

AQUACULTURE IN HOMESTEAD COCONUT GARDENS OF KERALA

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Coconut is an important crop of Kerala and economic destiny of millions of small holders depends to a considerable extent on the prospects of this crop. The traditional system of coconut farming has often not been sufficient to provide an incentive to improve the standard of life of the cultivators. Many cropping/farming systems have been identified which can be ideally integrated with coconut for higher returns. Another enterprise which has got tremendous scope in Kerala is aquaculture. With the modern management techniques evolved and the existing vast water resources, the state can bring about substantial increase in fish production through fresh water fish culture. Of late there is increased awareness among cultivators regarding sustainable agriculture and recycling of organic matter. Hence by integrating coconut farming with other enterprises can, not only meet various needs of the farmer but also can realise higher income returns.

A mixed farming system involving coconut, fodder-grass, dairy, poultry and rabbitry is in vogue at Central Plantation Crops Research Institute since 1972. In one hectare coconut garden, fodder grasses namely NB-21 and Guinea are grown in the interspaces. By utilizing the available fodder grass, it was found that 5 - 6 milking

cows can be conveniently maintained. The available cowdung is utilised to produce biogas by installing 3 cu. metre biogas plant. The remaining cowdung available is systematically recycled to the coconut and grass. In the system, other enterprises like poultry, rabbitry and quails have also been added. All the above systems have been found to be very much accommodative and complementary thereby enhancing total income from the system (Fig. 1). During 1992, a fish pond with the dimension of 27.5 m in length, 22.5 m width and 1.5 m depth was constructed. The soil being sandy and porous to contain percolation loss, the pond was lined with polythene film of 250 micron (1000 guage). As the maximum available width of the polythene film was only 12 m, the sheets had to be joined together. This was done by fusing the free ends with double overlap of about 10 cm. The polythene sheet is cleaned and then gateway (tracing paper) is placed

above the fusing edges and electric iron (Teflon coated) is passed gently over it. Care was taken to see that the polythene sheet does not get over heated and damage the sheet itself. The sealed portion is again bent and sealed second time to be extra sure that it is properly sealed and no gaps are left. The requirement of the polythene sheet needed for layout can be calculated from the information provided in Table -1.

After spreading the polythene sheet the free ends are to be anchored in trench of 30 cm (depth) and 40 cm (width) after the embankment of 1 m all around. Preferably clayey or laterite soil is to be filled upto 10 cm at the bottom of the pond. This soil layer will help to facilitate natural recycling of the food material and to arrest the temperature fluctuations during hot days. The pond water is maintained with the help of internal water source. To facilitate

Table - 1.
 Relationship between thickness and area coverage of agrifilm

Micron	Thickness		Approx. area coverage per kg of film (sq. metres)	Weight per sq. m of Agrifilm (kg)
	mm	guage		
100	0.110	400	10.74	0.093
125	0.125	500	8.59	0.116
150	0.150	600	7.16	0.139
175	0.175	700	6.14	0.163
200	0.200	800	5.37	0.186
225	0.225	900	4.77	0.209
250	0.250	1000	4.29	0.233



draining of water from the pond whenever needed, an outlet pipe is provided at 1 ft. above the bottom of the pond. An over-flow pipe is also provided about 1 ft. below the embankment so as to drain the excess water. Both the outlets and the drain pipes are fixed with strainers so that fish does not escape. As the pond is lined with polythene sheet, there will not be natural ecosystem. Hence, artificial aeration is a must. For this, 1 HP blower was installed through which air is pumped into the pond at 12 different points for proper aeration all through the pond.

Pond Management

In the semi-intensive system, as the natural food available in the pond will not be sufficient for the fish, it is necessary to supplement it with cowdung, chemical manure and artificial food. The cowdung and chemical manure requirement is given in Table - 2.

more, application of manure is to be temporarily suspended so that its growth is arrested. Chemical manure is to be broadcast all over the pond whereas cowdung may be dumped in the corner of the pond.

