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A Study on Prevalence of Predominant Integrated Farming Systems in Coastal Odisha

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ABSTRACT: A study was conducted to investigate the prevalence and characteristics of predominant Integrated Farming Systems (IFS) in the coastal region of Odisha, India. Odisha being a coastal state in eastern India is the most disaster-vulnerable state in India where conventional farming practices are still being practiced. To enhance the food security and livelihoods of farmers, especially small and marginal farmers, IFS is being encouraged as a sustainable agricultural system that aims to increase productivity, reduce risk, and promote resilience in the face of disasters. Integrated Farming Systems involve the integration of various agricultural components, such as crops, livestock, fishery, and other allied activities, to enhance productivity, sustainability, and income generation. The study employed a combination of surveys, interviews, and field observations to collect data from a representative sample of farmers in the coastal region. Information was gathered on the types of farming systems practiced, the components integrated, and the extent of adoption among farmers. Preliminary findings indicate that the coastal region of Odisha has a significant presence of integrated farming practices. The predominant IFS observed include combinations of (Crop + Livestock), (Crop + Poultry), (Crop + Livestock + Poultry), (Crop + Livestock + Resource Generating), (Crop + Livestock + Fishery), and (Crop + Livestock + Fishery + Mushroom + Resource Generating) systems where FS IV generated high returns and FS-II was least profitable among 6 enterprises. The findings underscore the importance of IFS as a viable and sustainable farming strategy, contributing to increased agricultural productivity, environmental sustainability, and improved livelihoods.

Keywords: IFS, BCR, Predominant, Employment.

INTRODUCTION

India is one of the world's fastest emerging economies and accomplishing higher rates of economic growth, India is as yet falling behind in terms of providing better nutrition and livelihood for the small and marginal farmers. Despite 70 percent of the population being involved in agriculture and allied activities have issues evolved around the world such as food security, employment generation, as well as natural resources management. As per the Global Hunger Index Report 2022, India secured the rank of 107 out of 121 countries scoring 29.1 out of a 100-point scale, pegged in the 'serious' category (GHI Report, 2022). To combat the situation of nutritional and livelihood issues a sustainable agricultural system needs to be adopted. IFS can lead to an increase in yield and income for farmers as they can diversify their income sources by integrating crops, livestock, forestry, and fisheries as well as a decrease in the cost of production (Ugwumba *et al.*, 2010). Climate-resilient agriculture technologies need to address the country's climate change scenario and demonstrate the best solutions to assist farmers in adjusting to the effects of climate change (Priyanka *et al*., 2022), for which promoting integrated farming system can be adopted to minimize loss by increasing productivity and sustain livelihood in the face of disasters. For the small and marginal farmers of India, IFS can play a vital role in enhancing their economic situation and livelihood (Devendra and Thomas 2002; Singh *et al.*, 2006). In Odisha, a disaster-vulnerable state in India, IFS is being encouraged to enhance the food security and livelihoods of farmers, especially small and marginal farmers. Integrated Farming System also increases the standard of living by providing higher food production (Singh *et al*., 2007). This integration enables farmers to diversify their income sources, improve soil health, and

reduce production risks associated with climate change. It has contributed to the conservation of natural resources, such as soil and water, by minimizing the use of chemical fertilizers and pesticides. Integrated farming systems must be widely adopted to stabilize the income and nutritional security of farm families throughout the nation. This can be achieved by empowering the farm families through proper information dissemination about technologies, incentives, and extension support related to the IFS.

MATERIALS AND METHODS

To study the predominant IFS practiced in coastal districts of Odisha, out of 7 coastal districts 3 were selected purposely namely Puri, Khordha and Bhadrak. 2 blocks each from 3 districts were selected randomly and a list of farmers practicing both the Integrated Farming System and conventional farming were procured from the District Agricultural office of respective districts. The primary data was collected from 208 respondents practicing both the integrated farming system and conventional farming systems by survey method using a well-structured and pretested (questionnaire). To minimize the errors, the quantitative data were collected in local units but later on, they were converted into standard units. The major focus was on the type of Integrated farming systems adopted by the marginal and small farmers to enhance their livelihood. Data, thus collected were scrutinized, coded and tabulated on the Excel sheets for further analysis.

