

EMPOWERING NEXT-GEN AGRICULTURE: RURAL YOUTH PARTICIPATION IN FARMER PRODUCER ORGANIZATION'S

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ABSTRACT

Young people have the potential to change the way agriculture is conducted with the use of technology; however, participation in agriculture is decreasing year after year because of the traditional, unsustainable and structural challenges of farming. However, the Farmer Producer Organisations (FPOs) overcome these constraints by bringing together small and marginal farmers, enhancing their livelihoods through collective action both in the upstream and downstream value chain. In light of the potential of FPOs to boost the GDP of India through the use of untapped potential of young people in Agriculture, this study aims to comprehensively review youth participation in FPOs and identify the socio-economic impacts and operation drivers that influence youth participation in the existing literature. To serve this purpose, the present study opted for systematic literature review along with bibliometric analysis. The major findings of the study reveals that India is found to be the country with highest scientific production where almost highest peak of 19 articles were published in 2024 and Indian Journal of Economics and Development is found to be the dominant most relevant source. Though, the publication starts from 2003 after formal institutionalizing of FPO in India by 2002, most of the studies were published after 2020 due to promotion activities carried by FPO. Further, future studies can assess the impact of youth participation on FPO leadership and effect of digital platform on the performance of FPO. Finally, it can be concluded that FPOs can be used as a tool to effectively collectivize farmers to adopt climate change mitigation strategies faster.

KEYWORDS: SWOC analysis, FPO, Young Farmers, Climate change mitigation strategies, India

INTRODUCTION

Rice India is often called a young nation, with more than two-thirds of its population comprising youth (Bhutia et al., 2017). As the farming population ages globally, involving young people in agriculture is essential for ensuring food security and economic growth. Recognizing their potential, the FAO describes youth as “key agents of change.” Nearly 70% of India’s population lives in rural areas, where agriculture, cottage industries, self-employment, and services contribute significantly to the country’s economy (Chakraborty et al., 2025). Agriculture and allied sectors remain the backbone of rural India, contributing about one-fifth of the country’s Gross Value Added (GVA) and providing employment to 46.1% of the workforce (FAO, 2025; Jayashree et al., 2023).

Despite its importance, youth participation in agriculture is declining. While over 44% of adolescents depend on agri-food systems for their livelihood, compared to only 5% of adults, the share of working youth engaged in agriculture has fallen from 54% in 2005 to 44% in 2025 in low-income countries (Juneja et al., 2025). Studies further suggest that integrating unemployed or disengaged youth into agriculture and agri-food systems could increase global GDP by 1.4% (Juneja & Gulati, 2025).

Youth involvement is crucial for transforming agriculture into a modern, sustainable, and profitable sector. Young farmers are generally more receptive to new technologies and innovations, helping accelerate technology transfer, improve supply chains, and strengthen market access. However, several challenges discourage their participation, including limited access to technology, poor-quality inputs, land fragmentation, pest and disease incidence, inadequate credit and extension services, rising input costs, low profitability, high production risks, and weak bargaining power (Paswan et al.; PIB, 2025; PIB, 2026).

Statement of the problem

To harness the untapped potential of young farmers and address the persistent challenges in agriculture, strong institutional mechanisms such as Farmer Producer Organisations (FPOs) have emerged. FPOs bring together small and marginal farmers, helping transform agriculture from a subsistence activity into a commercial enterprise through collective strength and improved forward and backward linkages (Paswan et al., 2022; Walia & Kaur, 2023). By providing a platform for collective action, FPOs reduce transaction costs, minimize price exploitation, and help overcome many limitations of traditional farming systems (Paswan et al., 2022; Joshi et al., 2026).

As a result, FPOs positively influence agricultural productivity, intensification, commercialization, and ultimately farmers’ income (Joshi et al., 2026). They also promote the adoption of improved practices such as soil health management

and efficient water use (Muvva), while encouraging rural youth to engage in agribusiness, digital technologies, entrepreneurship, and value-chain activities (Joshi et al., 2026).

Against this backdrop, the present study seeks to comprehensively examine rural youth engagement in FPOs by analysing participation trends, identifying the key drivers and barriers influencing their involvement, and assessing the socio-economic impacts of FPO participation on young farmers through a SWOC analysis of existing literature.

