International Journal of Farm Sciences **6(2)** : 231-239, 2016

Integrated farming system for enhancing income, profitability and employment opportunities

RK TARAI, TR SAHOO and SK BEHERA

Krishi Vigyan Kendra, Kalahandi, Bhawanipatna, Kalahandi 766001 Odisha, India
Email for correspondence: ranjanouat@gmail.com

ABSTRACT

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 system (IFS) therefore assumes greater importance for sound management of farm resources to enhance the farm productivity, reduce the environmental degradation, improve the quality of life of resource poor farmers and maintain sustainability. KVKs are thriving hard to empower farmers towards entrepreneurship through a combination of technological interventions for their betterment at macro- and micro-level trade, economy, health and happiness. This paper entails information on IFS adopted by 3 farmers in the Bhawaniptana block of Kalahandi district of Odisha promoted by Krishi Vigyan Kendra, Kalahandi under Orissa University of Agriculture and Technology for two consecutive years from 2011-12 to 2012-2013. All the integrated farming systems analyzed were crop-based (fruits, vegetables, pulses etc) integrations involving dairy, duckery and fish as major enterprises. In case of farmer 1, the net profit obtained from IFS was Rs 298000 with a B:C ratio of 2.5:1 from 5 acres of land. He created employment opportunities of 845 man days for males and 250 man days for females from various enterprises. In case of farmer 2 net profit obtained was Rs 352300 with a B:C ratio of 4.7:1 and he created employment opportunities of 750 man days for males and 345 man days for females from various enterprises. Similarly in case of farmer 3, net profit of Rs 290700 was obtained with a B:C ratio of 2.96:1 and he created employment opportunities of 995 man days for males and 285 man days for females from integrated farming of different enterprises.

Keywords: Integrated farming system; income; profitability; employment

INTRODUCTION

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. Due to intensive agriculture several ills have also appeared in Indian agriculture such as declining factor productivity, degradation of natural resource base, environmental degradation including ground water

depletion and contamination and declining profitability and productivity threatening not only crop production system but also the life supporting system as a whole (Gill et al 2009). In Odisha 82 per cent of the farmers are considered small and marginal with an average holding size of 0.8 hectare owning 52 per cent of the farm land and rest being owned by the medium and large farmers. Farming is mainly rice-based and as much as 52 per cent of the gross cropped area is under rice of which more than 61 per cent is rainfed. The per capita availability of land in Odisha is reduced to 0.12 ha in 2000 from 0.39 ha in 1950 and is projected to further reduce to 0.05 ha by 2020. Only vertical expansion is possible by integrating farming components requiring lesser space and time and ensuring reasonable returns to farm families. The integrated farming system (IFS) therefore assumes greater importance for sound management of farm resources to enhance the farm productivity, 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. The need for diversification is must since the income of farmers who depend solely on the produce of their traditional mono crop of rice pattern is decreasing due to narrow margin of profitability and changing food consumption habits. Integrated farming has immense potentiality to emerge out as an effective tool for improvement of rural economy due to low investment and high profitability (Nanda and Bandopadhyay 2011). Integration of horticulture and fish is an eco-friendly and income generating practice not only applicable but also profitable for a small or marginal farmer. Compared to many farm technologies, horticulture cum fish culture is low cost technology. It saves farmers' time allowing them to undertake double benefit from the same field or area (Laxmi et al 2015). The primary objective of a farming system is to improve the well-being of individual farm families by increasing the productivity of their farming systems given the constraints imposed by resources and environment (Norman and Collinson 1985). Backyard poultry and vermicomposting can be added to increase farm income and strengthen livelihood. Essential inputs of horticultural crops like seeds and seedlings of fruits and vegetables are less costly and available everywhere and also there is very less chance of pest and disease incidence. KVKs are thriving hard to empower farmers towards entrepreneurship through a combination of technological interventions for their betterment at macro- and micro-level trade, economy, health and happiness (Prabhukumar and Rayudu 2013). Keeping this fact in view a trial was conducted by the Krishi Vigyan Kendra, Kalahandi, Bhawaniptana to implement integrated based farming system in farmers' fields.

METHODOLOGY

The study was conducted in selected farmers' fields with pond dyke used for production of horticultural and forestry produce. Pond was an essential and viable component of the trial with vegetable production system. The trial was formulated in terms of 2 treatments in which the first treatment or technology option was disintegrated farming practices ie monoculture of paddy cultivation only without integration with agri-horticultural crops or no systematic utilization of dyke without appropriate combination of vegetables round the year. The integrated technology 2 was integrated farming system in which various enterprises like horticultural crops, forestry species, duckery, dairy and fish farming along with paddy were taken. This was compared with the conventional monoculture of rice cultivation. The data were collected on economic parameters like expenditure, gross returns, net return, B:C ratio etc for two consecutive years from 2011-12 to 2012-13. The data were taken in the fields of 3 different farmers in 3 villages of Bhawaniptana block.

