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Short communication

Studies on sustainable livelihood of farmers in horticulture-based farming systems

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ABSTRACT

Study on horticulture + crop + dairy + poultry (H + C + D + P) and horticulture + crop + dairy+ poultry + sheep/goat (H + C + D + P + S/G) farming systems was conducted in Tiruvallur and Thanjavur districts of Tamil Nadu, India to understand the contribution of horticulture-based farming system in providing sustainable livelihood and influencing techno-socio-economic characteristics of farm families. A Sustainable Livelihood Index (SLI) was developed. The H + C + D + P was not only perceived to be eco-friendly but also ensured high level of food security (76.92%) than H + C + D + P + S/G (66.67%). However, both the systems had low level of input recycling and permanent asset creation. The H + C + D + P + S/G was more profitable (60.00%) than H + C + D + P (46.15%). The livelihood sustainability was positively influenced by education, decision making pattern and communication behaviour. The study suggests that livelihood of poor farm families in developing countries would be improved better, if they are appropriately sensitized on horticulture-based farming systems.

Key words: Communication behavior, horticulture-based farming system, sustainable livelihood.

INTRODUCTION

Horticulture crops as components of farming system play significant roles in the livelihood of farm families in terms of nutrition, employment and income security. When farmers integrate allied enterprises rationally, the synergistic interactions of them have a greater effect from the same size of land. The role and nature of involvement of component enterprises including horticulture crops within farming systems assume greater importance in spearheading the agricultural growth and income of individual farm families (Swaminathan, 8). Sustainable livelihood, which ensures continuous income and employment for an individual farm family is possible from a farming system which is compatible to the land and water resources. Higher productivity and profitability from appropriate enterprise combinations could be achieved by analyzing certain techno-socio-economic factors which influence sustainable livelihood. Horticultural crops are known individually to contribute food, nutrition, income and employment from a small piece of land for small farmers (Ponnusamy *et al.*, 6). Its effect is phenomenal when it is understood from cropping system and farming system perspectives. The present study was conducted to understand the contribution of horticulture based farming system in providing the sustainable livelihood and influencing techno-socio-economic characteristics of farm families.

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MATERIALS AND METHODS

The study was conducted in Tiruvallur and Thanjavur districts of Tamil Nadu by selecting 13 cases of horticulture + crop + dairy + poultry (H + C + D + P) combination and 15 cases of horticulture + crop + dairy + poultry + sheep/goat (H + C + D + P + S/G) combination. Data were collected using a structured interview schedule. The respondents were categorized into three groups; based on their obtained score, as low, medium and high based on the cumulative square root frequency method for ascertaining the level of sustainable livelihood. A sustainable livelihood index (SLI) was developed to assess the effectiveness of different farming systems.

SLI was calculated using seven dimensions of sustainable livelihood, which include environmental conservation (EC), permanent asset creation (PAC), food security (FS), nutritional security (NS), input recycling (IR), employment generation (ES) and annual income (IG) 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 totaled. 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 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.

RESULTS AND DISCUSSION

The H + C + D + P system was perceived to be environmentally sound (46.15%) when integrated with crop, dairy and backyard poultry and when sheep/ goat was added as an enterprise, perception slipped to medium level (Table 1). Majority of the farmers had low level of permanent assets creation, which might be attributed to the inability of small and marginal farmers to invest more on bore wells, farm sheds, tractors, drip irrigation, sprayers etc. The system with sheep and goat as component had relatively low investment capacity. H + C + D + P system had reported higher level of food security as compared to H + C + D + P + S/G. It is understood that a farmer while 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. in his system even in a small plot. Eighty per cent of respondents possessed medium level of nutritional security from H + C + D + P + S/G as compared to H + C + D + P system (76.92%) implying that high food security need not necessarily ensure high nutritional security which is slightly a broader concept.

