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RESEARCH ARTICLE

The role of farmer producer organizations in enhancing livelihood security: Evidence from Tamil Nadu

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Abstract

In India, small and marginal farmers have been affected by agricultural production concerns. Several organizational prototypes are emerging that integrate them into the value chain, with the goal of increasing income and decreasing transaction costs. Farmer producer organizations (FPOs) are one of the most essential. The present study was carried out in Tamil Nadu's southern districts, namely Ramnad, Theni, Virudhunagar, Madurai, Sivagangai, Thanjavur, Trichy and Pudukottai. An ex-post facto research design was utilized to analyze the livelihood security of FPO members and non-members. The survey included five districts with a total of 600 FPO members and 300 non-members. This study compares the household livelihood security (HLS) of FPO members and non-members across four domains, including education, food, health and economic security. Farmer producer organization members show higher security in all areas, with a group index of 0.652 for education, 0.707 for food, 0.723 for health and 0.750 for economic security. The composite security index for FPO members is 0.701, indicating medium security, compared to 0.6566 for non-members. These findings highlight the benefits of FPO membership in improving access to resources, support systems and overall livelihood security. These findings align with several sustainable development goals (SDGs), including SDG 1 (no poverty), SDG 2 (zero hunger), SDG 3 (good health and well-being), SDG 4 (quality education), SDG 8 (decent work and economic growth), SDG 10 (reduced inequalities) and SDG 12 (responsible consumption and production), highlighting the potential of FPOs in enhancing livelihood security and contributing to sustainable agricultural development.

Keywords: composite livelihood security index; farmer producer organisation; livelihood security; sustainable development goals

Introduction

According to the 2011 agricultural census Government of India (GoI), India had about 138 million farm holdings. Approximately 92.8 million of them were marginal farm holdings, with individual operational land holdings of less than 1 hectare, while another 24.8 million were small farm holdings, with individual operational and holding sizes ranging from 1 to 2 hectares. As a result, marginal and small farm holdings together accounted for 85.0 % of all farm holdings in India in 2010-11. The country has approximately 92 million small holdings, accounting for nearly 21 % of the World's total of 450 million, making it the second largest after China (1). Although smallholder agriculture is argued to be important for economic development and poverty reduction in developing countries, its growth is hampered by the need for institutional innovations to overcome market failures (2).

Sustainable livelihood as one that "can cope with and recover from stress and shocks, maintain its capability and assets and provide sustainable livelihood opportunities for the next generation..." (3). Unfortunately, not all homes have the same ability to deal with stress and frequent shocks. Poor people face difficult trade-offs between asset preservation, income production and current and future food supplies (4-6). FPOs are thought to improve farmers' livelihoods by collecting payments for inputs and offering forward linkage. To better understand the livelihood security of FPO members and non-members, a survey of 18 FPOs was conducted. It was discovered that the majority of FPOs are involved in input supply, followed by product aggregation. FPOs with more innovative operations had higher turnover and net profit (7).

A livelihood is typically defined as a series of economic activities that enable a household to cover its necessities while also earning some revenue. When done on a regular basis, these might become a "way of life". The great majority of people earn a living in the informal sector, either through self-employment or wage work (8, 9). In a larger sense, livelihood refers to people, their capacities and means of subsistence, such as food, income and possessions. Income and storage are tangible assets, whereas claims and access are intangible (10). Sustainable livelihoods should be both environmentally and socially responsible. Farmers' livelihoods in India rely heavily on agriculture and related activities, while agriculture is dependent on land, water, agricultural inputs, loans, markets, government regulations and knowledge (11, 12).

FPO was founded with the goal of organizing farmers, particularly small producers, at various levels throughout numerous states in order to promote technology penetration, increase production and improve access to inputs and services and enhance farmer earnings, ultimately strengthening their long -term agricultural livelihoods (13-15). FPOs are promoted by various agencies, such as National Bank for Agriculture and Rural Development (NABARD) and Small Farmers' Agribusiness Consortium (SFAC) are playing lead role with maximum number of FPOs promoted by them. Several state governments are also promoting FPOs. FPOs have been promoted under national cooperative development corporation (NCDC) and national rural livelihood mission (NRLM). The objective of this study is to analyse the livelihood security of farmers in FPO and comparing with non-members in selected districts of Tamil Nadu.

