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## Study of fishery based integrated farming system approaches for doubling farmer's income in Bundelkhand region

**KS Shukla, CM Tripathi and Manoj Kumar**

### Abstract

Study of fishery based integrated farming system in combination with horticulture, Agro forestry and crops was done during 2016-17 and 2017-18 at KVK, Chitrakoot. The units established under this system are fishery, fruit plant (Guava, Lemon, Jack fruit, Banana, Mango, pomegranate, Aonla, Agroforestry like Teak. Eucalyptus with pigeon pea, Vegetables like Bottle guard, sponge guard, bitter guard, Brinjal, tomato and chili on bunds in multi story system. These models were created for doubling the farmer's income and check the people migration in the Bundelkhand region. The maximum area was covered with fishery enterprise which is about to 50% area over to total land. However, remaining area was covered in other component of IFS i.e. Agro forestry, fruit plants, Crops and vegetable. During the study year 2016-17 and 2017-18, the gross expenditure was Rs. 79905/- and 82632/- and the gross income Rs. 209780/- and 216294/- per ha was obtained by fishery based Integrated farming system by KVK during the year respectively, however some additional income and employment generated through complementary activities. Round the year, the average net income Rs. 128908/- and Rs.134469/ha generated during the study years 2016-17 and 2017-18, Which is more than double that is 2.45 & 2.18 times higher than conventional farming. The farmer's were earned Rs. 57693 & 59014 /ha through the traditional farming over the year 2016-17 and 2017-18. Besides the several constraints this integrated farming model can enhance farmer income and employment opportunity in Bundelkhand. The man days created through IFFS was 463 and 456 per year which is more than traditional farming practice.

**Keywords:** IFS, man days, BC ratio, net return

### 1. Introduction

Integrated fish farming is sequential linkage between fish farming and agriculture or animal husbandry with fish farming as major commodity (Ayyappan *et al.*, 2011) <sup>[1]</sup>. Modern cultural practices such as Integrated farming is considered as sustainable farming practice, which leads to increases productivity with greater efficiency in resources utilization, reducing risk by crop diversification for small scale farming households (Ayyappan *et al.*, 2011) <sup>[1]</sup>. Earlier farming occupation seems to the non profitable activity in this agrarian country that is dominated by crops more than 70%. Food production is still the major source of livelihood for a large section of cultivators and agricultural labourers in India. The average size of the landholding has declined to 1.16 ha during 2010-11 from 2.28 ha in 1970- 71. If this trend continues, the average size of holding in India would be mere 0.68 ha in 2020 and would be further reduced to 0.32 ha in 2030 (Agriculture Census, 2010-11) <sup>[2]</sup>. The process of production of food grains in the predominantly small holding agricultural economy (with 67.1 percent land holding less than 1 hectare) is a source of employment and income, and leads to food security of farmers, agricultural labourers and their families (NSSO, 2019) <sup>[3]</sup>. A sustainable technology is the need of the hour for higher production from existing agricultural land and water. Production and productivity increase in agriculture alone will not ensure doubling farmers' income (Srinivasan, 2017) <sup>[4]</sup>. The government of India has started several programmes in a mission mode and set a target to double the farmer's income up to Year 2022 in a sustainable manner. The livelihood development and food security is one of the important issues for thousands of the house hold suffering from malnutrition. Farmer did not show interest to involve themselves in agricultural works and migrate toward big cities in search of jobs due to lower profit. The integrated farming and system diversification is one of the livelihood options to increase the income and employment and it is also able to check migration. The integrated farming system is very improved system which includes crop, vegetables, fruits, live stock, Fisheries and some

complementary enterprises like mushroom, beekeeping, food processing etc. IFS utilize or recycle the byproduct of different component of the system and help in decreasing air pollution, improve water quality and enhance the soil fertility and finally increase total output in a sustainable manner. In this regard, integrated farming offers a possible solution and holds a great promise and potential for augmenting production, betterment of rural economy and employment generation, and finally improving socio-economic status of weaker rural community. (Ital *et al.*; 1999) <sup>[5]</sup> stated that integration of two or more appropriate combination of enterprises like crop, dairy, piggery, fishery, poultry, bee keeping etc. for each farm according to the availability of resources helps to sustain and satisfy the necessities of the farmer. The approach aims as increasing income and employment from small land holding by integrating various small enterprises and recycling crop residues and by-products within the farm itself (Behra and mahaptra, 1999) <sup>[6]</sup> (Singh *et al.*, 2006) <sup>[7]</sup>

A report says that a farm household needs to have at least 1 ha of land to make ends meet every month (The Hindu, 2014) <sup>[8]</sup>. This integration not optimizes the production but also reduces the system oriented pollutions. The integration of aquaculture with live stock and crop farming offers great efficiency in resource utilization reduces risk by diversifying crop and provides additional food and income. The advantages of IFS are pooling and sharing of resources / input. Integrated systems are about bringing crops and livestock into an interactive relationship with the expectation that together, as opposed to alone, they will generate positive effects on outcomes of interest, such as profitability overall productivity, and conservation of non-renewable resources. Systems also reflect natural resources available and the impact on their use, wildlife issues, target and non-target plant and animal species, micro-organisms, and indeed all of the definable and indefinable factors that ultimately interact to result in an outcome that is never constant. The integrated farming system approach is considered to be the most powerful tool for enhancing profitability of farming systems, especially for small and marginal farmers to make them copious.