The farmer 1 (Mr Janmejaya Mohapatra) having 15 acres of land was only following monoculture of paddy. However after KVK's intervention through on-farm testing (OFT), front line demonstrations (FLD) and training programmes he was motivated to follow the integrated farming system involving various enterprises like fish, duckery, vermicomposting, horticultural crops like banana, coconut, yam, gladiolus, rose, marigold and forestry species like bamboo, eucalyptus etc.

In case of farmer 2 (Mr Murali Budhia) the existing farming system was agriculture + dairy where primary source of income was agriculture particularly from commodities like paddy. After KVK's intervention the farming system was transformed to agriculture + horticulture + animal husbandry. The Budhia family consisted of four brothers with four housewives who were all engaged in farming activity. The eldest brother Mr Murali Budhia was well assisted by younger brothers. Looking at the potential of fruit and vegetable cultivation in the village and his interest during 2011-12 and 2012-13 KVK scientists advised him to go for developing an integrated farming system model involving fish, sugarcane, vegetables, fruits and diary etc.

In case of farmer 3 (Mr Ashish Kumar Mund) having 14 acres of land was provoked to go for the integrated farming system involving various enterprises like maize, fish, dairy, vermicomposting, horticultural crops like banana and vegetables, pulses like arhar, oilseeds like ground nut etc after KVK's intervention through its mandatory activities of OFT, FLD and training programmes.

RESULTS and DISCUSSION

The data of results of integrated farming system applied at the farms of three farmers are presented in the Tables 1, 2 and 3.

In case of farmer 1 (Mr Janmejaya Mohapatra) highest net profit of Rs 105000 was obtained from banana followed by fish farming (Rs 51500) and rose (Rs 51000) among crop components (Table 1). Though paddy was cultivated in 11 acres of land the net profit obtained was Rs 60500 only. The net profit from vermicomposting and duckery was Rs 9000 and 7000 respectively. From all the enterprises the net income obtained was Rs 298000 excluding the yield from forest and coconut plantation (which will yield from next two to three years) with a B:C ratio of 2.5:1. With the farmer's practice, the net profit from the same land was Rs 35000 with corresponding B:C ratio of 2:1. Farm family was able to get more employment opportunities in comparison to the traditional rice farming. He created employment opportunities of 845 man days for males and 250 man days for females from various enterprises like duckery, vermicomposting, vegetables, fruits, floriculture etc. Mishra and Nanda (2013) reported that integrated farming system at Nayagarh district of Odisha in 1.2 ha land resulted in a total income, net income and B.C ratio of Rs 163200, Rs 91800 and 2.29:1 respectively as against Rs 70600, Rs 32600 and 1.86:1 from the conventional farming system. Farmers from his village and also from the nearby villages were highly motivated by the success of Mr Mohapatra and planned to replicate the integrated farming system model at their own farms. The diversified nature of multifarious activities related to different enterprises included in integrated farming system provide a lot of opportunities of employment and keep farmers and their family members engaged for more time and help in improving the employment for rural poor. The results are in close proximity with the findings of Laxmi et al (2015) and Ravishankar et al (2007).

In case of farmer 2 (Mr Murali Budhia) the integration of crop with fish, dairy, horticultural crops and sugarcane resulted in higher net returns than adoption of conventional rice-rice alone. From the data presented in Table 2 it is clear that highest net profit of Rs 130000 was obtained from sugarcane followed by banana cultivation (Rs 12500). From all the enterprises the net profit obtained was Rs 352300 with a B:C ratio of 4.7:1. However through the traditional method of paddy cultivation on the same land he was able to get a net profit of Rs 7000 only with corresponding B:C ratio of 2.7:1. He created employment opportunities of 750 man days for males and 345 man days for females from the above enterprises. The income enhancement due to integration of processing and on-farm value addition

Table 1. Economics of the integrated farming system of Mr J Mohaptra, Duduri, Bhawanipatna, Kalahandi, Odisha (farmer 1)

