dioscorea esculenta</i>)	2827	5400	2573	6640	64	12	9.00
9. Banana	7272	11000	3728	7795	170	—	20.00
(A) 50% of area for tapioca and the rest for other intercrops							
1. Elephant yam	2684	5314	2630	6697	108	10	
2. Sweet potato	2088	3770	1682	5719	74	19	
3. Yam	2474	5282	2808	6875	79	12	
4. Banana	4696	7602	2905	6972	132	6	
(B) Mixed cropping with pepper, cocoa, and pineapple (suitable for irrigated holdings larger than 1 acre)							
	3979	11800	7821	15661	142	21	
(C) Mixed cropping with pepper and pineapple only							
	3695	6400	2705	6772	189	20	
(D) 50% area under Model (B) and the rest under intercrops							
1. Tapioca	3051	8002	4951	10905	118	17	
2. Elephant yam	3613	9112	5499	11453	132	15	
3. Sweet potato	3017	7568	4551	10504	99	24	
4. Yam	3403	9080	5677	11631	103	17	
(E) 50% area under Model (C) and the rest under intercrops							
1. Tapioca	2908	5302	2394	6461	141	16	
2. Elephant yam	3470	6412	2942	7009	156	14	
3. Sweet potato	2875	4868	1993	6060	122	23	
4. Yam	3261	6380	3119	7186	127	16	

TABLE 2. MONTHLY EXPENDITURE AND RETURNS (Rs.) PER HA OF GARDENLAND

Crop/Crops	Particulars	January	February	March	April	May	June	July	August	September	October	November	December	Total (Rs)
Coconut (Rainfed)	Cost of Maintenance	50	50	70	40	440	30	30	345	750	450	95	50	2400
	Value of produce	420	600	702	840	672	546	516	474	420	366	348	396	6300
Coconut (Irrig.)	Cost of Maintenance	264	265	285	155	440	30	30	345	750	450	95	168	3268
	Value of produce	695	997	1142	1393	1159	898	855	789	723	614	568	667	10500
Coconut + Cacao	Cost of Maintenance	295	805	315	593	918	70	50	895	614	470	850	325	6200
	Value of produce	1220	1800	2100	2660	3030	2320	1020	950	860	1240	2600	1900	21600
Multistoreyed Cropping	Cost of Maintenance	315	895	375	673	1158	100	300	905	694	940	860	345	7520
	Value of produce	1620	2340	3130	4190	3680	2320	1020	950	860	1240	2600	2300	26250

Rural credit

The annual outlay for good management of one hectare coconut garden of 175 adult bearing palms would be around Rs 2,233. The subsidiary crops enumerated in the Tables, would need another Rs 2,055 to Rs 7,272 per year depending upon the crops grown. Therefore the annual requirement of credit towards the inputs for intensive cropping programme would range between

Rs 5,500 to Rs 9,500 per annum. Of this outlay, the investment on the inter crop alone becomes recoverable during the course of the year, as the response to inputs in coconut strain accruing only from the third year and stabilised bearing of cacao is from the third year. This would mean that the credit facilities necessary for successful adoption of this intensive cropping programmes and realisation of enhanced agricultural production

should have two components, namely short-term and medium-term loans. In case irrigation equipment is to be installed, especially when the high intensity multi-storeyed cropping is adopted, a third component namely long-term loan also may be required which may be around Rs 5,000 per ha on an average.

Employment Opportunities

Most of these crops are labour intensive. The cost of cultivation of these crops mainly comprises two components, labour and fertilisers. One-fourth to half of the cost of cultivation in the case of most crops is towards labour charges. A pure plantation of one hectare coconut requires about 150 man days per year while under the different inter crops on mixed crops, it may go up to 350 man days. The employment opportunities generated through growing these inter and mixed crops are also furnished in Tables.

Prerequisites

For successful adoption of such cropping programme certain prerequisites are essential. One important factor that limits the adoption of inter/mixed cropping is the age of the palm. When the palms are young, plenty of solar energy and land area are available for any of the crops to be grown. Between the ages 8-10 years and 20 years, when the trunk of the palm is short, the canopy developed by the coconut leaves almost covers up and touches the land, very little sun-light penetrates the canopy and reaches the ground. During this period, only a few crops like colocasia which tolerate shade to a very high degree can get themselves established and give satisfactory yields. After the age of 20 years, as the trunk has grown taller, sufficient sunlight reaches the ground and most of the crops suggested in the Tables can be grown.

The second important factor that limits the cultivation of inter or mixed crops is the spacing between palms. As the palm density increases, the total volume of soil mass occupied by the effective root zone of coconut increases. Roughly an area of 12 square metres round the base of an adult palm confines the effective root zone. When the spacing is 7.5 m nearly 75 per cent of the land area is available for other crops. When the intensity of planting is as high as 300 per ha, the land area affectively occupied by the coconut roots may still be only 36 per cent leaving nearly two-thirds the land for growing inter and subsidiary crops. However, the shade cast by the canopy may be much higher and may restrict the choice of the inter or mixed crop to be grown.

The most important factor that limits the yield of both the main crop as well as the subsidiary crops is the management practices. It is essential that the main crop and the inter/mixed crop should be adequately and separately fertilised to obtain proper yields. It

may be pointed out here that one of the research for the low mean yield of 30 nuts/palms in Kerala is the inadequate fertiliser application and indiscriminate growing of inter crops. So long as the coconut grower continues this suboptimal farming practice, the success envisaged is the production of either the main crop or the subsidiary crop difficult to achieve.

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