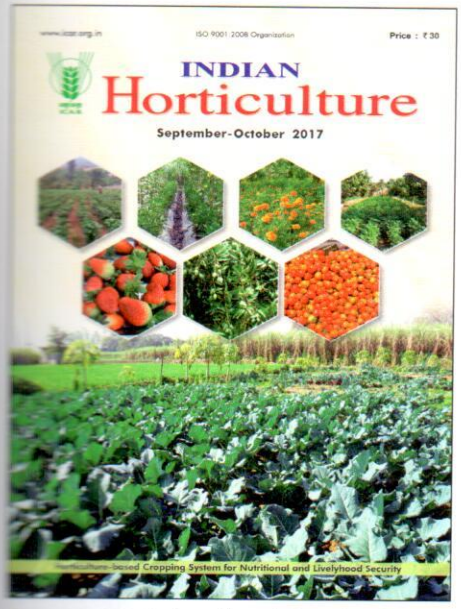

Cover : Horticulture-based Cropping Systems
Courtesy : ICAR-Indian Institute for Farming Systems Research, Modipuram

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Price : Single Copy ₹30, US $25
Special issue ₹100
Annual Subscription
1 Year ₹150, US $30
3 Years ₹400, US $85

ISO 9001:2008 Organization

भाकृअनुप
ICAR

INDIAN Horticulture

September–October 2017

Published bimonthly, Vol. 62, No. 5

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Acknowledgement

We acknowledge the cooperation rendered by by Dr Poonam Kashyap in commissioning of all articles along with their relevant photographs. We could bring out the state-of-the-art special issue of the *Indian Horticulture* due to her valuable and timely support.

– *Editor*

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Cultivation of horticultural crops pays

With increasing population and the need to ensure livelihood security, imperative to evolve a suitable strategy for augmenting production through farm and off-farm activities. By integrating horticulture crops and o agricultural activities based on the resource endowment and constraint different locations, it is possible to improve the farm production as wel employment opportunities of the individual farm households in the isl Compared to a monocropped situation, intercropping with spices, tubers vegetables with the existing coconut and arecanut plantations enha employment opportunities and diversified farm produces. Land shaping rainwater harvesting in the coastal lowlands opens up wide opportunity intensive vegetable cultivation in these areas. Such system presents a hi degree of resource use efficiency, productivity, sustainability and nutriti security. This will reduce the external dependence of islands for livelihood.

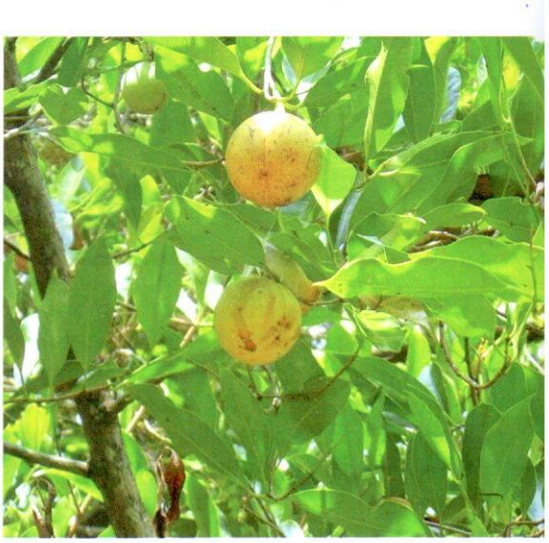
THE role of horticulture is changing rapidly from traditional to high-income generating activity due to generation of new technologies, crop varieties to face the challenges and its ability to offer solutions for various situations and entrepreneurs. In island agro-ecosystem, horticulture-based farming system has emerged as economically-viable system for small and marginal farmers and income of farm families could be enhanced significantly. Coconut, arecanut, black pepper and tree spices are important plantation crops, therefore, planation based farming systems and location-specific integrated farming system models offers ample scope for increasing the farm income through crop diversification and intensification.

HORTICULTURE-BASED FARMING SYSTEM

Coconut-based Farming System

Coconut plantations are mostly found on hill slopes in Andaman Islands while in Nicob it is mostly found in the coastal areas. In Islands mostly tall growing coconut trees in areas having more than 25% slopes. times dwarf varieties are found in private p The structure of coconut crown and the c of the leaf allow part of the incident sola to pass through the canopy and fall on th It was estimated that as much as 56% of th was transmitted through the canopy durin hours (10-16 hours) in palms aged around

A large variety of annual and perenni found suitable for growing under coconut Experiments showed that crops like tapioca foot yam, amaranthus, okra, snake gou gourd, coccinia, brinjal and bitter gourd c grown which yields 50 to 70% of their pure crop stand (Table 1). The adv coconut+vegetable systems is that separate



