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RESEARCH ARTICLE :

Crop + dairy + poultry farming system model for enhanced farm income in high altitude and tribal area of Andhra Pradesh

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SUMMARY : Farming system studies in high altitude and tribal area of Srikakulam district of Andhra Pradesh state in East Coast Plain and Hills Agro-climatic zone East coast plains, hot, sub humid to semi arid eco region (S7 Cd 2-5). Agro-ecological region with 915 mm rainfall distribution in 55 rainy days reveals farmer needs to be supported with finance during initial 3 years period @52.23 per cent, 37.46 per cent and 21.75 per cent of recurring cost, respectively. Net returns are getting doubled in first year of intervention itself. The increase income is attributed to increase in income from intervention in paddy crop, introduction of maize crop, feeding of supplement feed to the cattle and also the introduction of Vanaraja back yard poultry birds.

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BACKGROUND AND OBJECTIVES

Farming systems approach introduces a change in farming techniques for attaining food and nutritional security and for maximizing farm income through optimal utilization of resources by a judicious mix of allied enterprises like dairy, small ruminants like goat and sheep, poultry, piggery, fishery, sericulture etc., with crops suitable for the existing agro-climatic conditions and socio-economic status of the farmers. Advantages include food and nutritional security, enhanced and stable farm income and cash flow through allied components at regular intervals, maintain soil fertility and soil health, environmental protection through effective recycling of waste from animal based enterprises like dairy, goatery, piggery, poultry, etc. and employment generation. Factors which influences the selection of crops and other components in IFS includes food and other needs and resource base of the farmers, soil type, rainfall, irrigation facilities and length of growing season and market facilities.

Due to fragmentation of land holdings with increasing population, small and marginal farmers as well as about 15 to 18 per cent landless families living in the rural areas are

unable to generate remunerative employment and income. Eventually, with the lack of food and income security the poor families are compelled to migrate to cities in distress keeping their agricultural lands fallow. This phenomenon may become a major national challenge in the years to come.

RESOURCES AND METHODS

On-farm research evaluation of Integrated Farming Systems programme was taken up by OFR centre, Seethampeta under AICRP-IFS of ANGRAU, Guntur, Andhra Pradesh. The study area, Srikakulam is situated in East Coast Plain and Hills Agro-climatic zone East coast plains, hot, sub humid to semi arid eco region (S7 Cd 2-5) Agro-ecological region with 915 mm rainfall distribution in 55 rainy days per annum. The net sown area of the district is 2,71,000 ha with cropping intensity of 129 per cent. The major soil is shallow red chalka soils which contribute 50 per cent of the area followed by black soils (25%) and deep red chalks soils (20%). The major sources of irrigations are bore wells and open wells (69%) followed by tanks (17%). The major crops are rice, cashew, maize, greengram, redgram and groundnut. Mango is the major fruit crop of the district followed by banana and Guava. The district has local low yielding cattle population of 5,85,000. The non-descriptive buffaloes comprises of 4,48,800 and cross bred cattle population are 12,400. Sheep comprises of 9,60,000 goats are 2,46,200. Back yard poultry comprises 13,83,927 and commercial birds are 7,74,547 (Hand book of statistics of Srikakulam district, 2014).

OBSERVATIONS AND ANALYSIS

The on Farm Research Centre of AICRP-IFS identified twelve farmers for conducting the On-farm evaluation of farming system modules for improving profitability and livelihood of small and marginal farmers. The mean average small farmer having land holding size of 1.8 ha of Srikakulam district of Andhra Pradesh state. Average family consists of six members. Average age men surviving with 65 years old and their education levels are primary school standard. The geographical co-ordinates of his farm are N 17° 53' 40.0" latitude E 079° 28' 36.0" longitude and an altitude of 1036 ft. Major source

Table 1: Changes made in existing IFS practiced by farmers and additional cost (Rs.) (Mean of 12 households)

Existing system				Changes made (Diversification interventions made)	Cost of intervention
Module	Details	Cost (Rs.)	Net income (Rs.)		
Cropping systems	Rice-greengram 1.2ha Rice local variety (Isaka Ravvalu-Konda dhanyam), Rice-Imbalanced fertilizer use *i.e.,* 56-21-28 kg NPK per ha	36560	13060	*Kharif*- Medium-short duration high yielding varieties MTU 1001, 1010 and 1121 and balanced fertilizer application, *i.e.*, 80-60-50 NPK per ha 0.2ha	1460
	Greengram-Local Variety with high incidence YMV in 1.2ha	9720	6780	Maize crop with high yielding variety seed DHM—107+ Herbicides Atrazine and Paraquat was introduced with zero tillage practice 0.2ha	1100
Livestock	Cows-2, Grazing on open land : Low milk yield	8230	7610	Fodder strips, feed and mineral mixture supplied	2680
	Desi Birds-7, Desi birds : Low egg laying and Low meat production	140	2720	25 Vanaraja backyard poultry birds 6weeks old with all vaccination supplied per year+ Feed	2225
Product diversification	Composting			Vermicomposting Cemented rounded structures were supplied to make vermicomposting	900
Optional	No vegetable production purchasing vegetables from market			Kitchen gardening	150
		54650	30170		8515

of irrigation for his farm is bore well. The average livestock of farmer was having 2 local cows. He was getting a total net income Rs. 66420/- per year from his crop and livestock and was insufficient for meeting the requirements of his family.

