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Performance of vegetable crops (*Solanaceous*) in homestead agroforestry

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Abstract
A survey was conducted in three blocks of Kendrapada district about the homestead agroforestry system to compare productivity of vegetable crops in that system with respect to the productivity of recommended practices. It was found that chilli growing homestead farmers were using 20% less quantity of seeds as compared to the recommendation. It was also found that about 8.33% farmers were using DAP+Shamala+Gromor, 25% farmers were using FYM+Urea, 25% farmers were using FYM+DAP+Urea and 41.66% farmers using only FYM as a source of manure which is not recommended dose of manure. The similar type of non-recommended practices of production were being adopted in brinjal and tomato crop also.

Keywords: Homestead, agroforestry, brinjal, chilli, tomato

Introduction
The survival of human civilization depends to a great extent on the existence of adequate forest cover on earth. According to experts, for sustainable development and a better environment, a country should have at least 33 percent of its total land mass under forest cover, but in reality many countries have less than 25 percent forest cover. The green meadows and scenery of India is already a thing of the past and if these trends continue, the little forest that remains at present will be exhausted in the near future. Due to severe shortage of land there is a great limitation of expanding traditional forest in India. The demand for timber, fuel wood, food, fruit, fodder etc. may be fulfilled by raising suitable woody forest of perennial species in the large fallow land, river banks and coastal areas and also by growing suitable fruit trees, timber and fuel wood, fodder yielding trees by the side of the roads, highways, railways and embankments and through raising suitable fruit and forest trees in homestead and public places. 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 multi-layered vertical structure, often in a combination with raising livestock, and managed mainly by household members for subsistence production (Christanty, 1990; Fernandes and Nair, 1986; Hoogerbrugge and Fresco, 1993; Kumar and Nair, 2004). Next to forests, home gardens probably are most intensive and optimal biomass production systems.

Materials Method
Odisha is located between 17^0 49' N to 22^0 34'North latitudes and from 81^0 27' E to 87^0 29' East longitude on the eastern coasts of India. It is bounded by the states of West Bengal on the North-East, Jharkhand on the North, Chhattisgarh on the West, Andhra Pradesh on the South and Bay of Bengal on the east. It spreads over an area of 1,55,707 sq. Km (4.74% of India's total area) and has a coastline of about 529 Km. Kendrapara District lies in 20 degree 20' N to 20 degree 37' N Latitude and 86 degree 14' E to 87 degree 01' E Longitude. The Coastline of Kendrapara District covers 48 Km stretching from Dhamra Muhan to Batighar. Its bioclimatology is much influenced for the short radial distance from the Bay of Bengal.
In this study the preference for vegetables are recorded. The criteria are fixed for all the vegetable species. Score was given against the entire criterion. The score 1 represented the most preferred and 4 represented the 4^{th} most preferred species.

Method of Data Collection
The study is conducted for field-level primary data and researcher himself collected data required for the study. There are three main methods by which farm survey data are gathered. These are (i) direct observation, (ii) interviewing farmers, (iii) record kept by farmers. Data were collected through field visits in the study area and personally interviewing with the sample farmers. Interviews were normally conducted in farmer's house in their leisure time

And even in the homesteads when they worked in the plots. They provided information from their memory. In order to minimize the response error, question were asked in simple Odia. After completion of each interview, each interview schedule is checked and noted properly.

Data Processing and Analysis

After completion of field survey data from all the interview schedules are coded, compiled, tabulated and analyzed in accordance with the objective of study. In the process, all the responses in the interview schedule are given numerical coded value. Local units were converted into standard and quantitative data were converted into quantitative ones by means of suitable scoring whenever necessary. The responses to the question in the interview schedules are transferred to a master sheet to facilitate tabulation.

For describing the different characteristics and their constraint facing, the respondents were classified into several categories. These categories were developed by considering the nature of distribution of data, general understanding prevailing in the social system and possible score system. Descriptive analysis such as range, number and percentage, mean standard deviation and rank order were used whenever possible. The vegetables were found to be grown in homestead agroforestry system in kharif, *Rabi* and summer season all over Kendrapara district.

Chilli

It was found that chilli growing homestead farmers were using 20% less quantity of seeds as compared to the recommendation (Table 1). It was also found that about 8.33% farmers were using DAP+Shamala+Gromor, 25% farmers were using FYM+Urea, 25% farmers were using FYM+DAP+Urea and 41.66% farmers using only FYM as a source of manure.

