



REVIEW ARTICLE

A review on farmer producer organization: A catalyst for empowering small and marginal farmers

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Abstract

Farmer Producer Organizations (FPOs) are emerging as transformative mechanisms in agriculture, especially amidst land fragmentation and the prevalence of small and marginal farmers. With agriculture supporting nearly half of India's workforce while contributing approximately 18 % to the national GDP, the sector undergoes multiple challenges, including declining farm sizes, climate variability, water scarcity and persistent market inefficiencies. Against this backdrop, this review examines the multifaceted role of FPOs in enhancing agricultural productivity, market access and farmer livelihoods across the diverse and widespread country, India. By consolidating resources, knowledge, information and market power, FPOs help members achieve economies of scale, enhance bargaining power and access premium markets that were previously out of reach for individual farmers. Evidence indicates that well-functioning FPOs contribute to increased farmer incomes, improved food security and enhanced resilience to climate and market shocks. Critical considerations as India pursues agricultural self-sufficiency and sustainable intensification. However, FPOs also face significant challenges, including governance constraints, limited access to capital, weak management capacity and concerns regarding long-term sustainability. The review analyses various FPO models, their implementation frameworks within India's policy environment and critical success factors while identifying research gaps in impact assessment methodologies and scalability approaches. With government initiatives like the "Formation and Promotion of 10000 FPOs" scheme, FPOs are poised to play a pivotal role in India's agricultural transformation, offering both opportunities and lessons for sustainable rural development.

Keywords: challenges; collectivization; farmer producer organization; impact; small and marginal farmers; sustainability

Introduction

Asia holds 525 million farms worldwide, accounting for 87 % of the farms, with China alone accounting for 193 million small farms, followed by India, which accounts for 23 % of the world's small farms (1). Small and marginal farmers outnumber large farmers and despite their limited landholdings, they contribute significantly to agricultural output. These farmers often rely solely on crop cultivation due to limited land availability, which restricts diversification into livestock or other activities (2). Consequently, many are shifting toward secondary and tertiary sectors to supplement their income, as both on- and off-farm earnings are essential for doubling their income (3).

One of the major challenges faced by small and marginal farmers is chronic indebtedness. A significant portion of their credit comes from non-institutional sources and is used for non-agricultural expenses such as weddings and social ceremonies. A very small amount is spent on obtaining the resources, like agricultural inputs (4). To address these challenges and empower the 56 % of Indian farmers who belong to the small and marginal category, the

concept of Farmer Producer Organizations (FPOs) was introduced. FPOs aim to reduce poverty and improve agricultural livelihoods across the country (5).

Empowerment of the farmers is the need of the hour to enable them to make a choice and change them into desired actions. The level of empowerment depends entirely on individual characteristics, household characteristics, economic characteristics and the ability of the farmers to make decisions regarding farm activities (6). Thus, this empowerment is provided by the farmer producer organization, which was an initiative that was started to increase the productivity and annual income twofold, improve member participation and provide access to training and information (7, 8). Today, FPOs include 70-80 % of small and marginal farmers, contributing to the development of rural economies and creating opportunities for women's empowerment (9).

This review aims to compile the benefits, economic impacts, success stories and lessons learned from FPOs, along with the challenges they face. Drawing on these insights, the paper proposes new strategies and approaches to

enhance farmer participation in FPOs and improve their effectiveness as agents of farmer empowerment.

As defined in the literature, “Empowerment is the ability to make a choice and change them into desired actions.”

The main objectives are

1. To evaluate the economic and social benefits accrued by small and marginal farmers through their participation in FPO.
2. To document and analyze successful case studies of FPOs in India and other developing countries for cross-learning.
3. To identify key operational, institutional and socio-cultural challenges that hinder the effectiveness.
4. To explore the role of technology, policy support and institutional linkage.
5. To propose policy-level and grassroots-level strategies to improve inclusivity, governance and sustainability in FPO operations.

FPOs were established to create a sustainable and equitable environment for farmers, aiming to enhance productivity and income. They are guided by cooperative principles such as voluntary and open membership, democratic participation, independence, education, training and inter-farmer cooperation (Ministry of Agriculture & Farmers Welfare) (10). Farmers are empowered socially, boosting confidence and creating empowerment for the farmers to increase their profits of the farmers (6, 7). The success of FPO depends on timely funds from the government, proper planning of activities by the members of the FPO, provision of grants and awareness to farmers and the officials of the department require training to work efficiently (11, 12). The impact of FPOs on farmers, as illustrated in Fig. 1 and 2, is both significant and transformative.

Methodology

Systematic article searches and screenings were performed by generating keyword combinations in the two databases, Scopus and Science Direct. Searches were conducted using ‘TITLE’ and ‘title abstract-keyword’ in the databases. A language restriction was applied and only English-language articles were included in the review. Peer-reviewed journal articles from these databases were collected. Non-journal sources such as books, book chapters, conference papers, editorials, letters, patents, reference works and trade publications were excluded. Peer-reviewed journal, articles from these databases were collected up to the year 2024 (Fig. 3).

Strings used for searching articles

Strings used for searching articles is explained in Table 1. The search strings were developed by the author to systematically identify relevant literature related to Farmer Producer Organizations (FPOs), their impact on empowerment, sustainability and economic development in India and other developing countries. The strings combined Boolean operators (AND, OR) and keywords such as “Farmer Producer Organizations,” “empowerment,” “sustainability,” and “economic development” to ensure comprehensive retrieval from databases.

The term used and the frameworks of data collection

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework ensures transparency and rigor in systematic reviews by outlining the selection, screening and analysis. It removes the duplicates systematically, screens for relevance and excludes studies that do not meet the pre-defined criteria, with reasons specified.

The process is visualized in a PRISMA flow chart for clarity. A list of articles as per Table 1 was generated using “Farmer Producer Organizations” OR “FPO” OR “Farmer Cooperatives” in the title and the title-abstract-keyword. The filtering procedure for the Boolean keywords “Farmer

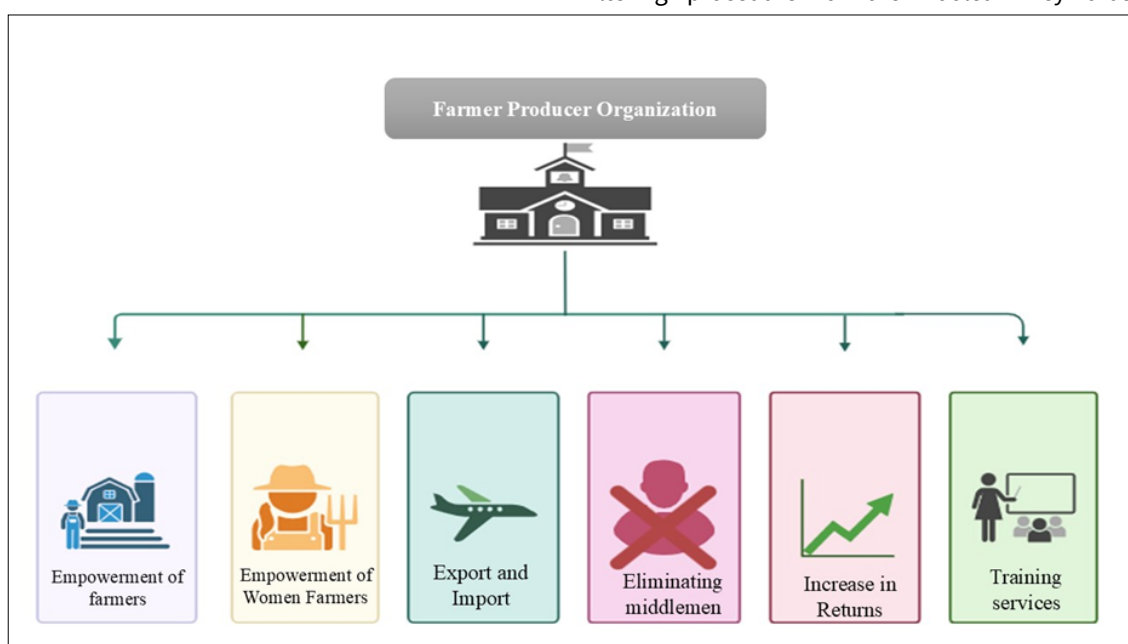


Fig. 1. Functional impact of farmer producer organisation (FPOs) on agricultural development. Source: Compiled by the author based on secondary literature and institutional reports including NABARD (2020), Small Farmers’ Agribusiness Consortium (SFAC) and research publications on the functioning and impact of FPOs in India (accessed in 2024).

