Impact assessment of cluster approach in integrated coconut management

Swapna Surendran* and E.K. Thomas**

The Coconut Development Board (CDB) in 2005 started the cluster development programme in the selected coconut producing important areas of Alappuzha district as a pilot scheme. It is a compact area approach in which coconut farmers in a contiguous area are selected and registered as a cluster.

Introduction

In India, coconut plays an important role in agrarian economy in many states particularly in the states of peninsular India. The sector provides employment in India to nearly 10 million farmers contributing nearly Rs. 7,000 crores annually to the Gross Domestic Product along with a share of 6 per cent to the vegetable oil pool of the country (Singh, 2005).Coconut is essentially an oilseed crop providing all amenities for human life, which include food, energetic beverage, medicine, fibre, wood and a variety of raw materials for the production of an array of products of commercial importance. Presently, coconut is cultivated in more than 90 countries of the world. The world production of coconut sums up to around 5 million tonnes annually. Indonesia, Philippines and India are the major producers of coconut in the world. The area covered under the coconut cultivation in the world is around 26 million acres (Chadha, 2007).

Even though India occupies third place in coconut production in the global scenario, the coconut economy is suffering from many constraints. More than 90 per cent of the 5 million coconut holdings in the country are less than one hectare in size. The need for increasing the productivity of coconut is gaining importance, as 30 per cent of the palms in the premier coconut growing states are senile and showing declining trend in productivity. Apart from all these, unexpected price fluctuation is a serious matter of concern for the present coconut sector. It is in this context the Coconut Development Board (CDB) in 2005 started the cluster development programme in the selected coconut producing important areas of Alappuzha district as a pilot scheme. It is a compact area approach in which coconut farmers in a contiguous area are selected and registered as a cluster. Farmers having landholdings of size ranging from five cents to four acres were included in the cluster possessing one to 200 palms in the holding, with a financial assistance up to Rs 7000 per acre for two consecutive years. The present paper aims at a systematic *ex post* evaluation of the socio-economic impact of the cluster approach in

*Senior Research Fellow, NAIP on Establishing and Networking of Agricultural Market Intelligent Centres in India

** Professor, Department of Agricultural Economics, College of Horticulture, Kerala Agricultural University post, Trichur - 680 656.

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integrated coconut management programme in Alappuzha district of Kerala.

Methodology

The study was undertaken in Alappuzha district of Kerala as the cluster programme was implemented by Coconut Development Board for the first time in 2005-06 in the Kanjikuzhy, Pattanakkadu and Muthukulam panchayaths of this district. Coconut constitutes around 45 per cent of the total cultivated area in the district, followed by paddy (25.35 %). Two panchayaths viz. Kanjikuzhy and Pattanakkadu from Cherthala taluk and Muthukulam panchayath from Karthikapilly taluk were selected for the study. Kanjikuzhy cluster is located towards East of Kanjikuzhy panchayath. Pattanakkadu and Uzhuva clusters belong to VII and VIII wards of Pattanakkadu panchayath respectively. Muthukulam cluster lies in Muthukulam panchayath.

Simple random sampling technique was adopted for the selection of respondent farmers from the four clusters viz. Kanjikuzhy, Pattanakkadu, Uzhuva and Muthukulam. From each cluster, 40 farmers were selected at random making a total sample size of 160. After collection of data, the total sample was post stratified into two classes based on the area included in the cluster. Class I included farmers having cultivable area less than 50 cents and Class II accommodated the farmers having cultivable area of 50 cents and above. The distribution of total sample is shown in table 1.

Both primary and secondary data were used for the study. Baseline survey report of the clusters and the secondary data regarding area, production and productivity of coconut in Kerala and Alappuzha districts were collected from the Statistics Division of the Coconut Development Board, Kochi. The primary data required for the study was collected from the participant farmers using a pre-tested interview schedule through personal interview method. The survey was conducted during April-May 2008.

Compound growth rates of area, production and productivity were estimated by fitting an exponential function of the type shown below to the time series data as used by Babu *et al* (2006).

$$Y_t = ab^t$$

From the estimated regression coefficient, compound growth rate is calculated by using the formula:

CGR = (Antilog b- 1) * 100.

The estimation was carried out using the software STATISTICA.