Materials and Methods

The study was conducted in the southern zone of Tamil Nadu, specifically in Ramnad, Theni, Virudhunagar, Madurai, Sivagangai, Trichy, Thanjavur and Pudukottai. A purposive sampling method was adopted for selection of respondents. These districts were selected for their agricultural significance and active presence of FPOs. Table 1 shows the FPO selected based on authorised share capital. The selection of FPOs based on their authorized share capital helps determine the level of resources and support needed to assist these organizations in their growth and development (20).

This resulted in a total sample size of 900 farmers, comprising 600 FPO members and 300 non-members. Data was collected using a structured questionnaire, focusing on socioeconomic factors, market access, production practices, income levels and impact of FPO membership on overall welfare.

The household livelihood security index (HLS) uses a balanced weighted average approach with a large number of indicators, where each indicator assumed to contribute equally to the overall index. The indicators are grouped into different domains representing the security areas such as economic, education, food and health security as shown in Table 2.

Economic security: It includes annual income earned, value of land, value of livestock and value of household farm assets and household savings.

Food security: It includes annual consumption expenditure and quantity consume.

Education security: It consists of number of years of schooling of adult males, number of years of schooling of females and number of years of schooling of children.

Health security: It comprises yearly expenditure on health problems and the availability of health care centers.

For instance, the following is a standardized indicator *j*:

$$Z\ ind\ j = \frac{Indicator\ j - \min j}{\max i - \min j}$$

The indicators' minimum and maximum values (max *j*, min *j*) came from the same household. The applicable household livelihood security index for the given domain was developed by averaging the standardized indicators after each indicator representing a different livelihood security domain was standardized:

$$HLS_j = \frac{\sum_{i=4}^{j} Z\ ind\ j}{j}$$

The household's composite livelihood security (CLS) index was calculated using the formula below:

$$CLS = \frac{\sum_{i=1}^{n} w_i\, HLS_i}{\sum_{i=1}^{n} w_i}$$

Where, w denotes the weights assigned to each HLS index based on the weights of indicators utilised to create it. The CLS index and the index of various indicators have been classified into three categories: low security (0.000-0.499), medium security (0.500-0.799) and high security (0.800-1.000). The UNDP's index development methodology was adopted; the study's index categorization criteria are almost identical to those used by UNDP to categories HDI (21). To compare the level of security for each indicator among all sample households, uniform categories have been created for all indices.

Table 1. No. of selected FPCs based on the amount of authorized share capital

Authorized share capital (Rs. in lakh)	Farmer producer organization	References
0-5	Malaikottai Paddy Farmers Producer Company Limited Agathiar Farmers Producer Company Limited Pudukkottai Organic Farmers Producer Company Limited	(16, 17)
6-10	Suranam Traditional Crop Producer Company Limited Usilampatti Farmers Producer Company Limited Manamadurai Farmers Producer Company Limited Thirunadu Collective Farming Producer Company Limited Ambuliaaru Agriculture Producer Company Limited Karambakudi Taluk Farmer Producer Company Limited Mullaiyaru Farmer Producer Company Limited	(18)
10 Above	Vagai Millets Farmers Producer Company Limited Chellampatti Jasmine And Millets Farmers Producer Company Limited Srirangam Banana Farmer Producer Company Limited Kalaiyarkovil Groundnut Farmers Producer Company Limited T. Vadipatti Farmer Producer Company Limited Mullipadi Farmer Producer Company Limited Thanjavur Kalanjia Jeevidam Producer Company Limited Orathanadu Farmer Producer Company Limited Rajaraja Cholan FPCL Mukkanicholai Agriculture Producer Company Limited	(5, 19)