MATERIAL AND METHODS

This study employs a systematic literature review (Aria et al. 2017) with a bibliometric analysis method to determine the level of involvement of rural youth in FPO. This research design, to make sure that the literature is examined comprehensively, has a quantitative data and a qualitative synthesis. The bibliometric analysis provides a quantitative diagnosis of the publication context, highlighting studies that are heavily cited, prominent thought-leaders and major thematic changes (Passas 2024). This methodological approach is well suited to outlining the intellectual structures and research landscapes, and illustrates the long-term development of scientific knowledge production (Linnenluecke et al. 2020).

Database selection and search strategy

Reputed academic databased such as Web of sciences, Scopus and Google Scholar were used to gather primary data for the bibliometric mapping to ensure a robust inventory of rigorous, peer-reviewed literature. To capture a comprehensive set of relevant studies on rural youth participation in farmer producer organizations, the search string contains a combination of Boolean characters with appropriate keywords viz, “young farmers”, “participation”, “farmer producer organization”, “farmer producer companies”, “agricultural cooperative”, “farmer organizations”, “producer organizations” and “rural youth”.

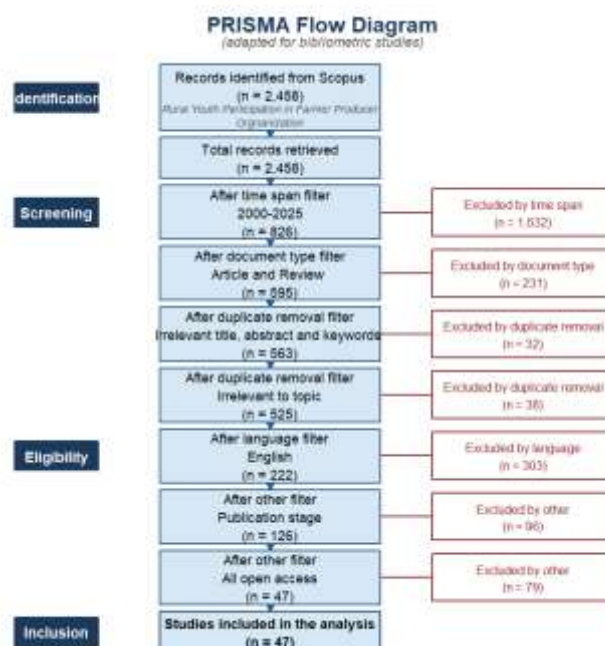
Inclusion and Exclusion criteria

The criteria for selecting articles were 2001-2025 (timespan), research and review articles (document type), English (language), Open access and published article were selected for the study. Whereas, the articles before and after the timespan, other than research and review article such as book chapters, conference proceedings (document type), non-English articles were excluded. The structured framework for evaluating studies is presented in Table.1.

Criteria	Inclusion	Exclusion
Identification		
Time span	2001-2025	<2001 & >2025
Document type	Research article, Review	Conference paper, Book chapters
Language	English	Non-English
Access	Open access	Gold, Hybrid Hold, Green, Bronze
Source	Journal	Conference proceedings, Book and Book chapters
Screening		
Title and Abstract	Relevant and pre-defined keywords in the titles and abstract	
Full text	Relevant studies that focus on pre-defined keywords and purpose of the study	

Screening and selection process

During baseline search of articles relevant to FPOs, a comprehensive literature dataset was initially retrieved. Further, this dataset was systematically filtered through an initial screening of titles and abstracts to filter out irrelevant studies. Subsequently, shortlisted records were subjected to a detailed full-text examination against the established inclusion criteria. This systematic extraction process was executed under the guidance of the PRISMA framework, with the precise step-by-step breakdown mapped in Figure 1.



Data Analysis

Thematic clusters and annual scientific production, as well as the most relevant sources, countries scientific production over time, the trending topics and the concurrence network, were identified through bibliometric analysis using software like VOS viewer version 1.6.20 and R studio (Bibliometrix) version of 4.6.0. With the use of those technologies, a complete quantitative overview of the previous literatures was obtained. In addition, an in-depth understanding was gained by conducting a systematic literature review for qualitative information related to the role of geospatial approach towards community forest management and environmental resilience.