The estimation of cost and returns in coconut needs special treatment, which differ in many aspects from that of seasonal and annual crops. The cost of cultivation was therefore estimated by amortizing the establishment cost as suggested by Nelson *et al* (1973), with the modifications given by Das (1984) for estimating cost and returns in Kerala as shown below:

$$A = \frac{i}{i - (1+i)^{-n}}$$

where A is the annuity cost.

i = rate of interest and

n = bearing period in n years.

For estimating cost of production per nut, the establishment cost was amortized into an annuity cost @ 12 per cent, prime lending rate of State Bank of Travancore, the lead Bank of Alappuzha district at the time of project implementation. The estimate is standardized for one hectare, planted with a spacing of 7.5m X 7.5m (175 palms per hectare) ie. for one standard hectare. In this method, annuity cost at the market rate of interest 12 per cent has been calculated.

Impact assessment was carried out using 'before and after approach' using cropping pattern, crop productivity and farm income as the indicators of impact.

Results and Discussion

A systematic administrative structure was followed by the Coconut Development Board for the implementation of cluster development programme. Deputy Director from the Board was given the charge of cluster development programme at district level, under whom a Technical Officer and a Field Officer were deployed for the

Table 1. Sampling frame undertaken for the study

District	Taluk	Panchayath	Clusters	No. of farmers
Alappuzha	Cherthala	Kanjikuzhy	Kanjikuzhy	40
		Pattanakkadu	Pattanakkadu	40
			Uzhuva	40
	Karthikapilly	Muthukulam	Muthukulam	40
Total	2	3	4	160

effective implementation of the programme. Deputy Director reviewed the overall development of the cluster in a district. Technical Officer and Field Officer were engaged in imparting training on various aspects of coconut cultivation. They arranged classes for increasing the awareness regarding integrated coconut management practices to the stakeholders, and also for making best use of the assistance provided by the Board.

At the cluster level, a farmer participatory approach was followed for better administration of the activities. The complete responsibility of a cluster was given to a General Convener, who was a good farmer and social activist of the area with good leadership qualities, capable of building up good rapport with the beneficiary farmers. Each cluster was further divided into small groups of 50-60 farmers, and one group leader was selected from among them. These small groups were further divided into mini groups of 10-12 farmers and a Convener was selected for each of the mini groups. This administrative structure was found to be very effective in the procurement and distribution of inputs to the stakeholders. A calendar of month wise operations in coconut gardens was prepared by the experts of the Board, with the active involvement of the General Conveners, Group Leaders, Conveners and progressive farmers of the area, and the copies were distributed to each and every farmer included in the cluster. Cluster meetings and group meetings were organized once in a month and once in a week respectively in order to evaluate the activities in cluster and also for ensuring better participation in the group. The financial assistance extended to the clusters under reference was Rs. 14.33 lakhs as shown in Table 2.

Table 2. Details of financial assistance given by the Coconut Development Board for the four clusters under reference

Clusters	Area (hectares)	Palms (No)	Annual assistance (Rs in lakhs)
Kanjikuzhy	24.12	4339	4.08
Pattanakkadu	24.65	4566	4.19
Uzhuva	18.77	3328	3.13
Muthukulam	16.83	3101	2.93
Total Assistance	14.33		

Table 3 Compound growth rates (CGRs) of area, production and productivity of coconut in Kerala

Period	Particulars	CGR(in percentage)	Variance Explained
Whole Period (1975-76 to 2005-06)	Area	1.37	74.84
	Production	2.70	83.54
	Productivity	1.38	77.15
Pre WTO (1975-76 to 1994-95)	Area	1.90	83.52
	Production	3.40	72.78
	Productivity	1.20	40.05
Post WTO (1995-96 to 2005-06)	Area	-1.10	49.27
	Production	0.35	3.60
	Productivity	1.49	60.44

Trends in area, production and productivity of coconut

Growth rate of a variable may be defined as the rate of change per unit of time, usually a year. The estimation of growth rates was done for getting a clearer background regarding the trend of coconut cultivation and production in the area of study.

For analyzing the trend in area, production and productivity of coconut in Kerala and Alappuzha districts, data from 1975-76 to 2005-06 and 1983-84 to 2005-06 respectively were collected from the Coconut Development Board. Data for Alappuzha district were collected from 1983-84 onwards, prior to which Pathanamthitta was a part of Alappuzha. The estimated growth rates of area, production and productivity for the whole periods and sub periods for Kerala and Alappuzha district using exponential model are shown in table 3 and table 4 respectively.