Result indicates that both the systems had low level of input recycling (Table 1). Closer integration of the different components in a farming system can enable the farmers to get adequate nutrients for the sustenance of the healthy family (Hawtin, 2; Shah, 7). Both the systems created high employment. In general, vegetable crops always provide regular employment for the entire farm family even in a small plot size of 0.125 ha. The flower crops such as jasmine, rose and crossandra were found to generate high employment in terms of man days/ha. The farm family could generate additional employment through IFS (Jayanthi *et al*., 3). The total income obtained from all the enterprises owned by the respondents for the past one year was computed as annual gross income of family. The results indicate that H + C + D + P + S/G systems were found to contribute higher net income to the farm families (Table 1), since they were engaged in commercial farming including fisheries, vegetables, flowers, sugarcane etc. The additional returns from IFS could be obtained with range of 100 to 300 per cent, while solo enterprises such as rice, dairy, poultry, tomato, bhendi could ensure benefit cost ratio of only 1.75, 1.37, 1.44, 1.64 and 1.48, respectively (Ponnusamy, 5). Despite their small or medium holdings and small livestock holding, farmers in the study area earned an additional income due to better integration of farm enterprises including the use of family labour.

A total of 13 variables were selected to ascertain the relationship with sustainable livelihood (Table 2). The results ('r' values) revealed that in horticulture + crop + dairy + poultry (H + C + D + P) system, education, decision-making pattern and communication behaviour exhibited positive and highly significant relationship and cropping intensity showed significant relationship with sustainable livelihood, whereas, other variables did not show any significant relationship. Higher the education, decision-making pattern and communication behaviour, higher will be the sustainable livelihood of IFS farmers in this particular system. The cropping intensity is also one of the factors that contribute for sustainable livelihood of the above system by the respondents (Table 2). The fruit and vegetable farming is not only employment intensive, but also enhances the gross as well as net

Table 1. Level of sustainable livelihood from horticulture-based farming systems.

S. No.	Sustainable livelihood parameters	Enterprise combination					
		H + C + D + P (N = 13)			H + C + D + P + S/G (N = 15)		
		Low	Medium	High	Low	Medium	High
1.	Environmental conservation	3 (23.08)	4 (30.77)	6 (46.15)	3 (20.00)	8 (53.33)	4 (26.67)
2.	Permanent asset creation	8 (61.54)	3 (23.08)	2 (15.38)	8 (53.33)	4 (26.67)	3 (20.00)
3.	Food security	0 (0.00)	3 (23.08)	10 (76.92)	0 (0.00)	5 (33.333)	10 (66.67)
4.	Nutritional security	3 (23.08)	10 (76.92)	0 (0.00)	3 (20.00)	12 (80.00)	0 (0.00)
5.	Input recycling	7 (53.44)	3 (23.08)	3 (23.08)	8 (53.33)	6 (40.00)	1 (6.67)
6.	Employment generation	2 (15.38)	5 (38.47)	6 (46.15)	1 (6.67)	0 (0.00)	14 (93.33)
7.	Income generation	2 (15.38)	5 (38.47)	6 (46.15)	1 (6.67)	5 (33.33)	9 (60.00)

H = Horticulture, C = Crop; D = Dairy; P = Poultry; S/G = Sheep/Goat
Figures in parentheses indicate percentage

Table 2. Correlation coefficient of sustainable livelihood parameters with other variables in C + D + P + H and C + D + P + S/G + H systems.

Independent variable	Correlation coefficient (r)	
	H + C + D + P	H + C + D + P + S/G
Family size	-0.079	0.243
Age	0.004	0.121
Education	0.723**	0.107
Farming experience	-0.025	0.175
Social participation	-0.061	0.406
Land holding	0.302	0.410
Cropping intensity	0.604*	0.089
Livestock holding	-0.251	-0.205
Marketing behaviour	0.339	0.135
Training	0.380	0.295
Decision-making pattern	0.785**	0.59*
Perception	0.347	0.52*
Communication behaviour	0.837**	0.790**

H = Horticulture, C = Crop; D = Dairy; P = Poultry; S/G = Sheep/Goat; *'** Significant at 5 & 1% levels

returns of the farmer (Dileep *et al.*, 1). The results indicate that proper education, training and adequate communication support and consultation will result in sustainable livelihood of farmers who practise crop + dairy system + poultry and horticulture. It is presumed that education will have strong influence on the individual to consult various sources of information and to have positive perception.

