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REVIEW ARTICLE

# A comprehensive review of farmers producer organizations in India: Historical evolution, current status and future policy challenges

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## Abstract

Agriculture plays an important role in India but faces various challenges. A large number of farmers in India have small and marginal holdings of less than two hectares, which is linked to the increasing fragmentation of land. Many institutional policies aim to improve the farmer's livelihoods to mitigate the disadvantages of land fragmentation. These measures include the formation of Primary Agricultural Cooperative Society (PACS), Self-Help Group (SHG), Joint Liability Group (JLG) and Common Interest Group (CIG). However, there are limitations to these initiatives, as they often provide considerably more managerial control and influence to local powerful individual. In response, Farmers Producer Organizations (FPOs) have emerged as pivotal entities aimed at integrating smallholders into mainstream markets. India has over 10,000 FPOs, benefiting 4 million farmers and increasing income by 20-25%. But 70% face sustainability challenges. Policy initiatives, such as NABARD's Rs.6,865 crore schemes, an aim to address these issues. This paper considered the Scopus database using the Boolean keyword "Farmer" and "Producer organization" and identified articles were shortlisted after screening using PRISMA framework. While previous studies have offered insights into various aspects of FPOs, there remains a significant lack of cohesive analysis integrating historical trends, current challenges and future policy directions. This study identifies key factors influencing FPO system, including governance mechanisms, market linkages and capacity-building initiatives. The review highlights current challenges and opportunities within the FPO system, suggesting policy recommendations for future development. The findings offer valuable insights into the transformative potential of FPOs and inform strategic policy recommendations to ensure their sustainability in India's agricultural sector.

## Keywords

current status; evolution; farmer producer organisation; future policy; performance; sustainability

## Introduction

India is the second-largest country in the world after China, with over 92 million small holdings which account for 21% of the 450 million small holdings worldwide. The country's operational landholdings increased over the years, indicating a decline in the average landholding size (1). This trend reflects an increase in land fragmentation. As smallholders, these farmers face inherent challenges, such as the absence of economies of scale, limited access to information and their inability to participate in the price discovery mechanism. Farmer suicides have risen in recent years, primarily due to crop failures and sharp declines in market prices. Farmers are the foremost and direct victims of agriculture risks, including price risks and marketing risks (2). Through the continuous adaption of new technology, farmers have been able to mitigate risks and make decisions based on the availability of resources, external environment and their preferences.

Indian farmers are proficient producers but face significant challenges in marketing their products due to lack of access to markets in rural areas, limited awareness of other markets and poor marketing skills to meet demand in accordance with price fluctuations. One of the ways to reduce their risk is mobilize farmers for organizational action, arrange inputs, farm services and collective marketing to benefit from economies of scale. The only option to address these smallholders' issues is to organize them into a group, enabling the application of economies of scale. Government, commercial and civil society organizations have attempted to connect smallholders to input and output markets through a variety of institutional interventions. Numerous attempts have been made in the past to organize the farmers into various groups, including Commodity Interest Groups (CIGs), Self-Help Groups and Agricultural Cooperatives (3). However, the success achieved has been limited and confined to a few regions. As an institutional tool for enhancing smallholder agricultural performance through increased market participation, Farmer Producer Organizations (FPOs) are receiving renewed attention from donors, governments and scholars (4). Small-scale farmers must be integrated as farmer collectives to get the benefits of agricultural produce (5).

Farmer collectives are seen as a crucial component in connecting smallholders to contemporary markets. These collectives offer numerous advantages, such as reducing intermediaries in marketing channels and an increasing farmers income (6). Farmer's revenue from membership in farming organizations is an essential factor in raising agricultural output levels, providing financial benefits and improving their overall welfare (7).

The research gap identified in this study lies in the absence of a comprehensive systematic review that integrates past, present and future policy frameworks for FPOs. Farmers producer organizations (FPOs) in India emerged in the early 2000s to address challenges such as land fragmentation and limited market access. Promoted by institutions like NABARD, they enable collective action, improving farmers' market linkages, financial access and productivity. This study focuses on the dimensions of performance, sustainability, livelihood impact and social capital accumulation of FPO. Social capital in FPOs refers to the trust, networks, and relationships that enable collective action, improving cooperation and resource-sharing among members. Performance is measured by the FPOs success in increasing incomes, ensuring sustainability and enhancing market access through effective governance and management. While existing literature provides fragmented insights into various aspects of FPOs, there is a lack of a cohesive analysis that spans across temporal frames and addresses the holistic evolution and trajectory of FPOs. This study aims to fill this gap by integrating historical trends, current challenges and prospective policy directions to offer a comprehensive understanding of FPO dynamics. It also seeks to inform strategic policy recommendations for enhancing their effectiveness and long-term viability in India's agricultural sector. The conceptual framework is presented in Fig. 1.