RESULTS AND DISCUSSION

Annual Scientific Production

The annual scientific production on rural youth participation in Farmer Producer Organizations (FPOs) is presented in Fig. 2. The publication trend began in 2003, shortly after the introduction of the FPO concept in India under the Companies Act, 1956. Over the next two decades (2003–2022), research output remained limited, with only a few articles published annually. However, scientific production increased substantially from 2022 onwards, reaching a peak of approximately 19 publications in 2024, before declining to 11 articles in 2025.

The low publication output during the initial years suggests limited academic attention and specialization in this research area. This may also be attributed to the declining interest of rural youth in agriculture, as many prefer non-farm and white-collar employment opportunities. In contrast, growing awareness of youth engagement in agriculture, advancements in digital technologies, and the effects of the COVID-19 pandemic stimulated greater research interest, leading to a sharp rise in publications after 2022.

The apparent decline in publications during 2025 is likely due to the time lag between article publication and database indexing, a common limitation in annual bibliometric analyses. Furthermore, rural youth often participate in FPOs as informal labourers, technical service providers, or custom hiring operators rather than as registered farmer-members. Since many are not recorded as equity holders, their participation remains inadequately documented, limiting the availability of data and restricting further research in this area.

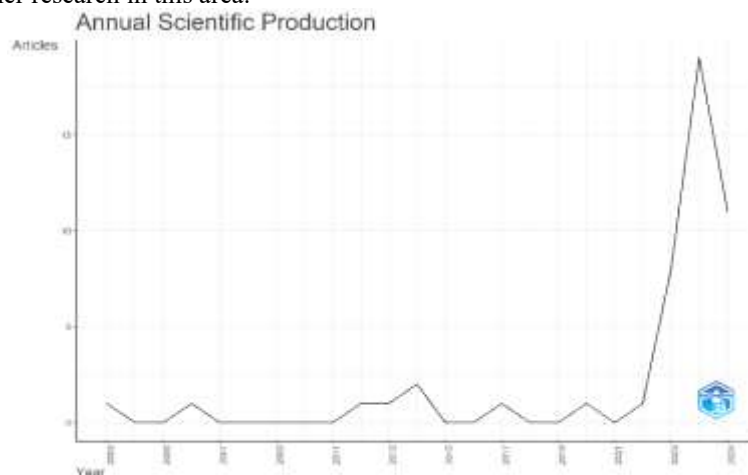


Fig.2. Annual Scientific Production of articles from 2000 to 2025 on rural youth participation on FPO

Most relevant sources

The most relevant publication sources on rural youth participation in Farmer Producer Organizations (FPOs) were identified using Biblioshiny in R Studio and are presented in Fig. 3. The analysis shows that the Indian Journal of Economics and Development is the leading source, contributing 10 articles to the dataset. The larger and darker node in the figure indicates its greater relevance to the study theme. This prominence may be attributed to the journal's focus on issues related to farmer empowerment, collective action, market participation, and economic development, which closely align with the objectives of FPOs.

The International Journal of Rural Management ranked second with three published articles. Other notable sources included Annals of Public and Co-operative Economics, Economic and Political Weekly, International Journal of Social Economics, Journal of Asian and African Studies, and Journal of International Food and Agribusiness Marketing, each contributing two articles. African Geographical Review and African Journal of Agricultural and Resource Economics contributed one article each. These journals publish studies that fall within their respective scopes related to rural development, agricultural economics, and farmer institutions.

The findings indicate that empirical research specifically focusing on rural youth participation in FPOs remains limited. This research gap may reflect practical challenges faced by rural youth within FPOs, including restricted land ownership, leadership dominance by older farmers, and organizational priorities that often emphasize landholding size and production performance over demographic inclusiveness.

