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Research Article

INTEGRATED FARMING SYSTEM FOR DOUBLING THE FARM INCOME THROUGH SUSTAINABLE RESOURCE MANAGEMENT FOR ENSURING LIVELIHOOD SECURITY OF RESOURCE POOR FARMERS

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Abstract: Agriculture is a back bone of Indian economy and 70 Percent Indian population depending on Agriculture, area under cultivation is shrinking day by day and there is hardly any scope for horizontal expansion of land for enhancing food production. The only available option is vertical farming *i.e.*, integrated farming systems, this approach includes cropping systems and subsidiary enterprises (Dairy, Sheep *etc.*). Accordingly, the land was divided component wise into percent area out of 1.0 ha. Growing cropping systems like paddy-paddy /paddy-finger millet/paddy-pulse with 50 percent area in order to meet the family food requirement and in addition to get better profit out of these produce. The results after 7th year of establishment of integrated farming system indicated that overall average net returns of Rs.1,88,497 and highest was contributed by crop component alone (Rs. 86,651) followed by horticulture (Rs. 40,528), dairy (Rs. 39,997) and sheep (Rs. 18,280).The total quantity of produce recycled was (32,132 kg /l/no's) worth of Rs.48,398 (four years average) was obtained. Effective recycling of farm waste in terms of vermicompost/compost can save Rs.14,379 by addition of 1735 kg of nutrients in-terms of N, P & K which in-turn sustains soil productivity through the recycling of organic nutrient sources from various enterprises. The total annual mandays generated out of various components varied from 515 to 965 mandays by facilitating cash income on regular basis and also generate additional employment for families.

Keywords: Integrated Farming System, Doubling Farm Income, Sustainable Farming

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Introduction

At the dawn of the new millennium, agriculture in India is facing the challenge to achieve sustainable food security with shrinking land resources by producing an additional 50 million ton of food to meet the requirement of the prognosticated population of 1,200 million in the country. Because of declining per capita availability of land in India (less than 0.07 ha per capita), there is hardly any scope for horizontal expansion of land for food production. Hence, intelligent management of available resources, including optimum allocation of resources, is important to alleviate the risk related to land sustainability. Moreover, proper understanding of interactions and linkages between the components would improve food security, employment generation as well as nutritional security. This approach can be transformed into a farming system that integrates crop components (paddy-paddy/finger millet/pulses) with enterprises such as Horticulture components (vegetable unit, arecanut garden, banana block, coconut block, drumstick block and fodder unit), Dairy unit, Sheep unit, Vermicompost and Compost pit, Azolla unit and Biogas production to increase the income and improve the standard of living of small and marginal farmers. The challenge of such an integrated farming system (IFS) is to upgrade technological and social disciplines on a continuous basis and integrate these disciplines to suit the region and the farm families in a manner that will ensure increased production with stability, ecological sustainability and equitability. Research study carried out in irrigated land at the Agricultural and Horticultural Research Station in Kathalagere has demonstrated the technical feasibility and economic viability of the integrated farming systems. Besides facilitating cash income, these farming system models generated additional employment for family labour and minimized the risk associated with conventional cropping system. However, the possibilities of exploring the linkage of components in the farming system were not explored in the farm field. This paper presents some insights on IFS of crop and allied enterprises implemented in on-station situations.

On station

Integrated Farming System model for irrigated condition (1 ha.)

The study has been conducted on irrigated based integrated farming system for small and marginal farm holders with an area of 1.0 ha at Agricultural and Horticultural Research Station, Kathalagere, Davangere district of Karnataka state under Bhadra command area during 2011-12 to 2017-18 under financial and technical assistance from Indian Institute of Farming System Research (IIFSR), Modipuram, Meerut of Indian council of Agriculture Research (ICAR) New Delhi. The allocation of land resource for accommodating different enterprises was done as per the family needs and size/numbers of individual components of the system. Out of one hectare area, 0.50 hectare was allotted for crop component (Cereals, pulses and millets), 0.35 hectare was taken up with Horticulture crops (Arecanut, Coconut, Banana, Drumstick and Vegetables). Diary and Sheep components were also introduced as additional components with HF cow (one) and sheep (10+1). Green fodder block was fixed in an area of 0.03 hectare (Fig.1). Additional components like compost (2 units), vermicompost (3 units) and Azolla (2 units) were included subsequently in the system. Cow dung, urine, sheep excreta, farm wastes and crop residues were properly recycled by composting (FYM and vermicompost) and incorporated in to the soil. Similarly, Azolla was released in to paddy field as source of nitrogen fixer and also used as animal feed in limited quantity (1:10 ratio of Azolla and feed). Cost of production includes all (fixed and variable costs) input cost, labour and machineries were subjected for calculation.