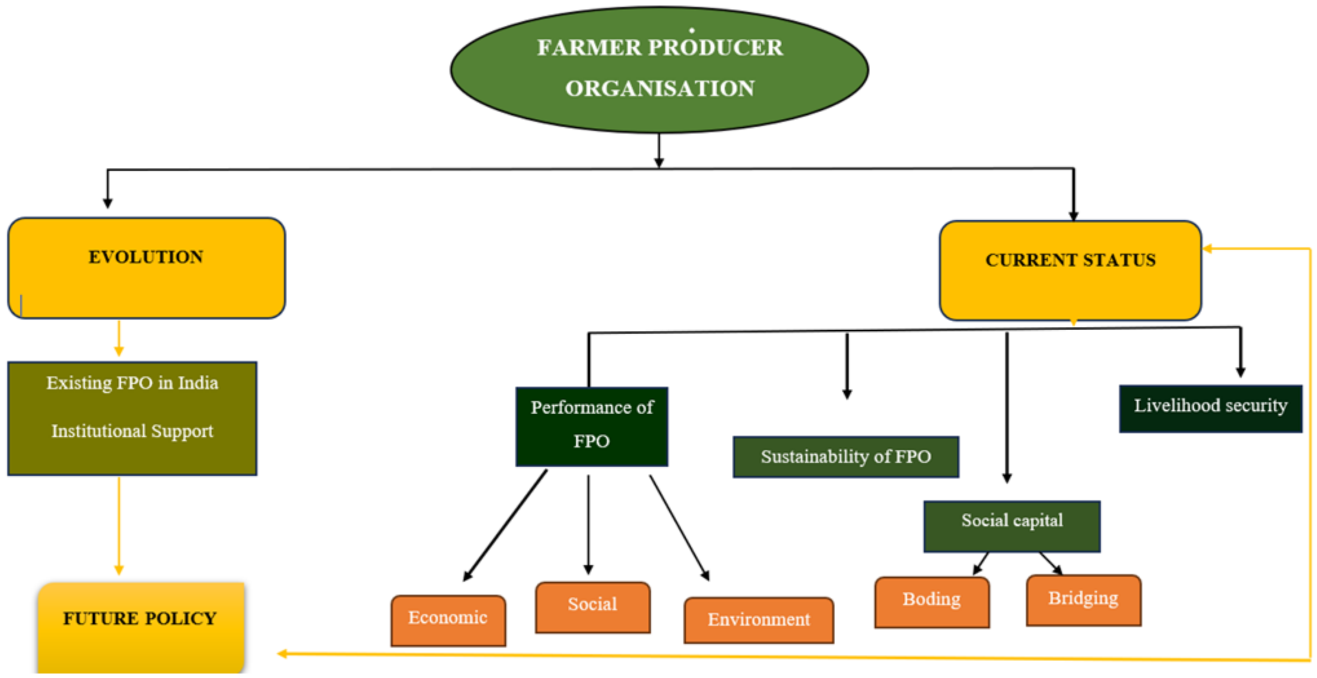


**Fig. 1.** Conceptual framework.

## Materials and Methods

Systematic article searches and screenings were performed by generating keyword combinations in the two databases, Scopus and ScienceDirect. Searches were conducted using the fields '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, research notes and trade publications were excluded. Peer-reviewed journal, articles from these databases were collected up to the year 2023.

### STRINGS USED FOR SEARCHING ARTICLES

| |
|---|
| “FARMER” AND “PRODUCER ORGANISATION” |
| “FARMER” AND “PRODUCER ORGANISATION” AND “PERFORMANCE” |
| “FARMER” AND “PRODUCER ORGANISATION” AND “PERFORMANCE” AND “LIVELIHOOD” |

### The term used and frameworks of data collection

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework ensures transparency and rigor in systematic reviews by outlining the selection, screening and analysis process. It systematically removes duplicates, screens for relevance and excludes studies that do not meet predefined criteria, with reasons documented. The process is visualized in a PRISMA flow diagram for clarity and replicability. A list of research articles was generated using “Farmer” AND “Producer Organisation” OR “Farmer” AND “Producer Organization” in the title and the title-abstract-keyword. The filtering procedure for the Boolean keywords "Farmer" AND "Producer” AND “organization" was used in the subsequent search. In 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 reference FPOs in the article title (Fig. 2). The total number of articles found was 1,158 from Scopus, 1,696 from ScienceDirect databases and 12 articles from Google Scholar, prior to removing duplicates. The second step involved removing duplicate articles found across the databases. The third step was to exclude publications that was reviewed articles and research papers that lack the performance, social capital, sustainability and livelihood of FPO. The fourth step included only case studies that demonstrated performance, social capital, sustainability, and livelihood impacts. This process excluded 2,910 articles from Scopus and ScienceDirect databases. This ensured that only articles focusing on evolution, status and future prospects of FPOs. Therefore, 77 articles were selected for further analysis.

## Results and Discussion

### Evolution of FPO

Farmers’ Producer Organizations (FPOs) is a collective of farmers with specific interests and concerns, governed by a set of rules and regulations. It includes a formal membership, structure, status and functions for its members. It entails organizing farmers at the village level into FIGs, which are consist of 15 to 20 farmers with shared goals. these groups are formed to promote resource sharing, knowledge exchange and collective action. They play a vital role in improving access to inputs, technology and markets, thereby enhancing productivity and income. Subsequently, these FIGs unite to establish FPOs. An FPO operate on the basis of the clustering approach concept by offering agricultural input services and technical assistance, opening up markets and creating jobs (8, 9). FPOs have helped to diversify high-value crops, helped the most disadvantaged people to enhance their access to credit and information services, encouraged group efforts and public-private partnerships, opened up access to the global market, enabled quicker and better prices for produce, and improved supply chain organization.

According to the companies act of 2013, farmer organizations in India can be structured as producer companies under the cooperative societies act, cooperatives under the companies Act of 2013, non-profit entities under the companies act of 2013, or trusts under the Indian trusts act of 1882.

In India, the primary agricultural cooperative society (PACS) is one of the most traditional types of producer associations. Apart from this, there are various other types of producer organizations that serve particular or multiple purposes, such as Farmers' Clubs (Thirunelly Farmers’ Club, Kerala), CIGs (vegetable growers' CIG, Haryana), federation of SHGs (SEWA Federation, Gujarat), SHGs (Kudumbashree SHGs, Kerala), JLGs (Samunnati JLGs, Tamil Nadu). However, the failure of farmer collectivization through cooperatives in the agriculture sector, the escalating agrarian crisis and the rapid private-sector growth through corporatization sparked fresh ideas about combining the finest features of corporates and co-ops. In 2000, a group led by Professor YK Alagh advocated the idea of producer corporations. In 2002, the companies act of 1956 was revised to include a new provision, "Part IXA" for "Producer Companies," introducing a brand-new category of corporate entity. These businesses were established based on the principle of "patronage" and "mutual assistance principles" to combine the best features of the corporate and cooperative sectors, benefiting primary producers, particularly small and marginal farmers (10).

