



REVIEW ARTICLE

Guiding farmers in choosing the right farmer organization: A systematic approach

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Received: 28 February 2025; Accepted: 18 July 2025; Available online: Version 1.0: 26 August 2025; Version 2.0: 23 September 2025

Cite this article: Boomish P, Jahanmohan KR, Senthilnathan S, Sudhalakshmi C, Sujatha P. Guiding farmers in choosing the right farmer organization: A systematic approach. Plant Science Today. 2025; 12(sp1): 1-10. <https://doi.org/10.14719/pst.7995>

Abstract

The emergence of farmers organizations is helpful valuable institutional mechanism for small and medium farmers that has attracted increasing attention from researchers and policymakers. The review examines the existing literatures on farmer organizations to provide clear guidance for farmers to select the most suitable organizational structures. This review analyses various types of farmer organizations such as Farmer Producer Organizations (FPOs), cooperatives, self-help groups (SHGs), commodity-based associations and contract farming partnerships, examining their characteristics and benefits. It also identifies key factors that farmers should consider when choosing an organization, such as economic benefits, access to resources and services, governance structures, social capital and sustainability. This paper presents a systematic decision-making framework to help farmers evaluate and select organizations that align with their needs and goals. The analysis also highlights significant challenges faced by different types of farmers organizations, such as financial constraints, governance issues, low member participation, market access difficulties and environmental factors. This also focuses the role of digital tools and technology in strengthening farmers organizations, particularly in areas of market access, governance and financial services. Finally, this also identifies critical research gaps in longitudinal sustainability studies, technology adoption, gender dynamics, member participation and policy frameworks. This comprehensive analysis aims to assist farmers in making informed decisions when joining farmer organizations and offers insights for researchers and policymakers to enhance the effectiveness of farmer organizations in promoting agricultural sustainability and rural development.

Keywords: challenges; decision framework; farmer producer organization; technology tools

Introduction

Farmer organizations play a key role in promoting sustainable farming practices and improving the livelihoods of smallholder farmers. Smallholder farmers, who make up a sizable share of the world's agricultural workforce (for instance Honduras has approximately 15000 horticultural producers, of whom only 2.6 % are part of producer organizations), frequently deal with issues like poor bargaining power, restricted market access and insufficient financial and technical resources (1). By promoting group action and enhancing farmers' access to necessary services and markets, farmer organizations such as FPOs, cooperatives, SHGs and commodity based associations have become important institutional mechanisms to address these issues. While contract farming and partnerships are not formally classified as farmer organizations, they serve as institutional arrangements that complement the efforts of farmer organizations by facilitating better market access, input support and value chain linkages (2). Farmers must band together and work as a group if they

want to have better access to markets. Primary research in Mexico and Central America has focused on identifying appropriate organization types, their suitability for specific commodities and the roles of public and private actors in supporting them. Maize farmer associations improve market accessibility and help the poor by offering clear benefits in obtaining supplies such as seed, fertilizer and financing (1).

Due to variations in institutional support, regulatory frameworks and socioeconomic circumstances, farmer groups' acceptance and efficacy varied between geographical areas and agricultural systems. According to studies, properly organized farmer organizations can greatly increase agricultural output, lower transaction costs and generate economies of scale, all of which improve farmers' resilience and income (3, 4). However, despite their potential advantages, many farmer organizations face difficulties with member involvement, governance, funding and market access, which can have varying effects depending on the situation (5).

This review aims to provide a comprehensive synthesis of existing research on farmer organizations, their structure, benefits and challenges. Specifically, it will (i) classify different types of farmer organizations and their functions, (ii) analyze key factors influencing farmers' decisions to join these organizations, (iii) identify challenges faced by farmer organizations in different regions and (iv) highlight research gaps and policy recommendations for strengthening these organizations. By systematically reviewing global evidence, this paper seeks to inform researchers, policymakers and practitioners on best practices for designing and managing effective farmer organizations that enhance agricultural sustainability and rural development.