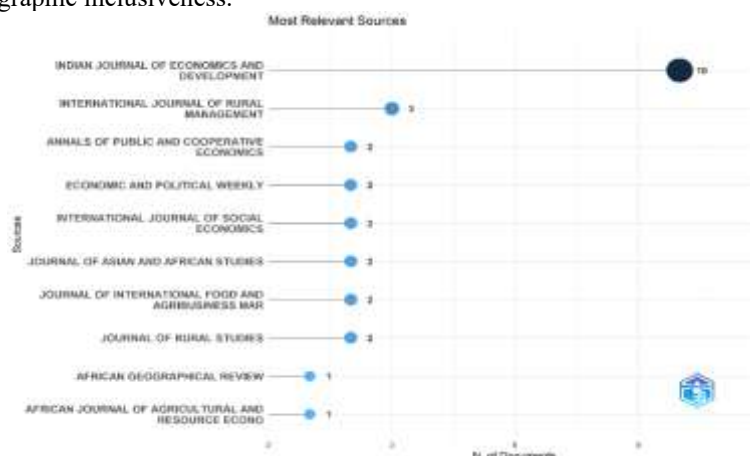


Fig.3. Most relevant sources of articles under study

Countries scientific production

Figure 4 presents the country-wise scientific production on rural youth participation in Farmer Producer Organizations (FPOs). The intensity of the blue colour indicates the volume of publications from each country. India emerged as the leading contributor, showing the highest concentration of authors and publications in this research area. Moderate contributions were observed from the United States, Canada, China, and Australia, while countries such as Brazil, Germany, the United Kingdom, South Africa, Nigeria, Kenya, and Tanzania recorded only a few publications. Grey regions indicate no publications meeting the inclusion criteria.

India's dominance can be attributed to the institutionalization of FPOs under the Companies Act, 2002, which encouraged extensive research on farmer collectivization and rural development. In contrast, countries with large-scale commercial farming systems, such as the United States, China, and Australia, have fewer studies on FPOs. The limited but growing contributions from Sub-Saharan African countries reflect increasing research interest in smallholder aggregation models and farmer collectives.



Fig.4. Map depicting the country scientific production on rural youth participation in FPOs

Sources production over time

For better understanding of the production dynamics of articles on rural youth participation in FPOs during 2000-2025 was analyzed with the help of Biblioshiny of R studio. The systemically mapped production dynamics exhibiting the temporal evolution and historical shifts within research domain of compiled articles was present in Fig.5.

Though the present study aims to examine the studies for the past 25 years, the publication of articles meeting the inclusion criteria started to publish from 2003. During the first decade, almost all journals show zero cumulative production. The

first publication occurred around 2012-2013 by Journal of Rural Studies and it continues to maintain the same publication trend for next nine years.

While, between 2022 and 2023, multiple journals such as Indian Journal of Economics and Development, International Journal of Rural Management, Economic and Political Weekly started to publish articles on this domain simultaneously. It is mainly because of the central sector scheme “Formation and Promotion of 10,000 FPOs” that aims to initiate, promote and implement more FPOs. Thus, this scheme creates interest among the researchers to study about FPO functions, performance, benefits, constraints in functioning and success stories.

Finally, exponential growth of Indian Journal of Economics and Development can be observed during 2023-2025 publishing 10 articles. Consequently, International Journal of Rural Management steadily increases to publishing 3 articles, while the other journals maintain the plateau by publishing 2 articles each by 2025. As FPO have successfully improved the livelihood of farmers through collective decision making, marketing and so on; more research articles were published on FPO. Though there were lot of studies on FPO, studies involving youth participation in FPO was very scarce, which signifies the need for future research.

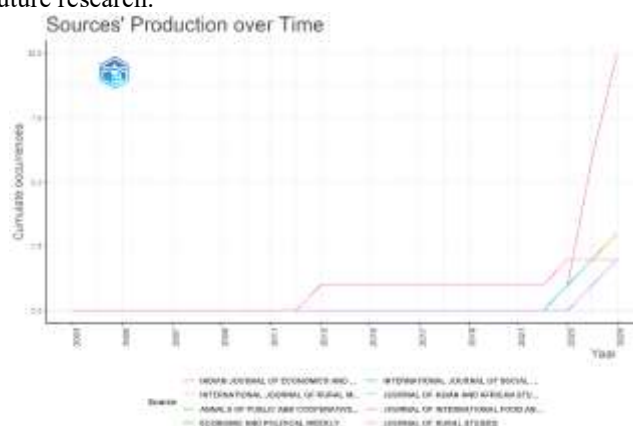


Fig.5. Production dynamics on rural youth participation in FPOs during 2000-2025

Keyword analysis

To understand the intellectual structure of the research domain, a keyword co-occurrence network and word cloud analysis were conducted using R Studio (Figures 6 and 7). The co-occurrence network reveals four major thematic clusters: institutional design and organizational performance (red), operational and socioeconomic outcomes (green), environmental sustainability (blue), and crop-specific value chains (purple). The size of each node represents keyword frequency, while the links indicate the strength of relationships among concepts.

