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RESEARCH PAPER

Factors influencing adoption of Integrated Farming System at farmer's level and their contribution to farmers income

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Abstract: A study to determine factors affecting adoption of IFS and contribution to enhancing of farmers income was undertaken during 2018-19 in in Belagavi and Vijayapur district by following *ex post-facto* research design. The data was collected by personal interview method with help of structured schedule.Snowball technique was used to identify30 farmers practicing IFS in two districts. Thirty farmers and 12 farmers not practicing modern agricultural technology were selected for comparison of cost and returns.The results found that equal percentage (26.67 %) of farmers adopted the integrated farming system including the combination of field crop+ animal husbandry+ horticulture crop. While study found that education, land holding, information seeking behavour, scientific orientation and progressiveness of the farmer had contributed to adoption of integrated farming system. Further, integrated farming system with combination of field crops + animal husbandry + horticultural crop + vermicomposting contributed more to income (₹115807.02 and 116570.45) when compared to growing only filed crop (₹ 51573.45 and 40346.56) in Belagavi and Vijayapur district, respectively. High wage rates and non-availability of inputs were the major constraints faced by integrated farming system adopted farmers.

Key words: Enhancing farmers income, Sustainable agricultural technologies

Introduction

Technological change has been the major driving force for increasing agricultural productivity and promoting agriculture development in all countries. In the past, the choice of technologies and their adoption was to increase production, productivity and farm incomes. Over many decades, policies for agriculture, trade, research and development, education, training and advice have been strong influences on the choice of technology, level of agricultural production and farm practices. Sustainable agricultural technologies identified for the study are integrated farming system and organic farming.

An Integrated Farming System (IFS) is one which focuses on judicious combination of two or more of agriculture enterprises and effective recycling of residue waste for better management of available resources with small and marginal farmers to generate more income and employment for family laborerduring off seasons. These enterprises not only supplement the income of the farmers but also helps in providing employment to the family member throughout the year (Behera *et al.,* 2001). The average income of a farmer is ₹ 1670 per month which can be doubledby adopting different enterprises (Anon., 2017). The adoption of IFS could generate additional income ranging from ₹ 9,000 to 2,00,000 per hectare, depending on inclusion of number and kind of additional farm enterprises and their effective combination (Ponnusamy and Gupta, 2009).Integration of various enterprises in a farm ensures recycling of farm residues, optimum use of available resources, increase in employment opportunities, minimization of risk and uncertainties and also increase the farm income (Pushpa, 2010).

Farmers income remained low in relation to income of those working in the non-farm sector, ultimately causing detrimental effect on interest in farming and farm investment and also forcing young generation away from the farming sector. Realizing this fact, doubling farmers income by 2022 was initiated by Government of India. This can be achieved by adoption of these modern agricultural technologies. Hence, present study was undertaken to determine the factors affecting adoption of IFS and contribution of IFS to income of the farmers.

Material and methods

The present investigation was undertaken in Belagavi and Vijayapur district of Karnataka state. These two districts were selected for research study as they represent two Agroclimatic zone *i.e.,* northern transition zone (Belagavi) and Northern dry zone (Vijayapur). Snowball technique was used to identify farmers adopting IFS. Thirty farmers *i.e*., 15 each from Belagavi and Vijayapur districtwere selected. Thus, total sample consisted of 30 farmers practicing identified IFS and 12 farmers (six each from one district) who had not adopted IFS were selected for comparison of cost and returns. Personal interview method was used to collect the data using structured schedule.

Results and discussion

Adoption of integrated farming system in Belagavi and Vijayapur district

The study observed that farmers had adopted four types of integrated farming system (Table 1), which mainly includes field crops + animal husbandry + horticultural crops (26.67 and 33.33 %), field crops +animal husbandry + vermicomposting (26.67 and 26.67 %), field crops + animal husbandry + horticultural crops + vermicomposting (26.67 and 20.00 %) and field crops + animal husbandry + vermicomposting + horticultural crops + forestry (20.00 and 20.00 %) in Belagavi and Vijayapur district, respectively. During last one-decade