Table 2. List of indicators used in estimation of livelihood security

S. No.	Dimensions/indicators	Scores
I.		**Education security**
1.	Literacy level of respondent	College = 5, Higher secondary = 4, Secondary = 3, Primary = 2, Illiterate = 1
2.	Type of schooling of respondent	Private = 4, Government = 3, School cum labour = 2, Labour = 1
3.	Literacy level of children	College = 4, Higher secondary = 3, Secondary = 2 Primary = 1
4.	Type of schooling of children	Private = 3, Government = 2, School cum labour = 1
II.		**Food security**
1.	Consumption frequency	Daily thrice = 4, Daily twice occasionally thrice = 3, Favouritism among children = 2, Favouritism among sex of children = 1
2.	Meat consumption frequency	Weekly = 4, Monthly = 3, Six months once = 2, No meat = 1
3.	Vegetables, fruits and milk consumption frequency	Daily = 4, Weekly = 3, Occasionally = 2, Rarely = 1
4.	Source of cereals	Own source = 5, Private shop = 4, Private and ration shop = 3, Ration shop = 2, Kind pursuits given as wages = 1
III.		**Health security**
1.	Access to health services	Private hospital = 3, Government hospital = 2, Traditional medicines = 1
2.	Water source	Own borewell + Water connection in house = 4, Water connection in house = 3, Common tap near house = 2, Hand pump or well within village = 1
3.	Sanitation	Toilet facility inhouse = 3, Public toilet = 2, Open land = 1
IV.		**Economic security**
1.	Ownership of house	Owned = 2, Rented = 1
2.	Type of house	Pucca house = 4, Tiled house (concrete) = 3, Tiled house (mud) = 2, Hut = 1
3.	Rooms available in house	4 rooms + kitchen = 5, 3 rooms + kitchen = 4, 2 rooms + kitchen = 3, single room + kitchen = 2, single room *cum* kitchen = 1
4.	Ownership of holdings	Own land = 2, No own land = 1
5.	Size of land holdings	> = 5 acre = 4, 2 to 4.9 acre = 3, <2 acre = 2, tenant = 1
6.	Irrigation type	Fully irrigated = 3, Partly irrigated and partly rainfed = 2, Only rainfed = 1
7.	Livestock	Only milch = 3, Both milch and draught = 2, Goat or sheep or poultry = 1
8.	Durable asset possession	Land = 5, House = 4, Livestock = 3, Vehicle = 2, Others = 1
9.	Value of durable assets	>Rs. 100000 = 3, Rs. 50000 to Rs. 100000 = 2, Rs. 10000 to Rs. 50000 = 1
10.	Source of income	On-farm = 4, Off-farm = 3, Non-farm = 2, Self-employed = 1
11.	Earnings/year	> = Rs. 100000 = 3, Rs. 75000 to Rs. 100000 = 2, Rs. 50000 to Rs. 75000 = 1
12.	Source of savings	Savings in bank + chit funds cash = 5, Chit funds + liquid cash = 4, Savings in bank alone = 3, Chit funds alone = 2, Liquid cash alone = 1
13.	Savings/year	Rs. 35000 to Rs. 50000 = 4, Rs. 20000 to Rs. 35000 = 3, Rs. 5000 to Rs. 20000 = 2, <Rs. 5000 = 1
14.	Source of borrowings	Banks = 3, SHG = 2, Unorganized sector alone = 1
15.	Debt borrowed	> = Rs. 100000 = 5, Rs. 50000 to Rs. 100000 = 4, Rs. 20000 to Rs. 50000 = 3, Rs. 10000 to Rs. 20000 = 2, < Rs. 10000 = 1
16.	Electricity	House having electricity = 2, Free electricity = 1
17.	Cooking fuel	Gas stove = 3, Kerosene stove = 2, Gas stove+ wood = 1

Table 3. Distribution of respondent according to their access of educational security (n = 900)

S. No.	Education security	Members		Non-members	
		Number	**Percent**	**Number**	**Percent**
	Literacy level of respondent				
1.	Low	263	43	129	43
	Medium	124	20	54	18
	High	213	35	117	39
	Total	600	100	300	100
	Type of schooling of respondent				
2.	Low	145	24	76	25
	Medium	260	43	151	50
	High	195	32	73	24
	Total	600	100	300	100
	Literacy level of children				
3.	Low	198	33	81	27
	Medium	199	33	116	39
	High	203	34	103	34
	Total	600	100	300	100
	Type of schooling of children				
4.	Low	116	19	70	23
	Medium	412	69	199	66
	High	73	12	31	11
	Total	600	100	300	100

Results and Discussion

Livelihood security is critical to the development and sustainability of FPOs, since it has a direct impact on the economic, social and environmental well-being of its members (22). FPOs improve economic stability by increasing access to markets, credit and technology, resulting in higher income and resilience. They also improve access to services like as healthcare, education and agricultural assistance, all of which contribute to household well-being. Furthermore, FPOs help to food security by supporting sustainable agriculture methods, assuring a consistent food supply for their members (23, 24).