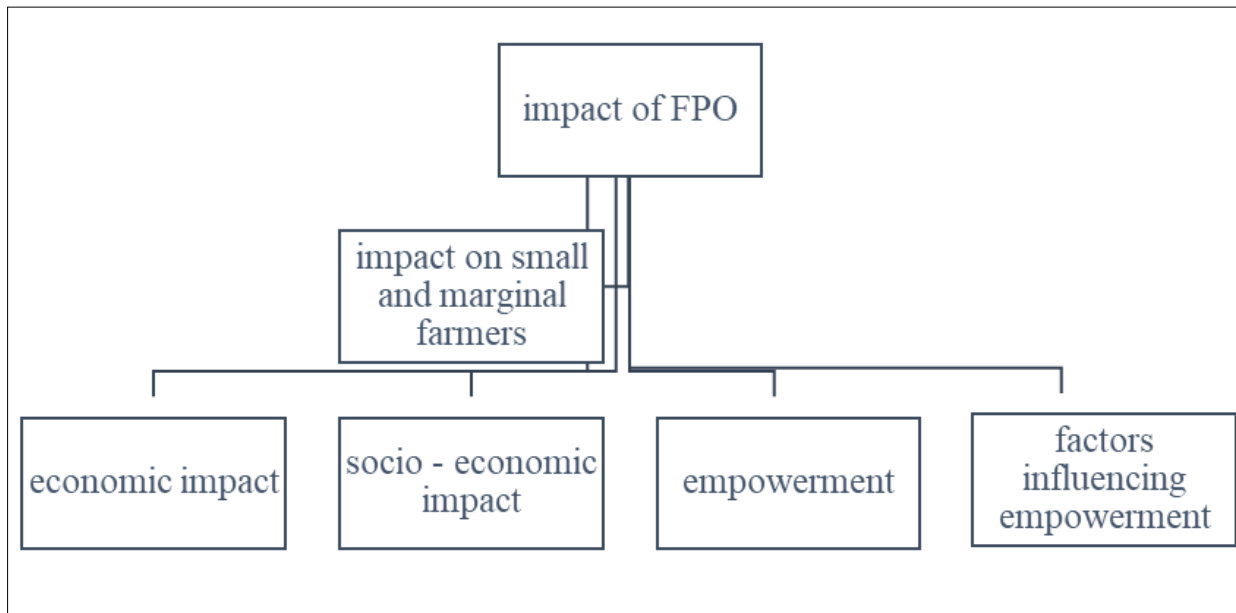


Fig. 2. Conceptual Framework depicting the impact of Farmer producer organisations (FPO) on Small and marginal farmers. Source: Developed by the author based on a conceptual synthesis of key themes from scholarly articles, policy documents (NABARD (2020); SFAC) and field-based studies focusing on the economic, socio-economic and empowerment dimensions of FPOs (accessed in 2024).

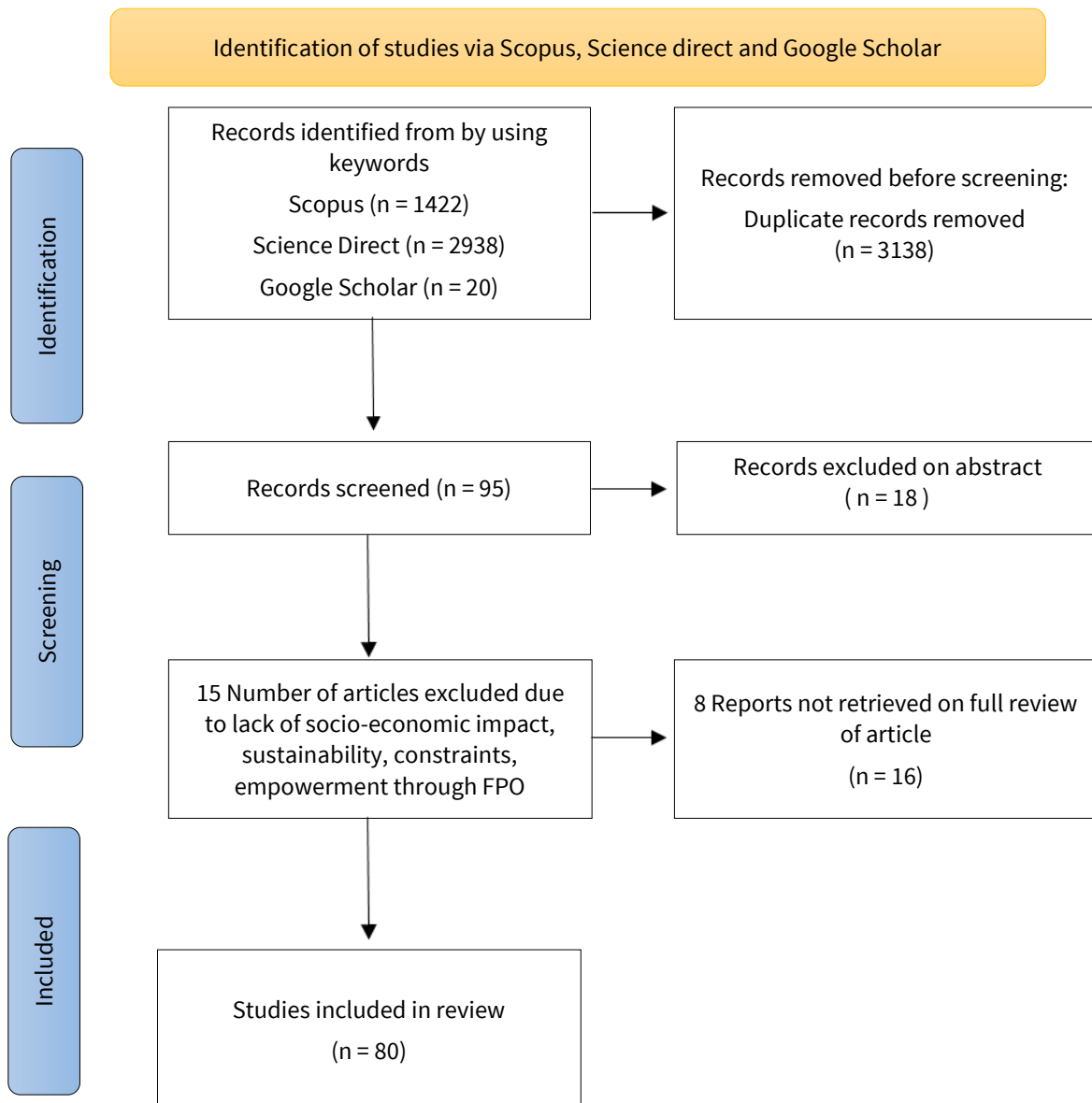


Fig. 3. PRISMA flow diagram depicting the systematic identification, screening, eligibility and inclusion of studies related to Farmer Producer Organizations (FPOs) from Scopus, ScienceDirect and Google Scholar databases. Source: Developed by the author based on PRISMA 2020 guidelines.

Table 1. Strings used for searching articles

“Farmer Producer Organizations” OR “FPO” OR “Farmer Cooperatives”
“Farmer Producer Organization” AND “India” OR “developing countries” AND “empowerment”
“Sustainable agriculture” AND “Farmer Producer Organizations” AND “farmer resilience”
“Farmer Producer Organizations” AND “economic development” OR “socioeconomic impact”
“Smallholder farmers” AND “Farmer Producer Organizations” AND “sustainability”
“Farmer Producer Organizations” AND “India” OR “developing countries” AND “empowerment”

Producer Organization” AND “India” OR “developing countries” AND “empowerment”, “Sustainable agriculture” AND “Farmer Producer Organizations” AND “farmer resilience”, “Farmer Producer Organizations” AND “economic development” OR “socioeconomic impact”, “Small holder farmer” AND “Farmer Producer Organizations” AND “sustainability” and “Farmer Producer Organizations” AND “India” OR “developing countries” AND “empowerment” was used in the subsequent searches. In the PRISMA framework, the first phase involved selecting research articles by excluding conference proceedings, books or book chapters, encyclopaedias, short communications and reports that did not have reference to FPOs in the article title.

