Research Article

Indian Journal of Extension Education
Vol. 59, No. 1 (January–March), 2023, (101-106)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Sustainable Livelihood Security of Integrated Farming Systems Practicing Farmers through Different Enterprise Combinations in Andhra Pradesh

T. Sri Chandana[1]*, P. L. R. J. Praveena[2], T. Lakshmi[3], D. Subramanyam[4] and B. Ravindra Reddy[5]

[1]Ph.D. Student, [2]Professor & Head, [3]Professor, [4]Principal and [5]Project Officer, Department of Agricultural Extension, S.V. Agricultural College, Tirupati-517502, ANGRAU, Andhra Pradesh, India
*Corresponding author email id: talarisrichandana39@gmail.com

ARTICLE INFO

Keywords: Integrated farming system, Enterprise combinations, Livelihood security, Farmers and Sustainability

http://doi.org/10.48165/IJEE.2023.59121

Conflict of Interest: None

ABSTRACT

The present study described the sustainable livelihood security of integrated farming systems practicing 189 farmers through different enterprise combinations in Chittoor district of Rayalaseema region, East Godavari from Coastal region and Srikakulam from North Coastal region during 2020-21. Indicators under each dimension of sustainable livelihood security were selected by item analysis. Out of 52 indicators, finally 25 indicators of sustainable livelihood security were selected based on relevancy weightage and mean relevancy score. The results revealed that majority of the farmers practicing Integrated Farming System had permanent asset creation (54.50%), food and nutritional security (53.97%), economic security (53.97%), input recycling (52.38%), occupational security (51.32%), financial security (50.79%), environmental security (47.09%) and social security (42.33%). The overall sustainable livelihood security index was nearly half (47.62%) among the farmers in medium category. Most of the farmers were having medium and high sustainable livelihood security due to integration of more enterprises which enabled optimum utilization of available resources through recycling resulting in more income, employment, and more food security throughout the year.

INTRODUCTION

Integrated farming is a sustainable and effective tool for improving rural economy due to its cumulative cost effectiveness, low investment and higher profitability. It optimizes the farm productivity per unit area through incorporation of recycling wastes and residues from one farming system to the other with due environmental consideration. Indian farming community is dominated by small and marginal farmers and hence Integrated Farming System (IFS) approach has been identified as the way-out for providing income and employment to the millions farmers and farm women engaged in agriculture sector. It has immense potential to ensure livelihood as well as income security to the persons engaged through any component of IFS (Minakshi et al., 2019). The efforts of late has been to develop an integrated approach which uses optimum levels of the suitable enterprises to yield maximum possible net income (Puste et al., 2013) which is stable as well. Integrated farming system can enhance the productivity and profitability of prevailing farming systems by proper integration of additional enterprises to ensure livelihood security of marginal and small farmers and simultaneously securing agricultural sustainability and eco-friendly environment. Different farming systems have been developed and being practiced by the farmers indigenously without any rationale for utilizing the residues arising out of cropping /animals raising and other associated enterprises at farm. The income from average farmers from cropping alone is hardly sufficient to sustain their family. social impacts like care about workers health, safety and welfare also be the part of any sustainable system (Nain et al., 32020). Hence the present study was undertaken with an objective to study the sustainable

Received 11-09-2022; Accepted 26-12-2022

livelihood security of integrated farming systems practicing farmers through different enterprise combinations.

METHODOLOGY

Predominant IFS models pertaining to each of the three regions which were being followed by most of the farmers were selected based on secondary data available with Department of Agriculture. One district from each region i.e. Chittoor, East Godavari and Srikakulam from Rayalaseema, Coastal and North Coastal regions respectively were selected purposively for the study based on the highest number of farmers practicing the selected IFS models. Three mandals from each of the districts were selected purposively for the study based on highest number of farmers practicing the selected IFS models making a total of nine mandals. Three villages from each of the three selected mandals were selected by following simple random sampling procedure thus making a total of 27 villages. From each of the selected villages, seven farmers who were practicing IFS for more than five years were selected purposively thus, the sample constituted to a total of 189 farmers. The number of farmers practicing IFS in each of the selected villages was listed out in consultation with Department of Agriculture. From enlisted farmers uniform sample of seven farmers practicing similar predominant IFS models were randomly selected from each of the villages to ensure precise data. The data was collected through a structured comprehensive interview schedule and analyzed using cumulative square root frequency method for drawing meaningful interpretations.