HLS was calculated using an index that categorized households into low, medium and high security across four components such as education, health, food and economic security. The study compared the security levels of FPO members and non-members in the southern zone covering districts namely Ramnad, Sivagangai, Theni, Virudhunagar, Madurai, Thanjavur, Trichy and Pudukottai.

The data analysis reveals that both FPO members and non -members show a significant proportion of medium-level security in literacy and schooling, but FPO members tend to have an edge in educational outcomes as shown in Table 3. Specifically, 48 % of FPO members report medium literacy levels, slightly higher than the 47 % of non-members. Additionally, 43 % of FPO members have access to medium-level schooling, compared to 50 % of non-members. Both groups exhibit similar patterns, the subtle differences suggest that FPO members benefit from additional support structures, contributing to slightly improved educational outcomes. FPO membership has proven to enhance access to not only educational resources but also community support systems that foster both adult and child literacy (25).

FPO members benefit from holistic support, including adult literacy programs, workshops and community-driven initiatives that enhance both individual and family literacy. These initiatives not only improve adult literacy but also provide better educational resources for their children. FPOs foster ongoing learning, contributing to skill development and overall literacy improvements (26, 27). In contrast, non-members often lack access to such resources, hindering their educational advancement.

Children of FPO members show improved educational outcomes, with 69 % attending medium-level education schools, compared to 66 % of non-members' children. This reflects the broader positive impact of FPO membership on family and community education, especially in rural areas where educational opportunities are limited (28, 29). FPO membership provides families with the resources and support necessary for their children's academic success, ensuring long-term benefits in literacy, schooling and community development.

Research highlights that FPOs not only empower their members economically but also help reduce educational disparities in rural areas (30). By prioritizing both economic and educational growth, FPOs create a sustainable cycle of improvement that benefits current and future generations, underscoring their role in rural development and educational security (31). Food security, defined by availability, access, utilization and stability of food, is higher among FPO members compared to non-members (Table 4). This is evident in the frequency of food consumption, with FPO members enjoying more stable and frequent access to food.

FPOs enhance food security by improving access to agricultural resources, providing training on better farming techniques and securing better market prices for produce. These factors contribute to stable incomes, enabling members to consistently access diverse food (32). FPO members also benefit from collective purchasing power, bargaining strength and improved market opportunities, which support food security (33).

FPO members report higher consumption frequencies of vegetables, fruits and milk, indicating better access to a balanced diet. In contrast, non-members face more medium and low-frequency consumption, likely due to limited resources or financial instability. Economic stability provided by FPOs also offers greater resilience, with members accessing financial services and credit that ensure steady food purchases (34). Non-members lack these safety nets, leading to inconsistent food access.

Data shows that FPO members experience better food security across various categories. For example, 47 % of FPO members report medium food consumption and 29 % report high consumption, compared to 50 % and 27 % of non-

Table 4. Distribution of respondent according to their access of food security (n = 900)

S. No.	Food security	Members		Non-members	
		Number	Percent	Number	Percent
	Consumption frequency				
1.	Low	140	24	69	23
	Medium	284	47	151	50
	High	176	29	80	27
	Total	600	100	300	100
	Meat consumption frequency				
2.	Low	134	22	78	26
	Medium	295	49	137	46
	High	171	29	85	28
	Total	600	100	300	100
	Vegetables, fruits and milk consumption frequency				
3.	Low	128	21	69	23
	Medium	170	28	143	48
	High	302	50	88	29
	Total	600	100	300	100
	Source of cereals				
4.	Low	265	44	132	44
	Medium	164	27	52	17
	High	171	29	116	39
	Total	600	100	300	100

Table 5. Distribution of respondent according to their access of health security (n = 900)

S. No.	Health security	Members		Non-members	
		Number	Percent	Number	Percent
	Access to health services				
1.	Low	127	21	86	29
	Medium	285	48	133	44
	High	188	31	81	27
	Total	600	100	300	100
	Water source				
2.	Low	88	15	81	27
	Medium	272	45	138	46
	High	240	40	81	27
	Total	600	100	300	100
	Sanitation				
3.	Low	60	10	94	31
	Medium	155	26	72	24
	High	385	64	134	45
	Total	600	100	300	100

members. FPO members also have higher consumption of meat, vegetables, fruits and milk, with 50 % reporting high consumption in this category compared to 29 % of non-members (35). Additionally, FPO members have better access to cereals, with 39 % reporting high access compared to 17 % of non-members.

