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AGRONOMY

Impact of integrated farming system in ramanagara district: An analysis

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Abstract

An attempt was made to assess the impact of technological interventions initiated by KVK, Ramanagara under Integrated Farming System (IFS) among farmers. A great majority of the stakeholders lacked knowledge about improved varieties of ragi, redgram, horse gram, cowpea & foxtail millet. In order to increase the yield and productivity of these crops, improved varieties were inducted to farmers. Farmers were stimulated to go for cultivation of different vegetables in their backyards primarily for house consumption through introduction of nutrition kit developed by Indian Institute of Horticulture Research, Bangalore. Farmers expressed that this intervention reduced the drudgery of going out and buying the vegetables to the extent of 20 % and on an average each family produced about 80 kg of vegetables generating average revenue of ₹ 1026 per season. Improved giriraja chicks were introduced to farmers wherein there was 67 % increase in the number of birds after three years while each family could earn on an average of ₹ 6200/- from chicken. Considering egg production, each family could earn average net income of ₹ 6800/- at the end of three years. Out of one sheep inducted, it is worthy to note that each family could maintain an average of 5 sheep's per family after three years. At this rate it could be articulated that ₹ 13,750/- was the average net income gained by each family from the sheep meat. The wilt incidence in redgram could be controlled to the extent of 75 % through introduction of trichoderma subsequent to which there was additional increase in income of ₹ 4300/- per ha. Promotion of improved fodder crops namely CO-3 & CO-4 resulted in 6.6 % increase in milk yield.

Highlights

- Selected farmers were empowered and capacity was built through training & demonstration with respect to new technologies, motivating them to start integrated farming system by utilizing the existing resources effectively.
- In order to up-scale the Integrated Farming System and as a testimony, 10 model stake holders have been identified and developed as model stake holders who would be the role models for other stake holders to adopt the technology
- Crop diversification through improved varieties integrated with animal component resulted in obtaining higher productivity and profitability of small and marginal farmers

Keywords: Integrated farming system, yield gap, technological intervention, impact

It is projected that the India's population would touch 1370 million by 2030 and to 1600 million by 2050. To meet the demand, it is estimated that 289 and 349 mt of food grains needs to be produced during the respective periods. The current scenario in the country indicates that the area under cultivation may further dwindle and more than 20% of current cultivable area will be converted for non-agricultural purposes by 2030.

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. The Integrated farming systems (IFS) therefore assumes greater importance for sound management of farm resources to enhance the farm productivity, reduce 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. Farming system is a mix of farm enterprises in which farm families allocate resources for efficient utilization of the existing enterprises for enhancing productivity and profitability of the farm.

Assuming greater importance for improving livelihood and nutritional security, there is a need for conserving and recycling of farm resources, enhancing farm productivity and reducing environmental degradation. In the milieu, University of Agricultural Sciences, Bangalore through Krishi Vigyan Kendra (KVK), Magadi, Ramanagara, has initiated integrated farming system in collaboration with Government of Karnataka, India in 48 villages of Magadi taluk of Ramanagara District covering 2871 stakeholders. In the present study an attempt was made to assess the impact of technological interventions made among farmers to integrate the enterprises keeping in view the whole farm productivity.

Methodology

Krishi Vigyan Kendra, Ramanagara District had

Table 1: Yield Gap, Constraints Identified and Interventions Planned

Crop / Enterprise	Problem / Constraints	Causes	Yield gap (%)	Interventions Planned
Tomato	Severity of spotted wilt virus, leaf curl virus & *Helicoverpa*	Lack of knowledge about resistant varieties and climatic conditions	35	Training & Demonstrations
Ragi	Neck blast and drudgery in field operations	Non- availability of resistant varieties and climatic conditions and lack of improved tools & equipment's	42	Demonstrations
Mango	Leaf hoppers, Powdery Mildew, Fruit Fly and intercultivation operations	Improper application of chemicals and poor maintenance of the orchards	45	Demonstration of IPM practices and extension literature
Banana	Panama wilt and Pseudostem weevil	Predominance of the disease in Yellakki banana, poor management practices against Pseudostem weevil	11	Frontline demonstration
Red gram	Fusarium wilt, *Helicoverpa* and *Maruca*	Predominance of wilt in the region, Poor management practices against *Helicoverpa* and *Maruca*	84	Introduction of new variety
Dairy	Low milk yield	Non availability of improved fodder crops & poor nutrition	18	Introduction of improved fodder varieties
Sericulture	Drudgery & Low yield	Non adoption of mechanization Low yield due to diseases	25	Method demonstrations
Livestock	Low productivity in livestock keeping	Non availability of improved sheep breeds Non availability of chicks suitable for backyard poultry Lack of fattening due to improper nutrition in sheep rearing	15	Introduction of improved breeds

implemented a project on 'Integrated Farming System for Sustainable Livelihood' in 48 villages of Magadi taluk (block) of Ramanagara District covering 2871 stakeholders from 2011-12 to 2014-15. For the purpose of the study, secondary data available at data bank of KVK was used as a starting point. With the aid of resulting secondary data, additional information from the beneficiaries of the project was also collected to analyze the impact of technological interventions of KVK under IFS. Three Grama Panchayat's viz., Kalya, Kaleri and Hosapalya where IFS was initiated were selected for the study. From each Grama Panchayat, four villages were selected. Again, from each village 25 farmers where IFS was initiated were selected for the study. Thus the total sample size for the study was 300 farmers from 12 villages of Magadi taluk of Ramanagara District of Karnataka.