To design the comprehensive interview schedule an index of sustainable livelihood security was constructed following the standard procedures including: Selection of dimensions, Measurement of dimensions of sustainable livelihood security, Selection of indicators and Computation of the index.

The sustainable livelihood security has multidimensional aspects. It includes environmental security, permanent asset creation, food and nutritional security, input recycling, economic security, financial security, occupational security and social security. Therefore, it was important to select dimensions, which were representative indicators of all these sectors of human life. The availability of authenticated literature and through discussion with experts in relevant field played an important role in the identification of these dimensions. Each of the dimensions was operationally defined for its quantification and the measurement was done as below:

$$I_i = \frac{\text{Obtained score}}{\text{Maximum obtainable score}} \times 100$$

where, i= (A, B,.…H) dimensions

Indicators under each dimension of sustainable livelihood security were selected by refining the available literature on relevant subject. Finally, 52 indicators were retained after editing and considered for judge's rating. Item analysis is an important step while constructing valid and reliable index. In item analysis using criteria the indicators having relevancy weightage (RW) >0.85 and mean relevancy score (MRS) > 2.56 were considered for including in the sustainable livelihood security index. The items were prepared under each indicator of sustainable livelihood security for final data collection from the farmers. The final 25 selected indicators (items) of sustainable livelihood security and their respective relevancy weightage and mean relevancy score shown in Table 1.

After arriving index scores of all the eight dimensions of sustainable livelihood security, the overall index score of sustainable livelihood security was calculated by using the formula:

$$\text{Sustainable Livelihood Security Score (I)} = \frac{A+B+C+D+E+F+G+H}{8}$$

Where, A = Environmental Security, B = Permanent asset creation, C = Food and nutritional security, D = Input recycling, E = Economic security, F = Financial security, G = Occupational security and H = Social security. The final standardized index measuring the Sustainable Livelihood Security of the farmers practicing IFS was used for the present investigation. The sustainable livelihood security scores ranges from 0-100.

RESULTS AND DISCUSSION

Sustainable livelihood security of farmers practicing integrated farming systems through different enterprise combinations was analyzed by taking distribution of the respondents based on sustainable livelihood security dimensions and its indicators and the results were represented in the Table 2. In case of environmental security**,** more than two fifth (47.09%) of the IFS farmers had medium environmental security. Environmental security indicators like access to natural resources *i.e.* water, eco-friendly farming practices and protection from natural calamities *i.e.* floods and droughts have been explored. The findings indicated that majority of the farmers had medium environmental security. Owing to their experience and motive of earning profits, the IFS farmers were rationale in utilizing the resources, adopted some of the eco-friendly practices like recycling farm and animal waste, INM, soil and water conservation techniques. This might be the reason for majority of the IFS farmers having medium level of environmental security. The findings further throw light on the need of creating awareness among the IFS farmers on resource management and practicing eco-friendly practices. The results were in conformity with those of Sudhanand (2017) who reported that majority (43.06%) of the respondents were having moderate environmental sustainability.