Intercropping in coconut garden

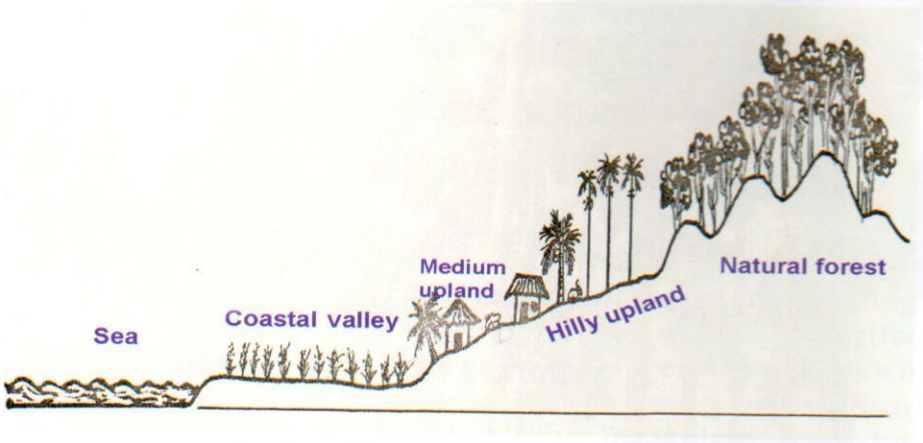
Arecanut and cinnamon system

Table 1. Economic analysis of coconut-based cropping systems for Andaman

Cropping system	Total cost (₹)	Gross return (₹)	Net return (₹)	*Additional benefits by intercrops*	
				Net return (₹)	Employment generated (man days year⁻¹ ha⁻¹)
Coconut	17000	49000	32000	-	-
CN + Elephant-foot yam	64100	110900	46800	14800	131
CN + Ginger	74500	142000	67500	35500	500
CN + Tapioca	34700	100400	65700	33700	130
CN + Vegetables	33000	83000	50000	18000	125
CN + Clove	47880	101000	53120	21120	150
CN + Banana	59680	130150	70470	38470	230
CN based HDMSCS	52000	140000	88000	56000	191
CN + Fodder	29000	95000	66000	34000	120

for monsoon and post-monsoon seasons can be grown which provides for diversity and additional income. This also helps to ensure local supply of seasonal vegetables as most of the vegetables are transported from mainland India. In well aerated and soils with high organic manures, flower crops like *Heliconia*, *Anthurium*, *Jasminum pubescence*, crosandra, marigold besides medicinal and aromatic plants like long pepper and patchouli were found suitable. Ginger and turmeric are the important spice crops commonly intercropped in coconut gardens. The intercropping of tapioca and ginger in coconut recorded higher net returns when compared to other crops like turmeric, elephant foot yam, amaranthus and bhendi.

High density multi species cropping systems (HDMSCS) involves growing a large number of crops at very high plant population per unit area to meet the diverse needs of the farmers such as food, fuel, timber, fodder and cash. It includes growing of large,



Cross-sectional view of typical physiography of the island

medium and small canopy crops arranged in a systematic way. In this Islands spice based HDMSCS can be promoted among the farmers which will generate high net returns and additional employment.

Arecanut-based Farming System

Similar to coconut, arecanut as a sole crop does not utilize the available natural resources, i.e. soil, space and light effectively. Orientation and structure of arecanut canopy permits upto 40% of incident radiation to penetrate down. Studies on rooting

Arecanut + black pepper on gliricidia

pattern revealed that a palms planted at 2.7 m could use effectively o of land area. Under isla climatic conditions a plantations are more i inter/mixed cropping an storeyed cropping than plantations. The compac of arecanut crown rais above the ground (10 allows more sunlight to pa to ground and mainta humidity which in turn excellent growth of shad shrubs/trees (banana and and vines (betel leaf and pepper) and va short statured biennials and annuals (pin ginger, turmeric, yams and other tuber Evaluation of arecanut based cropping showed that arecanut+cinnamon and arecanu pepper are more profitable in the island. Re high as ₹2,50,000/ha could be obtained by cropping of arecanut as against ₹1,60,000 case of sole arecanut. In recent years, va mixed crop with arecanut has become th profitable spice in similar climatic condit Kerala.