Table 1. Adoption of integrated farming system in Belagavi and Vijayapur n=30

Sl. No.	Particulars	Belagavi (n_1=15)		Vijayapur (n_2=15)	
		f	%	f	%
1.	Field crops + Animal Husbandry + Horticultural crops	4	26.66	5	33.33
2.	Field crops + Animal husbandry + Vermicomposting	4	26.67	4	26.67
3.	Field crops + Animal husbandry + Vermicomposting+ Horticultural crops	4	26.67	3	20.00
4.	Field crops + Animal husbandry + Vermicomposting+ Horticultural crops+ forestry	3	20.00	3	20.00

Integrated farming system has been promoted for sustainable agriculture by state agricultural department and State Agricultural Universities (SAUs.). It is also fact that field crops alone don't support their livelihood due to climatic variation such as the delayed and erratic monsoon and dry spell experienced frequently by farmers. It has become essential to adopt more components along with field crops like horticulture crops, livestock, grass and forest crops. Further the study observed that farmers who adopted animal husbandry had also adopted vermicomposting. Livestock has been traditionally followed by all farmers. Due to awareness and government scheme, farmers had adopted vermicomposting, which had resulted in improving fertility of the soil. All most equal proportions of farmers had adopted IFS with different combination. Choice in the combination might be influenced by the resource's availability at farmers level, knowledge of farmer and support of extension agency. Rajeshwari (2014), who found that over one third of farmers adopted integrated farming system with agriculture + horticulture + dairy in Dharwad district. Govardhan *et al.* (2018) carried out research on one hectare model of IFS during 2015 at Agricultural Research Institute, Telangana. This model was compared with predominant cropping system rice-maize in one hectare. The study revealed that gross (₹ 1243250) and netreturns (₹ 609106) of first year of IFS model were more than gross (₹ 218880) and net returns (₹ 138373) of rice-maize crop sequences.

Further, it is clear from Table 2 that close to 50 per cent of the farmers were in medium category of adoption of integrated farming system (46.67 and 40.00 %),while one third of them were in high adoption category (33.33 %) in Belagavi and Vijayapur districts, respectively. It is mainly due to the fact that most of the farmers had adopted minimum of three components and maximum of five components. In each component, they had adopted majority of the recommended practices. Hence, they were found in high and medium category of adoption of IFS. Srinika *et al.* (2017) reported that profitable farming system adopted in Adilabad district were paddy-sericulture-poultry, paddy-paddy-dairy-moriculture, paddy-paddy-tomato-cotton-poultry.

Table 2. Distribution of respondents according to adoption of integrated farmingsystem n=30

Sl. No.	Particulars	Belagavi (n_1=15)		Vijyapur(n_2=15)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	3	20.00	4	26.66
2.	Medium	7	46.67	6	40.00
3.	High	5	33.33	5	33.33
		SD =1.25 Mean =10		SD=1.12	Mean=9.86
		Low=9.46	High=10.53	Low=9.38	High=10.34

Factors influencing the adoption of integrated farming system

Data in Table 3 depicts that education, land holding, information seeking behaviour, scientific orientation and progressiveness of the farmer had positive and significant association with adoption of integrated farming system. Adoption of integrated farming system means adoption of various enterprises hence higher land holding provides greater opportunity to adopt various enterprises. Scientific orientation and information seeking behavior might have enabled farmers to understand the additional advantages of integrating of enterprises. Study provides empirical evidence that land alone may not promote farmers to adopt IFS, scientific orientation and information seeking behavior are necessary to take the idea forward and adopt. Information seeking behavior essentially make farmer to contact different sources and get conviction. It can also be observed that progressive farmer tends to understand better and adopt. As IFS has become one of the means to face climate change affect, there isneed to conduct Campaigns involving progressive farmer. The department should provide more information on integrated farming system through various channels including Information Communication Technology (ICT). There is need to provide technical and material support to farmers, so that a greater number of farmers can adopt IFS. Raghu and Manaloor (2004) found that farm size is positively associated and statistically significant with adoption of nutrient and pest management practices. Ponnusamy and Koushalyadevi (2017) observed that education was significantly correlated with total income only for the overall IFS, but not with different enterprise

