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Impact of Integrated Farming System Approach on Sustainable Production for Farming Community

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A B S T R A C T

The integrated farming system study was conducted at farmers field of villages of vridhachalam block of Cuddalore District to improve farmer's income and ensure their sustainable livelihood. Study was conducted in three demonstrations in wet land situation with components viz., Crop, Fish, poultry and FYM & vermicompost and two demonstrations in dry land situation with components viz., Crop-Fodder crop-Livestock-Vermicompost. In wet land situation, the annual total net return of the IFS model was Rs. 346,766 with the highest been contributed by crop viz., Rice and Maize (Rs. 233680.00), followed by fisheries (Rs. 89250), organic manure production (Rs. 12986) and poultry (Rs. 10850). In dry land condition, the annual net return of the IFS model was Rs. 24188 with the highest been contributed by animal husbandry (Rs.12778), followed by crop (Rs. 6460) and fodder crops (Rs. 4950). Effective recycling of farm waste in terms of FYM (45.6 q), vermicompost (35 q), goat manure (8.7 q) and poultry manure (1.72 q) and can save Rs.31100 per year by addition of 1632 kg of nutrients in-terms of N, P & K. The total annual mandays generated out of various components varied from 387 to 685 mandays. The result concluded that higher farm income was possible by adopting or using new integrated farming system and also achieves sustainable production by effective recycling of natural resource in addition to meeting family needs.

Introduction

Agriculture in India is facing multiple and complex challenges which are expected to become more severe with the passage of time. Some of the major challenges are sustainability of natural resources, impact of climate change and decline in factor of productivity. The operational farm holding in India is declining and over 85 million out of 105 million are below the size of 1 ha. Due to ever increasing population and decline in per capita availability of land in the country, practically there is no scope for horizontal expansion of land for agriculture.

Only vertical expansion is possible by integrating farming components requiring lesser space and time and ensuring reasonable returns to farm families. The Integrated

Farming Systems (IFS) therefore assumes greater importance for sound management of farm resources to enhance the farm productivity and reduce the environmental degradation, improve the quality of life of resource poor farmers and maintain sustainability. In order to sustain a positive growth rate in agriculture, a holistic approach is the need of the hour. Farming system is a mix of farm enterprises in which farm families allocate resources for efficient utilization of the existing enterprises for enhancing productivity and profitability of the farm.

These farm enterprises are crop, livestock, aquaculture, agro-forestry, agri-horticulture and sericulture. Integrated farming system approach is not only a reliable way of obtaining fairly high productivity with considerable scope for resource recycling, but also concept of ecological soundness leading to sustainable agriculture. Sustainable development in agriculture must include integrated farming system (IFS) with efficient soil, water crop and pest management practices, which are environmentally friendly and cost effective.

In IFS, the waste of one enterprise becomes the input of another for making better use of resources. In integrated crop livestock farming system, crop residues can be used for animal feed, while manure from livestock can enhance agricultural productivity. An IF also plays an important role in improving the soil health by increasing the nitrogen, phosphorous, organic carbon and microbial count of soil and thus, reduces the use of chemical fertilizers.

Moreover, IFS components are known to control the weed and regarded as an important element of integrated pest management and thus minimizes the use of weed killers as well as pesticides and thus protects the environment. The water use efficiency and water quality of IFS was better than conventional system. One of the option to evaluate the potential of age-old mixed farming now as an IFS in enhancing income of farm families within the reasonable time period.

Materials and Methods

The integrated farming system study was conducted at farmers field of Alichikudi and Puliyur village of Vridhachalam block, Cuddalore District under Front Line Demonstration, Krishi Vigyan Kendra, Vridhachalam for finding the contribution of total income to the livelihood of farmers who practices integrated farming system. Study was conducted wetland and dryland condition. Under wetland situation, three demonstrations were carried out with components viz., Crop, Fish, poultry and vermicompost production farming system in 1.0 hectore. Out of one hectare area, 0.5 ha was allotted for crop component viz., rice and maize field crops & in dry land situation two demonstration were carried out with components viz., Crop, Fodder crop, Livestock and FYM & Vermicompost farming system in 1.0 hactore. Out of which, for crop component 0.5 ha was allotted and 0.25 ha for fodder crops.