With regard to permanent asset creation, 54.50 per cent of the IFS farmers had low permanent asset creation. Assets were the symbols of growth and development. It solely depends on their economic standards. The utility of such assets meet the domestic needs of farmers. Majority of the farmers were medium land holders who had difficulty in investing huge amount on assets like bore wells, tractors, chaff cutters etc. Due to their financial status, they could invest on assets like sprayers, construction of temporary structures for storing farm produce and for providing shelter to animals. Further, from the findings, it was observed that the farmers with sheep and poultry as major components had relatively low investment capacity. This might be the reason for majority of the farmers having low asset creation. The findings draw support

Table 1. Selected of indicators/ items based on relevancy test

S.No.	Indicators	RW	MRS
A.	Environmental Security		
1.	Exposure to environmental hazards*	0.96	2.90
2.	Extent of adoption of eco-friendly practices*	0.93	2.80
3.	Access to natural resources*	0.92	2.76
4.	Conservation of natural resources	0.78	2.36
5.	Quality of final products	0.68	2.06
6.	Reduction in the use of external inputs	0.81	2.43
7.	Conservation of biodiversity	0.78	2.36
8.	Conservation of ecosystem	0.77	2.33
B.	Permanent asset creation		
9.	Income to invest on assets*	0.93	2.80
10.	Assets to perform agricultural operations*	0.92	2.76
11.	Assets pertaining to livestock and other agriculture allied enterprises	0.81	2.43
12.	Assets for hiring purpose to other farmers*	0.95	2.86
13.	Bank subsidies and loans to farmers*	0.94	2.83
14.	Awareness about new or improved implements/machinery by the farmers	0.81	2.43
15.	Maintenance of implements/machinery	0.73	2.20
C.	Food and Nutritional security		
16.	Extent of food availability*	0.95	2.86
17.	Extent of food accessibility*	0.93	2.80
18.	Extent of food affordability*	0.92	2.76
19.	Extent of food quality*	0.95	2.86
20.	Consumption of nutritive food	0.74	2.23
21.	Stability in food consumption	0.80	2.40
22.	Malnutrition problems	0.74	2.23
D.	Input recycling		
23.	Recycling of by-products in different enterprises*	0.92	2.76
24.	Awareness about recycling between enterprises	0.82	2.46
25.	By products produced in different enterprises*	0.93	2.80
26.	Maximum enterprises where the by product used as input to other enterprises*	0.94	2.83
27.	Frequency of by products used as input to other enterprises*	0.94	2.83
28.	Establishment of biogas unit	0.77	2.33
29.	Production of organic manures	0.81	2.43
E.	Economic security		
30.	Income from different enterprises of IFS*	0.93	2.80
31.	Annual income from other sources*	0.93	2.80
32.	Income generating activities value addition and processing	0.78	2.36
33.	Possession of high milk yielding animals / superior breeds of poultry birds	0.80	2.40
34.	Leasing of farm machinery to other farmers	0.84	2.53
F.	Financial security		
35.	Savings*	0.95	2.86
36.	Access to credit and farm subsidies	0.81	2.43
37.	Access to markets	0.76	2.30
38.	Indebtedness*	0.90	2.70
39.	Insurance*	0.95	2.86
G.	Occupational security		
40.	Stability and security of work*	0.93	2.80
41.	Employment status of family and hired*	0.94	2.83
42.	Equal opportunity and treatment in employment	0.78	2.36
43.	Safe work environment	0.84	2.53
H.	Social security		
44.	Trust and solidarity*	0.94	2.83
45.	Membership and participation in social groups*	0.90	2.70
46.	Family education status	0.75	2.26
47.	Trainings received*	0.91	2.73
48.	Food self sufficiency	0.80	2.40
49.	Awareness about socio-economic development programmes	0.74	2.23
50.	Equality in income and food distribution	0.77	2.33
51.	Access to resources and support services	0.77	2.33
52.	Frequency of urban contact	0.66	2.00