The total number of articles was 1422 from Scopus and 2938 from ScienceDirect databases and articles from Google Scholar, before removing duplicates. The second step involved removing the duplicates found across the databases. The third step was to exclude review articles and research papers that lack the socio-economic impact, sustainability, constraints and empowerment through FPO. The fourth step included only research articles and case studies that had socio-economic impact, sustainability, constraints and empowerment through FPO. This process excluded articles from Scopus and ScienceDirect databases. This ensured that only articles focusing on evolution, status, impact of FPO on small and marginal farmers and prospects of FPOs were included. Therefore, 80 articles were selected for further analysis.

Results and Discussion

A notable structural break can be seen in Fig. 4, which shows the trend in published articles on of articles (FPOs over time. From 1960 and about 2010, research interest remained low, with only a few articles published annually. However, between 2010 and 2015, a steady increase in publications suggests growing awareness and interest in FPOs. After 2015, a significant surge in scholarly output is evident, likely driven by government initiatives, increased funding and a global focus on sustainable agriculture. In Kenya, agricultural cooperatives, dairy cooperatives support around 17,000 small-scale farmers have increased their incomes and reducing post-harvest losses (13). While in Bangladesh, farmer marketing groups focus on collective marketing, training, capacity building and women’s participation (14) and the cooperative union of Ethiopia has provided international market access to their farmers, enabling high price realization (15). Although the number of publications has risen sharply in recent years, the dotted trendline indicates a consistent long-term growth pattern, supporting the presence of a structural break. This pattern demonstrates how FPOs are becoming more widely acknowledged as an essential model for the empowerment of smallholder farmers.

Background of farmer producer organizations and small and marginal farmers in India

Historically, cooperatives were established to support small

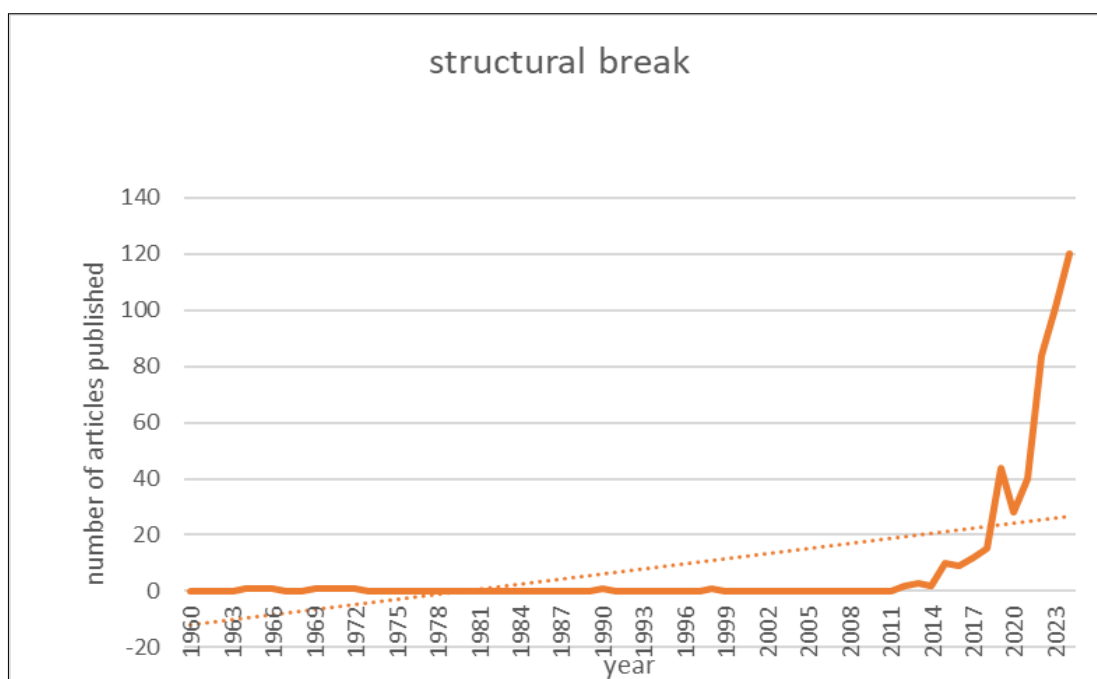


Fig. 4. Structural break in scholarly publications on farmer producer organisations (FPOs) 1960-2023. Source: compiled by the author from Scopus database and Google scholar search results using keywords “Farmer Producer Organization,” “FPO,” and Farmer Collectives” (accessed in 2024).

and marginal farmers in India. While they achieved some success in states like Gujarat and Maharashtra, their performance was largely ineffective in other regions due to a lack of resource provision, weak capacity building and inefficient management.

To address these shortcomings, Farmer Producer Companies (FPC) were introduced. An FPC typically comprises ten or more primary producers and one or two producer institutions registered under the Indian Companies Act, 2013. The FPC works under a regulatory framework, which makes it more efficient compared to a cooperative (16, 17).

Following the recommendations of the Alagh Committee (1999), FPCs were introduced as an alternative to state-led cooperatives. Initially, their adoption was limited, with notable activity primarily in Madhya Pradesh. A boom was later observed because of guidelines formed by the Small Farmers' Agribusiness Consortium under the Ministry of Agriculture. The number of FPCs increased drastically due to the thrust of public policy through SFAC and the National Bank for Agriculture and Rural Development (NABARD) played a critical role in the widespread growth of FPCs across the country (18).

An FPC must be composed of producers engaged in both farming and non-farming activities. It is a registered legal entity, where investment from member farmers is essential. In addition, the government also supports FPCs through financial and technical assistance to help develop their business operations. The profits generated are shared among the members of the producers in proportion to their shareholding.

There is a growing divergence. FPCs represent a transformative model which aligns with market needs, but over-reliance on corporate structure may marginalize the farmers. Additionally, hybrid models - combining features of both cooperatives and companies have also emerged to be complicated.

There are 4959 producer companies in India, with Maharashtra having the highest number of producer companies, 1950, while states such as Punjab, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and northeastern states show a low FPO penetration due to less awareness among the farmers (19) (Table 2). The number of marginal and small holdings is increasing while the medium and large holdings are in decline, indicating land fragmentation to be on the rise, which reinforces the need for collectivization through FPOs, as they get limited access to capital and resources (20) (Table 3). Farmers rely on rainfall for the land as the total irrigated land is only 39 % and the irrigated land is high among the medium farmers compared to the large farmers, as schemes are accessed by the marginal farmers and group-based irrigation systems through FPOs can benefit the farmers (20) (Table 4).

Services provided by FPO that empower farmers

The services that are provided by FPOs (Fig. 5) are as follows:

Availability of inputs

Membership in FPOs enables farmers to access agricultural inputs at reduced costs due to bulk purchasing. Additionally, members have greater access to financial instruments such

Table 2. Details of farmer producer companies state-wise

S.No	State	No. of producer companies
1.	Andhra Pradesh	147
2.	Arunachal Pradesh	15
3.	Assam	87
4.	Bihar	221
5.	Chandigarh	1
6.	Chhattisgarh	32
7.	Delhi	7
8.	Gujarat	108
9.	Haryana	257
10.	Himachal Pradesh	7
11.	Jammu & Kashmir	10
12.	Jharkhand	70
13.	Karnataka	195
14.	Kerala	53
15.	Madhya Pradesh	237
16.	Maharashtra	1950
17.	Manipur	26
18.	Meghalaya	1
19.	Mizoram	4
20.	Nagaland	6
21.	Orissa	177
22.	Puducherry	1
23.	Punjab	13
24.	Rajasthan	114
25.	Tamil Nadu	241
26.	Telangana	119
27.	Tripura	8
28.	Uttar Pradesh	654
29.	Uttarakhand	14
30.	West Bengal	184
	Grand total	4959

Source: Press Information Bureau.

as the Kisan Credit Card and institutional loans, which are often difficult for individual farmers to obtain (21). The financial requirements of all FPOs are met by NABARD since all required inputs are provided; this enables the farmers to save the money that would otherwise be spent in transport, transaction and quality maintenance (22).