Component	Area/#	Intervention	Expenditure (Rs)	Gross return (Rs)	Net profit (Rs)	B:C ratio	Employment generation (man days)	
							Male	Female
Recommended practice (T_2)								
Grow-out fish culture	1.32 acre	Scientific pisciculture	28500	80000	51500	2.8:1	845	250
Arhar	0.5 acre	HYV- ICPL-87	1000	8000	7000	8:1		
Fodder	0.005 acre	Hybrid- Napier	200	400	200	2:1		
Banana	1.0 acre	Variety G -9	60000	165000	105000	2.75:1		
Floriculture	1.0 acre							
Gladioli	0.4 acre	HYV -Thailand	3000	18000	16000	6:1		
Rose	0.3 acre	Variety-Hybrid T	31500	82500	51000	2.6:1		
Marigold	0.3 acre	Variety-Inca	3500	50000	46500	14:1		
Paddy	1.0 acre	SRI package	6000	31500	25500	5.25:1		
	10.0 acre	IPM & INM	35000	70000	35000	2:1		
Vermicompost	10 x 20 x 5 m^3	Composting technique	8500	17500	9000	2.05:1		
Yam	200	Cultural practice	2500	20000	17500	8:1		
Duckery	50	Feed management	13000	20000	7000	1.53:1		
Eucalypatus	500	Clone planting	6700	Will yield after next 2 years				
Bamboo	100	Variety.Sunderikani	700	Will yield after next 3 years				
Coconut	25	Variety Sakhigopal	4200	Will yield after next 3 years yrs				
Total	5.0 acre		204300	502900	298600	2.5:1		
Farmers practice (conventional methods) T_1								
Traditional paddy cultivation	15 acre	Conventional broadcasting method	35000	70000	35000	2:1		

Table 2. Economics of the integrated farming system of Mr Murali Budhia, Kanakpur, Bhawaniptana, Kalahandi, Odisha (farmer 2)

Component	Area/#	Intervention	Expenditure (Rs)	Gross return (Rs)	Net profit (Rs)	B:C ratio	Employment generation (man days)	
							Male	Female
Grow-out fish culture	0.5 acre	Feed management	7000	20000	14000	2.8:1	750	345
Banana	1.0 acre	INM & IPM	35000	160000	125000	4.5:1		
Sugarcane	0.7 acre	Variety- CO-62000	20000	150000	130000	7.5:1		
Paddy	1.5 acre	Traditional (Kharif) & SRI (Rabi)	20000	65000	45000	3.3:1		
Brinjal	0.3 acre	Variety- Uktal Keshari	3000	8000	5000	2.7:1		
Chilli	0.2 acre	Variety- Jawla Mukhi	1300	5400	4100	4.1:1		
Cowpea	0.1 acre	IPM	1500	10000	8500	6.7:1		
Tomato	0.15 acre	IPM	5000	18000	13000	3.6:1		
Total	4.0 acre	-	94600	446900	352300	4.7:1		
Buffalo	1	Feed management	1000	6500	5500	6.5:1		
Mango	10	Nutrient management	800	4000	3200	5:1		
Conventional method								
Traditional paddy cultivation	2.26 acre	Conventional broadcasting method	4000	11000	7000	2.7:1		

Table 3. Economics of the integrated farming system of Mr Ashish Kumar Mund, Siripur, Bhawanipatna, Kalahandi Odisha (farmer 3)

Component	Area/#	Intervention	Expenditure (Rs)	Gross return (Rs)	Net profit (Rs)	B:C ratio	Employment generation (man days)	
							Male	Female
Grow-out fish culture	1 acre	Scientific pisciculture	30000	90000	60000	3:1	995	285
Arhar	0.5 acre	HYV- ICPL-87	3000	9000	6000	3:1		
Maize	0.5 acre	Variety- Prabala	3000	12000	9000	4:1		
Vegetables	0.5 acre	HYV, IPM	5000	20000	15000	4:1		
Paddy	8 acre	Seed production MTU-1001	40000	120000	80000	3:1		
	2.0 acre	SRI package	16000	56000	40000	2.5:1		
Groundnut	0.5 acre	INM	1500	4000	2500	2.7:1		
Banana	1.0 acre	G-9 variety	30000	80000	50000	2.7:1		
Total	14.0		147900	438600	290700	2.96:1		
Duckery	30 birds	Feed management	5000	14000	9000	2.8:1		
Dairy	2	Feed management	14400	33600	19200	2.3:1		
Conventional method								
Traditional paddy cultivation	14.0 acre	Conventional method	56000	117600	61600	2.1:1	-	-

employment generation by 50-75 man days/ household has also been observed by Gill and Gangwar (2009). By seeing Mr Budhia's success other farmers had been shifting from monoculture paddy cultivation to integrated based farming system. Farmers also included new enterprises like dairy and poultry in their paddy-paddy farming system. Income substantially increased with technological intervention in sustainable manner. Many farmers of the district have been motivated by his success and some farmers with average holding size of 2.0 ha had adopted fruit and vegetable-based farming model with input assistance like drip irrigation, borewells, weeders, polyhouses etc from various schemes running in the district. Following the concept of integrated farming system through supplementation of allied agro-enterprises by recycling the waste of one enterprise for another was an appropriate step for providing round the year employment and livelihood security (Gangwar and Ravisankar 2014).

