



E-ISSN: 2278-4136

P-ISSN: 2349-8234

JPP 2018; 7(1): 1335-1338

Received: 29-11-2017

Accepted: 30-12-2017

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Assessment of economic status of different agroforestry systems in North Eastern coastal plain zone of Odisha

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Abstract

Now-a-days there has been growing interest to strengthen the local food production practices to meet the need of the present population particularly resource poor farmers. Therefore much importance has been given towards home gardens to enhance household food security and nutrition in a sustainable manner throughout the year. Home gardens are considered as an integral part of local food production systems and meets basic human needs. A home garden is a piece of land with a definite boundary surrounding a homestead, being cultivated with a diverse mixture of perennial and annual plant species, arranged in a multilayered vertical structure, often in combination with raising livestock, and managed mainly by household members for subsistence production. The cost of cultivation increased with increase of holding size from 0.2 acre to 1.6 acre where as reverse trend was obtained when it was calculated per acre basis. Next to natural forests, home gardens probably are most intensive and optimal biomass production system. A large numbers of products such as vegetables, fruits, herbaceous food crops, animals etc which supplemented the staple food production practices in open agricultural fields. It plays a major role in home use and income, enhancement of overall farm productivity, soil fertility through addition of litter and organic matter, biodiversity conservation etc. The home gardens of different sizes were found playing various roles. They provide aesthetics, ornamental, improved food quality. The kinds of benefits are more or less similar in all holding sizes, although the quantity of tangible benefits is proportionately more in higher size home gardens.

Keywords: Home gardens, multilayered, farm productivity, biodiversity conservation

Introduction

Home gardens are one of the most complex and diverse agro-ecosystems worldwide. Home garden systems have existed for millennia (Kumar & Nair, 2004; Soemarwoto & Conway, 1992) in many tropical regions, where they played an important role towards the development of early agriculture and domestication of crops and fruit trees, a still ongoing process (Kimber, 1978; Miller & Nair, 2006; NinezI, 1987; Smith 1996). In India the home gardens are generally found in tropical and sub-tropical areas and characterized by high species diversity and usually three to four vertical canopy strata. These consist of an herbaceous layer near ground, a tree layer at the upper level and one to two intermediate layers. The lower most being at less than 1.0 m in height dominated by different vegetables like okra, chilli, tomato, cabbage, dioscorea etc and the second layer is 1-4 m height comprising food plants such as banana, papaya, lemon etc. The third layer is at 4-10m height occupied by fruit trees like guava, drumstick, custard apple etc. The upper layer is the tree layer which can be divided into two consisting of the emergent full grown timber and fruit trees having height more than 20m and medium size trees of 10-20m. In the upper layer species like *Magnifera indica*, *Samanea samam*, *Bambusa vulgaris*, *B.tulda*, *Cocos nusifera*, *Areca catechu* *Artocarpus heterphyllus*, *Aegle mormalus*, *Tamarindus indica*, *Azadirachta indica*, *Leucaena leucocephala*, etc are grown. In addition to these components, livestock also contributes significantly to the household income of small-scale home gardens in many developing countries, while fulfilling many social and cultural needs (Wilson, 1995). Rahman (1995) explored the consequences of homestead crop production under homestead agroforestry practices on family income and woman's status the data in Bangladesh reveal that these farms have earned substantial income and production gains. The woman of the households gained in terms of higher social status. The gender status in particular has improved significantly on these households as evidenced by the increased participation woman in taking decisions on crucial socioeconomic matters in the households. In some of the very small gardens, where land is a constraints to crop production, livestock are sometimes the main income generating, serving as cash buffers and capital reserves (Devendra and Thomas, 2002).

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In raising a home garden, farmers follow the multistoried, diversified nature of the forest. Large homesteads maintain fish ponds, fruit trees, flower plants and bamboo grooves along with an area for keeping milk cows, bullocks, goats and ducks (whose dung/fecal matter provide excellent source of organic manure) and storage granaries. Almost every backyard in coastal Odisha, West Bengal and Assam also has a small pond used for ablutions, growing aquatic leafy vegetables, fish, supplement of irrigation and to absorb flood. Intensive farming in homesteads or backyards over micro plots located contiguous to or little away from homes is a traditional practices globally. Approximately 75% of all the households in Bangladesh where different crops, including trees are grown in combination with livestock and fish. Most of the home gardens are rectangular in shape, built on mounds to raise them above the water level during the annual flood, and usually fenced by trees or shrubs. A tropical home garden serves several houses in a cluster and has space for vegetable gardens, a yard for threshing and communal activities, cattle sheds, ponds, trees, shrubs and bamboo. The most frequently

harvested plants are generally grown in the back yard, at the pond side, and around the cow shed for the provision of fruit/food, fuel wood, timber and fodder both the domestic use as well as for cash (Millate-e-Mustafa-*et al.*, 2000).

Material and methods

The experiment was carried out in a Randomized Block Design (RBD) with three replications. For this the district was divided into three regions, each region represented one replication. The region- 1 covered the Northern part of the Bhadrak district comprising two blocks such as Bonth and Bhandaripokhari. The region –11 covered the central part of the district comprising Bhadrak, Dhamnagar and Tihidi. The region - 111 covered the southern part of the district comprising Basudevpur and Chandabali. In each region economics of home gardens of 15 different sizes were studied.