In Kerala, area showed an increasing trend during the whole period (1.37 per cent) and Pre-WTO period (1.90 per cent) while it showed a decreasing trend (-1.10 per cent) in Post-WTO period. In case of Alappuzha district, growth in production (1.1 per cent) was more or less equally contributed by expansion of area (0.48 per cent) and growth in productivity (0.63 per cent) for the whole period. The increasing trend of production in Pre-WTO period was mainly due to expansion in area (1.68 per cent) even when the growth rate of productivity (-0.36 per cent) showed a negative trend whereas in Post-WTO period, the growth in production (0.54 per cent) was stagnant, which was mainly due to the decline in area (-1.12 per cent).

Impact on cropping pattern

The cropping pattern existed in the area before and after the project is presented in table 5, indicating the change in percentage share of each crop in the gross cropped area during the programme.

Table 5.Change in cropping pattern of sample respondents (in per farm basis)

Particulars	Before the project			After the project		
	Class I	Class II	Overall	Class I	Class II	Overall
Main crop-coconut	22.26 (91.27)	94.07 (94.03)	40.67 (92.90)	25.98 (89.90)	95.29 (92.65)	43.74 (91.41)
Inter crops- Nendran	0 (0)	0.17 (0.17)	0.04 (0.09)	0.13 (0.45)	0.44 (0.43)	0.21 (0.45)
Njalipoovan	0.66 (2.71)	1.88 (1.88)	0.97 (2.22)	0.67 (2.32)	2.14 (2.08)	1.05 (2.19)
Yams	1.32 (5.41)	2.51 (2.5)	1.62 (3.70)	1.31 (4.53)	2.63 (2.56)	1.65 (3.45)
Tapioca	0 (0)	0.35 (0.35)	0.09 (0.20)	0.18 (0.62)	0.62 (0.6)	0.29 (0.60)
Vegetables	0.15 (0.62)	1.07 (1.07)	0.39 (0.89)	0.63 (2.18)	1.73 (1.68)	0.91 (1.90)
Total area under intercrops	2.13 (8.73)	5.98 (5.97)	3.11 (7.10)	2.92 (10.10)	7.56 (7.35)	4.11 (8.59)
Gross cropped area	24.39 (100)	100.05 (100)	43.78 (100)	28.9 (100)	102.85 (100)	47.85 (100)

(Figures in parentheses indicates percentage to the total) (One cent = 1/100th of an acre)

The gross cropped area showed a change from 24.39 cents to 28.90 cents for Class I and 100.05 cents to 102.85 cents for Class II, and for overall sample, it changed from 43.78 cents to 47.85 cents. Even though the area under coconut showed a decline in relative terms for all the classes, it increased in absolute terms for Class I from 22.26 cents to 25.98 cents, for Class II from 94.07 cents to 95.29 cents and for overall sample from 40.67 cents to 43.74 cents. For all the classes, area under intercrops showed an increase in absolute terms and relative terms. In Class I, area under intercrops increased from 2.13 cents to 2.92 cents whereas in Class II, it increased from 5.98 cents to 7.56 cents and the change for the overall sample was from 3.11 cents to 4.11 cents. The relative decline in area under coconut declined from 91.27 per cent to 89.9 per cent in Class I, 94.03 per cent to 92.65 per cent in Class II and 92.90 per cent to 91.41 per cent for the overall sample due to the increase in the proportion of area under intercrops from 8.73 per cent to 10.10 in Class I, 5.97 per cent to 7.35 per cent in Class II and 7.10 to 8.59 per cent in the overall sample.

The proportional increase of area under intercrops in Class I was mainly due to the introduction of crops like banana and tapioca and increase in area under vegetables from 0.15 cents to 0.63 cents in the post-project period. In Class II, the proportional area under *nendran* and *njalipoovan* variety of banana, tuber crops and vegetables showed slight increase. The proportion of area under coconut and intercrops for the overall sample before and after the project implementation was graphically plotted and presented in Fig.1. The cluster approach followed by the Coconut Development Board has created a motivation among the farmers to bring increased area under cultivation of intercrops as they could realize early returns considering the perennial nature of coconut. The timely distribution of quality material inputs like planting materials of intercrops and nutrients required for the crops proved successful in the implementation of the programme. Shift in cropping pattern and cropping intensity were studied and it was found that the area under coconut increased in absolute terms though it showed a decline in relative terms during the post-project period when compared to the pre-project period which was due to the more proportion of area brought

