Integrated Farming System in Fragile Tropical Island Ecosystem: A Case Study

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Abstract: North and Middle Andaman is one of the three districts of Andaman and Nicobar Islands situated about 1200 km from the mainland India. The climate of this island is distinctly tropical with an average rainfall of 3180 mm. The hot and humid climate present in this region is very much conductive for the development of plant pathogens and pests. As a result, farmer suffers huge losses due to crop failure. Given that, a large chunk of land in this region is covered with forest, the land that can be used for agriculture is comparatively very less. The land holding of most of the farmers in this region is in between 1-2.5 hectare only. In view of this, the application of new and costly technologies of commercial agriculture is limited in this region. Furthermore, In order to prevent the indiscriminate use of chemicals, and pesticides, and to conserve fragile ecological diversity of this region, Government of India has banned the import, supply, and use of chemicals and pesticides. All these had added the problems of farmers in this region. Inspite of all these adversaries, Of late, a man named Shri. Ashok Sarkar, small farmers with a land holding of 2.15 Ha with rural base and a big heart has braved to lead the way for others, which finds a place herein. The secrets of his spectacular success are the adoption of pond based integrated farming model. It is estimated that by the end of 2018 his annual income would amount to Rs 6, 50, 000/- against the present income of Rs 4, 29,300/-, when his orchard would give full potential yields.

Keywords: Island, Fragile, Pathogens, Agriculture, Technologies.

1 Introduction

North and Middle Andaman is one of the three districts of Andaman and Nicobar Islands situated about 1200 km from the mainland India. The region consists of nos. of creeks, which helps it to link via ferry services with the Port Blair city located in South Andaman and thus, to the rest of world. Apart from being located in one of the remotest place of India, the region has also been recognized as one of the major Biodiversity Hotspot **[1].** About 86 percent of the land in these islands is covered with dense forest. The climate of this island is distinctly tropical with an average rainfall of 3180 mm. Rainy seasons occurs about five to six months in a year i.e. May to October remains the monsoon season. The region is also known for its drought prone fragile environment and undulating topography. The hot and humid climate present in this region is very much conductive for the development of plant pathogens and pests. As a result, farmer suffers huge losses due to crop failure. Given that, a large chunk of land in this region is covered with forest, the land that can be used for agriculture is comparatively very less. The land holding of most of the farmers in this region is in

between 1-2.5 hectare only **[2].** In view of this, the application of new and costly technologies of commercial agriculture is limited in this region. Furthermore, In order to prevent the indiscriminate use of chemicals, and pesticides, and to conserve fragile ecological diversity of this region, Government of India has banned the import, supply and use of chemicals and pesticides. All these had added the problems of farmers in this region.

Inspite of all these adversaries, Of late, a man with small farmers with rural base and a big heart has braved to lead the way for others, which finds a place herein.

2 Materials and Method

2.1 Location

Govindpur village is located in Mayabunder Tehsil of North and Middle Andaman district. It is located about 200 km from the Port Blair city. As there is no private industries and there is limited opportunity for employment in government sector. The unemployment and poverty is the common scene in this area. The people here are totally dependent on agriculture for their living. This region comes under the category of rain fed area, and thus, the crop losses due to pest and pathogens, drought, and excess rain are common occurrence. The market for agriculture produce is located at a distance of about 200 Km and there are no cold storage facilities nearby. Despite all these odds, a small farmer named Shri. Ashok Sarkar managed to make a fortune and thus, needs special mention. According to him, adoption of scientific and technical innovations in agriculture, and understanding the dynamics of market is the secret of his success.

2.2 Background

Shri. Ashok Sarkar is the resident of Govindpur Village, North and Middle Andaman. His father Late Shri. Mahadev Sarkar was a farmer, who was allotted 2.15 hectare land in Govindpur village of Basantipur Gram Panchayat. Since his childhood he was very much interested in agriculture. He got the opportunity to work in Indian Navy but his father didn't allow him to join giving reasons to look after his younger siblings. He left the school at the age of 17 to assist his father in agriculture.

