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Study the Impact of Integrated Farming System on Reducing Cost of Cultivation and Increasing Income of Farmers in Chatra District of Jharkhand

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Authors' contributions

This work was carried out in collaboration among all authors. Author PS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors RKS and DO managed the analyses of the study. Author ZA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The study was conducted on purposively selected Mardanpur village of Chatra block in Chatra district where Sri. Danbhushan Lakra, Progressive farmer has developed a unique model of integrated farming system (IFS) in his 5 acres of the farm. He has designed the farm and segregated the land as per the crops and animal requirement. The IFS model comprised of field crops in 2 acres, vegetables in 1 acre, fruit plants in 0.5 acres, a pig farm in 0.25 acre, a dairy farm in 0.25 acre, Poultry in 0.25 acre, composite fish farming in 0.75 acres. Sri Danbhushan Lakra has adopted the best practices of farming under technological support of Krishi Vigyan Kendra, Chatra. The productivity and economic return of different enterprises and commodities were calculated and compared with previous productivity and economics. The result indicated that Sri. Danbhushan Lakra has got more than 80 per cent additional yield and profit on different enterprises, which are

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integrated into the farming system. He has reduced 60% external input like the feed of animal, chemical fertilizer requirement, overall he earns the annual net income Rs. 94430.75 that is 68.6% more as compared to his previous income. It happens due to the interrelation set of enterprises used so that the waste from one component became input for another part of the system, which reduced cost and increased productivity.

Keywords: Integrated farming system; productivity; economic importance; income; Chatra; India.

1. INTRODUCTION

Unsustainable farming leads to environmental pollution and threatens the livelihood of millions of small farm holders. Strengthening the agricultural production system for greater sustainability and higher economic return is a vital process for increasing income and food and nutrient security in developing countries [1]. Therefore, integrated farming system (IFS) is a multidisciplinary whole-farm approach [2] and very effective in solving the problems of small and marginal farmers. The approach aims at increasing income and employment from smallholding by integrating various farm enterprises and recycling crop residues and by-products within the farm itself resulting in reducing the cost of cultivation. Integrated farming systems are often less risky if managed efficiently, they benefit from synergisms among enterprises, diversity in produce, and environmental soundness [3]. On this basis, IFS models have been suggested by several workers for the development of small and marginal farms across the country [4,5,6]. It is now well recognised that achieving sustainable agricultural production needs a special effort to overcome the sector-based perspective and to provide solutions to real-world problems through scientific and socially robust knowledge [7]. Kajikawa et al. [8] argued that agricultural sustainability is the more representative disciplines-focus issue that provides also the most numerous links with other fields within the overall landscape of sustainability research. Several workers have examined the importance of the approaches in sustainability studies which recognize the urgency to adopt multi-inter-trans-disciplinary approaches [7,9,10,11,12, 13,14].

According to Soni et al. [15] the prices of inputs and outputs commonly change, together with reliance on external resources, farm size, farm ownership and the method of farming, often as a cause and result of increasing population pressures [16,17,18]. The farmers need to be assured of regular income for living at least above the poverty line. In this context, Integrated Farming System (IFS) is one of the important solutions to face this peculiar situation.

Keeping this fact under consideration KVK Chatra developed 5-acre crops and animal-based Integrated Farming System with available resources which will result in sustainable development. This study was taken into account to assess the effectiveness of the IFS in terms of yield and farmer's economic profit than the traditional approach and to popularize the new approach in grass root farmer's level.

2. METHODOLOGY

KVK Chatra has developed 5 acres based module of integrated farming system in the year 2009, with discussion from farmers and suggestion given by scientists. After that, this module was implemented on the field of Sri Dan Bhushan Lakra who has five acres of land at one place near the renovated pond under NICRA project of Mardanpur village of Chatra block in Chatra district of Jharkhand. Before implementation of the farming system module, Rice and Maize were the important crops in Kharif and some area they grow wheat and mustard in Rabi season. They also grow vegetable for their home consumption. For better utilization of his 5-acre land, the IFS module was discussed with Mr Dan Bhushan and designed the farm and segregated the land as per the requirement of the crop. The layout of the farming system has been given in Table 1.