Technical and some physical inputs of agriculture are given to farmer during the study period. All the activities regarding farming i.e. crops cultivation, livestock rearing, poultry, fish culture and organic manures production, homestead components and spent time of family members recorded every day in data register by household members and the data were also recorded personally by the researcher by visiting the study area and interviewing the family members. All possible efforts were made to ensure the collection of reasonably accurate

data from the farm household through face-to-face interview and recall basis.

Cost of cultivation of every farm enterprises calculated by sum of internal input cost, external input cost, labour cost and transportation cost. Gross returns from farm produce calculate on the basis of total produce and sold produce of farm enterprises separately. Also recorded the byproducts of every enterprise of farm and their recycling pattern within a farm and outside of farm and income generation also recorded.

Results and Discussion

Economics of integrated farming system

Wet land condition

In wet land situation , the annual total net return of the IFS model was Rs . 346,766 with the highest been contributed by crop viz., Rice and Maize (Rs. 233680.00), followed by fisheries (Rs. 89250), organic manure production (Rs. 12986) and poultry (Rs. 10850) (Table 1 and 2). Integration of different farm enterprises generated additional net income Rs. 241716 per annum where in comparison to Rs. 105050 by conventional cropping (Table 3). The average B: C ratio of the farming system was 3.71 when compared with 4.15.

Dry land condition

In dry land condition, the annual net return of the IFS model was Rs. 24188 with the highest been contributed by animal husbandry (Rs.12778), followed by crop (Rs. 6460) and fodder crops (Rs. 4950) (Table 4 & 5). The average B: C ratio of the farming system was 2.24 when compared with 1.83 (Table 6). IFS method records higher net returns and benefit cost ratio in because this method comprises the components like cropping, fodder crops, goat rearing and cattle. Similar results were reported by Ugwumba *et al.,* (2010) and Ortega *et al.,* (2009). The organic manures are also prepared by using animal waste.

Resource recycling in integrated farming system

Effective recycling of farm waste in terms of FYM (45.6 q), vermicompost (35 q), goat manure (8.7 q) and poultry manure (1.72 q) and can save Rs.31100 per year (Table 7) by addition of 1632 kg of nutrients in-terms of N, P & K. Total organic manures production was 91.02 q with the highest been contribute d by FYM followed by vermicompost, goat manure and poultry manure and the total quantity (91.02 q) of organic sources of nutrients are being recycled from farm waste obtained from different components. Recycling of farm wastes in form of organic manures within the system itself was found very economical in saving Rs. 31100 per year as well as save the use of chemical fertilizers or its substitutes and also improve the soil health condition, there by enhanced the organic matter and microbial activity which resulted in sustainable. Similar findings also recorded by Kumara *et al.,* (2017) that the total quantity (462.50 kg) of organic source of nutrients are being recycled from farm waste obtained from different components. More than 35 per cent of NPK requirement would be met through recycling of farm wastes in form of compost and vermicompost within the system itself.

During lean period activities viz., compost preparation and vermicompost production activities taken up in the IFS module to recycle the animal wastes, crop residues, grass and fodder tree wastes etc within the farm. About 35 quintals vermicompost produced and used as farm input and also sold as the manures to farmers. The integrated farming system provides excellent

opportunity for organic recycling, moreover, and it reduces farmer's dependency on external or market purchased inputs. It offers good scope for recycling of crop components to the animals and vice versa.

Integrated farming system provides excellent opportunity for organic recycling and it reduces farmer's dependency on external or market purchased inputs. It offers good scope for recycling of crop byproducts and residues to the livestock and livestock waste as valuable manure to crop activity (Vairavan *et al.*, 2000). Application of 50 per cent nitrogen through fertilizer and 50 per cent through goat manure enhanced the soil fertility status and provided better opportunity for recycling of manure to the crops was observed by Radhamani (2001) under vertisols of Western Zone of Tamil Nadu.