Results and Discussion

An attempt was made to analyze the extent of yield gaps in major crops and enterprises practiced constraints and reasons responsible for yield gaps. Based on the identified causes for the constraints, suitable interventions were planned to reduce the yield gap. The specifics presented in Table1 indicate that there was 35% yield gap in tomato due to spotted wilt virus, leaf curl virus and helicoverpa. Lack of knowledge about resistant varieties was the main reason for the yield gap and hence suitable capacity building programs and demonstrations were planned. Farmers are not obtaining the desired yield & income due to neck blast in ragi and drudgery in field operations for which 42 % yield gap exists. Mango is the major fruit crop wherein majority of the farmers rely on this crop for major income. However, 45 % yield gap was noticed which is due to pests and diseases as indicated

Table 2: Impact of Technological Interventions among Farmers under Crop Component

S.no	Crop / variety	No. of farmers	Area (ha)	Major interventions	Average yield qt/ha		
					BMY	DMY	% increase
1.	Ragi (MR-1,MR-6, ML-365, GPU-28, GPU-66,)	2871	1798	1. Mixed cropping system- Ragi: Redgram: Castor Ragi: Cowpea 2. Improved and High yielding varieties	12	15	24.5
2.	Redgram (BRG-1 & BRG-2)	2871	550	Improved and High yielding varieties	8.5	10	18.00
3.	Horse gram (PHG-9)	424	43	Improved and High yielding varieties	6	7	17.50
4.	Cowpea (IT-38956)	263	44	Improved and High yielding varieties	7	8.5	21.00
5.	Foxtail Millet(HMT-100-1)	12	21	Contingent dryland crop-New induction	New induction	15	-
6.	Sun hemp(Local)	54	27	Improved and High yielding varieties	1.5	2	33
1.	Banana - G9	07	0.4	Tissue culture saplings	600	1000	67
	Papaya	2825	1.13	New Induction	-	650	-
	Drum Stick	3053	50	-	495	560	13.1
	Curryleaf	2825	2.5	-	72	85	18.0
	Lemon	2825	50	-	75	94	12.0
	Lime	2825	50	-	-	Pre-Bearing stage	-

Note: BMY: Bench mark yield, DMY: Demo yield

Table 3: Promotion of Backyard Nutritional Kitchen Gardening and its Impact

S. no	Vegetable Seeds	Qty of seeds/ kit / Family (g)	Total No. of families	Total prodn (t)	Vegetable grown / Family (Kg)	Revenue generated / Family / season (Rs)
1	Ridge gourd	10.2	1465	23.4	16	192
2	Bitter gourd	10.2		16.4	11	168
3	Radish	10.2		18.8	13	128
4	Pumpkin	5.1		56.3	38	384
5	Palak	5.1		2.3	2	154
Total					80	1026

Table 4: Animal Component Integration in IFS and its Impact

Animal Component	2011-12 (bench mark)	2012-13	2013-14	% increase (per family)	Income obtained per family (₹)		
					2011-12	2012-13	2013-14
Giriraja Birds (Nos) / family	7	15	25	67	-	-	
chicken (Gms)	200	3500	4200	20	455	3675	6200
Eggs (Nos.)	0	520	850	63	2340	4680	6800
Sheep (No)	1	3	5	-	-	-	
Meat from Sheep (Kg)	8	14	22	57	4900	8750	13750
Total income (₹/Family/Year) = 7695					7695	17105	26750
Expected additional income of ₹ 51550/- per family for Three years can be generated from Animal component							
13% of farmers purchased additional sheep and 18% of farmers have multiplied.							

Table 5: Effect of Technology Induction for Strengthening Different Enterprises

Technological Intervention	No. of farmers covered	Parameter / Unit	Average yield			Additional income (₹ /ha)
			Bench Mark	Demo	% increase or decrease	
Chawki rearing trays	150	Cocoon yield per 100 DFLs (Kg)	45	54	20	4500
Area specific mineral mixture & cattle feed	389	Milk yield (lts/day/animal)	6.5	7.00	8	2310
Sheep mineral mixture (area specific)	2137	Body Weight (Kg)	7	22	114	8800 per sheep
Mango fruit fly traps	117	Pest Infestation (%)	85	33	-52	9400
Trichoderma viride	560	Wilt incidence (%)	48	12	-75	4300
Pruning secateurs	96	labour charges for pruning per ha (₹)	3000	300	90	-
Fodder: C0-3, Co-4 & DHN-6	1509	Milk yield (lts/day/animal)	7.25	7.75	6.6	2310

in the table. Demonstration of IPM practices and educative literature were the interventions planned by KVK. 18 % of yield gap (milk yield) noticed in dairy animals was due to non-availability of fodder throughout the year for which introduction of new improved varieties of fodder namely CO-4, COFS-29 & DHN-6 were planned as intervention of KVK. Similarly, constraints responsible for yield gap in sericulture and livestock enterprises were also identified and suitable interventions were planned and implemented. The intention was to x-ray some of the constraints of resource poor farmers and causes of low crop productivity (yield gap) in the changing environment. The agricultural production and productivity is particularly vulnerable to disruption by weather (Anonymous 2004) as well as those caused by the farmers themselves.