*Selected indicators

Table 2. Dimensions and indicators of sustainable livelihood security

S.No	Category	Integrated Farming Systems						Total
		Rayalaseema		Coastal		North-Coastal		
		A+D+H	A+D+Se	A+D+P	A+D+P+Pl	A+D+H+S	A+D+Pl+S	
Environmental security								
1.	Low environmental security (<71)	9 (4.76%)	6 (3.17%)	15 (7.94%)	18 (9.52%)	10 (5.29%)	13 (6.88%)	71 (37.57%)
2.	Medium environmental security (71-81)	17 (8.99%)	22 (11.64%)	9 (4.76%)	10 (5.29%)	16 (8.47%)	15 (7.94%)	89 (47.09%)
3.	High environmental security (>81)	5 (2.65%)	4 (2.12%)	7 (3.70%)	4 (2.12%)	5 (2.65%)	4 (2.12%)	29 (15.34%)
Permanent asset creation								
1.	LowPermanent asset creation (<47)	17 (8.99%)	16 (8.47%)	15 (7.94%)	20 (10.58%)	18 (9.52%)	17 (8.99%)	103 (54.50%)
2.	Medium Permanent asset creation (47-58)	10 (5.29%)	7 (3.70%)	11 (5.82%)	7 (3.70%)	11 (5.82%)	10 (5.29%)	56 (29.63%)
3.	High Permanent asset creation (>58)	4 (2.12%)	9 (4.76%)	5 (2.65%)	5 (2.65%)	2 (1.06%)	5 (2.65%)	30 (15.87%)
Food and Nutritional Security								
1.	Low Food and Nutritional security (<49)	7 (3.70%)	10 (5.29%)	5 (2.65%)	3 (1.59%)	3 (1.59%)	4 (2.12%)	32 (16.93%)
2.	Medium Food and Nutritional security (49-57)	10 (5.29%)	15 (7.94%)	15 (7.94%)	17 (8.99%)	23 (12.17%)	22 (11.64%)	102 (53.97%)
3.	High Food and Nutritional security (>57)	14 (7.41%)	7 (3.70%)	11 (5.82%)	12 (6.35%)	5 (2.65%)	6 (3.17%)	55 (29.10%)
Input Recycling								
1.	Low Input recycling (<67)	9 (4.76%)	7 (3.70%)	10 (5.29%)	3 (1.59%)	6 (3.17 %)	3 (1.59%)	38 (20.11%)
2.	Medium Input recycling(67-84)	10 (5.29%)	23 (12.17%)	14 (7.41%)	19 (10.05%)	10 (5.29%)	23 (12.17%)	99 (52.38%)
3.	High Input recycling (>84)	12 (6.35 %)	2 (1.06%)	7 (3.70%)	10 (5.29%)	15 (7.94 %)	6 (3.17 %)	52 (27.51%)
Economic Security								
1.	Low Economic security (<39)	10 (5.29%)	10 (5.29%)	8 (4.23%)	6 (3.17%)	10 (5.29%)	7 (3.70%)	51 (26.98%)
2.	Medium Economic security (39-64)	16 (8.47%)	15 (7.94%)	14 (7.41%)	19 (10.05%)	18 (9.52%)	20 (10.58%)	102 (53.97%)
3.	High Economic security (>64)	5 (2.65%)	7 (3.70%)	9 (4.76%)	7 (3.70%)	4 (2.12%)	4 (2.12%)	36 (19.05%)
Financial Security								
1.	Low financial security (<75)	1(0.53%)	5(2.65%)	3(1.59 %)	5(2.65%)	7(3.70%)	4(2.12%)	25 (13.23%)
2.	Medium financial security (75-88)	27 (14.29%)	12 (6.35%)	11 (5.82%)	12 (6.35%)	14 (7.41%)	20 (10.58%)	96 (50.79%)
3.	High financial security (>88)	3 (1.59 %)	15 (7.94%)	17 (8.99%)	15 (7.94%)	10 (5.29 %)	8 (4.23%)	68 (35.98%)
Occupational Security								
1.	Low occupational security (<49)	3 (1.59%)	4 (2.12%)	8 (4.23%)	7 (3.70 %)	6 (3.17%)	4 (2.12%)	32 (16.93%)
2.	Medium occupational security (49-55)	9 (4.76%)	11 (5.82%)	10 (5.29 %)	9 (4.76%)	10 (5.29 %)	11 (5.82%)	60 (31.75%)
3.	High occupational Security (>55)	19 (10.05%)	17 (8.99%)	13 (6.88%)	16 (8.47 %)	15 (7.94%)	17 (8.99%)	97 (51.32%)
Social Security								
1.	Low social security (<67)	11 (5.82%)	6 (3.17%)	8 (4.23%)	6 (3.17%)	5 (2.65%)	5 (2.65%)	41 (21.69%)
2.	Medium social security (67-83)	12 (6.35%)	11 (5.82%)	13 (6.88%)	20 (10.58%)	14 (7.41%)	10 (5.29%)	80 (42.33%)
3.	High social security (>83)	8 (4.23%)	15 (7.94%)	10 (5.29%)	6 (3.17%)	12 (6.35%)	17 (8.99%)	68 (35.98%)
Sustainable Livelihood Security								
1.	Low Sustainable Livelihood Security (<61)	7 (3.70%)	11 (5.82%)	8 (4.23%)	4 (2.12%)	5 (2.65%)	8 (4.23%)	43 (22.75%)
2.	Medium Sustainable Livelihood Security (61-67)	21 (11.11%)	20 (10.58%)	20 (10.58%)	12 (6.35%)	7 (3.70%)	10 (5.29%)	90 (47.62%)
3.	High Sustainable Livelihood Security (>67)	3 (1.59%)	1 (0.53%)	3 (1.59%)	16 (8.47%)	19 (10.05%)	14 (7.41%)	56 (29.63%)
	Total	31	32	31	32	31	32	189 (100.00%)

