

Selected integrated farming system models

for enhanced income

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Under National Agricultural Innovation Project (NAIP), supported by the World Bank and implemented by Indian Council of Agricultural Research (2006-14), an effort was made to enhance income of the rural people living in selected disadvantaged regions through technology-led innovation systems. Very often emphasis on one component in rural areas, particularly among those people whose livelihood is threatened can not lead to overall livelihood improvement of a household. Accordingly, interventions in IFS mode (crop-livestock- aquaculture) were planned and demonstrated, keeping in view the overall need of the area, available technological options, market accessibility both for input and produce etc. Some of the IFS models demonstrated with success are discussed here.

Key words: Enhanced income, Integrated farming system, Intervention

Integrated Rice – Fish – Poultry system

Annamalai University demonstrated integrated rice–fish–poultry farming system on 430 farm holdings in 12 villages of Cuddalore, Villupuram, Nagapattinam and Thiruvannamalai Districts of Tamil Nadu (Fig. 1). The intervention included transplanted rice in 200 m² area, 20 poultry birds kept in cages of size 1.8 m × 1.2 m × 1m and 100 fingerlings (rohu, mrigal, catla, common carp) in trench of 20 m² area. The results indicated annual increase in net return per household by ₹ 33,000 to ₹ 50,500/ha/year for

two and three crops, respectively. Poultry manure addition due to poultry dropping was 11.4 to 19.6 t/ha and also pest suppression ranged from 17 to 27%.

Integrated rice-fish-vegetable model

Integrated rice-fish farming followed by vegetable crops, utilizing the residual moisture and nutrients added by activities of fish, was promoted in a total area of 160 ha by Assam Agricultural University in Lakhimpur, Kokrajhar and Karbi Anglong districts (Fig. 2). A unit area of 2,800 m² was put under this

system. Major emphasis was on replacing the existing low yielding rice varieties with high yielding varieties like Ranjit, Gitesh, Jalashree and Jalkuwari. Trenches were made on the sides of rice field with a depth of 0.6 m and 0.6 m width to accommodate the fish species (rohu, mrigal, catla, common carp and silver carp). After harvesting rice crop, vegetables (French bean, chilli and knolkhol) were cultivated in the field. Net economic benefit per household per annum from this intervention was ₹ 29,000. Rice production increased from 2.97 t/ha (baseline



Fig 1. Integrated rice-fish-poultry model



Fig 2. Integrated rice-fish-vegetable model



Fig. 3. Integrated *makhana*-fish-singhara system

value) to 4.6 t/ha. In addition to that beneficiary farmers got an average of 41 kg fish and 1.7 tonne vegetable from 2,800 m² rice fields.

Integration of *makhana* with fish and singhara (water chestnut)

Under NAIP-ICAR, RC for ER, Patna *makhana* was integrated with fish and water chestnut to enhance farmers income as compared to *makhana* alone (Fig. 3). The technology was demonstrated in an area of 50 ha with 96 beneficiaries in Darbhanga Sadar Block. The results revealed that *makhana* gave a total net profit of ₹ 7,90,636 with an employment generation of 9,437 man days/year; fish showed an additional net income of ₹ 4,65,677 with an employment generation of 889 man days/year whereas water chestnut generated an additional net income of ₹ 25,010 with an employment generation of 335 man days/year.

Integrated pig/poultry-fish-vegetable farming system model

About 98% of total population of backward districts of Assam lives in the rural areas. Pig rearing is one of the alternative livelihood options for most of the people. However, they are mostly rearing local breed in the back yard with poor condition. As a result, income from pig rearing is less. Integrated farming system with cross breed pigs/poultry, fish and horticulture as well as improved method of rearing was demonstrated for enhanced income by Assam Agricultural University, Jorhat in Lakhimpur, Kokrajhar and Karbianglong districts of Assam, (Fig 4). The results indicated that on an average a farmer can get an income of ₹ 54,500 and ₹ 90,000 from poultry- fish- vegetable and pig-fish-vegetable system, respectively.

Redgram based integrated farming system for Bidar, Karnataka

Redgram or pigeon pea (*Cajanus cajan* S.) is



Fig. 4 Integrated pig-fish-vegetable farming system

popularly known as Tur or Aharar in India. It is one of the major pulse crop of Northern Karnataka and important commercial crops of dryland farmers. Bidar district is considered as pulse bowl of Karnataka where in pulses like black gram, green gram, redgram and

Bengal gram are major crops cultivated in an area of 206,717 ha. Among these pulses, the share of redgram is to the extent of 65,642 ha. As estimated, the potential and present yield of redgram in Bidar district are 2,700 kg/ha and 829 kg/ha respectively. To bridge this yield gap (1,871 kg/ha) redgram transplanting was considered an viable option. To further add to the income, an integration farming system model of redgram (BSMR-736) and Bengalgram (JG-11) crop with vermicomposting, azolla cultivation and poultry was developed and demonstrated in Bidar district of Karnataka. This model was productive and profitable as it generated an average income of ₹ 1,53,200/HH/year to 240 households against an average pre intervention income of ₹ 63,700.