Besides this improved technology of farming, improved varieties recommended a dose of nutrient, the package of practices, drip and sprinkler irrigation, plastic mulching, reducing chemical fertilizer by using vermicompost, Plant residues, vermi wash, cow urine, Biogas slurry, application of Bio-Pesticides etc were included facilities in the farm.

The data on production cost and monetary return was collected for two years (2016-17 and 2017-18) from the Integrated farming system, to work

out the economic feasibility of integrated farming system over the farmers farming system.

3. RESULTS AND DISCUSSION

Increasing productivity of commodity/ enterprises under the Integrated Farming System: Production and productivity increase in integrated farming system is presented in Table 2.

Table 2 shows that so many commodities which were not taken by farmers before the implementation of the integrated farming system i.e. cauliflower, pig farming and duckery, which contribute 100% extra *income.* It also is seen in Table 2 that in dairy farming farmers were having indigenous Cow before IFS, which produces only 1kg/cow/day milk but after the introduction of the improved breed, they got 8kg/cow/day which was 700% more compared to before IFS. In vegetable cultivation farmer get 200% extra yield compared to previous practice and in field crops like Rice, Maize + Red gram, Wheat, Mustard, farmers get (52.38%), 30.76%), (61%), and (37.5%) extra yield respectively. It has happened due to the use of an interrelated set of enterprises so that the waste from one component becomes an input for another component of IFS, which reduced cost and improved productivity. This finding was also supported by the finding of Alexandratos N (ed) (1995).

Economics of Integrated Farming System (IFS): Analysis of Economics of Integrated Farming System as given in Table 3.

Table 3 shows that farmers get the maximum net income of Rs. 215000/ha in fish farming followed

Table 1. Layout of Integrated Farming System (IFS)

Sl. No	Crops/Enterprises	Area in Acre
1	Field crops	2.0
2	Fruit plant	0.5
3	Vegetable	1.0
4	Pig farming (5F + 1M)	0.25
5	Dairy farming (5 Cow)	0.25
6	Poultry	0.25
7	Compost fish farming	0.75
Total		5.0

Table 2. Increasing productivity of different commodities/enterprises under the Integrated farming system

S. No	Commodity/Enterprises	Yield Q/ha		Percentage increase
		Before (IFS)	After (IFS)	
Kharif				
	Rice	21	32	52.58
	Maize+Redgram	Maize -13	Maize – 17	30.76
			Red gram - 13	100.00
	Cucurbits	-	45	100
	Brinjal	42	135	221.4
	Cauliflower	-	155	100
Rabi				
	Wheat	13	21	61
	Gram	9.5	16	68.42
	Mustard	6.8	11	61.76
	Brinjal	6.48	156	144
	Cauliflower	-	168	100
Summer				
	Cauliflower	-	142	100
	Dairy (3 Cow)	1kg /cow/day	8 kg/cow/days	700
	Piggery (5F + 1M)	-	9 piglet/harrowing	100
	Duckery (6 birds)	-	180 egg/ duck/year	100
	Composite fish farm	23q/ha	38q/ha	65.21

Table 3. Economics of different enterprises/commodities under in integrated farming system before and after integration