### Existing FPO in India

About 85% of farmers in India have small and marginal holdings of less than two hectares, which is also connected to the increasing fragmentation of the land (11). Land fragmentation is a negative indicator for agricultural productivity and food security, as it raises production costs, promotes farm inefficiency and reduces farmers' net

India's largest FPOs,

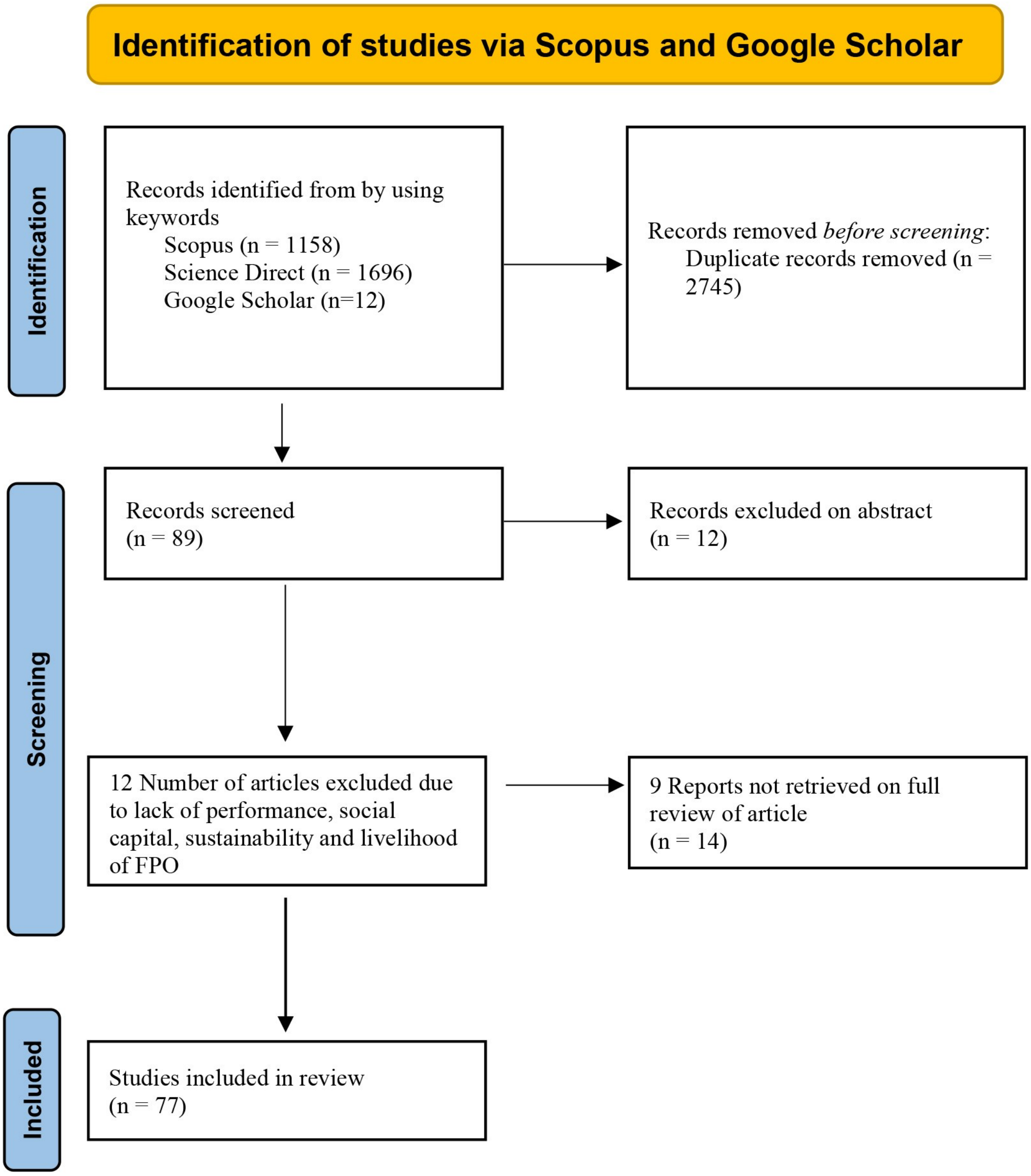


**Fig. 2.** PRISMA framework for screening of articles.

income growth (12). FPOs were established to address the challenges of land fragmentation in both input purchases and output sales. They help by organizing and mobilizing farmers to negotiate better prices for their produce, better market access and better information sharing (13). The primary objective of FPOs' is to integrate small farmers providing inputs such as seeds, fertilizers, loans, insurance, knowledge and extension services, both in the forward and backward directions. Market-led agricultural production, group marketing and processing are examples of forward linkages (14). Although small and marginal farmers are the primary beneficiaries of FPOs, these organizations are believed to empower farmers through collective bargaining and create an entrepreneurial element to farming with state intervention (15). India has witnessed remarkable success stories of Farmer Producer Organizations (FPOs) contributing to agricultural transformation. Sahyadri Farms in Maharashtra, one of empowers over 8,000 farmers in exporting grapes and vegetables, generating an annual turnover of ₹500 crore. Dharani Cooperative in Telangana promotes organic millet farming, enhancing incomes and market access for small farmers. Sri Rangan Farmers Producer Company in Tamil Nadu increased farmers' incomes by value-adding rice through its own mill. Women-led FPOs like those under MAVIM in Maharashtra have excelled in dairy and agro-processing, empowering rural women.

To enable farmers to efficiently participate in field production and market activities, FPOs are being encouraged to establish their own enterprises in India (16). To addresses the various challenges that small and marginal farmers, FPOs have adopted a hybrid company and cooperative model (17). This approach have proven successful in integrating farmers into modern supply chains for improved performance (18). FPOs are viewed as organizations that combine key elements of private sector profitability with cooperative principles that drive their objectives (19). However, FPOs are distinct from traditional cooperatives. Unlike traditional cooperatives, which often lack transparency, producer companies function within corporate regulatory frameworks (20). A modest distinction between FPOs and earlier collective forms is that are eligible for legal arrangements to allow dividend sharing of earnings. FPOs also assist members by securing better prices for their produce. The main objective of an FPO is to increase farmers competitiveness and provide them with a greater advantage in recently emerging markets (5). Fig. 3 depicts the number of FPOs registered by different agencies.

## Institutional support

In India, the establishment of FPOs is administered by the Department of Agriculture Cooperation and Farmers Welfare (DAC & FW), which has gathered the cooperation of other central government entities, including the Ministry of Corporate Affairs, Small Farmers' Agri-Business Consortium (SFAC, National Bank for Agriculture and Rural Development (NABARD), National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED), National Cooperative Development Corporation (NCDC), and Food Corporation of India (FCI). Backward interactions involve activities that support farmers in production, such as providing inputs, training, and access to technology. Forward interactions focus on helping farmers market and sell their produce, ensuring better prices and access to consumers. In backward Interaction, Sahyadri farms supply high-quality seeds, fertilizers, and modern farming techniques to grape farmers, ensuring improved productivity. In forward interaction, it handles post-harvest processing, packaging, and direct export of grapes to international markets, bypassing intermediaries and securing better prices for farmers. The FPOs seek to boost farmer income by integrating forward and backward interactions in agriculture, such as processing, quality control, training, market connections, and finance (5). The Government of India released the FPO formation guidelines in 2013, and the Ministry of Agriculture of the Government of India proclaimed 2014 as the "Year of Farmer Producer Organizations (FPOs)" with a special package allocation of ₹ 200 crores to NABARD as the PRODUCE fund to promote FPOs. Consequently, financial support from both NABARD and SFAC gave the creation of FPOs a further push (5).