In one ha of his farm, rice-greengram was the prominent cropping system. The farmers were growing popular long duration fine varieties and short duration medium slender coarse varieties for the last ten years. Excessive use of fertilizers (NPK ratio 1.7:0.3:0.1) lead to increase in pest and disease susceptibility. Benchmark grain yields were 4171 kg ha^{-1} and 6250 kg ha^{-1} during *Kharif* and *Rabi*, respectively.

Farmers were having 2 desi /local cows which are low milk yielders. The milk yield was 1260 litres/year excluding home consumption. Fat content in milk was low and was giving less price to milk. Mineral deficiency and improper nutrition were the reasons for low milk fat and production. Further, farmer was maintaining low productive local back yard poultry which are susceptible to diseases and family labour were not getting employment properly throughout the year.

Based on above limitations, low cost interventions were proposed and imposed as per farmers willingness and market demand in crop, livestock and product processing and value addition. Interventions like rational use of NPK fertilizers (4:2:1), introduction of MTU 1010 variety in particular during *Rabi* to combat cold were made in addition to other recommended package for yield enhancement. MTU1010 is 125 days duration long slender grain type tolerant to cold and shows slight tolerant to salinity and BPH.

In livestock module, low milk yield production and low fat content were addressed with supply of nutritious feed with mineral mixture. Farmer was introduced to *Azolla* production and giving it as supplemental feed to buffalo and back yard poultry throughout the year.

Region specific Vanaraaja birds were introduced in

Table 2: Economics of low-cost IFS over different years

Parameters	Benchmark (Before intervention)	Low cost based intervention period (years)				
		1st	2nd	3rd	4th	Mean
Cost of cultivation (Rs./year)	54650	63165	64860	66820	69840	65421
Gross return (Rs./year)	88490	138037	142420	154230	168270	150739
Net income (Rs./year)	30170	74872	77560	87410	98430	84568
B: C ratio	1.51	2.10	2.19	2.30	2.40	2.30

Table 3: Area and income share

Components	Area share (%)	Net income share (%)
Field crops including vegetables	100	65%
Horticulture (only fruits, plantations, spices, flowers etc)	0	0
Fodder (Please specify name of fodders here)	0	0
Livestock (dairy, poultry, goat, pig etc)	0	35
Fishery	0	0
Kitchen garden	0	0
Other enterprises (Pl specify like vermicompost, mushroom)	0	0

Table 4: Assessment of financial requirement

Year		Recurring Cost (RC) (A)	Deficit of RC (B)	% deficit of RC	Interest on deficit RC (4 %) (C)	Loan outstanding D= (B+C)	Net return (E)	Surplus after repayment F=(E-D)
Benchmark	1st	54650	0				30170	30170
Intervention	2nd	63165	32995	52.23	1319	34314	74872	40558
	3rd	64860	24302	37.46	972	25274	77560	52286
	4th	66820	14534	21.75	581	15115	87410	72295
	5th	69840	0	0	0	0	98430	98430

the back yard alternate to country birds to generate additional income. These birds survives with kitchen wastes, farm wastes, small insects, grasses available in back yards and other surplus farm products like bhusa, maize flour broken rice were fed to these birds. *Azolla* production and *Ghee* making from surplus milk were the intervention under product processing and value component. Interventions in rice-greengram system resulted in 29 per cent (13443 kg ha^{-1}) yield advantage than bench mark yield (10421 kg ha^{-1}). In buffalo the 11 per cent milk yield was increased (1399 l yr^{-1}) than the bench mark milk yield (1260 l yr^{-1}).

Additionally Rs. 32320 and 27260 gross and net income was earned by making interventions (Rs. 177920 and Rs. 93680) in all modules than the bench mark (Rs. 145600 and Rs. 66420) at the additional cost of Rs. 5060 (Rs. 84240) than the bench mark cost (Rs. 79180). 41 per cent additional gross and net income was realized within one year of introduction of IFS approach. Additionally 50 man days were created after one year of introduction of IFS approach.

Farmer needs to be supported with finance during initial 3 years period @52.23 per cent, 37.46 per cent and 21.75 per cent of recurring cost, respectively. Net returns is getting doubled in first year of intervention itself. The increase income is attributed to increase in income from intervention in paddy crop, introduction of maize crop, feeding of supplement feed to the cattle and also the introduction of vanaraja back yard poultry birds.

Conclusion:

The farming systems research, besides offering the potential scope to solve the technology development problems, will help the optimization of various agricultural components and their integration for multi-enterprise farming systems. This will result in development of sustainable and climate resilient farming practices through farming systems approach for enhanced and stable income on farm holding basis. The major outcome of the project will be the development of climate smart farming systems for diverse farming situations and farm categories.

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