Financial services

Despite the government providing enough credit facilities and subsidies, FPO started providing loans without taxing on agricultural income (23, 24). Beyond financial support, FPOs provide a range of services including low-cost inputs, access to machinery, direct marketing avenues, training programs to enhance skills and productivity, crop insurance and strong linkages to financial institutions and markets. They also assist in coordinating supply and demand, thus improving operational efficiency for farmers (25).

Marketing services

Farmer Producer Organisation plays a crucial role in establishing effective market linkages, which enhance the farmers' income. The farmers earn additional profits through value-added processes, which are adopted by FPOs. Unlike conventional markets, where farmers face exploitation by middlemen and receive lower prices whereas FPOs allow members to access better market rates. Moreover, by maintaining strong linkages with public and private institutions, FPOs have extended their services to remote areas (26, 27). It also emphasizes quality enhancement,

Table 3. Number and area of operational holdings by size group

Category of holdings	Number of holdings		Area		Average size of holding			
	2005-06	2010-11	2005-06	2010-11	2005-06	2010-11	2010-11	2015-16
Marginal (less than 1 hectare)	83694 (64.8)	92826 (67.1)	32026 (20.2)	35908 (22.5)	37923 (24.03)	0.38	0.39	0.38
Small (1.0-2.0 hectares)	23930 (18.5)	24779 (17.9)	33101 (20.9)	35244 (22.1)	36151 (22.91)	1.38	1.42	1.40
Semi-medium (2.0-4.0 hectares)	14127 (10.9)	13896 (10.0)	37898 (23.9)	37705 (23.6)	37619 (23.84)	2.68	2.71	2.69
Medium (4.0-10.0 hectares)	6375 (4.9)	5875 (4.2)	36583 (23.1)	33828 (21.2)	31810 (20.16)	5.74	5.76	5.72
Large (10.0 hectares and above)	1096 (0.8)	973 (0.7)	18715 (11.8)	16907 (10.6)	14314 (9.07)	17.08	17.38	17.07
All holdings	129222 (100.0)	138348 (100.0)	158323 (100.0)	159592 (100.0)	157817 (100.0)	1.23	1.15	1.08

Source: Department of Agriculture and Farmers Welfare (Agriculture Census 2015-16), Agricultural Statistics at a Glance 2023.

No. of holdings: '000 number. Area operated: '000 hectare. Average size: hectare.

Table 4. Estimated number of operational holdings by size classes and irrigation status

Size-class	Wholly irrigated	area	Partially irrigated	area	Irrigated area	Wholly unirrigated	area	Total holdings	Area
Marginal	45165	16336	11326	3765	2033	38418	14170	100251	37923
Small	9161	12117	4055	5229	3036	11837	15259	25809	36151
Semi-medium	4743	12018	2687	6530	3779	6186	14978	13993	37619
Medium	1835	9901	1324	6605	3751	2247	11281	5561	31810
Large	238	3836	208	2804	1427	370	5206	838	14314
All classes	61142	54028	19600	24933	14026	59059	60894	146454	157817

Source: Department of Agriculture and Farmers Welfare (Agriculture Census 2015-16), Agricultural Statistics at a Glance 2023.

Number of holdings: '000 number. Area operated: '000 Hectare.



Fig. 5. Key services provided by farmer producer organizations (FPOs) to ensure sustainability. Source: Compiled by the author based on secondary literature and the operation framework of NABARD (2020), SFAC and academic research on FPO functioning (accessed in 2024).

critical post-harvest activities such as grading, sorting, which improve the shelf-life and marketability of the produce (28).

Training services

Providing training services leads to the improvement of the rural economy and the creation of job opportunities for youth, creating a sustainable income source for the people (22). The managerial capabilities of farmers are closely linked to their access to training, market awareness and educational background (29).

Other services

The activities undertaken by FPOs include the creation of common assets, the development of business plans and the

establishment of strong forward and backward linkages, which help farmers secure better prices. Notably, even lower-quality produce can fetch better returns when marketed through FPO. This is largely due to reduced dependence on middlemen, collective bargaining and value addition (30). Additionally, it also provides insurance to farmers, networking, acting as pathways to maintain linkages and disseminates recent technologies to the farmers (30, 31). It also provides regular quality checks of the produce and field visits to ensure the quality is maintained (27). Services such as agricultural advisory support, marketing infrastructure, credit access, technological assistance, value addition and crop insurance play a pivotal role in encouraging farmer

participation in FPOs (31, 32). These components, like access to credit and marketing facilities that enable farmers to get more returns, attract farmers (33). Thus, FPO holds immense potential in improving the rural livelihood of the farmers by providing all the required facilities, inputs, capacity building and regular training (34).

Economic empowerment of marginalised farmers through FPOs

Farmers require proper planning, monitoring, implementation and increased access to all resources, like finance and natural capital. To assess the level of empowerment among farmers, parameters such as awareness, willingness to change, resilience in overcoming obstacles, capacity for cooperation and group solidarity are often considered. Empowerment within farming communities is commonly evaluated through qualitative indicators like social capital and networking. Active participation in such networks fosters the development of individual skills, knowledge and confidence (35).

Several factors influence the empowerment of farmers, including individual characteristics, the structure and function of Farmer Groups, the role of agricultural Extension services and the development of Agribusiness linkages. Among these, education is considered the cornerstone of empowerment. It encompasses not only formal education but also skill development and continuous learning. The three-dimensional empowerment framework - comprising degrees, realms and aspects of empowerment - is frequently applied to study lifelong learning initiatives among farmers. Moreover, the services provided by FPOs and the level of awareness and knowledge among members significantly contribute to their empowerment (36).

Factors influencing empowerment

Financial services

FPOs act as intermediaries between members and financial institutions, bridging the gap and expanding loan availability. They also promote new ventures like value addition and marketing (30). By offering crop insurance and other risk mitigation mechanisms, FPOs help farmers safeguard against financial losses due to adverse weather and crop failures (37). This reduces dependence on informal moneylenders who charge high interest rates on loans for farmers. FPOs also enable farmers to receive necessary subsidies and inputs from the government.

Increase savings and investment

FPOs enable farmers to pool their savings and the fund that is created is used in income-generating activities. These activities include setting up small-scale processing units, investing in value-addition activities and providing credit or loans for agricultural and allied. This collectivization helps in the economic growth of rural communities, allowing FPOs to reinvest in their members and expand their operations. It fosters entrepreneurship, reduces dependency on external credit and creates local employment opportunities (38).

Collectivization

Farmer collectives, such as FPOs, play a vital role in improving the socio-economic conditions of small and marginal farmers. Farmers gain better access to market information, institutional

investments and government schemes by coming together as a group (5). This collective approach addresses the challenges posed by fragmented land holdings, enhances financial returns through collective bargaining and reduces input costs and generates employment (39).

Profitability

Enhancing farm profitability remains a primary objective for smallholders. High input costs often pose a challenge; however, FPO membership enables farmers to procure quality raw materials at reduced prices through collective purchasing mechanisms. Additionally, FPOs contribute to capacity building by improving farmers' communication, leadership and decision-making abilities-factors essential for sustaining profitability in a competitive agricultural market (40).

Impact of FPO on marginalized farmers: economic impact and socio-economic impact

Factors that motivate the farmers to join the FPO are essential for them to be completely empowered. On joining the FPO, the farmers have witnessed an increase in area under farming for non-food grains, organic farming and an increase in the proportion of produce sold in open markets. Compared to non-members, FPO members report significantly higher net incomes, with the additional income often used for productive purposes such as loan repayment (41).

FPO membership leads to notable socio-economic changes, including increased social participation, higher confidence levels and enhanced annual income (42). High returns on investment and profit margins show that members of FPO earn more than non-members of the FPO. Members of FPOs have farming as their main occupation, have more access to information and education and have reduced transportation costs due to the collectivization of farmers (43).

An increase in annual income is a key indicator of farmer empowerment. FPOs contribute to this by enabling the collective marketing of produce, fetching better prices (44-46). Women's participation in FPOs also plays a vital role in boosting household income and promoting self-reliance. Membership further enhances farmer interaction with officials, fostering socio-political engagement (47-49).