Profitability of Integrated Farming System model

The experiment was initiated during 2011-12, after 7th year of study, results indicated that adoption of crop component, horticulture component, dairy unit,

Table-1 Component wise Net returns of Integrated Farming System

Year	Total Net returns(Rs.)	B:C Ratio	Cost of cultivation(Rs.)	Crops unit	Horticulture/ Plantation crops	Dairy unit	sheep unit
2011-12	109172	2.35	46403	58212	50960	0.0	0
2012-13	219574	3.47	63370	91591	54147	55313	18523
2013-14	251722	2.58	97400	93595	23625	90692	45450
2014-15	170058	2.77	61397	88040	37271	35184	9563
2015-16	182330	2.01	90900	72535	26625	55700	15845
2016-17	185190	2.57	72010	108885	35350	19010	24645
2017-18	201436	2.10	96140	93700	55721	24080	13935
Average	1,88,497	2.55	75,374	86,651	40,528	39,997	18,280

sheep unit and biogas production under irrigated upland conditions in one hectare farm area have recorded overall average net returns of Rs.1,88,497 and highest was contributed by crop component alone (Rs. 86,651) followed by horticulture (Rs. 40,528), dairy (Rs. 39,997) and sheep (Rs. 18,280) [Table-1 and Fig-2].

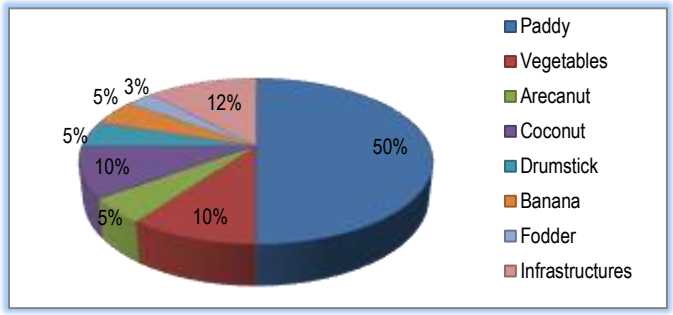

Fig-1 Component wise Area (%)

Growing crop alone (Paddy-Paddy cropping system) gave net profit of Rs.108885 with a B:C ratio of 1.28 as a conventional existing cropping system, but by combining crop component with other subsidiary enterprises has found significantly contribution in improvement of net profit of farmer to Rs.185190 with B:C ratio of 2.57 [1]. The dairy unit consists of 1 milch animal+2 calves. By keeping one milch animal, an average net income of Rs 39,997 could be achieved. The dung collected from 5 cows was sufficient to generate 1m3 of bio gas everyday. This could meet the fuel requirement of farm family apart from the preparation of gruel to the dairy unit, light vegetable wastes, crop waste, and problematic weeds like Parthenium and grassy weeds into rich manure that increases humus content of the soil. It is boon for sustainable agriculture earthworms arable to convert 1,000 tons of moist organic waste into 300 tons of rich dry vermicompost. It can consume almost all kinds of organic matter. In 45-60 days, 1 kg of earthworm (Approx. 1,000-1,250 worms) would produce roughly 10 kg of vermicast, the nutrient rich excreta of the worm. Vermicompost (mix of vermicast and other compost) contains 5, 7, 11, 2 and 2 times more nitrogen, phosphorous, potassium, calcium and magnesium, respectively, than crop waste or animal manure. Matured vermicompost is applied at the rate of 5 t/ha.