The vegetable initiative for urban cluster (VIUC), the Paramaparagat Krishi Vikas Yojana (PKVY), the Rashtriya Krishi Vikas Yojana (RKVY) and other government schemes are the state departments and central level entities in India that are striving to organize farmers into producer organizations. Of the central level organizations striving to promote FPOs across the nation, the SFAC and NABARD are the most important (21). Currently, about 6000 FPOs operate as registered producer organizations in India, whereas about 3200 FPOs operate as cooperative societies (NABARD, 2023) (22). Registered FPOs excel in

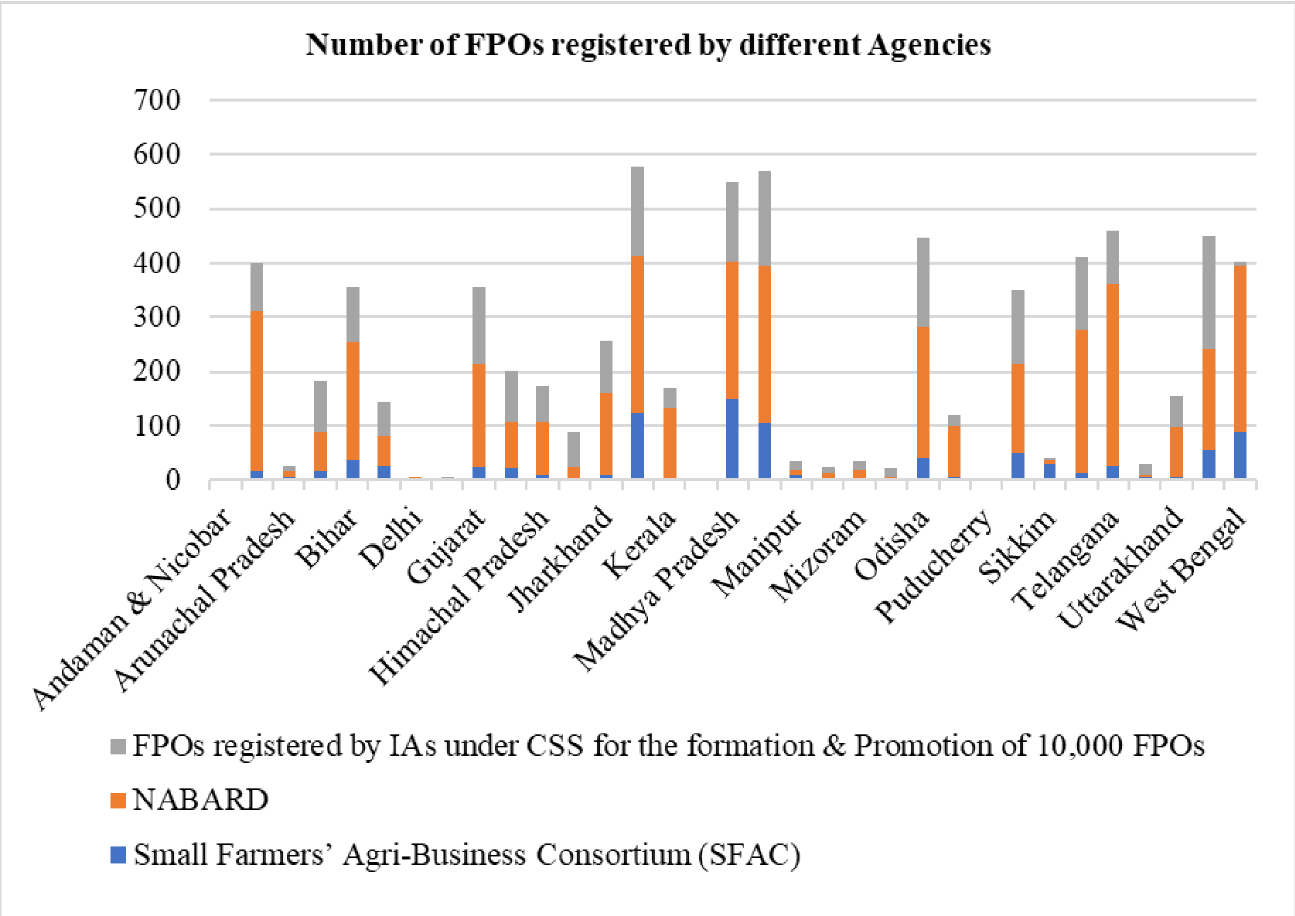


**Fig. 3.** Number of FPOs registered by different agencies.
(Source: Press Information Bureau, 2022)

market linkages and profitability, while cooperatives are more inclusive and effective at the grassroots, especially in sectors like dairy. FPOs are market-driven, while cooperatives thrive on community support, making them complementary for diverse farmer needs.

Numerous governmental and non-governmental organizations (NGOs) have attempted to group farmers and integrate them into the process of advancement by actively involving them in production, technology transfer, planning, marketing, execution, monitoring of various agricultural and rural development developmental projects (23).

## Multi-dimension of farmer producer organizations performance, social capital, sustainability and livelihood security of farmers

### Performance of farmers producer organizations

The purpose of the Sustainable Development Goals (SDGs) is to improve the lives of the poor and marginalized people. One of the sub-goals aims to achieve the SDGs by tripling agriculture productivity and the earnings of small-scale farmers. For small farmers, producer organizations are become increasingly important in ensuring improved access to services through intermediation (24). Access to markets, value-added possibilities, inputs and financial services is facilitated by transparent institution that guarantees inclusive, responsive, participatory and representative decision-making (21). Hence, FPO act as a driver to increase farmers' incomes, expand their market share, lower transaction costs and commercialize their agricultural output (25).