SIFS (Specialized integrated farming system) model

SIFS is practice of integrated farming system in which, while each component is interdependent but perform to its optimum level and one or more components can be raised to the level where it serves the level of self-employment venture. Based on studies conducted in Barabanki and Raebareilly district in UP a different model each for landless, small landholders and marginal farmers was recommended. The models and estimated income is given in Table 1.

Enhanced income through high value poultry race *Kadaknath*

An Indian poultry breed, *Kadaknath* is native to Jhabua district of Madhya Pradesh. This breed is famous for its meat quality, texture, and flavor and has special medicinal value in homeopathy. Due to its meat and alleged medicinal properties, it fetches high price bird and is in high demand in MP and adjoining states. However, it was observed that the population of this bird was declining rapidly and it was under threat of extinction and genetic erosion. An attempt was therefore made for conservation and promotion of this high value Indian poultry race under NAIP by RVSKVV, Gwalior

A suitably designed low cost shed

Table 1. Specialized integrated farming system (SIFS) model

Category	The Model	Input cost ₹/annum	Output ₹/annum
Landless/sub-marginal farmers	Poultry (300 chicks × 4 cycles), bovine (3-5 no.), <i>Azolla</i> , fodder on rented/waste land	21,000	2,55,000
Small landholders (1 acre)	Banana (300 seedling), poultry (200 × 4 cycle), fodder gladiolus/veg, dairy (6-8 adult), <i>azolla</i>	36,600	3,80,000
Landholding 1 ha	Banana (460 seedling), poultry (200 × 4 cycle), guava (60 plants) goats (30), gladiolus/veg, dairy (20 adult), <i>azolla</i>	5,04,000	1,125,000

**Fig. 5.** Conservation of Kadaknath poultry**Table 2.** Income from three-tier vegetable system in Vaishali (Bihar)

Model	Upper	Middle	Lower	Net Income, ₹/year
1	Bitter gourd (Cv. <i>Palee</i>)	Cowpea (<i>Pusa Komal</i>)	Elephant foot yam	3,60,000
2	Pointed gourd (Cv. <i>Dandari</i>):	Okra (<i>Parbhani Kranti</i>)	Cucumber (<i>Kareena</i>)	2,29,000
3	Pointed gourd (cv. <i>Dandari</i>)	Okra (<i>Okra Anamika</i>)	Amranthus	2,25,000

and one 100 poultry chicks of 10 days old were made available to each beneficiary (Fig 5). The farmers were educated on technologies for scientific poultry production, balance feeding, handling of feeder and drinkers, health management and marketing. This new Kadaknath production technology reduced the mortality rate from more than 50% to 10-12%. The birds gained the body weight in faster way and attained saleable weight of 1.10 kg in 105-120 days. On an average, an individual beneficiary got the net income of ₹ 90,000 to 1,00,000/beneficiary/ year. Due to success of this intervention, number of low cost poultry sheds have increased to 162 and are further increasing. A hatchery

was further supported by NAIP to ensure supply of chicks.

Impact of CSR-BIO on increasing the profitability of horticultural crops

CSR- BIO is a product developed using consortia of effective synergistic microbes in combination with dynamic patented media and dynamic substrate to cater the growth requirement of commercial crops in soils of pH 9.0 to 9.35. CSR BIO, developed under NAIP by consortia led by IVRI, Bareilly, was evaluated for its profitability and reduced use of chemicals in commercial crops like tomato and banana with adopters and non adopters. The studies were conducted in two major banana and tomato

growing areas of the Barabanki district (Trivediganj and Haidergarh). Results showed an overall increase in yield up to 22.43 and 15.62% in the adopters of tomato and banana which simultaneously increased the gross profitability to 20.11 and 17.39%, respectively. The use of plant protection chemicals was 47.33 and 33.36% lower than the non-adopters in tomato and banana, respectively. Adopters gained an average gross income of ₹ 2.78 lakhs from one acre while the non adopters obtained a gross profit of ₹ 2.36 lakhs from one acre of crop. Adopters sprayed their crops with pesticide / fungicide combination only for 7.333 times while the non adopters used chemical sprays for 11.067 times.

Introduction of high value vegetable cultivation under three-tier system

Under this system three models were introduced in backward districts of Bihar by ICAR RC for ER Patna and farmers were able to grow three different vegetables on the same piece of land at a time. The cost benefit ratio of the three models was 1:3.78, 1:3.22 and 1:2.53 respectively. The economics of the three-tier models is given in Table 2. The intervention has made a big impact in and around Vaishali district. The area under three tier system increased from 72 NAIP supported household to 220 additional household. This intervention was also demonstrated in North Bengal and NEH area by respective consortia.

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Krishi Unnati Yojana

The *Krishi Unnati Yojana*, a central sector scheme, is envisaged as umbrella programme for focusing on food security, by merging schemes on Soil-health Card, Integrated Scheme on Agricultural Co-operation and Agricultural Marketing, National Mission on Agriculture Extension, Horticulture Development, Price Stabilization Fund, National Mission on Sustainable Agriculture and other programmes.