Use of artificial feed helps in quick growth of fish. It is recommended to give mixture of groundnut cake and rice bran i.e. 1:1 ratio at the rate of 1 to 3 percent of body weight of fish. These materials are to be mashed thoroughly and made into ball with the help of water and suspended at minimum four places in the pond (Table-3). As in the system poultry droppings were available, around

Table - 2.
Quantity of manure to be applied/ha

Instalments	Cowdung Kg/ha	Quantity in kg/ha		
		Ammonium Sulphate	Super Phosphate	Calcium Ammonium nitrate
1st Month	5,000	75	50	20
2nd to 12th Month	2,000	75	50	20

First instalment is to be applied into the pond about 24 days before releasing the fish. If at any point of time, algal growth is 1 kg of poultry droppings were also applied everyday to the pond. This also helps to provide readymade food for the fish.

Table - 3.
Relationship between quantity of feed, species and time.

Instalments	Quantity of feed (kg/day/ha)		
	6 species	4 species	3 species
First 3 Months	3.0	2.0	2.0
3 to 6 Months	6.00	5.0	4.0
6 to 9 months	9.0	8.0	6.0
9 to 12 months	12.0	10.0	8.0
Total per year (kg/ha)	2700	2250	1800

Table - 4.
Growth of different varieties of fish

Varieties	Initials	Growth of fishes over a period of				
		Average weight (gms) / length (cm) time				
		After 1 month	After 3 months	After 5 months	After 8 months	After 12 months
Rohu	1/1	13/8.0	86/17	150/23	470/30	850/35
Catla	1/1	15/6.5	88/15	250/23	550/30	900/45
Mrighal	1/1	12/5.0	82/14.5	145/20	450/25	810/30
Grass Carp	1/1	25/8.4	90/19.5	275/20	900/36	1180/42

Quantity of fingerlings to be left in pond

About 4 - 6 cm long fingerlings of four selected species viz. Catla (*Catla catla*), Rohy (*Lebeo rohita*), Mrighal (*Cirrhinus mrighala*) and Grass carp (*Ctenopharyngodon idellus*) were left in the pond. Generally in one hectare pond area, about 3750 - 7000 fingerlings are to be left. The density of the population depends according to the level of management and the number of species of fishes that are to be left.

Growth and yield of fish

Normally fish is to be harvested from pond after 10 to 12 months period. Maximum weight of the fish at the end of one year varies from 900 to 1200 g per fish depending on the variety. In the present study the weight ranged from 810 g in case of Mrighal to 1180 g in the case of Grass carp.

Periodical growth of four varieties of fish is presented in Table - 4. It is desirable to harvest the fishes at periodical intervals so that the remaining ones in the pond can attain good weight. On an average, from one ha. integrated fish culture, it is possible to get 3000 to 4000 kg fish per annum.

Economics

In the present study to excavate a pond of approximately 0.0625 ha, the expenditure incurred

was Rs. 9,500. Cost of polythene sheet and laying charges amounted to Rs. 20,000. Recurring expenditure per annum towards the cost of fishseed, feed and labour wages totalled to Rs. 6578. By proper maintenance, the initial cost incurred i.e. Rs. 29,500 can be recovered in 2 to 3 years time. The life of polythene sheet under normal conditions is about 8 years.

From the sale of 360 kg fish realised in the study, the return was Rs. 10,800. Net profit after deducting the recurring expenditure was Rs. 4,222. (Table -5).

Precautions to be observed

1. As and when weeds are seen in the pond, they have to be removed.

2. The pond water should be neutral in pH for better development of fishes. In case the pH drops below 7.0, add 200 to 250 kg of lime per ha area.

3. In area where heavy rain is received and for a long period cloudy weather persists, it is common to observe growth of algae on the surface of water. Under cloudy weather due to excessive growth of algae there is a possibility of mortality of fishes due to eutrophication. This particular malady is called oxygen kill. To overcome the algal growth, it is suggested to remove it manually or broadcast copper sulphate.

Table - 5.
Economics of maintenance of aquaculture in 1 ha mixed farming system

S.No	Item	Amount (Rs.)
	Expenditure	
	(i) Fixed	
1.	Excavation of soil	9,500.00
2.	Cost of polythene sheet	14,000.00
3.	Miscellaneous cost	6,000.00
	Total	29,500.00
	(ii) Recurring	
1.	Fish seed	1,073.00
2.	Feed	3,205.00
3.	Labour	1,800.00
4.	Electricity & water charges	500.00
	Total	6,578.00
Returns:	From sale of 360 kg fish @ Rs. 30/kg	= Rs. 10,800/ annum
	Net profit	= Rs. 4,222/ "

Fig.1 LAYOUT OF AQUACULTURE IN COCONUT BASED MIXED FARMING SYSTEM