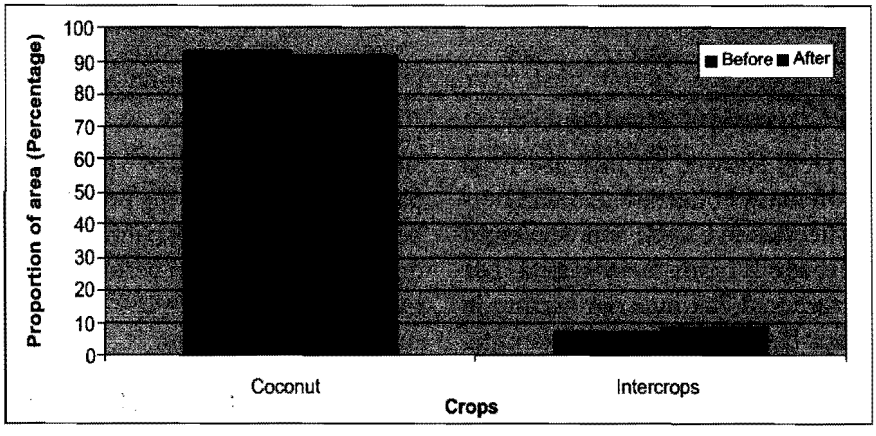

Fig. 1. Relative change in area of coconut and intercrops

under intercrops cultivation. Cropping intensity also showed a slight increase in the post-project period compared to earlier and the increase was from 108 to 109 per cent for the overall sample. After the project implementation, gross expenses showed an increase of about 23 percent due to the increased cultivation of intercrops and scientific management practices followed in the coconut gardens.

Impact on Crop Productivity

Yield of coconut showed a slight increase during the project period. In a perennial crop like coconut, more time is required for getting the full impact of any programme. Data on total number of palms in the holding, number of harvests, number of palms harvested and number of nuts harvested were compiled for working out the average yield per palm in a holding. Yield was expressed in two forms viz. nuts per palm and nuts per hectare basis, both with respect to number of total bearing palms in the holding. The details are given in table 6.

Table 6. Yield status of coconut before and after the programme

Particulars	Before			After		
	Class I	Class II	Total	Class I	Class II	Total
Nuts/palm based on bearing palms	31.12	30.90	31.48	32.21 (3.50)	32.87 (6.37)	32.67 (3.78)
Nuts/hectare based on bearing palms	5445	5409	5499	5635 (3.48)	5741 (6.14)	5638 (2.53)

(Figures in parentheses indicate percentage change)

Yield showed an increase from 5,445 nuts per hectare to 5,635 nuts per hectare in Class I and whereas it increased from 5,499 nuts per hectare to 5,741 nuts per hectare in Class II. For the overall sample, there was an increase from 5,499 nuts per hectare to 5,638 nuts per hectare after the project implementation. The results showed that there was only a slight increase in the yield status of coconut, and it is expected for perennial crops like coconut, where a stabilized yield increase expected due to more intensive management practices will take more time to materialize. This statement could be supported by the experimental study on high density multi species cropping system for root wilt affected gardens by Maheswarappa *et al.* (2003) who reported that it took almost seven years to get a stabilized yield and the productivity showed an increase from 30 nuts per palm per year during the pre-experimental period to 76 nuts per palm per year during 2000-01. Singh *et al.* (2002), has reported that coconut yield increased from 41.8 nuts per palm per year under monocrop to 53.43 nuts per palm per year under intercropping systems. The baseline data had reported a yield of 34 nuts per palm per year in Kanjikuzhy and Muthukulam and 29 nuts per palm per year in Pattanakkadu and Uzhuva panchayaths. The present study recorded a yield of 31 nuts per palm per year during the pre project period, and 33 nuts per palm per year during the post project period for the overall sample.

Impact on Farm Income

The returns obtained before and after the project from the main crop as well as from the intercrops were calculated in per hectare basis and per farm basis, the facts of which are presented in table 7. The returns from coconut showed an increase from Rs. 38,409 per hectare to Rs. 40,208 per hectare in Class I and an increase from Rs.36,607 per hectare to Rs. 40,117 per hectare in Class II. The returns from intercrops increased from Rs. 77,257 per hectare to Rs. 94,167 per hectare in Class I whereas it increased from Rs. 78,333 per hectare to Rs. 96,238 per hectare in Class II. For the overall sample, the returns from coconut increased from Rs. 37,322 per hectare to Rs. 40,153 per hectare whereas the returns from intercrops showed an increase from Rs. 78,333 per hectare to Rs. 96,238 per hectare after the project implementation. The class wise change in income status is graphically presented in Fig.2.