A= Agriculture, D=Dairy, H=Horticulture, Se= Sericulture, P=Poultry, Pl=Plantation, S=Sheep

with the studies of Ponnusamy (2006) & Ponnusamy et al., (2015); Gills et al., (2021).

In case of food and nutritional security, 53.97 per cent of the IFS farmers had medium food and nutritional security followed by high (29.10%) and low (16.93%) food and nutritional security. Food and nutritional security is the yardstick to measure the basic livelihood of a farmer. Per capita consumption and dietary pattern depends on their livelihood earnings and awareness on the nutritional status coupled with the requirement of different food items. Majority of the farmers might be poor in such knowledge as well as the income standards to take recommended food requirements. Hence, the integrated farming system could be great option to provide food security to small and marginal farmers in the future. The systems having horticulture, dairy, sheep and poultry had higher food security as compared to other systems. The integration of more enterprises in IFS resulted in more food security because of diversity in food basket and fulfilling their dietary requirements. It was understood that a farmer while cultivating food crops, horticultural crops and rearing animals needs to purchase only few items from market for their consumption. The results showed that livestock based integrated farming system were more food secured. The integration of crop and livestock based integrated farming increased food availability and accessibility of the farmers which made them food secure and reduced dependency on market. This result was in agreement with Begum et al., (2016) & Kowsalya (2017).

More than half (52.38%) of the IFS farmers had medium input recycling followed by high (27.51%) and low (20.11%) input recycling. Closer integration of different components in farming system enables recycling of energy and nutrients within the system. It was observed that farmers processed their produce and used for home consumption and thereby reducing the external expenditure. The chaffy grains and other wastes obtained at the time of harvesting and threshing of crops were also used as manure and as feed to the livestock. Small land holdings and lack of sufficient irrigation facilities prohibit farmers to produce sufficient feed and fodder. It was also observed that A+D+H and A+D+H+S system had high input recycling, in which paddy straw and groundnut wastes was used as fodder while animal dung, horticulture wastes and sheep droppings were used as manure. In A+D+Se and A+D+Pl+S systems, paddy straw, groundnut wastes were used as fodder while animal dung and sheep droppings were used as manure for mulberry and cashew crops. In all systems, each component by products was effectively utilized as input for other components by the farmers which depicted that farmers had knowledge about recycling among the enterprises. The results were in conformity with those of Ponnusamy and Devi (2017) who reported that majority (42.67%) of the respondents had recycled the inputs to a medium extent.