In horticulture + crop + dairy + poultry + sheep/goat (H + C + D + P + S/G) system, only communication behaviour was highly significant and decision-making pattern and perception were significant with sustainable livelihood. The other variables in this system did not exhibit any relationship with sustainable livelihood. When sheep and goat were incorporated in the horticulture based farming system, the education and cropping intensity which exhibited significance in H + C + D + P could not reveal any significance in H + C + D + P + S/G indicating a strong perception that only resource poor farmers could practice H + C + D + P + S/G system as sheep and goat is always perceived as poor man's enterprise. The step down regression analysis was worked out to calculate the contribution of independent variables on sustainable livelihood in H + C + D + P system and H + C + D + P + S/G system, the results of which are given in Tables 3 and 4.

The coefficient of multiple regression was found to be 0.779, which indicates that 77.90 per cent variation in the sustainable livelihood by the respondents was due to the combined influence of four variables selected for the study (Table 3). All the four variables, namely, education, cropping intensity, decision-making pattern and communication behaviour were positive but non-significant with sustainable livelihood.

The variables explained 63.40 per cent variation in the sustainable livelihood in the H + C + D + P + S/G system. It is also clear from the table that communication behaviour had significant influence the sustainable livelihood (Table 4). The regression coefficients of three independent variables, *viz*., decision-making pattern, perception and communication behaviour had positive contribution towards sustainable livelihood on H + C + D + P + S/G system. The farmers of this system by virtue of their better communication behaviour coupled with better decision-making might have acquired more perception which resulted in better sustainable livelihood. Keeping all other factors constant, a unit increase in the studied independent variables had an increase to the tune of 0.609, 0.628 and 0.599 units in improving the sustainable livelihood of farmers in H + C + D + P + S/G system.

The synergy of different enterprises, farm resources and farmers' priorities need to be maintained and the technological interventions should be designed in order to suit the farming

Table 3. Step-down regression analysis of independent variables with sustainable livelihood on H+C+D+P system.

Variable	Unstandardized coefficient		Standardized coefficient Beta	t-value	Sig.
	B	Std. Error			
Constant	-28.811	22.466		-1.282	0.236
Education	0.266	3.023	0.031	0.088	0.932
Cropping intensity	0.064	0.052	0.259	1.229	0.254
Decision-making pattern	0.519	1.915	0.112	0.271	0.793
Communication behaviour	0.452	0.252	0.612	2.130	0.066

R^2 = 0.779; F = 7.047

Table 4. Step-down regression analysis of independent variables with sustainable livelihood on H+C+D+P+S/G system.

Variable	Unstandardized coefficient		Standardized coefficient Beta	t-value	Sig.
	B	Std. Error			
Constant	-48.906	39.452		-1.240	0.241
Decision-making pattern	0.609	1.576	0.097	0.386	0.707
Perception	0.628	1.752	0.081	0.358	0.727
Communication behaviour	0.599	0.243	0.676	2.468*	0.031

* = Significant at 5% level; R^2 = 0.634; F = 6.343

system characteristics. In addition, the concept of 'home garden' needs to be given adequate policy support wherein the nutritional and health security of resource poor farmers can be ensured. Since, permanent asset creation at the farm level was low and prevalence of private money lenders was high in most of the systems, arrangement for liberal credit flow with two per cent interest rate will help farmers to make adequate investment in their farm so as to practise economically feasible enterprise and crop combinations. Similar emphasis was made by Jayanthi *et al*. (3), and Kumar (4). The low level of input recycling as found in the study can be increased through generating technologies on the optimum proportion of livestock that could be maintained by the farming community under varied agro-climatic and socio-economic situations.

Adoption of diverse farming systems could provide livelihood to the farm families on sustainable basis. The study concluded that food security attained by a farm family could not necessarily ensure nutritional security. Similarly, the high employment generation of a particular farming system need not lead to high income generation. Farming system integrating horticulture component was found to ensure medium to high level of sustainable livelihood parameters. Formation of commodity specific self-help groups and developing rural infrastructure such as road, cold storage, pasture land and reclamation of water bodies through *Panchayati Raj* institutions would provide impetus to practice profitable and scientific enterprise combinations which will enhance the sustainable livelihood of farmers in rural areas. Hence, research and extension agencies need to give more focus for integrating horticulture component in the existing farming system for enhancing the nutritional, income and employment benefits of resource poor farm families.

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