After the demise of his father, he started cultivating the land and took agriculture as his full time occupation. But, the life was not easy for him as he was the sole breadwinner of his family and had the responsibility for education and marriage of his sister, four daughters and one son. At this point of time, he realized the necessity of innovation in his farming practices to secure his livelihood and to improve the productivity of his land. In his tough times, the only thing he had was the willingness to work hard and the courage to take risks. So, he started attending the meetings and programmes conducted by Krishi Vigyan Kendra, and CIARI to get the information related to latest technical innovations, and scientific practices followed in the field of agriculture, livestock and fisheries. After gaining sufficient information on these technologies, he applied those technologies in his field and reaped huge benefits.

Today, he is well known person settled at Govindpur Village of Basantipur Gram Panchayat and living a happy and respectable life along with his wife and son. As a result of his hard work, he was able to get good earning from the agriculture and thus was able to bear all the expenses for the education and marriage of his sister and four daughters. Now, the only child he had left is his son, who has just passed his senior

secondary school and he wishes to send him for higher studies. As per his words, the agriculture has given him both name and fame.

2.3 Actions Taken

He remained in constant touch with Krishi Vigyan Kendra and ICAR-CIARI for technical support. He recognized that non-availability of timely and adequate water for irrigation was the serious constraint of his farm for achieving higher productivity and stability of farming. So, he invested his hard earned saving for construction of a large pond (66 m x 30 m x 3 m) to ensure sustainability of water supply for crop. As a result of this measure he was able to meet the demand of water for farm activities in dry seasons. He followed integrated approach in his farm and involved the component of Horticulture, Agronomy, Livestock and Fisheries to ensure security of his livelihood **[3]**.

He practiced crop rotation, seed treatment, and improved disease resistant varieties of indigenous pulses, and vegetable for integrated management of disease and pest in his farm **[4]**. In the low lying areas, he cultivated suitable varieties of paddy. A low cost shed net was also constructed for cultivation of high value crops to reap more benefits. The fertility and moisture content of soil was improved by mulching and application of vermin-compost. He used agriculture by products, fodder and unconventional low cost feeds for feeding the livestock. The waste from livestock was utilized for feeding the fish and preparation of vermin-compost. He learned the practices of mushroom cultivation, vegetative plant propagation and fish breeding to cater need based demand of the market.

He equipped his farm with threshing floor, one Power Tiller, Dhan Hauler, Diesel Pumpset, Electric Motor, and Spray Machine for ease of operation and to reduce the labour cost. Out of 2.15 ha, farming operation is confined to 1.65 ha, the rest is occupied by farm house, path, threshing floor, fallow upland area, and other infrastructures. The area allotted for different components of farm include Farm house (0.011 ha), Threshing floor (0.008), Cattle shed (0.005 ha), Poultry shed (0.001 ha), Kharif and Rabi crops (0.79 ha), Plantation crops (0.53 ha), Pond and Nurseries (0.29 ha), and Green fodder (0.003 ha) as listed in **Table.1 and Fig.1-3.** Vermin-compost Units (2 nos.) of 10 ton per annum capacity were constructed. The vermin compost was prepared by utilizing cow dung, poultry litter, farm, and kitchen.

3 Results and Discussion

The production and income generated from different farm components is shown in **Table 2**. Rice yield was about 180 kg, pulses 160 kg, oilseed 40 kg, Lobia 200 kg, Okra 180 kg, Arecanut 540 kg, Sapota 1000 kg and Banana 450 kg, while the milk yield from cow was 360 lit. The farmer sold about 50, 000 fish fingerlings and 8.75 kg earthworms. The data presented in Table 2 indicates the farmer obtained highest incomes from the sale of Arecanut fruits, Sapota fruits and Fish fingerlings. After selling his agriculture produce in the market he generated an income of Rs. 4, 29, 300/-. This kind of income in this area is unheard and unprecedented.