FPOs strengthen farmers' collective production and marketing power by coordinating farmers (26). In production-centric approach, FPOs enable farmers to engage in profitable farming through mechanization, input availability, and knowledge adoption. It also helps enhance farming methods, reduce input costs, altered cropping patterns, higher crop yield and output. These benefits associated with joining an FPO may assist farmers in making greater profits from agricultural and related sector operations (27). They also bring value by fostering connections, exploring ways to raise income, and collaborating with government initiatives**.** In contrast**,** market-centric FPOs perform better in business operations (28). The transactional output cost for members is two and a half times lower than for non-members, providing significant financial advantages and the members incomes increased by 20-25%. According to the comparison analysis, members had a mean transactional input cost per hectare that was much lower than that of non-members (29). It also improved the farmers financial circumstances and lifestyles by disrupting middleman networks and enabling direct sale to traders or buyers (26). They are thought to be one of the best strategies for improving the socioeconomic status and competitiveness of farmers (30). Thus, it is often needed to coordinate technology, input delivery, and extension services which equip farmers with the resources, knowledge, and market access they need for sustainable agricultural growth and socioeconomic advancement (18). FPOs face administrative challenges like poor management and complex regulations, financial issues such as limited credit access, and social barriers like low farmer participation. These challenges also offer opportunities for capacity building, policy support, and technology adoption.

### Social capital dynamics of farmers producer organizations

Understanding and establishing social capital to promote collaboration is essential in societies where confidence is low and physical distances between people are high (31). A paradigm shift from subsistence agriculture to commercial agribusiness is occurring in many developing nations, such as India. For businesses operating in the retail of agricultural produce and the processed food market, globalization has created a wealth of new prospects (9). Investments in co-dependent activities, such as skill development, finance, input delivery, and marketing education, must be integrated for pro-poor market connections to succeed, as separate investments may not be beneficial below a certain threshold (32). Farmers in FPOs are more likely to engage in collective action and mutual benefit if they have established networks, trustworthiness, and shared standards. The findings align with policies like NABARD's 10,000 FPO scheme, highlighting that FPOs thrive on networks, trust, and shared standards. However, accessing sufficient funds remains a significant obstacle to maximizing these benefits (18).

During their initial phase, FPOs face challenges such as raising equity capital and a lack of physical assets or collateral for loans (33). Producer companies need a large amount of money beyond equity within three years in order to grow, and they frequently approach banks for loans. However, banks are hesitant due to uncertainties about their capacity to secure additional funds and provide collateral, forcing businesses to rely primarily on member equity (34). A lack of equity capital during the initial phase, causes FPOs face difficulty addressing poverty. To break the cycles of poverty, strategies from Asia and Africa recommend combining small-scale agro-enterprise development with complementary interventions such as technology innovation, rural credit systems, communication, human capital formation, and physical infrastructure (35). Additionally, purchase orders with assurances from promoter groups may be necessary for financial support (36).

### Bonding and bridging

Relationships between people "with a common social background trust each other" inside groups or communities are referred to as bonding social capital (9). Self-efficacy is a key component of FPOs performance, and it helps farmers to remain persistence because they believe in their individual capability (37). In contrast to bonding social capital, bridging social capital refers to interactions that span clear social boundaries and typically involves weaker ties (38). Connectivity with more distant, external, or vertically positioned people or groups like financial institutions or governmental bodies defines linking social capital (14). Farmer-to-Farmer (F2F) extension system, various types of interactions can affect farmers' access to resources, social and professional networks, opportunities for advancement, and capacity growth. Bridging and linking social capital should be used in addition to bonding social capital for the best possible F2F system as shown in Table 1. The review demonstrates how farmer groups and communities may grow cautious and resistant to innovations and change in the absence of ties to external actors and institutions. However, without strengthening the social capital that is shared among the localized group of farmer participants, extensive external linkages (linking and bridging social capital) may result in the unequal distribution or hoarding of significant resources and power, further dividing society and the economy (9).

## Sustainability of farmer producer organisations under agricultural value networks

For FPOs, organizational and business factors are integral to sustainability. The long-term efficacy of an organization is ensured by its sustainability, which directly impacts small farmers' (39). Ensuring the sustainability of FPOs requires choosing a CEO is an important criterion who can effectively coordinate the members. Care should be taken to ensure that the CEO is a knowledgeable individual with a positive outlook (27). In addition to ensuring the company's viability and the members should have the ability to support themselves. On the consumer side the FPOs maintain their long-term efficacy by providing food access for the underprivileged where food accessibility is essential to reaching the SDGs. As agribusinesses, FPOs provide consumers more options while helping small farmers build their assets and diversify their sources of income. Coordinated activities within FPOs are essential for influencing commodity quality, quantity, and price as well as lowering production costs through improved negotiation (40).

**Table 1**. Difference between bonding and bridging

| Bonding Social Capital | Bridging Social Capital |
|---|---|
| Within organisation | Between organisation |
| Closed system | Open system |
| Inward looking | Outward looking |
| Horizontal | Vertical |
| Strong ties | Weak ties |

One of the most important factors affecting the long-term viability of FPOs is institutional support. This support helps organization to create new markets, implement best practices for agriculture, and give farmers managerial training. Many governments create FPOs to improve rural service delivery in order to boost economic growth and eliminate poverty because the benefits of FPOs can extend beyond agriculture to other industries (World Bank 2008). The establishment of new market connections, adoption of best practices in agriculture, and the provision of management abilities to farmers are all examples of the institutional support that is critical to the long-term viability of FPOs (41).

Economic stability achieved through financial management, governance, and reinvestment is a component of cooperative sustainability. Socially, it emphasizes community development, fair working conditions, and member well-being. Environmentally, it emphasizes conservation, reducing carbon emissions, and investing in sustainable technology for eco-friendly production. Federations ultimately improve the capacity of member cooperatives to achieve long-term economic, social, and environmental sustainability by fostering communication, resource sharing, and collective decision-making.

## Upliftment of livelihood security

Farmer-producer organizations (FPOs) are established at various levels within the state to organize marginal and small farmers, aiming to improve the standard of living for their members (42). Participation in FPOs significantly improves the living standards of smallholders by increasing prices and revenue (43). Compared to traditional marketplaces, FPOs raise prices by 5–10% and decrease input costs by 10–15%. FPOs provide financial services such as insurance while promoting farmers' welfare, self-sufficiency, and mutual aid. The most successful organization for motivating farmers to build their capacity, increase their aggregate output, and improve their bargaining power for inputs and agricultural products is the FPO (44). FPOs have a positive effect on economic growth by organizing farmers for increased living standards through guaranteed income, employment, and advanced production technology (45).