Situation analysis revealed that, a great majority of the stakeholders lacked knowledge about improved varieties and seed treatment in ragi, redgram, horsegram, cowpea & foxtail millet which are the important practices for higher productivity (Amithva *et al.* 2014). In order to increase the yield and productivity of these crops, improved varieties were inducted to IFSD stakeholders. The impact of induction of these crop varieties is detailed in Table 2. Improved varieties of ragi viz., MR-1,MR-6, ML-365, GPU-28, GPU-66 were inducted to 2871 farmers from 2011-2013 covering 1798 ha. On an average nearly 25 % of increase in income was noticed. There was considerable increase in yield of new varieties (BRG-1 & BRG-2) of redgram (18 %), horsegram var PHG-9 (17 %) and cowpea var IT-38956 (21 %). To incorporate horticulture component in the cropping system, drumstick, papaya, curry leaf & lime were introduced to farmers, wherein they have planted these crops on the bunds of their farm and backyards. Drumstick was inducted to 3053 farmers and there was more than 13 % increase in yield. The primary focus of agricultural research and extension is technology generation and dissemination. The number of technologies developed and introduced into the supply chain is important. At best, impact is assessed by the total numbers of adopters and increase in yield and income (Laura German *et al*. 2006; Desai *et al.* 2014), obtained by the farmers.

Farmers while purchasing vegetables for household purpose have an apparent habit of purchasing the cheaper vegetables irrespective of their nutritive value. This practice deprived them of a combination of nutritive vegetables from their menu due to higher prices leading to nutritional imbalance. Farmers were stimulated to go for cultivation of different vegetables in their backyards primarily for house consumption through introduction of nutrition kit developed by Indian Institute of Horticulture Research, Bangalore. Farmers expressed that this intervention reduced the drudgery of going out and buying the vegetables to the extent of 20 % and on an average each family produced about 80 kg of vegetables generating average revenue of ₹ 1026 per season (Table 3). Sanjeev *et al*. (2013) opined similarly.

Farmers of Magadi taluk (block) of Ramanagara District are mostly marginal and landless and their by animal husbandry becomes the profitable subsidiary occupation. The impact of the animal component induction is presented in Table 4. Improved giriraja chicks were introduced to farmers wherein there was 67 % increase in the number of birds after three years while each family could earn on an average of ₹ 6200/- from chicken. Considering egg production, each family could earn average net income of ₹ 6800/- at the end of three years. Sheep was the important animal component inducted which added much to the income from farming of many farmers. It is worthy to note that each family could maintain an average of 5 sheep's per family after three years. At this rate it could be articulated that ₹ 13,750/- was the average net income gained by each family from the sheep meat. It is interesting to see that about 13% of farmers purchased additional sheeps and 18% have multiplied the sheeps. Gangappa Gouda Biradar and Gangasharappa, N.R. (2015) reported similar findings.

Efforts were made to strengthen different enterprises of stakeholders by inducting critical inputs that would gain additional income to farmers through increase in productivity. Mechanism to encourage greater use of profitable enterprise combinations to produce more food from shrinking land resources, would assume greater importance for spearheading the agricultural growth (Swaminathan, 2005). The particulars depicted in Table 5 revealed that the induction of chawki rearing trays increased the cocoon yield by 20% resulting in additional income of ₹ 4500/- per 100 DFLs in seed area. Area specific mineral mixture and improved cattle

feed was inducted to 389 dairy farmers as a result of which the milk production increased by 8% obtaining additional income of ₹ 2310 per lactation per animal.. As a nutritional supplement, area specific sheep mineral mixture was introduced to 2137 farmers that resulted in 114 % increase in body weight of the sheep by the end of three years generating an average income of ₹ 8800/- per sheep.

Due to induction of fruit fly traps in mango, the fruit fly incidence reduced by 52 % resulting in additional increase in income of ₹ 9400/- per ha of mango. The wilt incidence in redgram could be controlled to the extent of 75 % through introduction of trichoderma. Srivastava, A.P. (2014) reported similar findings. Improved fodder crops viz., CO-3 & CO-4 were introduced to 1509 farmers resulting in 6.6 % increase in milk yield.

Conclusion

Based on the learning's, upon implementation of IFSD, it is proposed in general to educate farmers about the importance of IFS through various approaches. The issues of way forward for the KVK and the entire stakeholders involved are to up-scale the interventions in terms of technologies considering vertical and horizontal spread, to strengthen model stake holders, to facilitate drudgery reduction by the stake holders through establishment of agro service centers and also to establish commodity based associations to institute production and market linkages. Similar findings were reported by Dhiraj and Prem latha (2014).

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