Drastic changes are observed in the annual income, annual expenditure, annual income, annual savings, social participation and employment generation due to the adoption of improved technologies, increased awareness about markets and better market linkages (50).

Farmers are directly connected with the markets, leading to the elimination of various intermediaries, the earnings obtained are retained with the farmers and there is access to market information and prices for the smallholder farmers (51, 52). FPO increases technical efficiency due to effective production, timely inputs like fertilizers, labour and market information (53). Being a part of FPO has increased the members' annual income and increased socio-political participation and interaction among farmers and officials regularly (46).

Higher prices are obtained by the farmers of FPO because of better market linkages and reduced transaction costs, which contribute to increased annual income. On measuring the poverty index, it was found that members of FPO faced a lower severity of poverty than non-members of

FPO (54). The members of FPO have timely inputs that are also cheap, marketing facilities, marketing of produce, better price realization for their produce as they sell in bulk and sale of the produce at the right time, advisories to get better yield (21) and the savings have increased and social participation has increased, enabling them to participate in training and be aware of the processing and value addition of products (54).

FPOs help in getting better prices for the produce, collective bargaining and better remunerative prices, overcoming challenges posed by individual farmers in markets, market linkages and partnerships to enable farmers to receive better shares in the value chain, better credit and financial facilities for farmers (55). On establishing linkages with markets, the sales have increased and marketing facilities by creating contacts with local markets, processing industries and exports have further increased sales than the average sales of the market (56).

On comparison of members before and after joining the FPO, it was found that the net income of the farmers started to increase, with lower cost of cultivation, higher returns for their produce, increase in accounts in post offices (57). Members of the FPO had higher technical efficiency, which led them to adopt modern agricultural and cultivation practices, resulting in the minimization of cost and better prices for their produce and members can access the markets of cities (58).

Members avail both social and economic benefits, which include an increase in area under non-food grains, reflecting a shift toward more profitable and diversified farming systems. This transition is accompanied by an increase in net income, investment capacity, reduction in the burden of debt (59). Beyond the direct financial gains, it helps in improving the buyer-seller relationship, increasing access to the market and equipping them with timely market information, enabling them to make strategic decisions like holding the produce until the price is favourable (60).

Establishing a processing and value-addition unit helps in creating a source of additional employment, increasing demand and awareness among the farmers and creating new ventures and partnerships (61). FPOs lead to development in knowledge like market intelligence, Pest management, use of ICT, technical development involving value addition, capacity building, extension support and social development consisting of welfare services, conservation of natural resources and an increase in income (16). Producer companies establish links with retail markets as they don't get fresh produce, as they are highly dependent on wholesale companies and farmers are not aware of existing markets and their required standards to meet their needs; thus, FPOs pave the way for establishing linkages (62).

Economic empowerment

Continuous improvements such as increased production, better pricing for produce, access to crop insurance, effective price negotiations and rising incomes have significantly enhanced farmers' standard of living, thereby promoting economic development (38, 48). FPCs have become major creators of employment for farmers, agriculture being the main occupation and improvement in opportunities of

subsidiary occupation like business, allied activities and post-harvest activities with the main reason being improvement in management skills among the farmers after being members of the FPO which led to the increase in the level of annual income of the farmers. Furthermore, members have reported reduced expenditures and a doubling of their savings, highlighting the overall positive impact on their economic well-being (42).

Small and marginal farmers often face challenges due to limited access to marketing infrastructure and weak bargaining power. FPCs address these issues by promoting collective action, which results in better income and increased productivity. The main factors that influence the membership of the farmers are the timely availability of inputs, storage facilities, training related to capacity building and technology dissemination, leading to an increase in farm net income as observed in the Brahmaputra Valley Farmer Producer Company in Assam (63). The main drivers of farmers of Odisha to join FPO is the entrepreneurial communication, increased exposure to information which can be improved through increased crop yield and providing proper assistance to the members of FPO and annual income, along with the factors like age, fragmentation of land to be the other factors (64).

Social empowerment

Small and marginal farmers often face challenges due to limited access to marketing infrastructure and weak bargaining power. FPCs address these issues by promoting collective action, which results in better income and increased productivity. FPO membership has been identified as a significant factor for the improvement of the farmers' income and farmers' standard of living. The benefits associated with FPO, such as reduction in transaction cost, improvement in market linkage and better prices compared to non-members, are the driving force for a reduction in poverty (65).

Challenges faced by FPO and its members

FPOs face multiple challenges during both the formation and growth stages, including inadequate institutional support, weak networking, insufficient research and training opportunities, lack of working capital, poor management skills, unsustainable revenue generation and communication gaps (66). Different constraints are faced by the members of FPO, which include personal constraints like lack of initiatives, interest and cooperation; infrastructural constraints like lack of storage, processing and maintenance of machinery; and economic constraints like lack of sufficient finance, credit and insurance and high interest rates pose as challenges (67).

FPOs face several challenges in their functioning, including mobilizing the farmers, a lack of a necessary skill set among the members and financial constraints. Additionally, convincing members to become shareholders remains a significant hurdle, which can limit the capital and sustainability of the organization (68).

The challenges faced by the farmers (Fig. 6)

Personal constraints

Farmers tend to leave FPOs when they face challenges and lack participation in activities. A major reason for this

disengagement is the lack of meaningful participation in decision-making processes. When members perceive that their involvement does not lead to tangible benefits, such as better market access, input and income enhancement, they are less likely to remain committed.

Members lose trust and withdraw their membership when they do not receive timely input from FPOs.

Financial constraints

Financial constraints are among the most critical challenges faced by FPOs. Limited access to credit restricts their ability to offer essential services to members (69). The biggest challenges remain the farmer's ability to access credit from financial institutions, evaluation and proper monitoring, incentives to farmers who are performing well, no record maintenance of farmers, which makes farmers unaware of their membership and no punishment to the wrongdoers (28). Financial support is given to FPOs that hold more than 500 members; insurance covers only the products and not the FPO and due to insufficient financial support, they can't compete with huge markets and farmers aren't aware of the existence of the FPOs (70).

Technical and technological constraints

Lack of technical skills, risk management skills, sufficient credit facilities and inadequate access to infrastructure and access to markets, which in turn affect the sustainability of the FPO (65).

Digital platforms such as eNam and Agri bazaar enable FPOs to surpass the middlemen. The Sahyadri Farmers producer company in Maharashtra uses digital systems and online order processing, real-time pricing, enabling it to export to over 20 countries. Mobile-based agro advisory platforms provide farmers with customized information, which is beneficial to farmers in remote areas. To harness the advantages of technologies, digital literacy, capacity building and infrastructure deficits are crucial to ensure equitable digital inclusion (33, 71).

Lack of skills

The board of directors that is appointed by the farmers lacks the

skill set, managerial abilities and exposure to entrepreneurship, which poses a hindrance to the development of farmers.

Lack of infrastructure

Poor infrastructure, lack of technical skills, lack of risk mitigation techniques like insurance, weak financial support to deliver timely and quality inputs, inadequate professional management and manpower to run the FPOs smoothly (72). To build sustainability, FPOs face various challenges in terms of loyalty of members, availability of timely credit and when prices of the inputs are stable, the output prices are highly volatile and there is a lack of coordination between the government programmes and FPOs (57).

The lack of infrastructural facilities, remunerative prices in local markets, establishing strong forward and backward linkages, inadequate storage facilities and fluctuating market prices pose a huge challenge to FPOs (73).

Lack of communication

The effectiveness of FPOs largely depends on the managerial capabilities of their members, which are influenced by their education, market knowledge, income levels and willingness to take risks (61). FPOs struggle in finding potential buyers for the smallholders, as there is a lack of communication between the members and a lack of trust in the fund being spent on other activities leads to poor functioning of the FPO and selling of produce in the local markets (41). Due to a lack of flow of information, FPOs are not able to benefit from the ongoing schemes launched by organisations and a penalty is imposed in case of delayed compliance (68).

Gender constraints

Gender inequality remains a significant barrier within FPOs. Women, especially those from marginalized communities, often receive limited benefits due to social norms and power imbalances in rural areas. Their participation in FPO activities is restricted by caste-based discrimination and male-dominated decision-making structures. Consequently, women have reduced access to essential services such as credit, infrastructure and capacity-building programs (28, 74, 75).