In case of farmer 3 (Mr Ashish Kumar Mund) the integration of crop with fish, duckery, maize, arhar, groundnut and horticultural crops resulted in higher economic returns than adoption of conventional paddy cultivation. From the data presented in the Table 3 it is clear that highest net profit of Rs 80000 was obtained from seed production of paddy followed by Rs 60000 from fish and Rs 50000 from banana. In toto he got a net profit of Rs 290700 from integrated farming system with a B:C ratio of 2.96:1. However from traditional monoculture of paddy he got a net profit of Rs 61600 with a B:C ratio of 2.1:1. He also created employment opportunities of 995 man days for males and 285 man days for females from all the above mentioned enterprises.

Similar results were also found by Behera and Mohapatra (1999) who reported that the land-based enterprises like diary, poultry, fishery, mushroom, biogas etc complemented with cropping programme provided more income and employment to small and marginal farmers of Odisha.

CONCLUSION

An integrated farming system involving crop and non-crop components can be found economically more viable than the traditional cropping system. There are lots of options in integrated farming system but in Bhawaniptana scenario, integrated farming practice involving paddy and non-paddy based crops and other enterprises may be run significantly, efficiently and economically by small and marginal farmers. Integrated farming system enables the agricultural production system to be sustainable, profitable and productive. It not only enhances income and minimizes risk factors but also provides employment opportunities during the leisure period. No single farm enterprise is likely to support the small and marginal farmers for generation

of adequate income and gainful employment round the year. Small farming in resource poor areas must be sustainable, economical and intensive in order to provide long term support for livelihood and income to rural households. To achieve this farmers must have access to sustainable technology suitable and available in agriculture and allied sectors. However policies are required to harness and unleash the potential of small holder producers to build sustainable livelihoods while simultaneously helping the world to protect natural resource and mitigate climate change (Kokate 2013).

REFERENCES

Behera UK and Mohapatra IC 1999. Income and employment generation of small and marginal farmers through integrated farming system. Indian Journal of Agronomy **44(3):** 431-439.

Gangwar B and Ravisankar N 2014. Integrated farming system for enhancing farm productivity and livelihood security under changing climate. In: Souvenir, National Symposium on Management Options for Enhancing Farm Productivity and Livelihood Security under Changing Climate, 29-31October 2014, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India, pp 20-26.

Gill MS, Singh JP, Gangwar KS 2009. Integrated farming system and agriculture sustainability. Indian Journal of Agronomy **54(2):** 128-139.

Kokate KD 2013. Technology options for small farm intensification of small holder farms. Paper presented, 8th National Conference on KVKs on Sustainable Intensification of Small Holder Farms, 23-25 October 2013, University of Agricultural Sciences, Bangalore, Karnataka, India.

Laxmi NG, Singh M and Sharma RP 2015. Evaluation of integrated horticuluture cum fish farming in Malwa region of Madhya Pradesh, India. Current World Environment **10(2):** 667-671.

Mishra PJ and Nanda SS 2013. Integrated farming system for livelihood security in rainfed areas of Odisha. In: Natural resources conservation: emerging issues and future challenges (M Madhu, P Jakhar, PP Adhikary, H Gowda, VN Sharda, PK Mishra and MK Khan eds), Satish Serial Publishing House, New Delhi, India, pp 981-984.

Nanda PK and Bandopadhyay UK 2011. Recent advances in integrated livestock cum fish farming in India. Training Manual, Short Course on Advances in Production of Livestock Management Practices, IVRI, ERS, Belgachia, Kolkata, West Bengal, India.

Norman DW and Collinson 1985. Farming systems research in theory and practice. Proceedings, International Workshop, Haw Kesbury Agricultural College, Richmond, NSW, Australia, pp 16-30.

Prabhukumar S and Rayudu A 2013. Technological interventions pertaining to small holder farms through KVKs. Souvenir, 8th National Conference of KVKs on Sustainable Intensification of Small Holder Farms, 23-25 October 2013, University of Agricultural Sciences, Bangalore, Karnataka, India, pp 43-47.

Ravisankar N, Pramanik SC, Rai RB, Nawaz S, Tapan KR, Biswas and Bibi N 2007. Study on integrated farming system in hill upland areas of Bay Islands. Indian Journal of Agronomy **52(1):** 7-10.

Received: 30.10.2015 ***Accepted: 2.3.2016***