Factors such as age and education significantly influence the livelihood security of farmers involved in FPOs. Farmers' income is notably affected by education, as those with knowledge actively utilize FPO resources and subsidies (10). Furthermore, it was shown that a member's age had a positive effect on their income due to their experience, knowledge, and ability to reduce losses, older farmers earn higher revenues. Their ability to properly mitigate risks and persevere through challenges that distinguishes them apart from younger farmers who may be discouraged by losses (36). Therefore, youth with education in the state should join the FPO and participate in its training program, as it will help to increase income and lower the state's unemployment rate (22).

## Marketing

In India, the process of marketing agricultural products is complex. Farmers often sell their produce to middlemen in the market due to a lack of direct market access, which reduces their profit margins and makes their farming operations unsustainable. The unstructured nature of the agricultural sector results in limited linkages and restricted market access for farmers to sold their produce (46). In the absence of a strong local market or contractual agreements, the majority of small and marginal growers sell their produce at the farm gate, frequently to middlemen at low prices (47).

Farmer associations provide a solution by offering small and marginal farmers more options to participate in the market (48). By aggregating large volumes of produce, these associations enable farmers to access markets more efficiently than they could as individual producers (41). Both farmers and market functionaries benefit from streamlined market transactions facilitated by producer groups, which help reduce costs and save time (8). Collective action has led to new institutional, technological, and economic advances as well as the development of market niches (49).

Small farmers face obstacles such as land scarcity, lack of negotiating power, and difficulty in obtaining credit, all of which reduces economies of scale. FPOs provide access, voice, bargaining power, and scale advantages by connecting small farmers to larger markets. They offer significant benefits, including reduced risk, access to diverse market channels, group inputs purchases, increased productivity, and enhanced marketing opportunities (50).

Smallholder agriculture cannot be improved solely through access to technology and inputs alone. To reduce transaction costs and resolve coordination challenges along the value chain, innovative institutional arrangements are essential. If accessing output markets increases income, farmers might be ready to make the necessary investments. To increase farmers' access to output markets, cooperative efforts are essential (51). Farmers must become more socially capital-rich and develop both internal and external relationships with other members of their group, service providers, and participants in the market chain in order to become more organized (52). Farmer organizations serve as vital hubs for the fostering innovation uptake by facilitating effective information exchanges (53).

## Value addition

Although agricultural output has a limited shelf life, value addition can extend its shelf life and make it easier to transport processed goods to distant markets. In this way, the agricultural produce's price realization can be improved. Optimal institutional frameworks for FPOs, are outlined in Fig. 4. Although retail prices for agricultural produce have been rising, the price realization by small farmers has not risen commensurately (17). This trend significantly impacts the economy, consumers, and farmers alike. There are multiple areas where small farmers can receive support to increase their farm income. The nature and extent of institutional support for value addition in the agricultural produce, such that it enhances the net income of smallholder farmers. Small farmers to