The dominant keywords, “Farmer Producer Organization,” “FPO,” “India,” and “small farmers,” form the core of the network, highlighting the central role of FPOs in smallholder aggregation within India. The red cluster focuses on organizational performance, economic viability, stakeholder behaviour, and business development. Keywords such as “organic farming” and “Sikkim” emphasize the role of FPOs in promoting sustainable and specialized value chains.

The green cluster reflects the practical and socioeconomic impacts of FPOs, including farmer empowerment, income enhancement, and agricultural labour participation. The blue cluster highlights the contribution of FPOs to environmental sustainability and climate-resilient agriculture, while the purple cluster represents emerging research on crop-specific and sector-oriented supply chains.

The word cloud further confirms these findings, showing that research in this domain is largely centered on institutional development, farmer welfare, business performance, and sustainability. The presence of analytical terms such as “Heckman Selection Model” and “Garrett Ranking” also indicates the strong empirical orientation of the existing literature. Overall, the findings demonstrate that FPO research integrates institutional, socioeconomic, and environmental dimensions to support sustainable agricultural development.



Fig.6. Keyword analysis network using color coded community clusters

The analysis also emphasizes the need for continuous training and extension support to address skill gaps, improve technical efficiency, and enhance productivity (Mondal et al., 2025; Donkor et al., 2023). Strengthening production capabilities, increasing paid-up capital, and promoting group-based training can improve trust, reduce capital constraints, enhance collective bargaining power, and support the long-term sustainability of FPOs (Bernard et al., 2021; Kumar et al., 2023; Mondal et al., 2024; Pujitha et al., 2024; Suresh et al., 2024).

Table.2. SWOC analysis reflecting the systematic review on FPO

FACTORS	REFERENCES
STRENGTH	
Value chain, value addition	(Bhunia et al. 2025.) ; (Sangappa et al. 2023); (Roy et al . 2023).
Facilitate training and extension to members for increased technical efficiency and yield, identify training gap	(Mondal et al. 2025); (Donkor et al. 2023).
Better farming practices, change in cropping pattern, increased production and productivity	(Karunyalakshmi et al.2025); (Malaisamy et al. 2025); (Chintala et al.2022).
Market access and export of produce	(Malaisamy et al. 2025),;(Yazhini et al.2025);(Divya et al. 2024) ; (Roy et al. 2023); (Benson et al. 2023); (Anand et al. 2023) ; (Bäuml et al. 2022); (Pröll et al. 2022.); (Hill et al.2021).
Strengthens organizational response and internal cohesion	(Shanmuga Priya et al.2025).
Access to inputs and farming technologies	(Yazhini et al. 2025); (Donkor et al.2023) AND (Roy et al.2023).
Collectivize bargaining power	(Yazhini et al. 2025); (Pietrangeli et al.2023); (Roy et al.2023).
Reduce transaction cost	(Yazhini et al. 2025); (Divya et al. 2024)
Enhance infrastructure and financial services	(Yazhini et al. 2025).
Shared resources	(Yazhini et al. 2025) ; (Pandey et al. 2025).
Efficient management assistance	(Pandey et al. 2025).
Gaining premium prices through certification techniques and product traceability	(Jayasekhar et al. 2024).
Highly effective while dealing single products or performing selected functions	(Anand et al. 2023).
Food security	(Guyalo et al. 2023).
WEAKNESS	
Lack of financial support to run	(Karunyalakshmi et al. 2025);(Malaisamy et al. 2025);(Salokhe, S. 2025); (Eggen et al. 2024); (Malik et al. 2024),;(Jayasekhar et al.2024).
Reliance on hired labor and high cost of labor	(Yazhini et al. 2025); (Tlau et al. 2023);(Verma et al.2021).
Lack of participation of young people	(Christian et al. 2024).
Dependence on external agencies	(Malik et al. 2024).
Lack of trust, unequal work allocation, ineffective group leadership	(Singh et al., 2023).
Delayed payments	(Singh et al. 2023), (Tlau et al. 2023).
Doubting the feasibility of producer organizations	(Bäuml et al. 2022).
Neglecting women and poor farmers in decision making	(Mwambi et al. 2020).
OPPORTUNITIES	
Promote entrepreneurial behavior of youth	(Arunkumar et al. 2025).
Promote modern farming practices	(Malaisamy et al. 2025).
Promote climate adaption measures	(Srinidhi et al. 2025).
Effectively mobilize resources, adapt to market disruptions and maintain supply chain operations	(Shanmuga Priya et al. 2025).
Training programmes for capacity building of farmers	(Yazhini et al. 2025).
Foster sustainable agricultural development and improve livelihood	(Pujitha et al. 2024).
Regular training, promoting information exchange and utilizing extension services to improve communication behavior	(Mondal et al. 2024.) ; (Sisay et al. 2023).