The aims of IFS are to increased productivity and profitability in a sustainable manner and enhanced opportunity for agriculture oriented industries and standard of living of the farmers. The system is also helpful to eradicate mal nutrition and availability of foods round the year. This technology also involves avoiding deforestation to increase employment generation and Input-output efficiency. The major part of this system is adoption of new technology for solving problems.

## 2. Material & Methods

Chitrakoot District comes under Bundelkhand agro climatic zone of Uttar Pradesh. Comprising an area of 338897 ha and only 14700 ha are sown more than once in a year. As per census the total population was 991697 and 59.03% farmers falls under marginal categories having less than one hectare land. The irrigated area was also 37.56% of total cultivable land. The district enriched with four type of soil namely Mar, Rocker, Kavar and sandy loam. The district comes under Central Plateau & Hills Region (Bundelkhand) agro climatic zone receiving an average annual rainfall of 850MM with ambient temperature ranges between 04 °C to 48 °C. The present study was conducted at KVK, Chitrakoot to know the feasibility of fishery based integrated farming system. A Crop – Hort and fishery based farming system model was studied

and it was compared with traditional crop based farming system at KVK, Farm of same location having same area. The data was collected and analyzed scientifically. The data of fishery based integrated farming system was collected from KVK, IFS unit, in this system fish farming integrated with guava, Lemon, Pomegranate, Jackfruit, Brinjal, Tomato, Beans, sponge guard, bottle guard on either bunds. A agro forestry system also developed on bunds eucalyptus, teak and Pigeon pea grown on bunds. The conventional crop based farming system conducted at KVK was studied having the same area of one ha. All crops were grown scientifically with standard package of practices. The Yield data were collected year wise and compared with fishery based integrated farming model adopted at KVK. The cost of cultivation and productivity along with cost benefit ratio were also evaluated of the system.

## 3. Results and Discussion

The prevailing farming system in the district must be linked with improved farming which is to be implementing. Under the gradual shrinking of land holding, it is needed to integrate land based enterprises like minor live stocks, field and horticultural crops, etc. within the biophysical and socio-economic environment of the farmers to make farming more profitable (Behera *et al.* 2004) <sup>[9]</sup>. The success and feasibility integrated farming system suitable for particular micro climatic area is depending upon accurate planning and its execution at field level. (Okigbo, 1995) <sup>[10]</sup> stated that Integrated Farming System is as a mixed farming system that consists of at least two separate but logically interdependent parts of a crop and livestock enterprises. The livelihood of rural people depends upon agriculture and allied sector. It becomes difficult for the small and marginal farmers to sustain with the single farm enterprise unless resorting to integrated farming systems (IFS) for the generation of adequate income and year round employment within their small farms (Mahapatra, 1992) <sup>[11]</sup>.

The principle of such system is to reduce pollution, resource conservation, sustain production and better utilization of available resources without disturbing ecosystem. Before adoption of farming system it is very essential to know the present cropping system, requirement of food and its choices with proper marketing strategies. Integrated Farming System as a mixed animal crop system where the animal component is often raised on agricultural waste products while the animal is used to cultivate the soil and provide manure to be used as fertilizer and fuel (Jayanthi *et al.*, 2000) <sup>[12]</sup>. The traditional cropping pattern in Chitrakoot the area is mainly Rice – wheat/gram or Fallow – lentil/mustard/chick pea mixed with oilseed crops. Very few farmers are cultivating vegetables nearer to market places. The system productivity was very low. If we go through benefit cost ratio that is very less return in traditional farming system. A successful tribal integrated farmer in Orissa who was getting enhanced the productivity as well as the profitability and sustainability after adopting the IFS as compared to the conventional farming system and earned 7 times higher Net Monetary Return (NMR) as compared to traditional method of farming (Mohanty *et al.*, 2010) <sup>[13]</sup>. The present study based on the economic return and employment performance of fishery based integrated farming system compared with crop based farming system at KVK, Chitrakoot. The fishery based farming system production, income and expenditure data was collected and analyzed. The result indicated that the integration of fishery + vegetables +