Among members, a higher proportion had high access to health services (31 %) compared to non-members (27 %) as shown in Table 5. In terms of water source, 40 % of members were in the high category, while only 27 % of non-members were. For sanitation, 64 % of members had high access, significantly more than the 45 % among non-members. Non-members had higher percentages in the low category across all indicators, indicating poorer access. Overall, FPO members had better access to health services, water and sanitation than non-members (36).

The data on economic security clearly highlights that FPO members tend to enjoy better economic security compared to non-members across several key indicators, such as ownership of house, type of house, livestock possession and access to durable assets (37). The advantage of FPO membership is primarily attributed to the collective benefits members receive, including improved financial stability, access to better resources and enhanced bargaining power (38). These collective benefits significantly improve the economic security of FPO members, providing them with more reliable and sustainable sources of income, better living conditions and greater access to credit, savings and durable assets.

One of the most significant indicators of economic security is ownership of house. FPO members are at an advantage here, with 66 % reporting a medium level of house ownership and 17 % having high ownership. In contrast, only 25 % of non-members report medium ownership and 57 % report high ownership as shown in Table 6. This suggests that FPO members generally have better access to resources that allow them to own better housing, likely due to enhanced income opportunities (39). By pooling resources and improving market access, FPOs help their members increase agricultural income, enabling them to invest in housing and other assets.

When looking at the type of house, the difference becomes even more pronounced. A striking 74 % of FPO members report having high-quality housing, compared to just 17 % of non-members. Non-members report higher percentages of medium (53 %) and low-quality housing (30 %). FPO members have better financial stability due to their membership, which allows them to invest in better living conditions (37). Additionally, FPOs often provide access to group savings, affordable credit and collective investment opportunities, which non-members lack.

The possession of livestock further exemplifies the economic advantage for FPO members. While 46 % of FPO members report medium livestock possession and 26 % report high possession, only 11 % of non-members report high livestock ownership, with 74 % reporting medium levels (34). Livestock is an important source of both income and food security for farmers. FPO members benefit from collective support such as shared knowledge on animal husbandry, access to veterinary services and collective purchasing of feed.

Durable asset possession is another key indicator of economic security. FPO members report higher possession of durable assets, with 44 % indicating high possession compared to just 49 % of non-members (36). Durable assets like farming equipment, machinery, or vehicles are essential for improving agricultural productivity and increasing income. FPOs enable members to access costly equipment by pooling resources or offering financial assistance.

Finally, the ability to generate and manage income and savings is another area where FPO members show significant advantages. A substantial 36 % of FPO members report high income sources, compared to 28 % of non-members and 48 % report high savings, compared to 46 % of non-members (37). This reflects the enhanced financial security that FPO members experience due to improved market access, better pricing and collective bargaining power.

The composite security index (CLS) further reinforces these findings, with FPO members recording higher scores across education (0.652), food (0.707), health (0.723) and economic security (0.750) compared to non-members (educational 0.6307, food 0.6244, health 0.6477, economic 0.7235) as shown in Fig. 1 & 2. These results confirm that FPO membership is crucial for improving farmers' socio-economic security and resilience (39).

Table 6. Distribution of respondent according to their access of economic security (n = 900)

