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Studies on Integrated Farming Systems For Tribal Areas of Eastern Ghats In Andhra Pradesh

KEYWORDS: Integrated farming system, Productivity, Economics, Employment generation

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ABSTRACT *Integrated farming system studies comprising enterprises viz. field and horticultural crops, poultry, fishery (0.20 ha) and apiary (5 bee hive boxes) were evaluated in 0.6 ha area at Regional Agricultural Research Station, Chintapalli of high altitude and tribal zone of Andhra Pradesh during 2009-2012 with a view to generate sustainable production and profitability for small and marginal farmers. Field crops + Poultry + Fishery + Horticulture system recorded profitable integrated farming system with net income of Rs.29,102 and B:C ratio of 1.83 with productivity of 14.40 (t ha-1) and 464 man days/ha/year over arable cropping returns (Rs.14500/ha) and B:C ratio (1.47) with less productivity (7.50 t ha-1). Integrated farming system offer a pragmatic solution to meet the increasing demand for food, diversification in food habits and stabilizing the income thus improving the nutrition of the small-scale farmers with limited resources.*

Introduction:

In India, the farming community accounts for 80% under marginal and small farmer's category (GOI, 2011). Farmers under these categories are economically poor working in diverse, risk prone environments and with hardly sufficient to sustain their family. The declining trend in land holding percapita poses a serious challenge to the sustainability and profitability of farming. The production system adopted during Green Revolution has been explorative and the natural resources like soil and water were subjected to exploitation, as a result sustainability of agricultural production system has been jeopardized. This suggests the integration of land-based enterprises viz.dairy, fishery, poultry, duckery, apiary, field and horticultural crops within the farm, with the objective of generating adequate income and employment for the small and marginal farmers and thereby improves their livelihoods (Gill et al. 2010).

High Altitude and Tribal (HAT) areas located at Eastern Ghats, spreads over Srikakulam, Vizianagarm, East Godavari, Khammam and Visakhapatnam districts of Andhra Pradesh. The low lying areas comprise rice predominantly. Mixed cropping is a common practice in uplands comprising cereals, millets, pulses and condiments. The income from this farming is meagrely fulfils the subsistence needs of farm families. Though, integration of crops with cattle, goat, sheep and apiary and recycling of organic manure is being practiced since olden days, adopting non-scientific combination of enterprises resulting lower yields. Keeping this in view, a study was undertaken to evaluate performance of Integrated Farming System in High Altitude and Tribal Zone of Andhra Pradesh.

Materials and Methods:

An experiment was conducted on integrated Farming system at Regional Agricultural Research Station, Chintapalli, Andhra Pradesh, during 2009 to 2012 involving field (paddy, ragi, rajmash) and horticultural crops (banana), poultry, fishery and apiary in 3 components were evaluated in 0.6 ha area and cropping (rice-rice) alone as the control.

Crop component of rice-rice in low lands and ragi – rajmash sequence in rainfed situation were grown, pisciculture fingerlings @ 10,000 ha^{-1} (rohu 20%, catla 30% and mrigal 40%) were released into the pond and harvested after 10 months. Poultry birds of rajasree breed (150 No./batch) were maintained in the poultry shed constructed on the fish pond. The pond water was released into the paddy field for irrigation purpose. Trenches of 1 m depth, 0.6 m width were dug around paddy field for fish shelter. Irrigation was provided to fill the trenches throughout the crop duration. Banana plants were planted on the bunds of fish pond and paddy field. Bee hive boxes were kept on the field and pond bunds in the farming system. In 0.6 hectare area of integrated farming system, three components of farming systems were studied and the area allotted to each enterprise as detailed below.

Component 1 : Poultry, fisheries, field and horticultural system

Area of the fish pond sq.m	:	1000
No. of fingerlings raised No	:	2000
Area of the poultry shed sq.m	:	110
No. of the poultry birds Nos.	:	150
Name of the Breed	:	Rajasree
No. of banana plants plants	:	150

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Area for the ragi and rajmash crops : 2750 m^2

Component 2 : Paddy - Fish cum horticulture system

Area of the Paddy field : 880 m^2

Area for the fish around the paddy field : 480 m^2

No of banana plants around the field bund plants : 200

Component 3 : Horticulture-fisheries cum Apiary system

No of banana plants around the pond : 75

Area of the fish pond : 850 m^2

No of bee hives in the system : 5

Total area of the system : 0.60 ha.

Observations on the economics of individual components and the farming system as a whole and employment generation were recorded as per the standard procedure. Since, the study includes diversified enterprises like fish, poultry and crops; the yield was converted into rice equivalent yield as suggested by Singh et al. (2005).