The data for economics of farm operations is presented in the **Table 3** makes an interesting reading. During the period (2017-18), the farmer spent Rs. 2, 06, 437/- on farm activities like maintenance of farm, farm equipments, housing etc. The farmer informed that the cost of management for plantation crop and fish production is

negligible. As a result, the farmer obtained higher B/C ratio for Fish production (2.38) and Plantation crop (2.24), when compared with other components of farm. The B/C ratio for Vermin compost was found higher 2.50 as the farmer utilized the same for his farm, and earthworms so obtained were for sold or utilized to feed poultry. In contrast, the ratio was found lowest for Paddy (1.28) followed by pulses (1.58). It was observed that the cost of input, labour and management was quite higher for these crops. Overall, the farmer obtained a B/C ratio of 2.07 from the farm produce.

4 Future Plan

Shri. Ashok Sarkar has crossed the age 63 but he still work with the same spirit in his farm and still very much interested to adopt innovative farming practices. In order to achieve this, he remains in constant touch with Krishi Vigyan Kendra, N & M Andaman. In this respect, Krishi Vigyan Kendra has also transferred some important proven technologies such as broad bed furrow, multi-tier cropping, and rice cum fish farming system for efficient utilization of his low land areas and resources.

5 Conclusion

The philosophy of farming system revolves around better utilization of time, money, resources and family labour. Rainfed areas have its inherent problem. But if one is able to master the necessary inputs like land, labour, capital and farm management skills, and open to adopt improved scientific practices of agriculture, he can generate very high income. This will insure gainful employment round the year thereby ensuring good income and higher standard of living even from small holdings. The challenges of rain fed areas thus can be converted into opportunities.

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Table. 1. Area allotted for different components (2017-18)

Sl. Nos.	Particular	Nos.	Area Covered	Percentage
1.	Farm house	1	110 m2	0.51
2.	Threshing Floor (12m x7 m)	1	84 m2	0.39
3.	Low Cost Poly house(12m x7m)	2	168m2	0.78
4.	Cattle shed (10m x 5m)	1	50 m2	0.23
4.	Poultry shed (3m x 5m)	1	15 m2	
5.	Kharif crop and Rabi crop		7998 m2	37.24
	Kharif Crop (Paddy, Okra, Lobia)			
	Rabi Crop (Pulses, Cauliflower, Tomato, Green Chilli, Mustard, Okra, Lobia, and Mushroom)			
6.	Plantation crop		5332 m2	24.83
	(Banana, Coconut, Arecanut, Mango, Rose apple, Cinnamaon, Bay leaf, Papaya, Lemon, and Sapota)			
7.	Pond and nursery		2980 m2	13.86
	Pond (66mx30mx3m)	1		
	Nursery (20mx15mx1.5m)	2		
	Nursery (20mx17mx1.5m)	1		
8.	Vermin compost(2mx1.5mx1m)	2	6m2	0.02
9.	Fodder crop (3m x 10m)		30 m2	0.13
10.	Fallow upland area		1400 m2	6.53
11.	Miscellaneous (path, drainage, floriculture etc.)		3327 m2	15.58
	Total		21500 m2	100

Table. 2. Production and Income generated by different component (2017-18)