There was an increase in gross returns from Rs. 1,15,666 per hectare to Rs. 1,34,375 per hectare in Class I and from Rs. 1,16,055 per hectare to Rs. 1,38,331 per hectare in Class II and from Rs. 1,15,655 per hectare to Rs. 1,36,391 per hectare in the overall sample. This resulted in a considerable change in the income status of the farmer groups, which was primarily due to increased productivity of coconut, coupled with additional area brought under cultivation of intercrops, increased selling of tender nuts and seed nuts and the realized returns thereof. The percentage change was more in Class I compared to Class II, as is evident from the above table 7.

The Coconut Development Board spent an amount of Rs 14.32 lakhs towards the implementation of

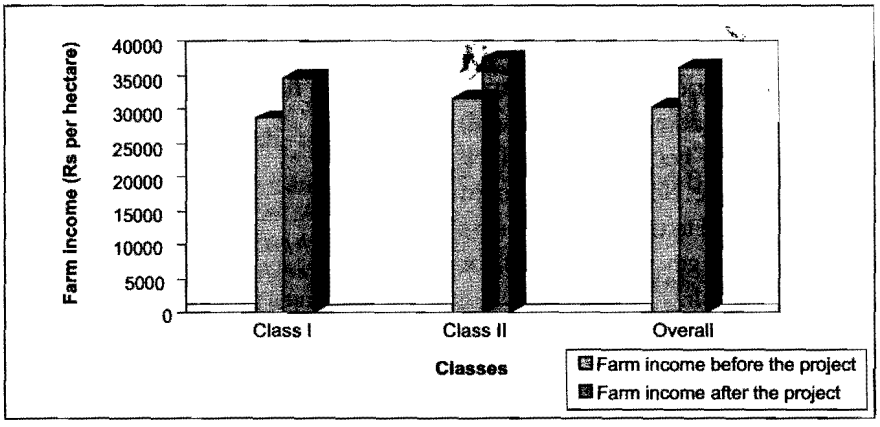

Fig. 2. Farm income of different classes before and after the project

Table 7. Class wise gross returns before and after the project

Particulars	Before			After		
	Class I	Class II	Total	Class I	Class II	Total
Coconut (Rs. per ha)	38409	36607	37322	40208 (4.68)	40117 (9.59)	40153 (7.58)
Intercrops (Rs. per ha)	77257	79448	78333	94167 (21.89)	98214 (23.62)	96238 (22.86)
Gross returns (Per ha)	115666	116055	115655	134375 (16.18)	138331 (19.19)	136391 (17.93)
Gross returns (per farm)	972	2831	723	1129 (16.15)	3374 (19.18)	852 (17.84)

the programme in the reference area. It could generate Rs 17.49 lakhs worth additional benefit to the society through enhanced productivity and additional income generation alone. There were indirect impacts like additional employment generation and commissioning of ancillary units like vermicompost units, nurseries, tender nut parlours etc., which could not be quantified. Once these indirect benefits are also accounted, the social gains could be much higher.

Level of participation in Cluster Meetings

Cluster meetings and group meetings were organized monthly once and weekly once respectively in order to evaluate the activities in cluster and also for increasing the participation of farmers in the group. The frequency at which the beneficiaries attended the meetings are presented in table 8.

Table. 8. Frequency of meetings attended by the beneficiaries

Particulars	Class I	Class II	Total
Regularly attended	26 (21.85)	21 (51.22)	47 (29.37)
Sometimes attended	41 (34.45)	13 (31.71)	54 (33.75)
Very rarely attended	37 (31.09)	7 (17.07)	44 (27.5)
Never attended	15 (12.61)	0 (0)	15 (9.38)
Total	119 (100)	41 (100)	160 (100)

It can be noted that only 29.37 per cent of the members regularly attended the meeting, while 33.75 per cent attended the meeting at times and 27.50 per cent attended cluster meetings very rarely.