While women are taking part as members, active



Fig. 6. Challenges faced by Farmer Producer Organizations (FPO) and their members. Source: Compiled by the author based on insights from NABARD (2020), SFAC reports and academic literature on Farmer Producer Organizations in India (accessed in 2024).

participation in decision-making, meetings, or access to services is minimal and they lack political and social empowerment (76). Gender mainstreaming, systematic integration of gender concerns into FPO policies, governance and formal extension remains absent (77).

The situation gets more complicated when caste and class intersect with gender; women have limited or no land ownership as they face double or triple marginalization, which limits FPO membership (78).

SWOT analysis of FPO

The SWOT analysis (Table 5) gives the strength, weakness, opportunities, threats which assess the working of FPO and how it plays a role in shaping the farmer's standard of living.

Conclusion

FPOs empower small and marginal farmers, creating employment opportunities and providing the required services for them to actively participate in the FPO. Farmers

Table 5. SWOT analysis of FPO

Strength: Promotes leadership (65, 79) Establishing linkages and networks (79) Credibility with government (24, 80) Collective action (81)	Weakness: Low literacy among farmers (75, 82) Lack of communication among members (57, 59) Low adaptation of technology (79, 83) Lack of training and services for farmers (65, 68)
Opportunities: Access to multiple resources (81, 84) Procuring and collectivisation of crops (84) Increase income and export competitiveness (82) Provide empowerment, access to information (85, 86)	Threats: Poor infrastructure (67, 87) Environmental problems (66) Lack of finance (64, 67, 88)

are collectivised and given training to improve their standard of living by generating better income and access to credit facilities. The challenges must be addressed so that FPOs can accommodate more farmers.

Way forward and policy implications

The government should provide initial funds to kickstart FPOs initially and all FPOs must be closely monitored for their work and completion of activities to ensure that it is efficient. If possible, FPOs should be linked to agricultural institutions so that they have access to technical developments and schemes. All FPOs should have better access to technological advancement to reach a huge market base for the produce and value-added products. And to increase the participation of members, it should be made compulsories for all the farmers to take part and it should be started at the grassroots level for the inclusion of all farmers. The government should take the initiative to supervise the FPOs and their work and check for improvements and study the changes. NABARD and SFAC should be responsible for periodic evaluation and performance-based disbursements should be linked to KVK, ICAR to provide access to agronomic training, value-addition technologies, FPO custom mobile apps should be developed for record keeping, under ministry of Electronics and record

keeping. NITI Aayog should be constituted to periodically review FPO policies and innovations. Areas like technology, facilitation, investments and policies backed by research should be given the limelight for further improvement.

Authors' contributions

AK designed the study framework and drafted the manuscript and SP conceived the overall research idea and provided guidance. All authors read and approved the final manuscript.

Compliance with ethical standards

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References

- Nagayets O. Small farms: current status and key trends. The future of small farms. 2005;355:26-9.
- Singh M. Challenges and opportunities for sustainable viability of marginal and small farmers in India. *Agricultural Situation in India*. 2012;77(2):133-4.
- Pal D, Singh G. Magnitude and determinants of indebtedness among small and marginal farmers: a case study of Patiala district in Punjab. Publication Division Directorate of Economics and Statistics Department of Agriculture and Co-operation Ministry of Agriculture Government of India. 2012;100:143.
- Ramappa K, Yashashwini M. Evolution of farmer producer organizations: challenges and opportunities. *Research Journal of Agricultural Sciences*. 2018;9(4):709-15.
- Ministry of Agriculture & Farmers Welfare GoI. Policy & process guidelines for farmer producer organizations [Internet]. New Delhi: Small Farmers' Agribusiness Consortium (SFAC); 2013.
- Mwololo HM, Nzuma JM, Githinji LM. Determinants of farmer empowerment in agriculture in Kenya: a Tobit approach. *Heliyon*. 2022;8(12). <https://doi.org/10.1016/j.heliyon.2022.e11888>
- Agarwal S, Goyal S. Progression of farmer producer organisations in India. *Indian Journal of Agricultural Sciences*. 2022;92(12):1490-5. <https://doi.org/10.56093/ijas.v92i12.118068>
- Rathour V, Tiwari P, Pandey P, Singh K, Singh D. Socio-economic upliftment of tribal women through FPO in Bastar district of Chhattisgarh. *Indian Journal of Extension Education*. 2022;58(4):144-8. <https://doi.org/10.48165/IJEE.2022.58429>
- Anand S, Ghosh S, Mukherjee A. Effectiveness of farmer producer organizations (FPOs) at different growth stages in transitioning to secondary agriculture. *Indian Journal of Extension Education*. 2023;59(3):90-6. <https://doi.org/10.48165/IJEE.2023.59317>
- Prabhakar I, Kumar A, Jha SK, Satyavathi T. Farmers' perception towards climate and millet producer organizations. *International Journal of Environment and Climate Change*. 2023;13(9):2754-61. <https://doi.org/10.9734/IJECC/2023/v13i92508>
- Sangappa, Charishma E, Babu KS, Rafi D, Laxmi B. Strengthening millet value chain through farmer producer organizations. *Indian Journal of Extension Education*. 2023;59(3). <https://doi.org/10.48165/IJEE.2023.59305>
- Widaty C. Village farmer community empowerment efforts (study of farmer social capital in the Pesantren Petani Nusantara program, Pangandaran Regency). *Jurnal Ilmu Sosial Mamangan*. 2023;12(1):1-10. <https://doi.org/10.22202/mamangan.v1i1.5757>