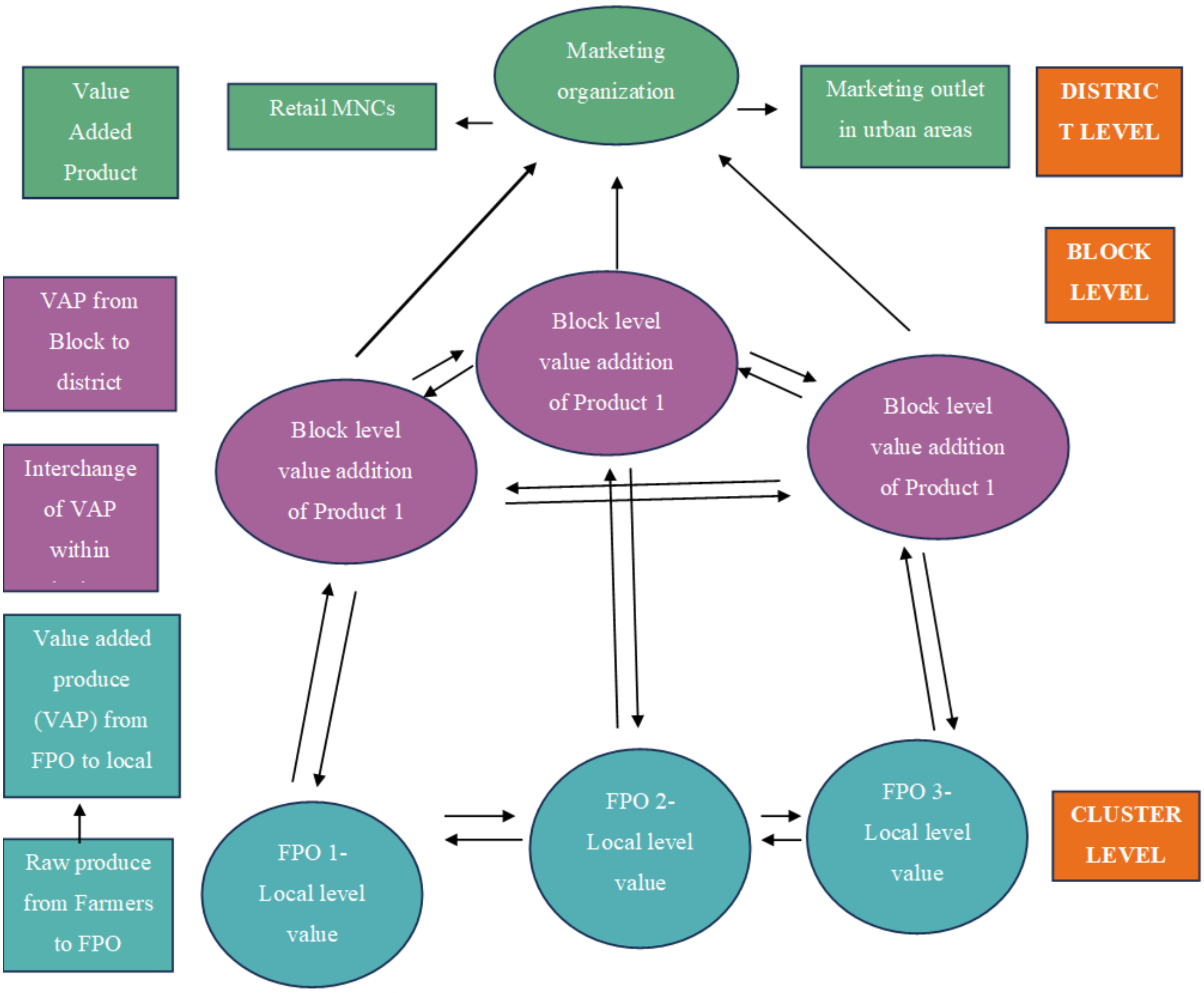


**Fig. 4.** Optimal institutional architecture of FPO's.

remain competitive and capitalize on their labour management advantages, they must devise strategies to mitigate the growing disadvantages they face when interacting with other supply chain participants (54). To improve the farmers' market access, particularly for high-value agricultural products (HVAPs), participating in value-adding operations like agro-processing and group marketing is essential (55). In contrast to those who concentrated on a single product or a small number of functions, FPOs that handled processing, manufacturing, and marketing functions in addition to diversifying their product line showed the best effectiveness of 68.40% (41).

FPOs may offer a way to address the issue of agricultural commodities not having enough value added and the unprocessed disposal of their produce (5). By pooling their resources to arrange input purchases and value-added agricultural processing, farmers can increase returns through group formation (56). Farmers must investigate potential customers for value addition, which are actively encouraged by farmer associations, in order to combat poverty (56).

Case studies highlight the success of value chain approaches, such as millet processing through FPOs. For instance, the ICAR-IIMR established a primary processing unit at an FPO farm gate, through the FPO strengthening the millet value chain by engaging FPOs or SHGs in preparing value-added products and delivering them through the GeM portal, ONDC, FPO Bazar, and e-commerce platforms. A study in Namakkal district, Tamil Nadu, surveyed 90 consumers using purposive sampling. It found that most respondents preferred FPOs value-added products for their perceived quality and health benefits (7).

However, low supplier skills make it difficult for value chains to achieve win-win outcomes since they are readily replaced and have little bargaining (33). Producer companies, which are micro-enterprises owned by farmers, combine elements of cooperatives and private businesses. They accept collaborative membership frameworks and gain the advantages of corporation law integration, which strengthens their knowledge and adaptability (6).

The rise of contemporary food markets retailers has an impact on farmers and agricultural output because they change supply chains, impose high standards of quality, and often favor direct collaboration with larger farms (57). Because of these difficulties faced by small-scale farmers, governments and non-governmental organizations (NGOs) are becoming more interested in FPOs. Smallholders' capacity-building and ability to participate in globally competitive markets are considered as being directly dependent on FPOs (58).

Producer companies act as effective intermediaries between smallholder farmers and modern food retail systems (6). Contracts between FPOs and consumers are encouraged by branding; however, contracts are frequently substituted by public certification of food safety and quality (59). Farmers use FPOs to supply supermarkets report higher profits per kilogram, although the volumes they supply remain limited.

### Integrated digital platform for FPOs

The primary challenges that members of FPOs had to deal with shortage of skilled labor, a lack of ICT skill, perishable goods, delayed credit availability, middleman exploitation (42). The primary operational and technological barrier that FPO members face is an absence in computer skills (60).

Within FPOs, intra-organizational links promote both relationship quality and continuity, while open communication and information exchange improve the quality of relationships (61). Agritech innovations have revolutionized agriculture and other industries as part of the 4$^{th}$ industrial revolution, which is illustrated by improvements in information technology. This has significantly altered FPOs and changed the face of agriculture (62).

Real-time updates on market pricing, weather forecasts, and agricultural techniques are provided by mobile-based advising services, which facilitate better decision-making (63). Despite the revenue and competitiveness gains achieved by integrating AI into agriculture value chains (AVC), research in processing and consumer sectors remains limited. Stakeholders use deep learning algorithms, such as artificial neural networks, for applications like consumer behaviour analysis, yield prediction, and water management (64). Blockchain-based system that maximizes efficiency, adheres to strict safety and integrity standards, and eliminates away with the need for information exchanges, middlemen, and a secure centralized structure (65).

### Advantages of FPO’s

Profitable FPO’s serve as robust local institutions for underprivileged producers, generating jobs and entrepreneurial prospects (66). FPOs negotiate cheaper rates by using scale economies for input purchasing and bulk produce marketing. By providing technology and market intelligence, they help farmers become more negotiating powerful. Processing and other value-added activities improve the market position of FPOs (3). They engage in value-adding activities, giving members access to technology and market intelligence, and strengthening their position (6). Furthermore, FPOs lower the expenses associated with obtaining information for members and potential buyers (NABARD, 2015). Farmers associations are a useful channel for smallholders into complex markets (13). To increase their competitiveness and income levels, FPOs provide small and marginal farmers with essential support in the form of high-quality inputs, technical assistance, financial resources, and access to formal marketing channels (41). FPOs enable collective farm operations by reducing transaction costs and strengthening farmers' position against structural limitations such as small holdings and globalization. Field trips, group discussions, and training sessions are examples of activities that promote increased cooperation and integration, which improves group stability (67).

## Limitations of FPO's

FPOs face challenges such as a low capital base, lack of external funding, skill shortages, operational issues, poor governance, and inadequate processing and storage capacities. Developing and expanding producer companies in remote areas is difficult due to limited infrastructure, capabilities, and access (66). Several factors affect sustainability and credit availability in different ways. These include the existence of non-producer memberships, the absence of primary or lead products and commodities, a lack of infrastructure, the presence of few investors, the marginality or small nature of the shareholders, capital-intensity (68, 69). FPO members face challenges in managing inadequate storage and transportation facilities, which hinder the timely and efficient movement of produce. Additionally, the lack of grading and packaging skills poses a considerable obstacle, hampering the ability to meet quality standards and fetch competitive prices in the market. Moreover, internal discord among members, driven by the pursuit of key positions within the organization, creates a divisive atmosphere that undermines collective progress (18).

The agricultural sector also struggles with undeveloped storage and processing facilities (10). This lack of infrastructure not only limits the value-addition potential of produce but also restricts farmers' access to technological advancements, such as ICT tools, due to insufficient computer knowledge. Moreover, labor scarcity during critical stages like harvesting exacerbates the challenges faced by farmers, leading to inefficiencies in production and post-harvest handling.