Table 3. Factors influencing the adoption of integrated farming system n = 30

Sl. No.	Variables	'r' value	'b' value	't' value
1	Age	0.046^{NS}	0.0076^{NS}	0.0495
2	Education	0.503*	0.157^{*}	2.053
3	Land holding	0.644**	0.183*	2.148
4	Size of family	0.207^{NS}	0.075^{NS}	1.151
5	Cosmopolitness	0.284^{NS}	0.014^{NS}	0.270
6	Extension participation	0.089	0.056^{NS}	0.0964
7	Information seeking behaviour	0.548*	0.171*	2.0580
8	Location of market	0.158^{NS}	0.015^{NS}	1.262
9	Risk orientation	0.246^{NS}	0.048^{NS}	0.279
10	Scientific orientation	0.597**	0.179*	2.0949
11	Access to the credit facility	0.146^{NS}	0.414^{NS}	1.661
12	Organizational participation	0.331^{NS}	0.110^{NS}	1.240
13	Progressiveness of the farmer	0.538**	0.184*	2.165

*: Singnificant at 5 %, **: Singnificant at 1 %, $R^{2=}$0.651

combinations, indicating the incremental benefits of adopting multiple enterprises by the farmers. The social participation was highly correlated with total income in crop + dairy and crop + dairy + poultry + horticulture, depicting the role played by market forces in horticulture and field crops. Landholding is an important variable for keeping multiple enterprises. Due to the importance of manure for recycling within the farm, livestock holding emerged as a significant variable in combinations having fishery and sheep and goat enterprises

Farmers income under different integrated farming system

The results related to cost and returns in IFSis presented in the Table 4 and it can be observed that in Belagavi district farmers adopted integrated farming system with field crops + animal husbandry + vermicomposting with an average income of ₹ 61430.14 per annum per hectare followed by field crops + animal husbandry + horticulture with annual average income of ₹ 74200.72, field crops + animal husbandry + vermicomposting + horticulture with annual averageincome of ₹ 87860.46 and field crops + animal husbandry + vermicomposting + horticulture + forestry with annual averageincome of ₹ 115807.02, while the income per annum on growing only field crop was ₹ 51573.45.

Similarly, in Vijayapur district average income of the farmers adopting integrated farming system with field crops + animal husbandry + vermicomposting was of ₹ 52570.56 per annum per hectare followed by field crops + animal husbandry + horticulture with annual income of ₹ 95320.29, field crops + animal husbandry + vermicomposting + horticulture with annual income of ₹ 116570.45 and field crops + animal husbandry + vermicomposting + horticulture + forestry with annual income of ₹ 127690.16 Whereas, ₹ 40346.56 was annual income of farmers who had grown only field crops.

Further, the integrated farming system with combination of field crop + animal husbandry + horticulture + vermicomposting + forestry is resulted in net returns of ₹ 115807.02 and ₹127690.16 in Belagavi and Vijayapur district, respectively. The results clearly indicate that increase in number of components would increase the net returns of a farm. It is interesting to note that field crops and animal husbandry which was traditionally followed provide additional income of about ₹ 10,000 per annum (₹ 61,430.14 - ₹ 51,573.45 in Belagavi and ₹ 52,570.56 - ₹ 40,346.56 in Vijayapur district). While adoption of horticulture crop would add further, approximately ₹ 13,000 and ₹ 43,000 in Belagavi and Vijayapur district, respectively. Further, thosefarmers who had adopted field crops combining livestock, horticulture and vermicompost were able to get almost double the income. It is evident from the results that the BC ratio was in the range of 2.45 to 2.65 in Belagavi district, while it was 2.10 to 2.30 in Vijajayapur district as compared to 1.95 and 1.68 with only one enterprise in these districts, respectively. It is worth mentioning that same piece of land having same resources, if adopted proper combination of enterprises can result in doubling farmers income. The results of the study provide a strong evidence and basis to popularize IFS under flagship programme of the government on doubling farmers income. Apart from enhanced income, it also provides security against climate variations. Even in the event of failure of any enterprise due to climate variation, farmer is assured of good income to support livelihood of the family (Ponnusamy and Gupta, 2009). The substantial additional income could be generated by practicing different enterprise combinations based on the location specificity and capability of farmers (Murugan and Kathiresan, 2005). Rajeshwari (2004) observed that by adopting farming system of agriculture + horticulture + dairy + forestry + vermi composting, farmers earned more income compared to other farming system.Shankar *et al.* (2017), revealed that integrated farming system has recorded higher average net returns (₹ 64380) and benefit cost ratio (10.35) over the conventional method. Higher profitability and productivity with lesser cost of cultivation of integrated farming system when compared to farmers practice.