Site-specific Integrated Farming Systems

The promotion of agricultural diversity t integration of different enterprises will have impact on food and nutritional security at ho level. Integrated farming system provides s opportunity for diversification of di agricultural activities and it can enhan productivity and profitability of existing f systems, to ensure livelihood security of farmers. Considering the natural resource climatic, economic and social factors of the i site specific integrated farming system provides greater opportunity to enhance th income and sustain the production. In the i

Table 2. Performance of different integrated farming systems over conventional practice

Farming system	Gross income (₹/ha)	Expenditure (₹/ha)	Net return (₹/ha)	Employment generated days)
(a) Hilly uplands				
Plantation + Buffalo + Poultry	4,74,440	83,732	3,90,708	528
Existing system	3,72,560	46,152	3,26,408	365
Additional benefit	1,01,880	37,580	64,300	163
(b) Mid slope or medium uplands				
Crop + Cattle + Poultry + Fish	5,52,017	1,57,850	3,94,167	438
Existing system	4,00,107	1,05,758	2,94,349	240
Additional benefit	1,51,910	52,092	99818	198
(c) Low-lying valley and coastal plains				
Vegetable + Cattle + Rice + Fish in BBF	2,94,000	94,000	2,00,000	338
Existing system	80,000	39,000	41,000	40
Additional benefit	2,14,000	55,000	1,59,000	298

Horticulture based farming system for low-lying areas

based on the physiographic location and crop composition three distinct horticulture based IFS models for each of the farming situations are found highly suitable. These are disscussed below.

Hilly Uplands

In the hilly uplands having more than 25% slope, plantation crops such as coconut and arecanut are dominant with few fruit trees like jackfruit, guava, and sapota in the homestead gardens. Majority of the farmers are doing mixed farming which also includes dairy, poultry and goat. Lack of linkage and resource flow between different components and soil conservation measures are the major drawbacks of the present system. Under such situations, coconut based farming systems involving cultivation of compatible crops in the interspaces of coconut and its integration with animal component will provide considerable increase in production and productivity per unit area, through more efficient utilization of sunlight, soil, water and labour. A study conducted at farmers field in a participatory approach showed that coconut based integrated farming system enhanced the net farm income to ₹3.9 lakhs/ha/year as compared to plantations alone (Table 2). There was an additional employment of 163 man days/ha/year. In addition to this, the modified system is inclusive of soil conservation and *in-situ* water harvesting strategies. At certain locations where arecanut is the predominant crop arecanut based IFS model can be practiced which also provide comparable advantage.

Medium Uplands/ Mid Slopes

In the mid hill portion of the longitudinal hills and small hillocks with 10-15% slope, cocon gardens are intercropped with banana and pineapp The soils are coarse, of medium depth with l nutrient and water retention capacity. Normally the end of the slope unmanaged fish ponds are a present. Backyard poultry, cattle and goat reari in a free ranching mode is commonly practic Study revealed that integration of vegetables, puls flowers and tuber crops with coconut and dairy goat gave an additional net return of about ₹ lakh and employment generation of 198 man-da ha/yr (Table 2). Organic waste recycling composting, mulching and soil conservati measures should be an integral component so as improve the resource use efficiency and fa productivity.

Low-lying Valley and Coastal Plains

In low-lying valley areas, rice cultivation alo is possible due to waterlogging for more thar months. In these areas soils are deep however, wa logging during monsoon season and high tide i major problem. At certain locations acid sulph soil is encountered which not only limits the c production but also fish culture. In these ar modifications of existing cropping system with sh duration rice followed by vegetables and integrat of cattle, poultry and fish resulted in an additio net farm income of ₹1.07 lakhs and employm generation of 201 mandays/ha/year (Table 2).

Alternatively land manipulation technique s as broad bed and furrow system (BBF) will hel tide over the water logging and diversificatio existing farming systems. Studies conducte Central Island Agricultural Research Insti

revealed that BBF based integrated farming system was highly remunerative and most suitable for low-lying areas. The crop component include rice and vegetable in 0.35 ha, 0.30 ha BBF with vegetables in the beds and rice-fish in the furrows. Land manipulation also helps to harvest rainwater in the furrows which enables fish culture and provide supplemental irrigation to the vegetables grown in the beds. In addition, two HF cross cows integrated with the vegetable production constitute the integrated farming system. The system recorded a total net income of ₹2,00,000/- from an area of 0.75 ha with employment generation of 338 mandays/ year. In the beds different seasonal vegetables are grown with high rate of returns.

Land and Water Management

The large-scale cultivation of improved crop varieties together with efforts to maintain good soil fertility and water management helps to increase production through higher yield per hectare. But land is a shrinking resource for island agric therefore, a rational land use plan is nee increase agricultural production by achieving yields per ha through intercropping, m cropping and increasing cropping intensity island agro-climatic conditions, broad be furrow system in the coastal lowlands, terraci soil conservation in sloppy land, rain harvesting, integration of animal componen farming system and organic waste recycling a important resource management strategies for horticulture based farming systems to rea maximum potential.

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