More than half (53.97%) of the IFS farmers had medium economic security. Earning required income to meet the basic needs of a family is one of the challenging tasks for farmers. To achieve the target, they might be seeking for different avenues so as to raise the income. The income generation was more due to livestock component and there was steady flow of income for farmers which made them economically secure. In the study area, in case of farmers with large land holdings, yield and price of the produce made them economically secure. In A+D+Se system, sericulture requires less space and expenses were also less and price of cocoons were remunerative. Hence, the farmers earned good income due to integration of different farm operations. The additional income can be generated and reduced migration by practicing different enterprise combinations based on farmer's capability and resource availability. Irrespective of farming systems, the farming system with more enterprise combination generated more income as compared to the farming systems with less enterprise combination. Hence, the economic security was medium for most of the farmers. This result was not in conformity with findings of Shivaji et al. (2018).

The results revealed that, half (50.79%) of the IFS farmers had medium financial security. Dairy component was common among all enterprise combinations and most of the farmers had livestock insurance for dairy component. In A+D+Se system, sericulture farmers were provided with subsidy by the government for establishment of enterprise. Most of the farmers were financially secure as the farmers were saving the income for future establishment of their enterprises. Farmers were also availing crop loans from banks for farm operations. Due to income flow round the year and financial support from banks, the farmers were able to perform the farm operations in effective manner. This might be the reason for most of the IFS farmers having medium to high financial security. This result was not in conformity with findings of Malsawmdawngliana & Rahman (2016). In case of occupational security, 51.32 per cent of the IFS farmers had high occupational security. The systems with livestock and sheep components generated more employment days in all the systems. In general vegetable and fruit crops provided regular employment for the farm family even in small piece of land. More number of enterprises in any of the farming system definitely adds for generating additional employment as compared to the farming systems with less enterprise combination. Hence, most of the IFS farmers had high to medium occupational security. This result was in agreement with Ponnusamy et al., (2015); Shivaji et al., (2018) & Minakshi et al., (2019).

With regard to social security, 42.33 per cent of the IFS farmers had medium social security. It is evident that in A+D+H+S and A+D+Pl+S systems, the farmers had high level of social security. This might be due to fact that farmers had trust and solidarity on each other in the society, membership and more extent of participation in social groups and attended more number of trainings on various aspects which might have motivated the farmers to have more participation and also to get the benefits of developmental programmes as well as to earn more income in order to bring change in standard of living. To make livelihood security stronger, secured and sustainable, proper training should given to farmer regarding farming practices through which they can derive their income to meet their household needs. The present finding is in line with the research work of Sabyasachi et al., (2021). Moreover, the farmers were in good contacts with extension personnel for information as well as for availing the schemes. Hence, most of the IFS farmers had medium to high level of social security.

An overview of data indicated that, nearly half (47.62%) of the IFS farmers had medium sustainable livelihood security followed by high (29.63%) and low (22.75%) levels of sustainable livelihood security. Livelihood is the means for survival of farmers. It is apparent from the data that majority of the farmers in A+D+P+Pl, A+D+H+S and A+D+Pl+S systems had high sustainable livelihood security. This might be due to integration of more enterprises which enabled optimum utilization of available resources through recycling resulting in more income, employment, and more food security throughout the year. Most of the farmers were having medium and high sustainable livelihood security due to integration of different enterprises in a viable manner. The enterprises not only generated sustainable income but also provided employment and required fewer inputs. Thus, the results clearly indicate that the enterprise combination plays a major role in contributing towards livelihood security. Enterprises like horticulture and poultry have made farmers self-sufficient in food, nutritional security and generated employment in village itself for increase income. Along with the benefits of sustainability and livelihood security, IFS also helps to mitigate the risks associated with mono cropping system. This has led for overall development of socio economic condition and livelihood security of farmers and his family. This result was in agreement with Rejula et al., (2017); Vani & Ritu (2022).