13. Wanyama FO. Cooperatives and the Sustainable Development Goals: a contribution to the post-2015 development debate; 2016.
14. Roy D, Zulfiqar F, Tsusaka TW, Datta A. Household food insecurity and dietary diversity of women of reproductive age among smallholder farming households in northwest Bangladesh. *Ecology of Food and Nutrition*. 2022;61(4):460-83. <https://doi.org/10.1080/03670244.2021.2024176>
15. Francesconi GN, Ruben R. The hidden impact of cooperative membership on quality management. *Journal of Entrepreneurial and Organizational Diversity*. 2012;1(1):85-103. <https://doi.org/10.5947/jeod.2012.005>
16. Dash S, Mazhar SH. A study on the impact of farmer producer organisations on its member respondents in Puri district of Odisha. *International Journal of Advances in Agricultural Science and Technology*. 2021;8(1):52-65. <https://doi.org/10.47856/ijaast.2021.v08i1.008>
17. Darshan N, Rajashekar B, Patil K, Ravi K, Naik JP. Farmer producing organizations for development of farmers in India: an economic perspective. *International Journal of Current Microbiology and Applied Sciences*. 2017;6(9):1611-5. <https://doi.org/10.20546/ijcmas.2017.609.198>
18. Prasad CS. Farming as an enterprise: ten years of FPO movement in India. *State of India's Livelihood Report*. Access Development Services: New Delhi, India; 2019. p. 37-48.
19. Ministry of Agriculture & Farmers Welfare goI. Data of registered FPOs: Press Information Bureau, Delhi; 2023.
20. Department of Agriculture and Farmers Welfare. Agricultural statistics at a glance 2023. Ministry of Agriculture and Farmers Welfare, Government of India; 2023.
21. Chintala G, Mani G. Collectivisation of farmers and farm produces through farmers producers organisations (FPOs) is benefitting farmers: some field level observations. *Indian Journal of Agricultural Economics*. 2022;77(2):232-42. <https://doi.org/10.22004/ag.econ.345194>
22. Dubey L, Sharif M, Hiremath D, Meena D. Generalised status of farmer producer organisations (FPOs) in India: a review. *Development (MoRD)*. 2021;3(4). <https://doi.org/10.36713/epra2016>
23. Halpati JR, Vahoniya ND, Vahoniya DR. Farmer producer organisation (FPO): a conceptual study about farmer producer company (FPC). *Asian Journal of Agricultural Extension, Economics & Sociology*. 2022;40(10):1185-97. <https://doi.org/10.9734/AJAEES/2022/v40i101676>
24. Jose AE, Jayalekshmi G, Lade AH. Socio-psychological constructs and perceived economic variables impacting the farmer producer organization members in Kerala: a quantitative analysis. *Asian Journal of Agricultural Extension, Economics & Sociology*. 2023;41(8):266-76. <https://doi.org/10.9734/ajaees/2023/v41i82006>
25. Pathania A, Chaudhary R, Kathuria K. Farmers producer organization: can transform the face of agri-business in India. *Journal of Pharmacognosy and Phytochemistry*. 2020;9(5S):745-50. <https://doi.org/10.22271/phyto.2020.v9.i5Sm.13176>
26. Khan MA, Pratap J, Siddique RA, Gedam PM. Farmers producer organization (FPO): empowering Indian farming community; 2020.
27. Jaya G, Lakshmi S, Gummagolmath K, Bhawar R. Strategies for promoting farmer producer organisations (FPOs) in India. *Journal of Agricultural Extension Management*. 2020;21(1):93-100. <https://doi.org/10.46977/apjmt.2024.v04i04.002>
28. Gangwar L, Hasan S, Prakash B, Sharma A, Singh K, Pathak A. Farmer producer organizations and innovative policy options for enhancing farmers' income in India. *Indian Journal of Agricultural Marketing*. 2022;36(1spl):51-63. <https://doi.org/10.5958/2456-8716.2022.00004.5>
29. Sangappa D, Laxmi B, Tengli MB, Ravi S. Determinants of managerial abilities of farmers: insights from millet based farmer producer organizations (FPOs) of Karnataka. *Indian Research Journal of Extension Education*. 2023;23(4):117-21. https://doi.org/10.54986/irjee/2023/oct_dec/117-121
30. Cherukuri RR, Reddy AA. Producer organisations in Indian agriculture: their role in improving services and intermediation. *South Asia Research*. 2014;34(3):209-24. <https://doi.org/10.1177/0262728014544931>
31. Krishna D. Farmer producer organizations: implications for agricultural extension. *Agriculture Extension Journal*. 2018;2(3):196-200.
32. Challuri B, Sudheer Patoju SK. Impact of farmer producer companies on marginal and small farmers: a study of Osmanabad district of Maharashtra, India. *Grassroots Journal of Natural Resources*. 2021;4(2):23-33. <https://doi.org/10.33002/nr2581.6853.040202>
33. Nagaraji S, Kajale D, Malik S, Kadam S. Digital needs & gaps assessment for farmer producer organizations in Maharashtra, India; 2023. <https://hdl.handle.net/10568/138469>
34. Agarwal S. Performance and prospects of farmer producer organisations in Haryana. *Haryana Agricultural University Hisar*; 2023.
35. Zikri I, Agussabti A, Akram M, Indra I, Kamaruzzaman S, Mujiburrahmad M, et al. Farmer empowerment and its contributing factors (a case study of patchouli farmer in Kabupaten Aceh Jaya). *Jurnal AGRISEP: Kajian Masalah Sosial Ekonomi Pertanian dan Agribisnis*. 2022;21(1):147-60. <https://doi.org/10.31186/jagrisep.21.1.147-160>
36. Carr AM, Tenywa M, Balasubramanian K. From learning to empowerment: a study of smallholder farmers in South West Uganda. *Journal of Learning for Development*. 2015;2(3). <https://doi.org/10.56059/jl4d.v2i3.124>
37. Hadley PA. Building co-operation in farmer collectives and across 'value' chains: institutional dynamics and power relations in Central India. *SOAS University of London*; 2023. <https://doi.org/10.25501/SOAS.00039610>
38. Thamban C, Jayasekhar S, Chandran K, Rajesh M. Sustainability of farmer producer organisations: the case of producer organisations involved in the production and marketing of 'neera' in the coconut sector in Kerala, India; 2020. <https://doi.org/10.25081/jpc.2020.v48.i2.6376>
39. Saha S, Pradhan K, Mukherjee A, Roy S, Yadav V. Association of farmers producer organization (FPO) farmers' progressiveness with socio-economic characters: a case study of sub Himalayan region; 2023.
40. Bora S, Ray G. Determinants of farmers' managerial ability. *Vikalpa*. 1986;11(4):309-12. <https://doi.org/10.1177/0256090919860406>
41. Singh G, Budhiraja P, Vatta K. Sustainability of farmer producer organisations under agricultural value networks in India: a case of Punjab and Gujarat. *Indian Journal of Agricultural Economics*. 2018;73(3):370-85. <https://doi.org/10.22004/ag.econ.343375>
42. Shelake C, Rathod M, Deore P. Socio-economic impact of farmer producer company on its members. *Journal of Agricultural Extension Management*. 2022;23(1):73.
43. Gurung R, Choubey M, Rai R. Economic impact of farmer producer organisation (FPO) membership: empirical evidence from India. *International Journal of Social Economics*. 2024;51(8):1015-28. <https://doi.org/10.1108/IJSE-06-2023-0451>
44. Sahoo SL, Das S, Mohapatra BP, Sahoo B, Dash A. Communication behavior analysis of the member farmers of farmer producer organizations (FPOs). *Young*. 2022;38:20-43.
45. Harrington T, Narain N, Rao N, Rengalakshmi R, Sogani R, Chakraborty S, et al. A needs-based approach to promoting gender equity and inclusivity: insights from participatory research with farmer-producer organisations (FPOs). *Journal of Social and Economic Development*. 2024;26(2):409-34. <https://doi.org/10.1177/0256090919860406>