mushroom + agro forestry + fruits obtained net return of Rs. 141116 & 134469 with CB ratio of 2.62 during 2016-17 and 2017-18 respectively. (Ray, 2009) [14] reported that the IFS with cropping, fisheries, poultry, mushroom provided a net additional income of Rs. 12,500 /ha /year and created an additional employment of 550 man days / year as compared to conventional cropping system. Whereas in conventional farming system cereals, oilseeds, pulses and vegetables were grown in all season gave net return of Rs.57693 and Rs.59014 annually with the CB ratio of 2.16 & 1.88 details provided in tables. (Tripathi *et al.* 2010) [15] reported that the integration of 7 different enterprises namely, crop+ fish+ goat+ Vermi compost+ fruit production+ spice production+ agro forestry obtained the net return to the tune of Rs. 2,30,329 annually with the Benefit Cost Ratio (BCR) of 1.07:1 and also reported the maximum per cent contribution of the enterprise is the fish production (68.53 per cent) followed by vermi composting (9.90 per cent), spices (8.46 per cent) and animal production (7.40 per cent). The BCR was found to be highest for the spice production (1.83:1) after fishery (2.25:1) followed by the vermicomposting (1.45:1). Reuse of waste products was the most advantage of integrated farming. Fishery based integrated farming was showing positive results in all means and system was highly profitable and the benefit was 2.45 &

2.28 times higher than conventional farming in both years respectively as given in tables. The man days created in both the system was also analyzed and it was found that by the fishery based farming system 463 & 456 man days created during both the years whereas by conventional farming it was 256 and 206 days in respective years. Integrated farming of crop, poultry and fish culture generated 453 additional mandays over arable farming on 0.40 ha land whereas on 1 ha it was between 559 to 630 man days with almost uniform distribution throughout the year compared to 182 man days in arable farming. (Jayanthi *et al.*, 1994) [16]. (Radhammani *et al.*; 2003) [17] described IFS as concepts of minimizing risk, increasing production and profits along with improving the utilization of organic wastes and crop residues. (Vision 2020; 2011) [18] suggested that the integrated fish farming is a diversified and coordinated system of producing fish and agricultural/livestock produce in fish farms with fish as the main component for maximal utilization of land/water through recycling of wastes and by - products, reduced application of fertilizers and feeds and maintenance of a balanced ecosystem.

### 3.1 Performance of Fishery based farming system-

**Table A:** Result of Fishery based farming system

Distribution of area in %	Enterprises	Expenditure		Outcome		Net Income		Mandays		B:C Ratio	
		2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
50	Fishery	65100	78500	189000	193000	123900	114500	463	456	2.62	2.62
0.001	Mushroom	1585	450	2800	1750	1215	1300				
20	Agro forestry	4900	1200	8500	12800	5662	11600				
20	Fruit plants	6800	425	1200	2650	3600	2225				
9.998	Vegetables	1520	1250	8280	6094	6739	4844				
0.001	Duckery	-	807	-	0	-	0				
	Total	79905	82632	209780	216294	141116	134469				

Performance of crop based farming system

**Table B:** Result of crop based farming system

Distribution of area in %	Crop/Variety	Production (Q.)		Income (Rs.)		Expenditure (Rs.)		Net income (Rs.)		Mandays		B:C Ratio	
		2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
0.16	Paddy	8.76	9.56	13864	13864	4710	6972	9154	7412	197	215	2.16	1.88
0.16	Green gram	1.85	2.01	10175	10175	3500	5602	6675	6453				
0.08	Pigeon pea	1.24	1.50	3720	3720	1500	2623	2220	4227				
0.08	Sesame	1.05	2.11	6300	6300	2689	4755	3611	8905				
	Paddy straw	10.12	10.2	500	500	100	300	400	9900				
0.32	Wheat	15.54	18.60	23310	23310	12540	20400	10770	10640				
0.16	Chick pea	3.45	3.75	14200	14200	5890	8525	8310	9225				
0.08	Lentil	1.68	2.15	5880	5880	2584	3698	3296	5687				
0.08	Linseed	1.19	1.36	4760	4760	1958	2055	2802	3385				
0.16	Vegetable	11.00	12.33	16500	16500	8690	9450	7810	2880				
0.12	Vegetable pea	2.88 q pod 2.07q seed	3.50 q pod 1.88 q seed	8055	8055	5410	5200	2645	2300				
	Total			107264	107264	49571	69580	57693	59014				

### 4. Conclusion

Fishery based farming is beneficial in increasing income, employment opportunity and mitigating climate change effect. Maintenance of ecological balance, generation of employment, increased input use efficiency and use of end products from one enterprise as input in other enterprise would be the objective of IFS. Farmer can get fresh, nutritious and balanced food for healthy lifestyle as a poshak thali. Promotion of this system act as a climate resilient technology,

utilization of available organic matter and nutrients for production of crops and improvement in soil health for sustainability within the system. Implementation of IFS would ensure minimization of risk, recycling of wastes and residues, integration of profitable enterprises, optimum utilization of all resources, maximization of productivity and profitability. To encourage farmers to adopt IFS, there is a need for the Government to consider providing subsidy for IFS models in a holistic approach through a single window system. There is

also a need to generate awareness amongst farmers, banking systems, as well as youth for promotion of IFS and increase the availability of credit for the different farming components. There is also a need for preparation of profitable bankable projects for particular agro-climatic zone as per market and need of small and marginal farmers.

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