S. No.	Economic security	Members		Non-members	
		Number	Percent	Number	Percent
	Ownership of house				
1.	Low	101	17	61	20
	Medium	397	66	75	25
	High	102	17	170	57
	Total	600	100	300	100
	Type of house				
2.	Low	67	11	90	30
	Medium	88	15	160	53
	High	445	74	50	17
	Total	600	100	300	100
	Rooms available in house				
3.	Low	21	3	72	24
	Medium	545	90	140	47
	High	35	7	88	29
	Total	600	100	300	100
	Ownership of holdings				
4.	Low	88	15	99	33
	Medium	230	38	140	47
	High	282	47	61	20
	Total	600	100	300	100
	Size of land holdings				
5.	Low	181	30	98	14
	Medium	170	28	139	74
	High	249	42	63	11
	Total	600	100	300	100
	Size of land holdings				
6.	Low	158	24	78	14
	Medium	238	34	124	74
	High	204	42	98	11
	Total	600	100	300	100
	Irrigation type				
7.	Low	178	29	92	31
	Medium	237	34	127	42
	High	185	36	81	27
	Total	600	100	300	100
	Livestock				
8.	Low	170	27	68	14
	Medium	281	46	178	74
	High	149	26	54	11
	Total	600	100	300	100
	Durable asset possession				
9.	Low	176	29	91	30
	Medium	213	28	62	21
	High	211	44	147	49
	Total	600	100	300	100
	Durable asset possession				
10.	Low	139	19	78	14
	Medium	278	46	124	74
	High	183	36	98	11
	Total	600	100	300	100

	Value of durable assets				
11.	Low	167	26	58	14
	Medium	223	30	156	74
	High	210	43	86	11
	Total	600	100	300	100
	Source of income				
12.	Low	54	9	84	28
	Medium	332	55	131	44
	High	214	36	85	28
	Total	600	100	300	100
	Source of savings				
13.	Low	149	25	97	32
	Medium	162	27	64	21
	High	289	48	139	46
	Total	600	100	300	100
	Source of borrowings				
14.	Low	134	22	107	36
	Medium	274	46	98	33
	High	192	32	95	32
	Total	600	100	300	100
	Electricity				
15.	Low	80	13	116	39
	Medium	259	43	93	31
	High	261	44	91	30
	Total	600	100	300	100

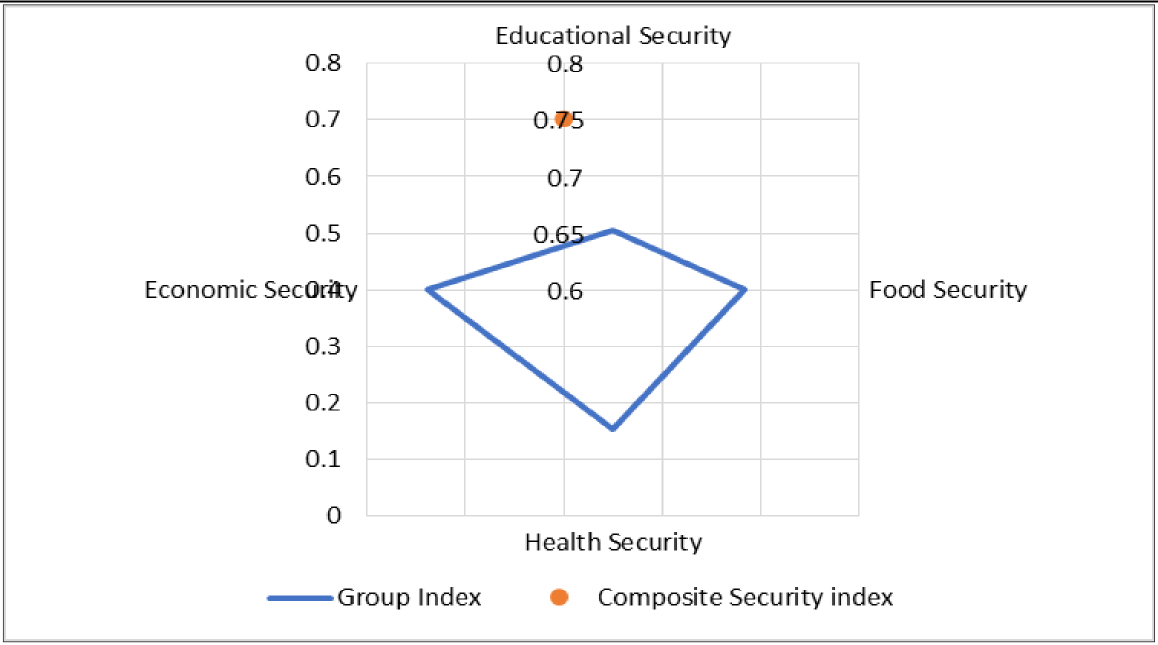

Fig. 1. Group and composite index of FPO members.