- doi.org/10.1007/s40847-023-00280-x
46. Gorai SK, Wason M, Padaria R, Rao D, Paul S, Paul RK. Leveraging group dynamics for enhancing the performance of farmer producer organizations in West Bengal. *Indian Research Journal of Extension Education*. 2023;23(3):1-7. https://doi.org/10.54986/irjee/2023/jul_sep/1-7
 47. Gautam S, Mallaiah L. Enhancing farmer's income and farmer producer organizations (FPOs) in India. *Saudi Journal of Economics and Finance*. 2024;8:91-101. <https://doi.org/10.36348/sjef.2024.v08i04.001>
 48. Amitha C, Savitha B, Rani VS, Laxminarayana P. Factors contributing to the performance of farmer producer organizations (FPOs): a study in Medak district of Telangana state. *International Journal of Bio-Resource and Stress Management*. 2021;12(3):192-8. <https://doi.org/10.23910/1.2021.2226>
 49. Jaacks LM, Singh N, Veluguri D, Connors K, Sooraj A, Kalra A, et al. Association of membership in a farmer producer organization with crop diversity, household income, diet diversity and women's empowerment in Uttar Pradesh, India. *PloS One*. 2025;20(3):e0319704. <https://doi.org/10.1371/journal.pone.0319704>
 50. Wankhade P, Rathod M, Uikey B, Waghmare R, Mendhe H. Impact of farmers producer company on members. *Journal of Agricultural Extension Management*. 2022;23(1):103.
 51. Yogitha P, Anjugam M, Amarnath J, Rani SP, Sivasankari B. Determinants of participation of members in farmer producer organization in Madurai district. *Asian Journal of Agricultural Extension, Economics & Sociology*. 2023;41(10):1-6. <https://doi.org/10.9734/ajaees/2023/v41i102133>
 52. Yadav V, Mukherjee A, Kumar U, Pan R, Chakrabarti A, Sarkar PK. Farmers producer organizations: boon for small and marginal farmers. *Agriculture & Food: e-Newsletter*. 2020;2(10):7-10.
 53. Monika I, Kishore NK, Gopal PS, Murthy BR. Understanding and assessing the current business operations performed by identified farmer producer organisation in Guntur district of Andhra Pradesh. *Andhra Pradesh Journal of Agricultural Sciences*. 2023;9(1):69-75.
 54. Malaisamy A, Arun S. Evaluating the socio-economic status on the economic performance of farmer producer companies in the southern districts of Tamil Nadu, India. *Journal of Experimental Agriculture International*. 2024;46(10). <https://doi.org/10.9734/jeai/2024/v46i102993>
 55. Lalitha N, Viswanathan P, Vinayan S. Institutional strengthening of farmer producer organizations and empowerment of small farmers in India: evidence from a case study in Maharashtra. *Millennial Asia*. 2024;15(2):278-99. <https://doi.org/10.1177/09763996221098216>
 56. Vadasri R, Mishra S. Linking farmer producer organizations with other markets: a sustainable change in marketing of farm produce. *International Journal of Environment and Climate Change*. 2022;12(12):1425-37. <https://doi.org/10.9734/ijecc/2022/v12i121583>
 57. Kumar A, Kumar V. Understanding of FPOs' business ecosystem and strategies to tap potential. *Indian Journal of Agricultural Marketing*. 2022;36(1spl):77-95. <https://doi.org/10.5958/2456-8716.2022.00006.9>
 58. Manaswi B, Kumar P, Prakash P, Anbukkani P, Kar A, Jha G, et al. Progress and performance of states in promotion of farmer producer organisations in India. *Indian Journal of Extension Education*. 2018;54(2):108-13.
 59. Singh G, Vatta K. Assessing the economic impacts of farmer producer organizations: a case study in Gujarat, India. *Agricultural Economics Research Review*. 2019;32.
 60. MP AA, Mathur A. Farmer producer organisations (FPOs): an approach for doubling farmer income by 2022. *Journal of Pharmacognosy and Phytochemistry*. 2018;7(6):1321-5.
 61. Sangappa DR, Ravi S, Charishma E. Assessment of millet stakeholders perception towards millets training program during international year of millets. 2024;8(Sb):915. <https://doi.org/10.33545/26174693.2024.v8.i4Sb.915>
 62. Trebbin A. Linking small farmers to modern retail through producer organizations-experiences with producer companies in India. *Food Policy*. 2014;45:35-44. <https://doi.org/10.1016/j.foodpol.2013.12.007>
 63. Bharali D, Gogoi H. Impact of farmer producer organization in augmenting farmers' income in Assam: a case study. *Age*. 2022;36:42-6.
 64. Acharya S, Acharya S, Mandal T. Evolving entrepreneurial trajectory in Odisha through farmer producer organisations: a new farm economy. *Education*. 2023;10:2-109. https://doi.org/10.54986/irjee/2023/jul_sep/104-109
 65. Kumar KNR, Reddy MJM, Shafiwu AB, Reddy AA. Impact of farmer producer organizations on price and poverty alleviation of smallholder dry chillies farmers in India. *Research on World Agricultural Economy*. 2023;4(3):46-62. <https://doi.org/10.36956/rwae.v4i3.880>
 66. Malik S, Kajale D. Empowering small and marginal farmers: unveiling the potential and addressing obstacles of farmer producer organizations in India. *Research on World Agricultural Economy*. 2024;5(1):32-47. <https://doi.org/10.36956/rwae.v5i1.994>
 67. Jayashree V, Rani AJ, Karthikeyan C, Malarkodi M, Selvi RG. Sustainability of Farmer Producer Organisation's-major constraints in functioning of FPO in Tamil Nadu, India. *Asian Journal of Agricultural Extension, Economics & Sociology*. 2023;41(9):861-8. <https://doi.org/10.9734/AJAEES/2023/v41i92113>
 68. Prasad M, Rajbhar R, Kumar A. Effective extension strategies and mobilisation of FPOs to market. *Agriculture*. 2022;5(1):39-45.
 69. Royal AP, Kishore MR, Kishore NK, Kumari PL. Challenges in hindering the performance of FPOs in Anantapur district. *Journal of Agricultural Sciences*. 2023;9(2):155-8.
 70. Chandrakar K, Chandrakar DK, Das D. Farmers Producer Organization (FPO): how it is changing farming scenario. *International Journal of Science and Research Archive*. 2023;8(1):761-5. <https://doi.org/10.30574/ijrsra.2023.8.1.0082>
 71. Mishra N, Vashisht A, Raghuvanshi S. Transforming Indian agriculture: unleashing the potential of digital agriculture using efficiency analysis. *Digital Agricultural Ecosystem: Revolutionary Advancements in Agriculture*. 2024:123-43. <https://doi.org/10.1016/j.agsy.2023.103751>
 72. Valamannavar S, Sumanth S. A review on farmer producer organisations: a new dimension to the farmer centric approach. *International Journal of Agricultural Sciences*. 2019;15(1):212-6. <https://doi.org/10.15740/HAS/IJAS/15.1/212-216>
 73. Royal AP, Kishore MR, Kishore NK, Kumari PL. Challenges in hindering the performance of FPOs in Anantapur district. *Acharya N.G. Ranga Agricultural University, Andhra Pradesh, India*; 2023.
 74. Bizikova L, Nkonya E, Minah M, Hanisch M, Turaga RMR, Speranza CI, et al. A scoping review of the contributions of farmers' organizations to smallholder agriculture. *Nature Food*. 2020;1(10):620-30.
 75. Pujitha GS, Kubrevi SS, Shah AH. Knowledge of women self-help group members regarding vermicompost production technology in Kashmir valley; 2023.
 76. Tijani SA, Yano I. Assessment of current status of women farmers in Japan using empowerment indicators. *Journal of Applied Sciences*. 2007;7(20):3006-14. <https://doi.org/10.3923/jas.2007.3006.3014>
 77. Barooah P, Alvi M, Ringler C, Pathak V. Gender, agriculture policies, and climate-smart agriculture in India. *Agricultural*

- Systems. 2023;212:103751. <https://doi.org/10.1016/j.agry.2023.103751>
78. Sabharwal NS, Sonalkar W. Dalit women in India: at the crossroads of gender, class and caste. *Global Justice: Theory Practice Rhetoric*. 2015;8(1). <https://doi.org/10.21248/gjn.8.1.54>
79. Sasikanth R, Ravichandran S. Assessing women farmers' perceptions of farmer producer organizations: a special reference to Namakkal district, Tamil Nadu, India. *Asian J Agric Ext Econ Soc*. 2023;41(10):727-37. <https://doi.org/10.9734/ajaees/2023/v41i102219>
80. Vahoniya DR, Vahoniya ND, Halpati JR. Farmer producer organisation (FPO): a conceptual study about farmer producer company (FPC). *Asian Journal of Agricultural Extension, Economic & Sociology*. 2022;40(10):1185-97. <https://doi.org/10.9734/AJAEES/2022/v40i101676>
81. Bikkina N, Turaga RMR, Bhamoriya V. Farmer producer organizations as farmer collectives: a case study from India. *Development Policy Review*. 2018;36(6):669-87. <https://doi.org/10.1111/dpr.12274>
82. Nikam V, Singh P, Sharma D. Nature and effectiveness of extension services provided by producers organization; 2016.
83. Sipayung BP, Joka U, Maulana AS, Onuigbo DM. Fiscal decentralization and farmer empowerment in Indonesia-Timor Leste border: a case study of village fund. *Caraka Tani: Journal of Sustainable Agriculture*. 2023;38(2):273-83. <https://doi.org/10.20961/carakatani.v38i2.67578>
84. Wahyudi ST, Badriyah N, Nabella RS, Sari K, Radeetha R. Economic empowerment through strengthening the role of farmer groups in TNBTS. *Journal of Community Service and Empowerment*. 2023;4(2):425-35. <https://doi.org/10.22219/jcse.v4i2.26030>
85. Mukherjee A, Singh P, Rakshit S, Priya S, Burman RR, Shubha K, et al. Effectiveness of poultry based farmers' producer organization and its impact on livelihood enhancement of rural women. *Indian Journal of Animal Sciences*. 2019;89(10):1152-60.
86. Nikam V, Ashok A, Pal S. Farmers' information needs, access and its impact: evidence from different cotton producing regions in the Maharashtra state of India. *Agricultural Systems*. 2022;196:103317. <https://doi.org/10.1016/j.agry.2021.103317>
87. Singh M, Tiwari D, Sharma A, Rana RK. Constraints in operationalizing FPOs in Punjab and strategies to mitigate them. *Agricultural Science Digest*. 2023;43(4):530-5. <https://doi.org/10.18805/ag.D-5494>
88. Jayashree V, Rani AJ, Karthikeyan C, Malarkodi M, Selvi RG. Sustainability of Farmer Producer Organisation's-Major constraints in functioning of FPO in Tamil Nadu, India. *Asian Journal of Agricultural Extension, Economics & Sociology*. 2023;41(9):861-8. <https://doi.org/10.9734/ajaees/2023/v41i92019>

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