CONCLUSION

It can be concluded that due to the successful integration of various enterprises, the majority of IFS farmers were in the medium level category for the majority of the indicators chosen. Integrated approaches can provide rural people, particularly small and marginal farmers, with a sustainable source of income. Improved technological demonstrations of crop, vegetable, poultry, and sheep farming can provide farmers with a good source of additional income. It is also possible to make efficient use of land and other resources. The enterprises not only generated long-term income, but also created jobs and required fewer inputs. Thus, the findings clearly show that the enterprise combination plays a significant role in contributing to sustainable livelihood security.

REFERENCES

Begum, R. A., Miah, M. A. M., Rahman, M. Z., & Sarker, M. A. (2016). Effect of integrated farming system in changing household food security of farmers in a *Haor* area. *Bangladesh Journal of Extension Education, 28*(1&2), 83-90.

Gills, R., Singh, R., & Nain, M. S. (2021). Sustainability and Organic Farming – A Case of Organic Cardamom (*Elettaria cardamomum*) Growers in Kerala State of India. *Indian Journal of Extension Education, 57*(1), 8-14.

Kowsalya, K. S. (2017). Impact of integrated farming system demonstration (IFSD) programme on livelihood and nutritional security of farmers of Mandya District. Ph.D. Thesis, *University of Agricultural Sciences, Bengaluru.*

Malsawmdawngliana, R., & Rahman, S. (2016). Management practices followed by the dairy farmers of Mizoram, India. *Journal of Livestock Science, 7*, 220-225.

Minakshi, M., Khare, N. K., & Singh, S. R. K. (2019). Assessing Integrated Farming System Models Apropos Employment Generation Potential in Madhya Pradesh. *Indian Journal of Extension Education, 55*(3), 65-68.

Nain, M. S., Singh, R., & Mishra, J. R. (2020). Relevance of good agricultural practices in organic production systems. *Journal of Community Mobilization and Sustainable Development, 15*(2), 306-314. https://doi.org/10.5958/2231-6736.2020.00003

Ponnusamy, K. (2006). Multidimensional analysis of integrated farming system in the coastal agro-ecosystem of Tamil Nadu. Ph.D. Thesis. *National Dairy Research Institute, Karnal.*

Ponnusamy, K., & Devi, M. K. (2017). Impact of integrated farming system approach on doubling farmers income. *Agricultural Economics Research Review, 30 (Conference Number)*, pp 233-240.

Ponnusamy, K., Shukla, A. K., & Kishore, K. (2015). Studies on sustainable livelihood of farmers in horticulture-based farming systems. *Indian Journal of Horticulture, 72*(2), 285-288.

Puste, A. M., Tanuj, K. M., Dasgupta, M., & Maity, T. K. (2013). Productivity, profitability and livelihood improvement through integrated farming system for new alluvial zone of West Bengal. *Indian Journal of Agronomy, 58*(4), 451-458.

Rejula, K., Singh, R., & Nain, M. S. (2017). Rice farming for food security and ecological sustainability: An analysis of farmers' awareness in Kerala. *Indian Journal of Extension Education, 53*(4), 101-106.

Sabyasachi, P., Seema, N., Harikrishna, Y. V., & Venkteshwar, J. (2021). Socio-economic correlates of livelihood security of small farmers in Jabalpur district of Madhya Pradesh. *Indian Journal of Extension Education, 57*(3), 57-59.

Shivaji, A., Gopal, S., Senthilkumar, R., Meena, B. S., & Sagar, W. (2018). Assessing livelihood variation among smallholders practising Integrated Farming Systems in tribal areas of Maharashtra. *Asian Journal of Extension Education, 36*, 151-164.

Sudhanand, P. L. (2017). Critical appraisal of farmer's mental health Vis-a-vis agricultural sustainability in green Revolution belt of India, M.Sc. (Ag.) Thesis, *National Dairy Research Institute, Karnal.*

Vani, C., & Ritu, C. (2022). Extent of adoption of available components in the IFS units of Kerala. *Indian Journal of Extension Education, 58*(4), 130-133.