S. No	Enterprises commodity	Yield Q/ha		Cost of Cultivation (Rs./ha)		Cross return (Rs./ha)		Net Return (Rs./ha)		BC Ratio	
		BIFS	AIFS	BIFS	AIFS	BIFS	AIFS	BIFS	AIFS	BIFS	AIFS
Kharif											
	Rice	21	32	19000	21000	44100	67200	25100	46200	2.32	3.20
	Maize+Redgram	13	17	9000	13400	14300	37600	5300	24200	1.58	2.70
	Cucurbits	-	54	-	32000	-	59400	-	27400	-	1.85
	Brinjal	42	135	28000	48000	37800	121500	9800	73500	1.35	2.53
	Cauliflower	-	155	-	48800	-	139500	-	90700	-	2.85
Rabi											
	Wheat	13	21	16500	17800	27300	44100	10800	26300	1.65	2.47
	Gram	9.5	16	14800	19600	20900	35200	6100	15600	1.41	1.79
	Mustard	8	11	10800	11600	18400	25300	7600	13700	1.70	2.18
	Brinajl	48	156	8000	51200	43200	140400	24800	89200	5.4	2.74
	Cauliflower	-	168	-	51300	-	184800	-	133500	-	3.60
Summer											
	Cauliflower farming	-	142	-	68000	-	156200	-	88200	-	2.29
	Dairy (3 Cow)	1 kg/cow/ days	8 kg/cow/ day	800/cow/ month	3200/cow/ month	1050/cow/ month	8400/cow/ month	250 Rs./month	5200 Rs./month	1.31	2.62
	Pig farming (5F + 1M)	-	9 piglet/ harrowing	-	46000/ harrowing	-	122000/ harrowing	-	76000	-	2.65
	Duckery	-	180 egg/ Duck/year	-	920 duck/year	-	1800/egg	-	880	-	1.95
	Composite fish farm farming	23	38	42000	89000	184000	304000	142000	215000	4.38	3.41

Table 4. Annual income in the 5-acre integrated farming system model

S. No	Commodity/Enterprises'	The area under different commodity /enterprises' before (IFS) Acre)	Annual income (Rs.) Farmer farm system	The area under different commodity / enterprises' after (IFS) Acre	Annual net income. (Rs.) and IFS
1	Field crops	4	37108	2	36272.00
2	Fruit plant	-	-	0.5 (Three years old)	10000.00
3	Vegetable	0.75	35000	1	121000.00
4	Piggery (5F+1M)	-	-	0.25	76000.00
5	Dairy, Improved Breed (5 Cow) (22Dasi breed)in farmer house	0.6	5500	0.25	260,000.00
6	Poultry	-	-	0.25	26400.00
7	Composite fish farming	-	-	0.75	64758.75
Total net annual income in one year			77608	-	594430.75

by Cauliflower cultivation of Rs. 88200/ha, pig farming Rs. 76000, field crops, Duckery and dairy respectively. The benefit-cost ratio was also found more in Rice 3.55 followed by cauliflower cultivation 3.60 and fish farming 3.41 respectively. The minimum cost-benefit ratio recorded in gram 1.79 followed by cucurbits 1.85 and duck farming 1.95 respectively. But overall under integrated farming system benefit-cost ratio would be more compared to farmer's farming system. It is due to location specific systems which have been developed based on available resources which yield result in sustainable development. Integrated Farming System (IFS) ensured that wastes from one form of agriculture become a resource for another form since it utilizes wastes as resources, we not only criminate wastes but we also ensure an overall increase in productivity, profitability for the whole agricultural systems. This finding agreed with the finding of Rajju Priya Sone et al. [15].

Annual net income within 5 Acre: After implementation on IFS in 5 Acre land annual income was calculated and it is presented in Table 4.

Table 4 showed that before the implementation of the IFS model farmer utilized his 4-acre land in field crops and get Rs. 37108 net income and grew vegetables only for home consumption with traditional technology in 0.75 acres and got Rs. 35000 net income annually, in dairy farming, farmers reared 2 cows of the local breed which gave only 1-litre milk per day and earned Rs. 5500 annual income. When calculating total annual income in 5-acre land farmer got Rs. 77608.

The table further showed total income after the adoption of the Integrated Farming System (IFS) model with the integration of different commodities and enterprises. Farmers get Rs, 594430.75 in 5 acres of land which is 686% more in comparison to farmer's farming system.

4. CONCLUSION

The present study was conducted to assess the effectiveness of the IFS in terms of yield and farmer's economic profit than the traditional approach and to popularize the new approach in grass root farmer's level. The integrated farming system gives unique opportunities for maintaining and extending biodiversity. The emphasis in such a system is on optimizing resource utilization rather than maximization of individual elements in the system. The wellbeing of poor farmers can be improved by bringing together the experiences and efforts of farmers, scientist, researchers. The variability happens due to the interrelation set of enterprises used so that the waste from one component became input for another part of the system, which reduced cost and increased productivity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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