RESULTS AND DISCUSSIONS

The total farm respondents of 208 were categorized as 135 marginal (<1 ha), 50 small (1-2 ha) and 23 medium (2-4 ha) adopted different farming systems mentioned in Table 1. The percentage of marginal farms in C, FS-I, FS-II, FS-III, FS-IV, FS-V and FS-VI was 28.15, 22.96, 10.37, 20.0, 11.85, 6.67 and 0.0 respectively. The respective figures for small farmers were 30.0, 18.0, 0.0, 14.0, 0.0, 24.0 and 8.0 in the case of C, FS-I, FS-II, FS-III, FS-IV, FS-V and FS-VI. The percentage of large farms in C, FS-I, FS-II, FS-III, FS-IV, FS-V and FS-VI was 21.74, 13.04, 0.0, 13.04, 0.0, 21.74 and 30.43 respectively. The total number of respondents was 61, 43, 14, 37, 16, 26 and 11 with respective percentages to the total of 29.33, 20.67, 6.73, 17.79, 7.69, 12.50 and 5.29 in the case of C, FS-I, FS-II, FS-III, FS-IV, FS-V and FS-VI respectively (Fig. 1). In the case of marginal farmers the number of farmers adopting different farming systems was 135 followed by 50 in the case of small farmers and the lowest was 23 in the case of medium farmers. The above results are in line with the findings of Shekinah *et al.* (2005), who compared four farming systems combinations of the dryland tract of the western zone of Tamil Nadu. Swain (2013) identified 4 IFS models in the Puri district of Odisha and Sahoo (2018) identified 7 IFS from 4 districts of Odisha.

Table 1: Farming Systems and number of respondents in the sample firms.

Sr. No.	Type of Farming Systems	Code	Number of Respondents			Total Respondents	Percentage to total
			Marginal (<1 Ha)	Small (1-2 Ha)	Medium (2-4 Ha)		
1.	Crop	C	38 (28.15)	18 (36.00)	5 (21.74)	61	29.33
2.	Crop - Livestock	FS-I	31 (22.96)	9 (18.00)	3 (13.04)	43	20.67
3.	Crop - Poultry	FS-II	14 (10.37)	0 (0.00)	0 (0.00)	14	6.73
4.	Crop - Livestock - Resource Generating	FS-III	27 (20.00)	7 (14.00)	3 (13.04)	37	17.79
5.	Crop - Livestock -Poultry	FS-IV	16 (11.85)	0 (0.00)	0 (0.00)	16	7.69
6.	Crop - Livestock -Fishery	FS-V	9 (6.67)	12 (24.00)	5 (21.74)	26	12.50
7.	Crop - Livestock - Fishery - Mushroom - Resource Generating	FS-VI	0 (0.00)	4 (8.00)	7 (30.43)	11	5.29
	Grand Total		**135 (100.00)**	**50 (100.00)**	**23 (100.00)**	**208 (100.00)**	**100**

(Figures in the parentheses indicate percentage)

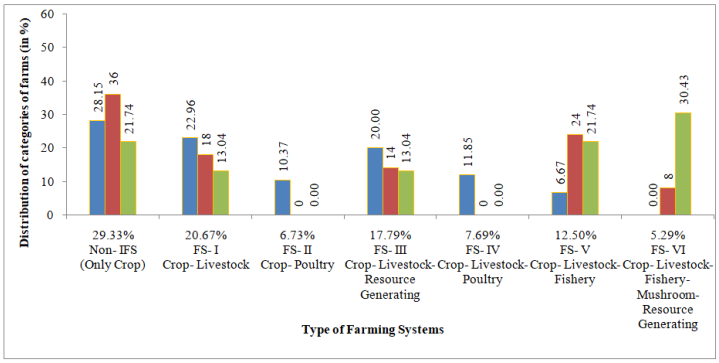

Fig. 1. Category of farms and different farming systems.

According to Fig. 2a IFS-I (C+L), 54 percent and 46 percent of respondent farmers were engaged in livestock and crop enterprises respectively. Fig. 2b IFS-I (C+P) indicates two components of which poultry (89%) was practiced more than that of the crop (11%). Fig. 2c IFS-III (C+L+RG) involved 3 components of which livestock

(50%) was practiced more as compared to crop (45%) and Resource generating (5%). Fig. 2d IFS-IV (C+L+F), components such as Fishery (67%) hold a major share followed by crop (29%) and livestock (4%). As per Fig. 2e IFS-IV (C+L+P), engagement in Poultry (50%) is more as compared to crop (40%) and livestock (10%) components. Fig. 2 f IFS-VI (C+L+F+M+RG), the major component was fishery (42%) followed by crop (35%), mushroom (13%), livestock (6%) and the component which was least practiced was Resource Generating (4%).

The above findings are in line with the findings of Manivannan *et al.* (2011) where goatery as the major livestock-based component (goat + crop/ goat + dairy + crop/ goat + dairy and goat + dairy + crop systems) in the farming systems adopted by farmers of Erode district of Tamilnadu. Tripathi and Rathi (2011) also stated that integration of horticulture and livestock-based components with main crop (crop + dairy /crop + dairy + goats + horticulture/ crop + horticulture+ goats/ crop +dairy + vegetables/ horticulture + dairy + vegetables) are practiced more often in Uttarakhand.