Discussion and Result: There are 15 treatments as given below-

Treatments	Details
T ₁	Indigenous and improved Agroforestry System of 0.2 acre
T ₂	Indigenous and improved Agroforestry System of 0.4acre
T ₃	Indigenous and improved Agroforestry System of 0.6 acre
T ₄	Indigenous and improved Agroforestry System of 0.8 acre
T ₅	Indigenous and improved Agroforestry System of 1.0acre
T ₆	Indigenous and improved Agroforestry System of 1.2 acre
T ₇	Indigenous and improved Agroforestry System of 1.4 acre
T ₈	Indigenous and improved Agroforestry System of 1.6 acre
T ₉	Indigenous and improved Agroforestry System of 1.8 acre
T ₁₀	Indigenous and improved Agroforestry System of 2.0 acre
T ₁₁	Indigenous and improved Agroforestry System of 2.2 acre
T ₁₂	Indigenous and improved Agroforestry System of 2.4 acre
T ₁₃	Indigenous and improved Agroforestry System of 2.6 acre
T ₁₄	Indigenous and improved Agroforestry System of 2.8 acre
T ₁₅	Indigenous and improved Agroforestry System of 3.0 acre

Various economic parameters such as cost of cultivation, gross return and net return and benefit cost ratio under different sizes of home gardens differed significantly from each other. The cost of cultivation varied from Rs.8, 348.00 to Rs. 30,264.00 per annum per unit of 0.2 to 1.6 acre. The cost increased with increase of holding size from 0.2 acre to 1.6 acre where as reverse trend was obtained when the cost of cultivation was calculated per acre basis. Maximum cost of cultivation of Rs.41,740.00 was obtained in holding size of 0.2 acre per acre basis while the minimum of Rs.18,915.00 in 1.6 acre per. The gross return ranged from Rs.18,340.00 to Rs.59,105.00 per holding per annum. The gross return per holding increased with increase of size of home garden. When it was estimated per acre basis the trend was reversed. The highest gross return of Rs.91,700.00 per acre was obtained in

0.2 acre and lowest (Rs.28,751.00) in 1.6 acre. Net return per holding in 1.6 acre found maximum (Rs 28,751.00) while the minimum net return (Rs.9,992.00) was obtained in 0.2 acre size. With increase of home garden size from 0.2 to 2.6 acre, the net return was increased per holding per annum. Net return per acre basis (Rs.49,960.00) was maximum in 0.2acre and home garden of 1.6 acre recorded the minimum net return of Rs.17,969.00. The net return per acre basis reduced from 0.2 acre to 1.6 acre with increase of home garden size. The highest B:C ratio of 2.19 was obtained in 0.2 acre holding and lowest B:C ratio of 1.95 was found in 1.6 acre holdings. B:C ratio gradually decreased with increase of home garden sizes from 0.2 acre to 1.6 acre except in holding sizes of 1.2 acre 1.4 acre which recorded a B:C ratio of 1.99.

Table 1: Economics of home gardens

Treatment	Role Played by Home Garden			Economics of Home Garden						
	Productive	Protective	Others	Cost of Cultivation (Rs)		Gross Return (Rs)		Net Return(Rs)		B:C ratio
				Per holding	Per acre	Per holding	Per acre	Per holding	Per acre	
1	2	3	4	5	6	7	8	9	10	11
T ₁ (0.2 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	8, 348	41, 740	18, 340	91, 700	9, 992	49, 960	2.19
T ₂ (0.4 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	15, 096	37, 532	32, 117	80, 292	17, 021	42, 760	2.14
T ₃ (0.6 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	19, 254	32, 090	40, 433	67, 389	21, 179	35, 299	2.10
T ₄ (0.8 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	22, 672	28, 340	47, 900	59,875	25, 228	31, 535	2.11
T ₅ (1.0 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	23, 990	23,990	49,179	49,179	25189	25189	2.05
T ₆ (1.2 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	25400	21, 167	50, 799	42, 333	25, 399	21, 166	1.99
T ₇ (1.4 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	27, 527	19, 662	54, 779	39, 128	27, 252	19, 466	1.99
T ₈ (1.6 acre)	Food, Fodder, Fuel, Timber	Ameliorate Climate, Germplasm conservation	Employment generation, Cash income, Meet House Hold requirements	30, 264	18, 915	59, 015	36, 884	28, 751	17, 969	1.95
T ₉ (1.8 acre)	0	0	0	0	0	0	0	0	0	0
T ₁₀ (2.0 acre)	0	0	0	0	0	0	0	0	0	0
T ₁₁ (2.2 acre)	0	0	0	0	0	0	0	0	0	0
T ₁₂ (2.4 acre)	0	0	0	0	0	0	0	0	0	0
T ₁₃ (2.6 acre)	0	0	0	0	0	0	0	0	0	0
T ₁₄ (2.8 acre)	0	0	0	0	0	0	0	0	0	0
T ₁₅ (3.0 acre)	0	0	0	0	0	0	0	0	0	0
SE _m (±)				1792.62	2289.055	3546.458	4832.305	1827.442	2586.763	
CD _(0.05)				4862.348	5825.111	13939.63	8159.96	4769.06	5484.9	

Conclusion

It was observed that home gardens provided households with cash crops as well as food crops. Home gardens although primarily used for subsistence purposes of the household being used to generate cash income. The home gardens meet the subsistence production and income generation of farmers particularly in rural areas. Although the choice of species is determined to a large extent by environmental and socioeconomic factors, as well as the dietary habits and market demands of the locality, there is a remarkable similarity with respect to species composition among different home gardens in various places, especially with respect to the herbaceous components. Crops planted in home gardens have been found to provide a major component of household food intake; they make a significant contribution to the nutrient requirements (proteins, carbohydrates and vitamins) of rural areas especially to children and women. The diverse products (fruits, vegetables, spices etc.), which are available year-round in systems. They provide economical benefits while remaining ecologically sound and biologically sustainable. The home gardens of different sizes were found playing various roles. They provide aesthetics, ornamental, improved food quality. Crops planted in home gardens have been found to provide a major component of household food intake,

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