Constraints in adoption of integrated farming system

It is clear from Table 5 that equal per cent (86.66 %) of IFS farmers expressed non availability of inputs in time and high wage rate as their major constraints, followed by lack of technical knowledge regarding IFS (80.00 %), high cost of inputs (70.00 %) and insufficient power supply (63.33 %) as production related constraints. Major marketing constraints expressed by the IFS farmers includes low remunerative price for the produce (86.66 %), price fluctuation (83.33 %), high transportation cost (80.00 %), inadequate demand for output in market (73.33 %) and no storage facilities for perishable farm produce (60.00 %). Among financial constraints expressed by the IFS farmers includes lengthy procedure of loan sanctions (86.66 %), non-availability of subsidies and credit (73.33 %) and high interest rate (63.33 %).

For any production system the basic requirement is quality inputs, hence non availability of inputs become the major constraint. Urbanization, migration of youths, higher drudgery, alternative job in village level and labor involvement in government schemes were the reasons for the shortage of labourwhich also resulted in higher wage rate. Farmers are not getting the good price for their produce this discourages the farmers to continue in agriculture.

Table 4. Farm income under different components of integrated farming system n=30

	Belagavi (n=15)		Vijayapur (n=15)	
	Average net returns (₹/ha)	BC Ratio	Average net returns (₹/ha)	BC Ratio
Field crops	51573.45	1.95	40346.56	1.68
Field crops + Animal Husbandry + Horticultural crops	74200.72	2.45	95320.29	2.80
Field crops + Animal husbandry + Vermicomposting	61430.14	2.12	52570.56	1.85
Field crops + Animal husbandry + Vermicomposting+ Horticultural crops	87860.46	2.58	116570.45	2.27
Field crops + Animal husbandry + Vermicomposting+ Horticultural crops+ forestry	115807.02	2.65	127690.16	2.30

Table 5. Constraints faced by the farmers in adoption of integrated farming system n=30

Sl. No.	Particulars	Response	
		Frequency	%
	Production constraints		
1	Non-availability of inputs in time	26	86.66
2.	High wage rates	26	86.66
3.	High cost of inputs	21	70.00
4.	Insufficient power supply	19	63.33
5.	Lack of technical knowledge regarding IFS	24	80.00
	Marketing constraints		
1.	Low remunerative price for the product	26	86.66
2.	Price fluctuations	25	83.33
3.	High transportation costs	24	80.00
4.	Inadequate demand for outputs in market	22	73.33
5	No storage facilities for perishable farm produce	16	60.00
	Financial constraints		
1.	Lengthy procedure of loan sanctions	26	86.66
2.	Non availability of subsidies and credit	22	73.33
3.	Interest rates are high	19	63.33

The findings were in tune with the findings of Rajeshwari (2014), who found that high wage rate, non-availability of inputs, price fluctuation lengthy procedure of loan sanctions were the major constraints in adoption of Integrated farming system. The constraints change from place to pace depending on the enterprises and facilities available. Nageswaran *et al*. (2009) observed that shortcomings perceived by farmers in managing IFS include procurement of breeds of livestock for dairy, timely availability of fish seeds and fish feed, low cost and efficient devices for irrigation, information about government schemes and credit facility. The study conducted by Pushpa (2010) reported that considerable percentage of farmers have mentioned that lack of technical service, lack of institutional credit source and inadequate market infrastructure as some of the important problems faced by them.

Conclusion

The study found that adoption of sustainable agricultural technology like IFS ensures substantial farm income to support livelihood of farmer. Addition of combination like livestock in integrated farming system ensures increased income of ₹ 10000, similarly horticulture component added more than 10000 income to farmer. Further, combination of livestock, horticulture, vermicompost and forestry had resulted in doubling farmers income. Land holding, scientific orientation, information seeking behavior and progressiveness of the farmer had influenced on adoption of IFS. Hence, campaign on adoption on IFS including progressive farmer is necessary, that can be initiated by department of agriculture.

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