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Note

Fisheries based farming system for sustainable livelihood of coastal farmers

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ABSTRACT

Fisheries is an important component in the coastal farming systems along with crop, dairy and poultry. In the present study, twelve farming systems in which fisheries is a component were studied by employing seven indicators of sustainable livelihood namely environmental conservation, permanent asset creation, food security, nutritional security, input recycling, employment generation and annual income in Tiruvallur and Thanjavur districts of Tamil Nadu. The results revealed that all the seven identified indicators were found to be higher in the fisheries based farming system. The farmers need to be educated and motivated to adopt fisheries as a component in farming system for attaining the much needed food and nutritional security as well as overall sustainability of the coastal farming systems. Institutional support coupled with development of rural infrastructure is suggested as strategies to promote this combination for the sustainability of agricultural systems in the coastal region.

Different enterprise combinations within the farming system remain the backbone of agriculture in sustaining the livelihoods of majority of Indian farmers. The role and nature of involvement of component enterprises and 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 in future (Kenneth, 1991; Swaminathan, 2005). Crop, dairy, poultry and fisheries are the major enterprises practised in different combinations by farmers in the coastal regions (Dube, 1995). In order to increase the productivity and profitability of these enterprise combinations, there is a need to asses the different parameters contributing to sustainable livelihood and also the role of the factors for the same. In this backdrop, a study was conducted to assess the sustainable livelihood parameters in crop+dairy+poultry+fisheries (C+D+P+F) combination.

The study was conducted in Tiruvallur and Thanjavur districts of Tamil Nadu by selecting 12 cases of crop+dairy+poultry+fisheries combination. Data were collected using a structured interview schedule. In this study, sustainable livelihood encompassed adoption of appropriate enterprise combinations resulting in generation of adequate income and employment, ensuring food and nutritional security for the family, conserving environment, effective input recycling and creation of durable farm asset. It was ascertained by means of a sustainable livelihood index (SLI) developed for this study.

SLI was calculated using seven dimensions of sustainable livelihood which include environmental conservation, permanent asset creation, food security, nutritional security, input recycling, employment generation and annual income from different enterprises. The values calculated from all the seven dimensions of sustainable livelihood

were multiplied with weightages assigned by experts for each dimension and then totalled. The arrived value was divided by 100 to obtain the sustainable livelihood index for each respondent.

$$SLI = \frac{(W1 \times EC)+(W2 \times PAC)+(W3 \times FS)+(W4 \times NS)+(W5 \times IR), (W6 \times EG)+(W7 \times IG)}{100}$$

The coefficient of correlation between profile variables and sustainable livelihood index was worked out to ascertain the nature of relationship in each farming system. The significant variables obtained in correlation analysis were subjected to multiple linear regression analysis using SPSS software package.

The data on seven indicators of sustainable livelihood through C+D+P+F farming system were grouped into three categories as low, medium and high using cumulative square root technique. The data are presented in Table 1.

Majority of the respondents (91.67%) had better perspective with respect to contribution of integrated farming system (IFS) towards environmental conservation in C+D+P+F system where wastes of poultry and dairy were recycled in fish ponds. Similar advantages have been reported earlier (Kenneth, 1991; Lightfoot *et al.,* 1993; Dube, 1995; Balusamy, 1996; Venkataramani and Umapathy, 1997; Jayanthi *et al.,* 2002; Murugan and Kathiresan, 2005).

The C+D+P+F system required heavy investment towards irrigation (borewell), pond excavation, inlet and outlet channels etc. Those systems with sheep and goat as component had relatively low investment capacity.

About 66.67% of the respondents had high level of food security. It is understood that a farmer cultivating food crop and rearing dairy animals needs to purchase only small quantities/ items when he is integrating horticultural crops such as vegetables, onion, greens etc. even in a small plot. Swaminathan (2005) defined food security in terms of availability, accessibility and affordability. The integrated farming system (IFS) can ensure food security to a farmer when he can optimally choose the appropriate system of farming which is within his capability for running the system. Kumar (2005) expressed that the output mix in Indian agriculture has undergone a significant shift from food grains to non-food grains and within food grains from coarse to finer cereals.

It was also found that 83.33% of respondents possessed high level, while 38% had medium level of nutritional security. The systems with horticulture and fisheries components contributed to better level of nutritional security. The nutritional security is described as a situation where all people have sufficient intake of food over a prolonged period relative to his/her needs for normal growth and physical development, body maintenance and for performance of daily activities. The use of diverse range of plants by poor farmers has often helped them to survive under difficult conditions apart from ensuring nutritionally balanced diet (Hawtin, 2005).

TABLE 1: *Sustainable livelihood parameters in C+D+P+F system*

S.No.	SL Parameters	Low	Medium	High
1.	Environmental conservation	0 (0.00)	1 (8.33)	11 (91.67)
2.	Permanent Asset Creation	1 (8.33)	6 (50.00)	5 (41.67)
3.	Food Security	0 (0.00)	4 (33.33)	8 (66.67)
4.	Nutritional security	0 (0.00)	2 (16.67)	10 (83.33)
5.	Input recycling	1 (8.33)	3 (25.00)	8 (66.67)
6.	Employment generation	0 (0.00)	5 (41.67)	7 (58.33)
7.	Total income	1 (8.33)	5 (41.67)	6 (50.00)

C-Crop; D-Dairy; P-Poultry; F-Fishery
Figures in parentheses indicate percentage

Small farmers grow a large number of crops in combinations while large farmers preferred single cropping.