Sr. Nos.	Item	Production	Sold @	Gross Return
1.	**Field Crop**			**Rs. 49,900/-**
A.	Paddy			**Rs. 36, 300/-**
	Swarna Jaya (Local Var.)	338 kg	Rs 50 /kg	Rs. 16, 900/-
	Jeera Rice(Local Var.)	55 kg	Rs 80/kg	Rs. 4,400/-
	C-14-08 (Local Var.)	300 kg	Rs 50 /kg	Rs. 15,000/-
B.	Pulses and Oil seed			**Rs. 13, 600/-**
	Green Gram (Local Var.)	120 kg	Rs 60/kg	Rs. 7200/-
	Black Gram (Local Var.)	20 kg	Rs 60/kg	Rs. 1, 200/-
	Cow Pea (Local Var.)	20 kg	Rs 60/kg	Rs. 1, 200/-
	Mustard	40 kg	Rs 100/kg	Rs. 4,000/-
2.	**Vegetables**			**Rs. 16, 300**/-
	Lobia	200 kg	Rs 40/kg	Rs. 8, 000/-
	Okra	180 kg	Rs 40/kg	Rs. 7, 200/-
	Cauliflower	20 kg	Rs 40/kg	Rs. 800/-
	Green Chilly			
	Tomato			
	Mushroom	1 kg	Rs 300/kg	Rs. 300/-
3.	**Plantation Crop**			**Rs. 1, 97, 700**/-
	Arecanut	540 kg	Rs 180/kg	Rs 97, 200/-
	Sapota	1000 kg	Rs 40/ kg	Rs 40, 000/-
	Banana	450 kg	Rs 10/kg	Rs. 4, 500/-
	Coconut	5000 nos.	Rs 3/piece	Rs. 15, 000/-
	Mango	100 kg	Rs 30/kg	Rs. 3,000/-
	Cinnamon	70 kg	Rs 300/kg	Rs. 21, 000/-
	Bay leaf	60 kg	Rs 100/kg	Rs. 6, 000/-
	Rose apple	100 kg	Rs 50/kg	Rs. 5000/-
	Papaya			
	Lemon			
	Lemon, Rose apple and Sapota	100 nos	Rs 60/ sapling	Rs 6, 000/-

	Layers			
4.	**Livestock**			**Rs. 21, 900**/-
	Milk	360 lit	Rs. 40/kg	Rs 14, 400/-
	Meat (Chicken and Duck)	50 kg	Rs 150/kg	Rs. 7, 500/-
	Egg			
5.	**Fisheries**			**Rs. 1, 40, 000**/-
	Fish Fingerlings (Rohu, Catla, and Mrigal)	50, 000 nos.	Rs 2/fingerling	Rs. 1, 00,000/-
	Fish (Rohu, Catle and Mrugal)	200 kg	Rs. 200/Kg	Rs. 40,000/-
6.	**Vermicompost**			**Rs. 3, 500**/-
	Earthworm	8.75 kg	Rs 400/kg	Rs 3,500/-
	Vermin-Compost	1000 kg	-	-
	Total			**Rs 4, 29, 300**/-

Table. 3. Economics of Farm operation (2017-18)

Sl. No.	Component	Input Cost	Gross Return	Net Return	B/C Ratio
1.	Field Crop				
	Rice	Rs.28, 314/-	Rs. 36, 300/-	Rs. 7, 986	1.28
	Pulses and Oil Seed	Rs. 8, 568/-	Rs. 13, 600/-	Rs. 5, 032	1.58
2.	Vegetables	Rs. 9, 128/-	Rs. 16, 300/-	Rs. 7, 172	1.78
3.	Plantation Crop	Rs.88, 182	Rs. 1, 97, 700/-	Rs. 1,09,518	2.24
4.	Livestock	Rs.12, 045/-	Rs. 21, 900/-	Rs. 9,855	1.81
5.	Fisheries	Rs.58, 800/-	Rs. 1, 40, 000/-	Rs. 81, 200	2.38
6.	Vermin-compost	Rs.1, 400/-	Rs. 3, 500/-	Rs. 2,100	2.50
	Total	**Rs. 2, 06, 437/-**	**Rs. 4, 29, 300/-**	**Rs. 2,22,863/-**	**2.07**

Figures:

Figure. 1. The infrastructure and machineries present at the farm of Shri. Ashok Sarkar.

Figure. 2. The image depicts various farm operation performed by Shri. Ashok Sarkar in the field of agriculture and allied sector.

Figure. 3. The activities started by Shri. Ashok Sarkar for development of his farm is shown.