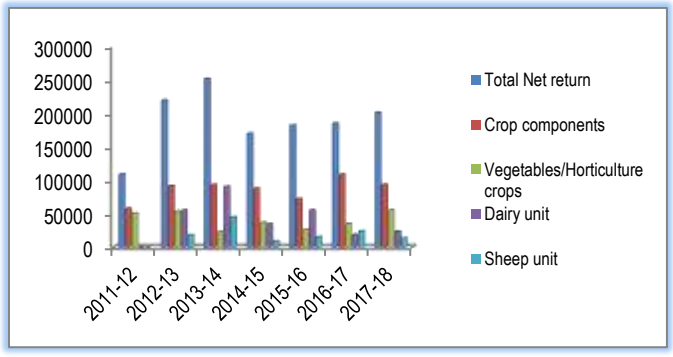

Fig-2 Component wise Net returns of Integrated Farming System

Employment generation in Integrated Farming System

Integrated farming system is an employment generative farming system compared to traditional farming which involving more enterprises *viz*., cropping, dairy and other subsidiary enterprises. Traditional farming (Cropping system) generates 25 workdays per acre per year, while the various cropping systems under IFS generated 240 workdays of employment. Employment generation in cropping is limited to the key operations of sowing, intercultural operations and harvest, and labour is not required during the rest of the year. Contrary to this, employment generation in a multi-enterprise farming system is spread uniformly round the year. Integrated farming system has created more number of working hours in the system due to involvement of more enterprises than cropping system alone. 1.0 ha model has generated 515 mandays, 760 mandays, 1070 mandays 932 mandays 954 mandays and 965 mandays per hectare per year during 2012-13, 2013-14, 2014-15, 2015-16, 2016-17 and 2017-18 respectively (Table 2), this has provided employment opportunity throughout the year due to involvement of more than one enterprise in the system [2&3].

Table-2 Employment Generation in different components (Mandays)

COMPONENTS	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Paddy	75	120	182	70	90	92
Vegetables	155	180	156	60	160	
Banana				30		
Arecanut				65		160
Coconut						
Dairy	180	180	317	325	322	325
Sheep	-	250	315	320	315	318
KG*, BP* etc.,	105	100	100	62	67	70
Total mandays	515	760	1070	932	954	965

** KG – Kitchen garden, BP – Boundary Plantation*

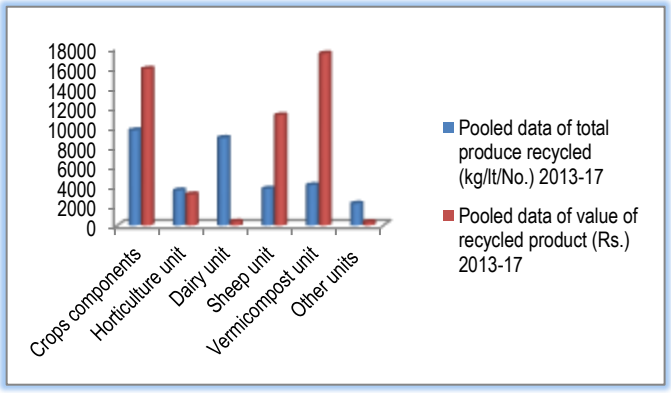

Fig-3 Resource flow model of integrated farming system

Resource Recycling in Integrated Farming System

The average quantity of nutrients recycled from farm waste from various components (2013 to 2017) accounted for 32,132 kg/l/no's of worth Rs.48,398 (Table 3&Fig 3). The total quantity of farm waste recycled from different components during the year 2017-18 accounted for 25,394 kg per annum. From this, 725.26, 694.88 and 314.41 kg of Urea, SSP and MOP respectively has been saved within the recommended dose of fertilizer which accounts Rs.14,379 (Table 4). Hence, effective recycling of farm waste through vermicomposting could save the usage of fertilizer and their by reduce the cost of cultivation. Recommended NPK of farming system (Crop component Horticultural and other Crops) was ranging from 300 - 3000 kg/ha and more than 35 percent of NPK requirement would be met out by recycling of farm waste in form of compost and vermi compost within the system and it was found very economical in saving of chemical fertilizers and also improves the soil health by improving microbial activity which resulted in sustainable production [4].

Table-3 Resource Recycling in Integrated Farming System

Components	Pooled data of total produce recycled (kg/lit./Nos.) 2013 to 2017	Pooled data of Value of recycled product (Rs.) 2013 to 2017
Crops (Paddy straw, weeds and crop residue)	9658	15878
Horticulture (Crop residue & Banana waste)	3560	3160
Dairy (Dung, urine & shed waste)	8882	400
Sheep (Dung & litter)	3728	11184
Vermicompost (Raw dung, urine and shed waste)	4086	17432
Other units (Dried leaves & coconut plant debris)	2218	344
Total	32132	48398

Table-4 Total amount of Nutrients added through recycling of farm waste and its market value (2017-18)

Recyclable farm waste	Quantity (kg)	Nutrient content (%) and total recyclable nutrients (kg)			Quantity of fertilizers (kg)	In terms of rupees (Rs.)
		N (kg)	P (kg)	K (kg)		
Cow dung	7900	1.1	0.43	0.47	725.26	4352
		-86.9	-33.97	-37.13	(Urea)	
Sheep litter	4994	2.95	0.74	1.83	694.88	6254
		-147.32	-36.96	-91.39	(SSP)	
Vermicompost	7500	1	0.37	0.53	314.41	3773
		-75	-27.75	-39.75	(MoP)	
Compost	5000	0.5	0.25	0.4	-	
		-25	-12.5	-20		
Total	25,394	334.22	111.18	188.27	-	14,379