Table 1 also indicates that respondents had high level (66.67%) of input recycling. Closer integration of the different components in a farming system enables recycling of energy and nutrients within the system. It was observed that many groundnut and sesame cultivating farmers processed portion of their produce into oil and used for consumption and thereby reducing the external expenditure on oil and also getting cakes as cattle feed. The chaffy grains and other wastes obtained at the time of harvesting and threshing of paddy were also used as manure in some of the study villages. Lack of awareness and confidence about biological pest control methods made them to depend only on chemical pesticides. Small land holding and lack of sufficient irrigation facilities prohibit farmers to produce sufficient feed and fodder. Similar observations were also made by Balusamy (1996) and Jayanthi *et al.* (2002).

It is apparent that almost half of the respondents (41.67%) reported medium level of employment generation. In general, vegetable crops always provide regular employment for the entire farm family even in a small plot of 0.125 ha. The farm family could generate additional employment through IFS (Natarajan, 1983; Satheesh *et al.*, 1985; Jayanthi *et al.*, 2002; Singh, 2002).

Majority of the respondents were operating a combination of farming enterprises which gave them sustained cash flow to manage many of the farm activities. The total income obtained from all the enterprises owned by the respondents for a period of one year was computed as annual gross income of family and based on the net income, classification was done. The results indicated that 50% of respondents belonged to high income groups (above Rs. 1,44,000/-) followed by middle income groups (Rs. 69,000 to Rs. 1,44,000/-). As expected, C+D+P+F was found to contribute higher net income to the farm families, since they were engaged in commercial farming including fisheries, vegetables, flowers, sugarcane etc. Despite their small or medium holdings and small livestock holding, farmers in the study area earned good income from such enterprises due to their intensive management including the use of family labour (Palaniappan and Sivaraman, 1996). Substantial additional income could be generated by practising different enterprise combinations based on the location and capability of farmers (Rangasamy *et al.*, 1995; Murugan and Kathiresan, 2005).

It is also important to ascertain the factors which have positive and negative relationship with sustainable livelihood in addition to influencing variables for the sustainable livelihood of farmers of fisheries based farming system. Hence, the correlation and regression analysis were conducted and the results are depicted in Table 2. The correlation results revealed that livestock holding have highly significant ($P<0.01$) positive relationship with sustainable livelihood. Land holding and communication behaviour also exhibited significant ($P<0.05$) positive relationship. Higher the livestock holding, higher will be sustainable livelihood as the level of recycling is higher in this farming system due to use of farm yard manure for fish pond and fodder grown on fish pond bunds for dairy animals. Availability of suitable land for fish farming will plays significant role in practising integrated farming. Better communication behaviour of the IFS farmers will facilitate knowing market trends, new knowledge and linkages.

The social participation, age and family size showed negative and non-significant relationship with sustainable livelihood whereas education, farming experience, cropping intensity, marketing behaviour, credit utilisation, training, decision-making pattern and perception had no significant relationship with sustainable livelihood.

The coefficient of determination (R^2) was found to be 0.818 (Table 2). This indicates that 81.80% of variation in sustainable livelihood was due to the combined influence of three variables taken for the study. It was also observed that out of the three independent variables, only livestock holding was found to have positive and significant ($P<0.05$) influence on sustainable livelihood. It might be due to the fact that livestock holding in C+D+P+F system contributes to effective recycling, particularly for manuring fish pond as well as grasses grown on the bunds for grazing by livestock.

TABLE 2: *Relationship between the different factors and sustainable livelihood*

S.No.	Correlation variables	Correlation coefficient	Regression variable	't' value
1.	Family size	-0.143	Constant	1.387
2.	Age	-0.013	Land holding	1.549
3.	Education	0.133	Livestock holding	2.688 *
4.	Farming experience	0.155	Communication behaviour	1.551
5	Social participation	-0.041	R^2	0.818
6.	Land holding	0.706*	F	11.953
7.	Cropping intensity	0.039		
8.	Livestock holding	0.839**		
9.	Marketing behaviour	0.409		
10.	Training	0.521		
11.	Decision-making pattern	0.519		
12.	Perception	0.560		
13.	Communication behaviour	0.585*		

C-Crop; D-Dairy; P-Poultry; F-Fishery
* Significant at 0.05 level; ** Significant at 0.01 level;

Major indicators of sustainable livelihood as identified for assessing the C+D+P+F enterprise combination suggest that this type of farming system needs to be extensively promoted in view of better livelihood of farmers and overall sustainability of coastal agro-eco system. Availability of adequate land holding, appropriate livestock holding and better communication facilities were found to play key roles for sustainable livelihood. Efforts are required to convince the farmers about the advantages of integrating livestock as one of the component enterprise for higher productivity, profitability and sustainability of coastal agricultural systems. Institutional support in the form of credit, critical inputs and extension services and development of rural infrastructure particularly road, irrigation and marketing support will further spearhead the sustainable C+D+P+F farming system.

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