Major Constraints

The major constraints experienced in the implementation of the programme were identified based on the opinions from respondents, general conveners, group leaders and conveners. The major constraint from the farmers' point of view was the lack of proper marketing facilities for their produce. Even though there was provision for procuring inputs together and its distribution among the respondents, no organized and systematic provision was observed in the clusters for the efficient marketing of the produce of the respondent farmers so as to ensure them a reasonable price. In the circumstances, they were compelled to sell their produce to local traders at a trader fixed price.

From the viewpoint of the concerned conveners and leaders, the major constraint was that present income of the beneficiaries generated from agriculture is not enough to meet their living expenses. Among the beneficiaries, 25 per cent were coir workers. There was a strong view that the chance of continuing with this approach was very less among such part time farmers unless they get timely and adequate assistance.

Unavailability of traditional climbers and skilled labour was a major constraint due to which the members were unable to carry out the harvesting and spraying operations in time. Even when the labour was available, the high wage rate could not be afforded by the

small farmers. The incidence of pests and diseases was another pernicious problem affecting the development of coconut sector in the study area.

Summary and Conclusion

Coconut being one among the important commercial crops linked with the livelihood of millions of the people in the country, the success of programmes like cluster approach to integrated coconut management has a direct bearing on large number of farmers engaged in coconut cultivation. The indicators used for the impact assessment show that the cluster approach in integrated coconut management could make a positive impact on cropping intensity, improving crop productivity and enhancing farm income. However, the programme can be made more effective if the following suggestions are also considered:

- Cluster approach should be extended for the marketing of the produce, thereby fetching better prices. Existing farmers clubs are to be strengthened and new ones are to be established and the clubs must be linked with the clusters and the market for better marketing of the output.
- The duration of financial assistance is for two years and after that period, the beneficiaries may not be able to continue with the project, because of the lack of assistance. So the period could be extended to three to four years in order to get a continuity for the approach.
- The approach should be extended to more areas across the state so as to bring more and more farmers into the arena of coconut farming.
- The financial assistance may be provided to other areas under possession of the farmers, otherwise there is a chance of diversion of the inputs provided for the holdings included under compact area to the land holdings owned by the beneficiaries in other places.
- Campaign must be launched by the Board for encouraging efficient recycling of the waste. At present, only some of the farmers have made use of the assistance for establishing vermi compost units in their holdings. Provision should be made so that other beneficiaries in the cluster should also be benefited from the vermi compost units established within the cluster.

References

Babu, K.Satheesh., Thomas, C. George., Ranjit, A. M. and Paul, T. Sheela. 2006. *Research priority setting in agriculture: The Kerala perspective.* Kerala Agricultural University, Thrissur, 72p.

Chadha, K. L. 2007. Global developments affecting the competitiveness of coconut industry. *Indian J. Hort.* 64(3): 241-250.

Das, P. K. 1984. Estimating production costs and returns for coconut in Kerala. *J. Plantn. Crops.* 12(2): 152-159.

Maheswarappa, H. P., Anithakumari, P. and Sairam, C. V. 2003. High density multispecies cropping system for root (wilt) affected coconut gardens. Its impact on productivity and economic viability. *J. Plantn. Crops.* 31(1): 23-27.

Nelson, A. G, Lee, W. F. and Murray, W. G 1973. *Agricultural Finance.* The Iowa University Press, pp 44-47.

Singh, R. 2005. Keynote address. In: Mathew, M. T. and Kumar, T. B. N. (eds.), Global coconut industry-Outlook for the future. *Proceedings of the international seminar on coconut, Goa, India.* Coconut Development Board, Kochi, pp 8-10.

Singh, S. P., Manjunath, B. L., Khan, H. H. and Shalini, B. 2002. Coconut based high density cropping system in Goa. *Indian Cocon . J.* 33(7): 9-12.

Cropping System in Coconut Gardens

Intercropping in coconut gardens : Intercropping refers to the practice of growing annuals/biennials in the interspaces of coconut. A large variety of crops have been found suitable for growing under irrigated and rainfed conditions.

Vegetables : Snake gourd, bottle gourd, amaranthus, coccinia, brinjal and bitter gourd are compatible crops with coconut. Intercropping with vegetables help to generate additional employment to the tune of 215 to 365 man days/ha/year.

Ornamental plants : Heliconia, Anthurium, Jasminum pubescence and Marigold

Medicinal and aromatic plants : Long pepper and Patchouli

Source : CPCRI