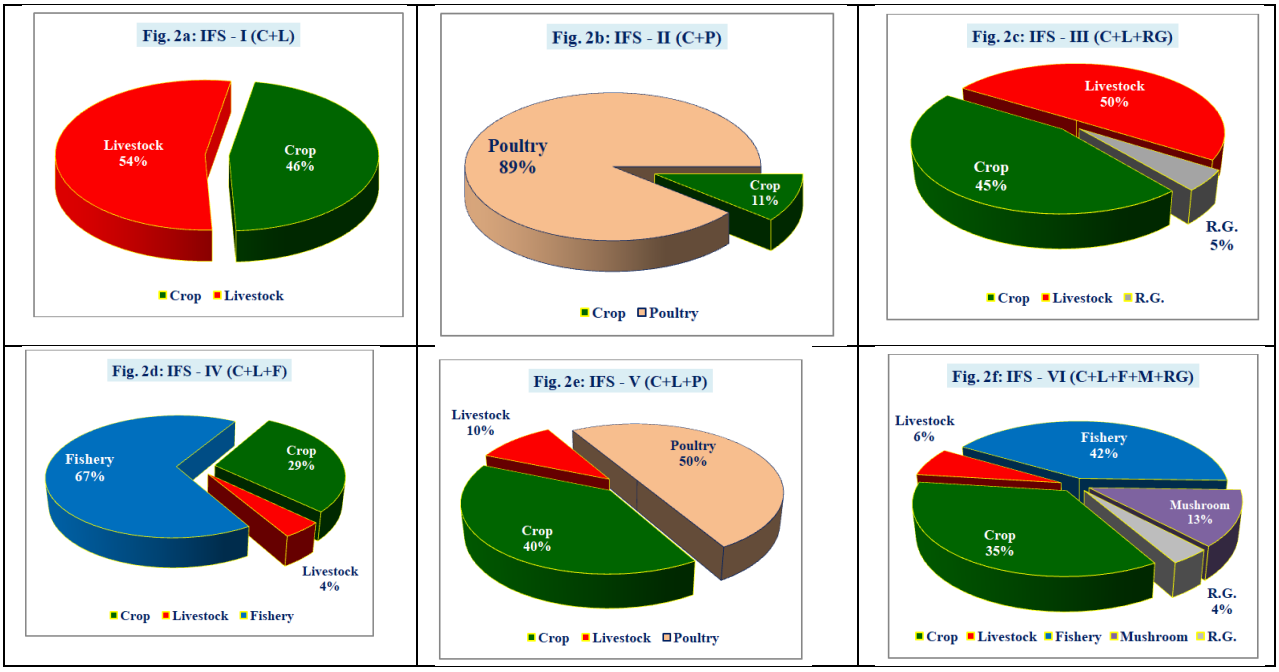

Fig. 2. Share of each enterprise in different farming systems.

The data showed that the Farming System- IV (Crop-Livestock -Poultry) in one acre of land is more profitable with BCR 3.17 and profitability percentage of 215.83 followed by Crop - Livestock - Resource Generating with BCR 2.99 and Crop - Livestock - Fishery - Mushroom - RG with BCR 2.87. The results above are in line with the findings of Panwar (2014) where he integrated crop sequences with animal components that improved the system profitability in totality even on small farms of 0.50 ha. Singh *et al.* (2012) comprised the components like crop, dairy, fishery, horticulture and apiary where he recorded higher productivity, profitability and employment generation. The study also revealed that farm enterprise IV (Crop - Poultry) was the least profitable enterprise out of 6 farming systems with a profitability percentage of 48.43% and BCR of 1.48.

Table 2: Profit structure of different farming system per year per acre.

Sr. No.	Type of Farming Systems	Code	Variable Cost	Gross Income	Profitability %	BCR
1.	Crop - Livestock	FS-I	95824.64	242989.8	154.03	2.54
2.	Crop - Poultry	FS-II	589455.91	874925	48.43	1.48
3.	Crop - Livestock - RG	FS-III	71363.65	213588.93	202.35	2.99
4.	Crop - Livestock -Poultry	FS-IV	65502	207834	215.83	3.17
5.	Crop - Livestock -Fishery	FS-V	74427.91	159463.87	114.253	2.14
6.	Crop - Livestock - Fishery - Mushroom - RG	FS-VI	67428	193953	187.37	2.87

CONCLUSION

The purpose of this study was to analyze the predominant Integrated Farming Systems practiced in Coastal Odisha. Efforts were made to systematically collate the data and analyze the share of each component in different farming systems. Preliminary findings indicate that IFS implementation in the coastal district of Odisha has demonstrated major economic outcomes from various farming systems. Out of numerous farming systems practiced only six (FS-I, FS-II, FS-III, FS-IV, FS-V and FS-VI) were selected which were more sustainable and economically viable farming systems, capable of addressing the challenges posed by climate change, resource limitations, and market dynamics in Odisha conditions. The study suggests that the adoption of IFS (FS-IV, FS-III and FS-VI) can have a significant increase in farm income and can promote resilience in the face of disasters and climate change. Therefore, there is a need for policymakers to promote IFS and provide the necessary support to farmers to adopt this sustainable and resilient agricultural approach.

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Conflict of Interest. None.

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