Providing digital literacy	(Muthulakshmi et al. 2024).
Farmer empowerment, Improve farmer's income and livelihood	(Jaacks et al., 2025); (Malaisamy et al. 2025) ; (Sahoo et al. 2024).
Market centric FPOs	(Jayasekhar et al. 2024).
Sustainable production	(Donkor et al. 2023).
Employment opportunities for educated youth	(Sharma et al. 2023).
Promotion of products	(Anand et al . 2023); (Basavaraj et al. 2022).
Reduce unfair trading practices	(Di Marcantonio et al. 2022).
Value addition	(Pröll et al. 2022).
CHALLENGES	
Long term sustainability	(Karunyalakshmi et al. 2025).
Lack of business and management skills	(Karunyalakshmi et al.2025);(Singh et al. 2023); (Tlau et al.2023).
Lack of capacity building	(Salokhe. 2025), (Jayasekhar et al. 2024).
Inadequate infrastructure facilities	(Malaisamy et al. 2025) (Salokhe. 2025), (Eggen et a., 2024); (Verma et al.2021).
Lack of knowledge on FPO and supply chain management	(Malaisamy et al.2025); (Eggen, et al. 2024); (Tlau et al. 2023) ;(Verma et al. 2021).
Absence of skilled professional	(Malik et al. 2024).
Lack of awareness	(Jayasekhar et al.2024).
Lack of capital turnover	(Kumar et al.2023).
Lack of computer skills	(Tlau et al. 2023).
Lack of storage facilities and price fluctuation	(Verma et al. 2021).

Future research directions

The review highlights the need for more empirical studies examining how structural barriers limit the active participation of small and marginal farmers in FPO governance, despite FPOs being designed to serve their interests. Much of the existing literature relies on descriptive analyses, indicating the need for more rigorous causal inference approaches to accurately assess the impact of FPO membership on youth income, labour allocation, and technology adoption.

Future research should explore the financial and market-related challenges faced by FPOs in adopting green technologies and examine how rural youth can contribute to green supply chains. There is also a notable research gap regarding the role of digital platforms in attracting, engaging, and retaining rural youth within FPOs. Integrating youth-led agricultural technologies could help bridge traditional FPO structures with modern, business-oriented enterprises.

In addition, greater attention should be given to the role of FPOs in scaling climate-resilient agricultural practices. Comparative studies between the Indian FPO model and farmer aggregation systems in China, Southeast Asia, and Sub-Saharan Africa are also recommended to identify effective and scalable governance practices across different socio-economic and political contexts.

CONCLUSION

This study provides a comprehensive bibliometric analysis of 23 years of global research on rural youth participation in Farmer Producer Organizations (FPOs). The findings reveal a clear paradox: while FPOs are widely recognized as important platforms for smallholder empowerment, market integration, and rural development, youth participation within these organizations remains a relatively underexplored research area. Academic interest remained limited for nearly two decades, but publication trends increased significantly after the COVID-19 pandemic, driven by growing attention to digital agriculture, climate adaptation, and agribusiness-oriented value chains.

The analysis shows that existing literature largely focuses on organizational performance, farmer attitudes, and institutional outcomes, while the experiences of small, marginal, and young farmers receive comparatively less attention. This research gap reflects broader structural challenges that limit youth participation in FPOs, including restricted access to land, leadership dominance by older generations, and limited opportunities for youth involvement in ownership and decision-making processes.

As a result, rural youth often engage with FPOs mainly as technical service providers, mechanization operators, or informal labourers rather than as active members and equity holders. The limited documentation of their participation also restricts the availability of reliable data for further research. Therefore, future policies and research should move beyond general organizational assessments and focus on creating more inclusive institutional frameworks. Strengthening youth leadership, promoting technological integration, establishing structured succession mechanisms, and developing inclusive equity models can help transform FPOs into sustainable agribusiness enterprises capable of attracting and retaining the next generation of farmers.

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