Table 1: Performance of chilli in homestead agroforestry

Chilli	Recommended practice	*Farmer's practice		Remarks/Gap
			R%	
1. Seed rate	0.75Kg/ha	0.6Kg/ha		-20%
2. Source of fertilizer & manure	Urea, DAP/SSP, MOP	DAP+Shamala+Gromor	8.33	Farmer has wasted his resources by excess application of mixed fertilizers.
		Urea+FYM	25	Imbalanced application of fertilizer.
		FYM+DAP	25	Imbalanced application of fertilizer.
		FYM	41.66	Non-application of inorganic fertilizers.
3. Fertilizer dose	125kg-N/ha	45kg- N/ha		Very low fertilizer dose.
	60kg- P_2O_5/ha	30kg- P_2O_5/ha		
	90kg- K_2O/ha	5kg- K_2O/ha		
4. Varieties/hybrids	Utkal Ava, Utkal Rashmi	Utkal Rashmi	25	Lack of awareness & technology transfer.
		Surya	8.33	
		Unknown Variety	66.66	
5. Seed Cost	Rs.2000/Kg	Rs.2800/kg		+29%
6. Yield	Green – 130q/ha	Green- 80 q/ha.		-38%
	Ripe- 60q/ha	Ripe- 30 q/ha		-50%
7. Disease control measure	Anthracnose/ Dieback- Indofil M 45 @3g/l. of water, Leaf curl virus- Rogor@2ml/l. or Confidor@ 2.5ml/10litres of water	Using Chemicals (but couldn't tell the name)	41.66	Lack of awareness regarding disease control measure.
		Not Using Chemicals	58.33	
8. Pest control measure	Thrips- Rogor/Confidor Aphid- Rogor/ Confidor Mite- Dicofol@1.5ml/l	Using pesticides (but couldn't tell the name)	16.66	Lack of awareness regarding pest control measure.
		Not using pesticides	83.33	
9. Cost of cultivation	Rs.90000/ha	Rs.75000/ha.		-17%

*Average of 12 farmers

It is clear that some farmers have wasted their resources due to application of excess mixed fertilizer and most of the farmers were either Practising organic farming or unwilling to apply inorganic fertilizers. The fertilizer dose adopted by the farmer was found to be 45kg N, 30kg P_2O_5 and 5kg K_2O per hectare which is a very low fertilizer dose. About 25%, 8.33% and 66.66% farmers were using Utkal Rashmi, Surya and unknown varieties respectively as seeds for cultivation of chilli. Farmers were using seeds which were 29% costlier than the recommended seed cost. The yield was 38% (green) and 50% (ripe) lesser as compared to the expected yield. For disease control measure, 41.66% farmers were using chemicals, but they didn't know the name of fungicide and 58.33% were not using any fungicide. For pest control measure, 16.66% farmers were using pesticides, but they didn't know the name of pesticides and 83.33% were not using any pesticides. The cost of cultivation was 17% lesser than the expected cost of cultivation.

Brinjal

It was found that brinjal growing homestead farmers were using 60% less quantity of seeds as compared to the recommendation (Table 2). It was also found that about 13.33% farmers were using DAP+Gromor, 26.66% farmers were using FYM+Urea and 60% farmers were using only FYM as a source manure. It is clear that farmers were not applied any potash-rich fertilizer and most of the farmers were either practising organic farming or unwilling to apply inorganic fertilizers. The fertilizer dose was found to be 60kg N, 20kg P_2O_5 and 0kg K_2O per hectare which is an imbalanced fertilizer dose. About 40%, 20% and 40% farmers were using Tarini, blue star and Utkal Madhuri respectively as seeds for cultivation of brinjal. Farmers were using seeds which were 4.34% costlier than the recommended seed cost. The yield was 36% to 47% lesser as compared to the expected yield. For disease control measure, 26.66% farmers using chemicals, but they didn't know the name of fungicide and

73.33% were not using any fungicide. For pest control measure, 26.66% farmers using pesticides, but they didn't know the name of pesticides and 73.33% were not using any pesticides. The cost of cultivation was 7% less than the expected cost of cultivation.