Transitioning to the realm of FPOs, obstacles persist in the form of political affiliations and limited access to banking services. Furthermore, FPOs grapple with profitability issues, as a significant proportion of individual members report inadequate profits. A lack of awareness about FPO-related schemes at the village level hinders information dissemination (3). Addressing these challenges requires concerted efforts to enhance organizational and management capacity, provide incubation support, and facilitate access to credit without collateral for FPOs (70). Moreover, rectifying issues related to poor professional management, working capital shortages, and limited access to loans is imperative for improving FPO performance (33). Overall, addressing these multifaceted challenges demands a holistic approach encompassing infrastructure development, capacity building, and policy reforms to foster sustainable agricultural practices and enhance the resilience of farming communities.

## Future policy

Increase the sustainability of FPOs by creating a National Board for oversight, supplying seed funding through a specialized organization, providing customized financial products for simpler loan approvals, working with agri-institutions for technical assistance, streamlining operations with shared infrastructure and certified accountants, and prioritizing government programs for marketing support (71). The creation of a food processing cluster, the formalization of an FPO consortium, and the construction of a warehouse to facilitate farmers' storage of their produce at the FPO level are essential for efficient operations, the growth of market linkages, and the registration of a federation (45).

A wide range of agricultural inputs, including fertilizers and pesticides, is sold by FPOs, along with value-added products, custom hiring and the manufacture of seeds for essential crops should be created. FPOs must design their own trademarks, brands, and logos for both processed and raw commodities enhance marketing and price realization (12). FPOs should diversify their offerings, create trademarks and brands, and integrate with initiatives like the *One District One Product* Scheme to overcome production limits and enable marketing and export opportunities (72). FPOs enable smallholder farmers to engage in collective market involvement, improves their efficiency and negotiating strength. By connecting them with corporate buyers, producer companies mitigate the adverse (70, 71).

Facilitators should enable share trading between shareholders and ensure proportional voting rights to address challenges in new generation cooperatives and farmer companies. They should help with business strategy development and establish clear exit plans to focus on capacity building and empowerment. Shareholders should be involved in setting objectives, understanding institutional arrangements, and performing good governance (73). In order to establish a policy environment that would support a mutually beneficial partnership between farmers and the organized sector, government intervention is required (74). To meet the increasing demand for agricultural products, increasing agricultural production requires significant institutional support (75).

It becomes quite difficult for individual small farmers to ensure their livelihood while coping with market risks and the effects of climate change (76). Smallholders lack the clout to influence the input or output market to their advantage. In addition, small landholdings raise the transaction costs for bulk customers such as processors, merchants, traders, and so on, as well as for producers. FPOs emerged as a solution in response. The comprehensive review addresses a notable gap in the existing literature by providing an in-depth analysis of FPOs, spanning past, present, and future policy considerations in the context of performance, sustainability, social capital dynamics and livelihood security. The paper highlights the challenges faced by FPOs, including issues identified through a review of their past and present status. Fig. 5 illustrates the government schemes related to financial support for FPOs. There is an urgent need to train those involved in FPO management or establish requirements for FPO office bearers, since the primary limitation on the operations of FPOs, as stated by all research on the subject, is inadequate professional management. This will support efficient FPO management. To enable FPO members and office bearers to make appropriate and timely choices, a suitable capacity

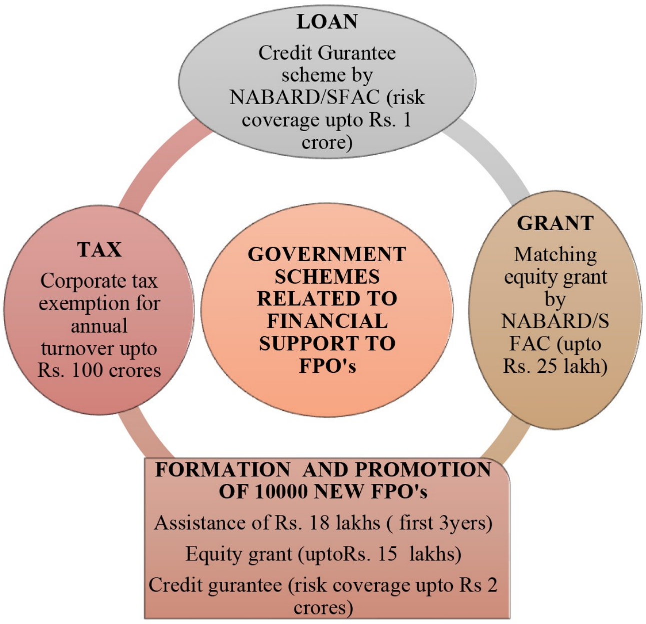


**Fig. 5.** Government schemes related to financial support to FPO's (FPO Policy paper by NAARM).

building approach should be used. Stronger connections between financial institutions and FPOs are necessary to encourage the development of large-scale agribusinesses. Adequate skill-embedded knowledge related to processing, value addition, storage of agricultural products and application of information and communication technology in marketing of produce should be provided. Adequate market intelligence, market infrastructure and supply chain should be promoted for getting optimum price for the produce (77). A policy should be developed to establish the FPOs as the grassroots organisation for extension delivery for scaling out the agricultural and agri-entrepreneurial knowledge to the farmers.

## Conclusion

This review offers forward-looking insights and strategic recommendations to enhance the effectiveness and sustainability of FPOs. These include establishing a National Board for oversight, providing seed funding, and offering tailored financial products. Initiatives such as food processing clusters and the formalization FPO consortia improve operational efficiency and market linkages. FPOs play a key role in poverty reduction and rural development by improving farmers' access to markets, resources, and technology. They enhance income stability, empower women, and create employment opportunities in rural areas. Additionally, FPOs advocate for farmers' needs, driving systemic changes in rural economies. Future prospects include scaling operations through digital tools, expanding market linkages, and enhancing financial access, thereby positioning FPOs as key drivers of sustainable agricultural growth in India. To maximize their impact, FPOs should diversify their offerings, establish trademarks, and integrate with schemes like One District One Product to overcome production limits.


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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. SPR and KR provided insights into the farmer producer organisation and helped with the literature review. KP and PA conceived the overall research idea, supervised the study, and coordinated the manuscript preparation. 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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