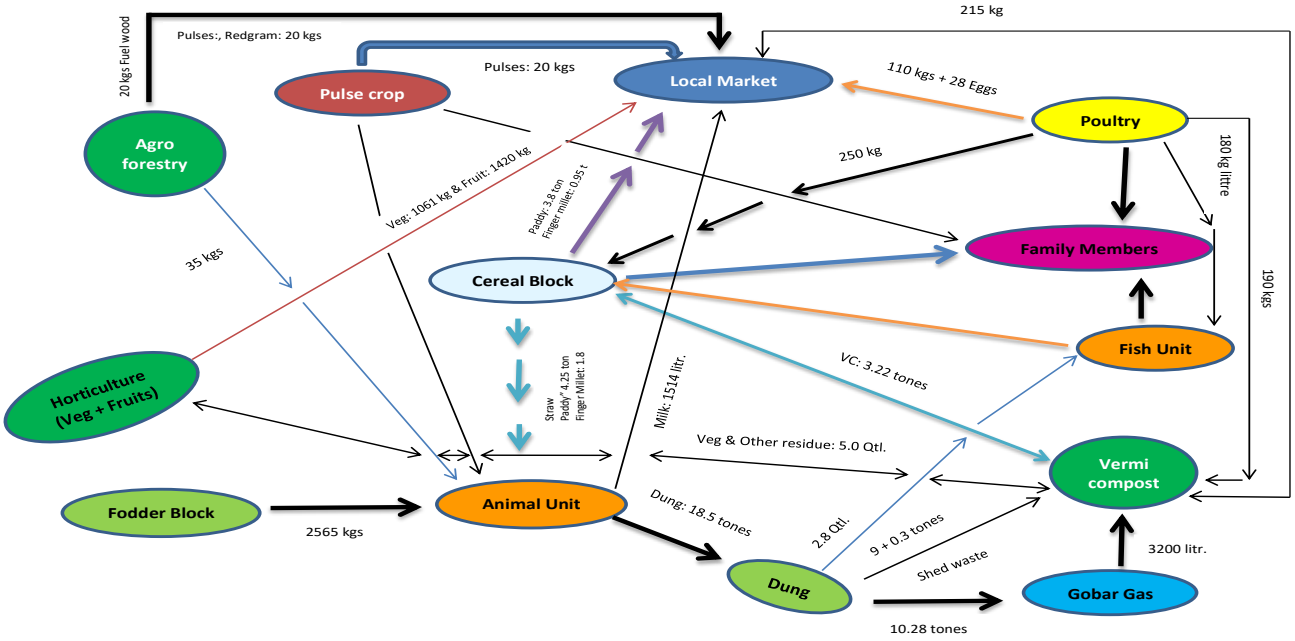

Fig-4 Resource flow model of integrated farming system for irrigated condition (1.0 ha)

Based on the research, it was concluded that IFS approach is better than traditional system in its contribution to productivity, profitability, economics and employment generation for small and marginal farmers.

Conclusion

The results clearly states that horizontal farming is not possible under alarming declining in net cultivated area day by day and only possible option is vertical farming i.e., integrated farming system where in integration of crop based enterprises which is enhances productivity, profitability and nutrition security of the farmer and sustains soil productivity through recycling of organic source of nutrients from the enterprises and similarly, product of one component is input of other component. Recent day Agriculture is not profitable mainly due cost production is very high and lot of money is spent on chemical fertilizers. Farming system approach is having notable advantage of utilizing low cost/ no cost material at the farm level for recycling of farm waste in the form of vermicompost and compost will certainly reduce the production cost and thereby improves the farm income considerably. IFS approach has started gaining momentum with farmers of all types, and is expected to reach its peak of acceptance around 2020. Integrated farming system would help in enhancing the sustainable production through diversified food products in order to attain nutritional security and profitability.

Application of Research: It is applicable for farmers having land holding upto 1 ha area under irrigated condition with 5 members farming family.

Research category: Integrated Farming System, Doubling Farm Income and Sustainable Farming.

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Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

References:

[1] Channabasavanna A. S., Biradar D. P., Prabhudev K. N. & Mahabhaleswar Hegde. (2009) *Karnataka Journal of Agric. Sci*., 22(1), 25-27.
[2] Devendra C. (1999) *Outlook on Agriculture*, 28,215-226.
[3] Jayanthi C. (2002) *IFS Adhoc Scheme. Completion Report*.
[4] Jayanthi C., Baluswamy M., Chinnusamy C and Mythily S. (2003) *Indian journal of Agronomy*., 48, 241- 246.