Table 2: Performance of brinjal in homestead agroforestry

Brinjal	Recommended practice	*Farmer's practice		Remarks/Gap
			R%	
1. Seed rate	0.5kg/ha	0.2kg/ha.		-60%
2. Source of fertilizer & manure	Urea, DAP/SSP, MOP	Gromor+DAP	13.33	Imbalanced application of fertilizer.
		Urea+FYM	26.66	Imbalanced application of fertilizer.
		FYM	60	Non-application of inorganic fertilizers.
3. Fertilizer dose	125kg-N/ha	60kg- N/ha		Imbalanced fertilizer dose.
	50kg- P_2O_5/ha	20kg- P_2O_5/ha		
	75kg- K_2O/ha	0kg- K_2O/ha		
4. Varieties/hybrids	Utkal Anushree, Utkal Keshari, Utkal Madhuri	Tarini	40	Lack of awareness & technology transfer.
		Blue Star	20	
		Utkal Madhuri	40	
5. Seed Cost	Rs.2300/kg	Rs.2400/kg		+4.34%
6. Yield	250- 300q/ha	160q/ha		-36% to -47%
7. Disease control measure	Bacterial wilt- bleaching powder@25kg/ha, well drained plot, crop rotation, raised bed during rainy season, Phomopsis blight- Blitox@3g/l or Bavistin @1.5g/l	Using Chemicals (but couldn't tell the name)	26.66	Lack of awareness regarding disease control measure.
		Not using chemicals	73.33	
8. Pest control measure	Fruit & Shoot borer- Coragen@2ml in 10 litres of water or padan 2g/l of water	Using Pesticide (but couldn't tell the name)	26.66	Lack of awareness regarding pest control measure.
		Not using Pesticide	73.33	
9. Cost of cultivation	Rs.75000/ha	Rs.70000/ha.		-7%

*Average of 15 farmers

Tomato

It was found that tomato growing homestead farmers were using 60% less quantity of seeds as compared to the recommendation (Table 3). It was also found that about 25% farmers were using Urea, 50% farmers were using FYM+Urea, 8.33% farmers were using FYM+DAP+Anusar and 16.66% farmers were using DAP+FYM as a source of fertilizer and manure. It is clear that farmers were not applying any potash-rich fertilizer. The fertilizer dose was found to be 72kg N, 28kg P_2O_5 and 0kg K_2O per hectare which is an imbalanced fertilizer dose. About 41.66%, 25% and 33.33% farmers were using Chiranjeeb, Utkal Kumari and Lakshmi respectively as seeds for cultivation of tomato. Farmers were using seeds which were 4% less costly than the recommended seed cost.

Table 3: Performance of tomato in homestead agroforestry

Tomato	Recommended practice	*Farmer's practice		Remarks/Gap
			R%	
1. Seed rate	0.5Kg/ha	0.2Kg/ha.		-60%
2. Source of fertilizer	Urea, DAP/SSP, MOP	Urea	25	Imbalanced application of fertilizer.
		Urea+FYM	50	Imbalanced application of fertilizer.
		DAP+Anusar+FYM	8.33	Imbalanced application of fertilizer.
		DAP+FYM	16.66	Imbalanced application of fertilizer.
3. Fertilizer dose	125kg-N/ha	72 kg-N/ha		Imbalanced fertilizer dose.
	a50kg- P_2O_5/ha	28kg- P_2O_5/ha		
	100kg- K_2O/ha	0kg- K_2O/ha		
4. Varieties/hybrids	Utkal Kumari, Utkal Raja, Utkal Deepti	Chiranjeeb	41.66	Use of proper varieties.
		Utkal Kumari	25	
		Lakshmi	33.33	
5. Seed Cost	Rs.2080/Kg	Rs.2000/kg		-4%
6. Yield	300-350 q/ha.	180 q/ha		-40% to -49%
7. Disease control measure	Early blight- Indofil M 45 @3g/l. of water, Leaf curl virus- Vector control, Damping off- Soil drenching with Captan@2g/l. of water	Using Chemicals (but couldn't tell the name)	58.33	Lack of awareness regarding disease control measure.
		Not Using Chemicals	41.66	
8. pest control measure	Fruit borer- Spray Indosulfan@2ml/l. of water	Using Pesticide (but couldn't tell the name)	25	Lack of awareness regarding pest control measure.
		Not Using Pesticide	75	
9. Cost of cultivation	80000/ha	70000/ha.		-12.5%

*Average of 12 farmers

The yield of chilli was 40% to 49% less as compared to the expected yield in the homestead of Kendrapara. For disease control measure, 58.33% farmers were using chemicals, but they didn't know the name of fungicide and 41.66% were not using any fungicide. For pest control measure, 25% farmers were using pesticides, but they didn't know the name of pesticides and 75% were not using any pesticides. The cost of cultivation was 12.5% lesser than the expected cost of cultivation.

In the present study area it was observed that yield of vegetables like, chilli, brinjal, tomato, were very low than the expected yield in the homestead agroforestry systems. Hossain (1996) observed the homestead vegetable production. He also found that vegetable production was very low in home gardens of Bangladesh. Government and non-government organizations have been working since the 1980s to improve and increase vegetable production in home gardens and on marginal farms in Bangladesh. Efforts have to date not been coordinated. Coordination of research and development effort is recommended.

Conclusion

It was concluded that there is lack of awareness and scientific practices specific to that agroclimatic condition & availability of natural resources for maximum income from the homestead agroforestry system. The local farmers may go through recommended crop production practices.

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