Results and Discussion

Productivity:

The productivity of integrated farming systems involving different components viz. Crop, poultry, fishery, horticulture and apiary integrated in the system was expressed in terms of rice grain equivalent yields (table 1). Integration of field crops + poultry + fish + horticultural crop (banana) resulted in highest system productivity (14.90 t ha^{-1}) in terms of rice grain equivalent yields. The integrated farming system besides generating higher productivity, also producing sufficient food, fruits, vegetables (rajmash) etc to the farm families. This system recorded 99.3% more productivity over cropping alone. Similarly, fish + horticulture + apiary system recorded 96% higher productivity (14.40 t ha^{-1}) than rice-rice alone. Paddy-fish-horticultural system gave 88.3% higher productivity over conventional cropping. Similar results in integrated farming systems over conventional cropping were reported by Korikanthimath and Manjunath (2009) and Sanjeev Kumar (2011). In rice-based farming system, risk is reduced due to diversification of system with low risk enterprises like fish and vegetable cultivation (Behera et al. 2008).

Economics:

Net income, operational cost and benefit: cost ratio has been studied as individual component wise (Table 2) as well as system wise (Table 1) during the three years study period. Field crops + poultry + fish + horticultural (banana) system were highly economical with the highest net income (Rs. 29,102). This was mainly due to the addition of poultry component which added maximum profit (Rs. 20910) to the system. Benefit cost ratio was higher in fish + banana + apiary system (1.96) followed by paddy + fish + horticulture (banana) system (1.89) and field crops + poultry + fish + horticulture (banana) (1.83). Higher B:C ratio in fish + banana + apiary system was due to less operational cost incurred and more net income from the farming system. Rautaray et al. (2005) reported the increased farm productivity and income through the integration of crops with fisheries.

While considering the individual enterprises, higher net returns of Rs. 20910 was obtained with poultry unit with benefit: cost ratio of 2.08 due to high cost of poultry birds in the market. A higher B:C ratio was obtained with banana cultivation on pond and field bunds (2.72) followed by fishery (2.50), apiary (2.16), poultry (2.08) and rajmash crop (2.02) as less input cost was incurred towards raising/ rearing the above enterprises.

Employment generation:

Integration of different components in an integrated farming system results in an increase in employment generation (Table 1). The average employment generation increased to 532 man days/ha/year by integrating field crops + poultry + fish + horticulture components over all other farming systems and was followed by horticultural crops + fish + apiary system (454 man days/ha/year) and paddy + fish + horticultural components (438 man days/ha/year). An extra average employment of 134, 56 and 40 man days per year were generated due to adoption of poultry + fish + horticultural system, horticulture + Fish + apiary system and paddy + fish + horticulture farming systems over cropping alone. The diversified nature of multifarious activities related to different enterprises included in integrated farming system provide a lot of opportunities of employment and keeps farmers and their family members engaged more time and help in improving the employment for rural poor. Similar results were reported by Sanjeev Kumar et al. (2011), Ravishankar et al. (2007) and Jayanthi et al. (2003).

Figre1. Poultry- Fish-Horticultural system

Figre 2. Paddy - Fish -Horticultural system

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Table 1: Economics, RGEY and employment generation of the different components in farming system model (Pooled data of 2010, 2011 & 2012)

Components	Revenue Generation (Rs.)	Expendi-ture (Rs.)	Net Income (Rs.)	B : C Ratio	Rice grain equivalent yield ($t\ ha^{-1}$)	Employment generation (man days/ ha/ year)
1) Field crops + Poultry + Fish + Horti-culture (banana)	64030-00	34928-00	29102-00	1.83	14.90	532
2) Paddy + Fish + Banana	6020-00	3170-00	2850-00	1.89	13.25	438
3) Fish + Banana + Apiary	5650-00	2870-00	2780-00	1.96	14.40	454
4) Crop-ping alone (Rice - rice)	3960-00	2684-00	1276-00	1.47	7.50	398

Table 2: Economics of the individual enterprises in farming system research (Polled data of 2010, 2011 & 2012)

Components	Area/No.	Operational Cost	Gross Income (Rs./ha)	Net Income (Rs./ha)	B : C Ratio
Paddy	1.0 ha	15250/-	22500/-	7250/-	1.47
Ragi	0.27 ha	6140-00	7600-00	1460-00	1.23
Rajmash	0.27 ha	5050/-	10250-00	6200-00	2.02
Poultry	670 No	19320/-	40230/-	20910/-	2.08
Fishery	0.1 ha	2938/-	7560/-	6122/-	2.50
Banana	0.12 ha	2480/-	6750/-	4270/-	2.72
Apiary	5 boxes	2080/-	4500/-	2420/-	2.16
Total		39608	71946	33776	1.74

Market price of the produce:
Paddy – Rs.7.50/- per kg, Ragi – Rs.10/- per kg, Rajmash – Rs.25/- kg, Poultry bird (50-60 days old age) – Rs.60/- per bird, Fish – Rs.70/- per kg, Banana – Rs.15/- per dozen, Honey – Rs.250/- per kg

Conclusion
Thus, the results of the present study on selection of profitable farming system and integration of suitable enterprises and recycling of farm wastes have clearly brought out the possibility of linking crop production with different related components for increased profitability, employment and improvement of livelihood sustainability for small and marginal farmers.

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