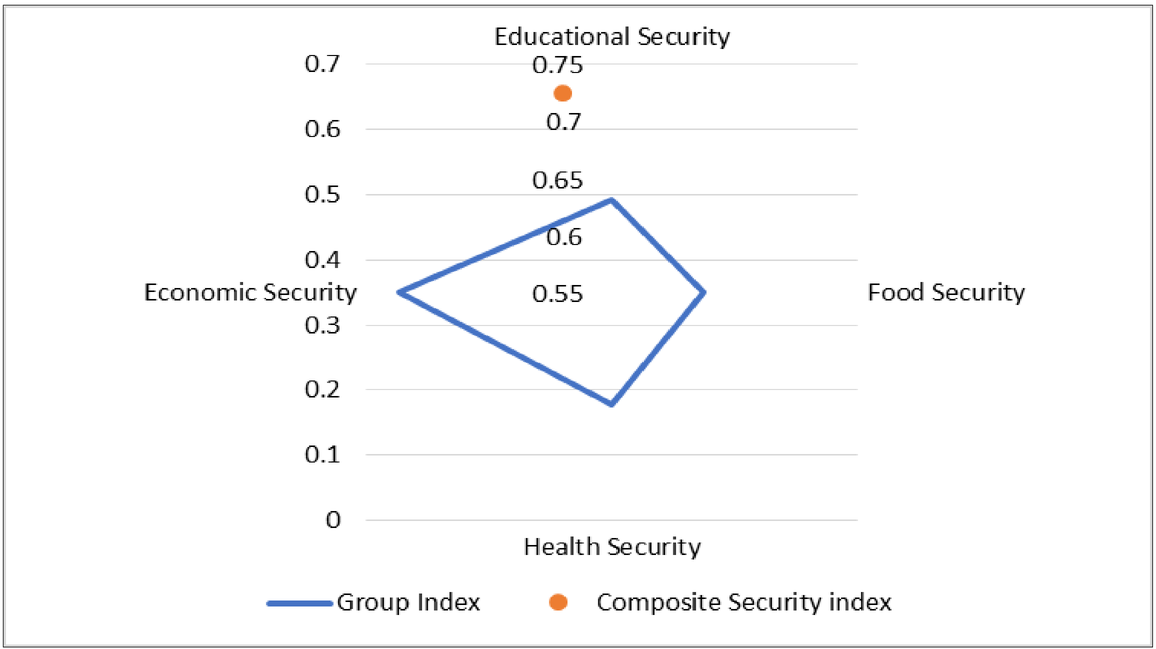

Fig. 2. Group and composite index of non-members.

Conclusion

In India, small and marginal farmers face significant challenges in agricultural production. Emerging organizational models, like farmer producer organizations (FPOs), aim to integrate farmers into the value chain, enhancing their income and reducing transaction costs. This study, conducted in Tamil Nadu's southern districts (Ramnad, Theni, Virudhunagar, Madurai, Sivagangai, Thanjavur, Trichy and Pudukottai), assessed the livelihood security of 600 FPO members and 300 non-members using an ex-post facto research design. The results showed that FPO members have higher household livelihood security (HLS) across education, food, health and economic domains. The group index for educational security for FPO members is 0.652, compared to 0.6307 for non-members. For food security, FPO members scored 0.707, while non-members had an index of 0.6244. Health security, FPO members scored 0.723, while non-members had a score of 0.647. Economic security, FPO members achieved a score of 0.750, while non-members scored 0.7235. The composite security index for FPO members is 0.701, indicating medium security, whereas non-members scored 0.6566, reflecting lower overall security. These results highlight the advantages of FPO membership in improving access to resources and enhancing overall livelihood security. Future research could focus on longitudinal studies to assess the sustained impact of FPO membership on livelihood security across diverse regions and crops. Investigating governance quality, gender participation, digitalization and value chain integration would provide deeper insights into factors driving FPO success. Additionally, examining policy effectiveness, financial sustainability and spillover effects on non-members can help strengthen FPO-based rural development strategies.

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Authors' contributions

AY designed the study framework and drafted the manuscript. AM participated in the article collection, contributed to the analysis of the results and assisted in drafting the manuscript. RM provided insights into the farmer producer organisation and helped with the literature review. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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