Table.1 Integrated farming system - wet land situation

Components included	No. of Demonstration (ha).	Economics of demonstration (Rs./ha)				Economics of check (Rs./ha)			
		Gross Cost	Gross Return	Net Return	BCR	Gross Cost	Gross Return	Net Return	BCR
Crop, Fish, poultry and vermicompost	3	127500	474266	346766	3.71	33520	138300	105050	4.15

Table.2 Data on additional parameters other than yield (*viz*., reduction of percentage in weed/pest/ diseases *etc*.) - Wet land situation

Data on other parameters in relation to technology demonstrated				Check		
Parameter with unit	Total cost	Gross return	Net return	Total cost	Gross return	Net return
Crop(Rice-maize)	76550	310230	233680	33250	138300	**105050**
Fish	24500	113750	89250	-	-	-
Chicks	2700	13550	10850	-	-	-
Vermi compost	**23750**	**36756**	**12986**	-	-	-

Table.3 Comparison of conventional cropping system and integrated cropping system - Wet land situation

Components	Cost of cultivation	Gross return	Net return	B:C ratio	Employment generation (man days /year)
Conventional cropping	33250	168300	105050	1:4.15	875
IFS	127500	474266	346766	1:3.71	1162
Additional advantage of IFS over conventional cropping	- 94250 (Expenditure)	305966	241716	-	387 man days

Table.4 Integrated Farming System - Dry land situation

Components included	No. of Demonstration (ha)	Economics of demonstration (Rs./ha)				Economics of check (Rs./ha)			
		Gross Cost	Gross Return	Net Return	BCR	Gross Cost	Gross Return	Net Return	BCR
Crop, fodder and goat	2	27690	62070	24188	2.24	12750	23456	10706	1.83

Table.5 Data on additional parameters other than yield (*viz*., reduction of percentage in weed/pest/ diseases *etc*.) - Dry land situation

Data on other parameters in relation to technology demonstrated				Check		
Parameter with unit	Total cost	Gross return	Net return	Total cost	Gross return	Net return
Crop (Food)	6215	12675	6460	12750	23456	**10706**
Crop (Fodder)	4725	9675	4950	-	-	-
Goat	**16750**	**39720**	**12778**	-	-	-

Table.6 Comparison of conventional cropping system and integrated cropping system- Dry land situation

Components	Cost of cultivation	Gross return	Net return	B:C ratio	Employment generation (man days /year)
Conventional cropping	12750	23456	10706	1.83	76
IFS	27690	62070	24188	2.24	312
Additional advantage of IFS over conventional cropping	-14940	38614	13482	-	236

Table.7 Production and recycling of organic manures in integrated farming system model

Organic manures	Area (m^2)	Production (q)	Use in farm (q)	Gross return (Rs.)	Cost of production (Rs.)	Net return (Rs.)	Family labour (Man days)	B:C
FYM	40	45	45	3500	650	2900	6	5.38
Goat Manure	10	10	10	1500	150	1350	1	9.00
Poultry manure	4	2.5	2.1	600	150	450	1	3.00
Vermi compost	12	35	35	25500	5000	20100	40	4.10
Total	**66**	**92.10**	**92.10**	**31100**	**5950**	**24800**	**48**	**5.22**

Integrated farming systems approach is profitable and more sustainable than the conventional sole cropping system and sustains soil productivity through recycling of organic sources of nutrients from the enterprises involved. The adoption of multiple farm enterprises in an integrated manner can ensure a substantial income generation to sustain the livelihood of farmers over the meagre income from self-standing enterprises as revealed from this study.

Study of the physical indicators helps in the evaluation of the enterprise combination in farming systems. Through the quantification of physical indicators viz., employment generation, nutritional status, energy equivalents and the resource and residue recycling, optimization of enterprise combination was possible. The nutritional security offered by the systems apart from the efficient bio resource utilization, residue recycling and employment generation makes such approaches effective for farmers of the wet and dry land tract.

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