Materials and Methods

Systematic article searches and screenings were conducted by creating all combinations of keywords across the two databases (Scopus and ScienceDirect). In the databases, searches were performed with fields 'Title' and 'Title-Abstract Keyword'. Language restriction was applied and only articles in English were included in the review. We retrieved peer-reviewed journal articles from these databases. We excluded non-journal sources, including books, book chapters, conference papers, editorials, letters, patents, reference works, research notes and trade publications. Peer-reviewed journal articles from these databases were collected up to the year 2024.

Strings used for searching articles

"Farmer" and "Organization "

"Farmer" and ("producer organization" or "cooperative" or "self-help group" or "commodity association" or "contract farming")

"Farmer organization" and ("challenges" or "decision framework" or "technology")

Frameworks used for data collection and analysis

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was used to ensure transparency and rigor in systematic reviews. This framework outlines the process of eligibility screening, duplication removal and relevance filtering. The flow of this process is outlined in a PRISMA flow diagram for clarity and replicability (Fig. 1). A list of research articles was generated using "Farmer" and "Organisation" or "Farmer" and "Organization" in the title and the title-abstract-keyword. The filtering procedure for the Boolean keywords "Farmer" and "farmer" and ("producer organization" or "cooperative" or "self-help group" or "commodity association" or "contract farming") 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. 1). The total number of articles found was 1726 from Scopus, 1946 from ScienceDirect databases and 48 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 details on factors, decision making framework, challenges and digital tools for farmers organization.

The fourth step included only articles that supports for the topic. This process excluded 3683 articles from Scopus and Science Direct databases. This ensured that only articles focusing on evolution, status and future prospects of FPOs. Therefore, 37 articles were selected for further analysis. Fig. 1 represents PRISMA framework of screening of article.

Results

Types of farmer organizations

Because they facilitate group action, increase market accessibility and improve the economic and social circumstances of farmers, farmer groups are essential to agricultural growth. These organizations come in a variety of shapes and sizes, each with unique benefits, roles and structures. FPOs, cooperatives, SHGs, commodity-based associations and contract farming partnerships are the main categories of farmer organizations. Fig. 2 represents the types of major farmers organizations available.

Farmer Producer Organizations (FPOs)

FPOs are legally registered entities composed of smallholder farmers who come together to collectively manage agricultural production, processing and marketing. FPOs provide their members with access to inputs, credit, technical knowledge and markets, thereby enhancing their economic viability (6). Studies indicate that FPOs improve farmers' bargaining power and reduce transaction costs by aggregating supply and negotiating better prices with buyers (7). The steps involved in establishing FPO is represented in Fig. 3 (8).

Cooperatives

Agricultural cooperatives are member-owned organizations that allow farmers to pool their resources for mutual benefit. They are widely recognized for their role in improving market access, reducing production costs and ensuring fair prices for members (9). Cooperatives enhance members' negotiating power when purchasing inputs and selling outputs, enabling them to achieve economies of scale (10). Additionally, cooperative structures foster trust and collaboration among members, strengthening social capital and community development (11).

Self-Help Groups (SHGs)

SHGs are informal associations of individuals, typically composed of small-scale farmers or rural women, who voluntarily come together to save money, access credit and support each other in economic activities. SHGs play a crucial role in financial inclusion by providing microfinance opportunities to farmers who lack access to formal banking institutions (12). Research suggests that SHGs enhance the adoption of sustainable farming practices by facilitating knowledge exchange and collective learning (13).

Commodity-based associations

Commodity-based associations are formed around specific agricultural products to improve quality control, market access and producer collaboration. These associations enable farmers to collectively negotiate prices, access industry-specific knowledge and improve the competitiveness of their produce (14). These organizations help smallholder farmers establish direct links with local and international markets, reducing dependency on intermediaries (15). Additionally, they enhance the bargaining power of farmers and provide technical assistance to improve productivity and quality

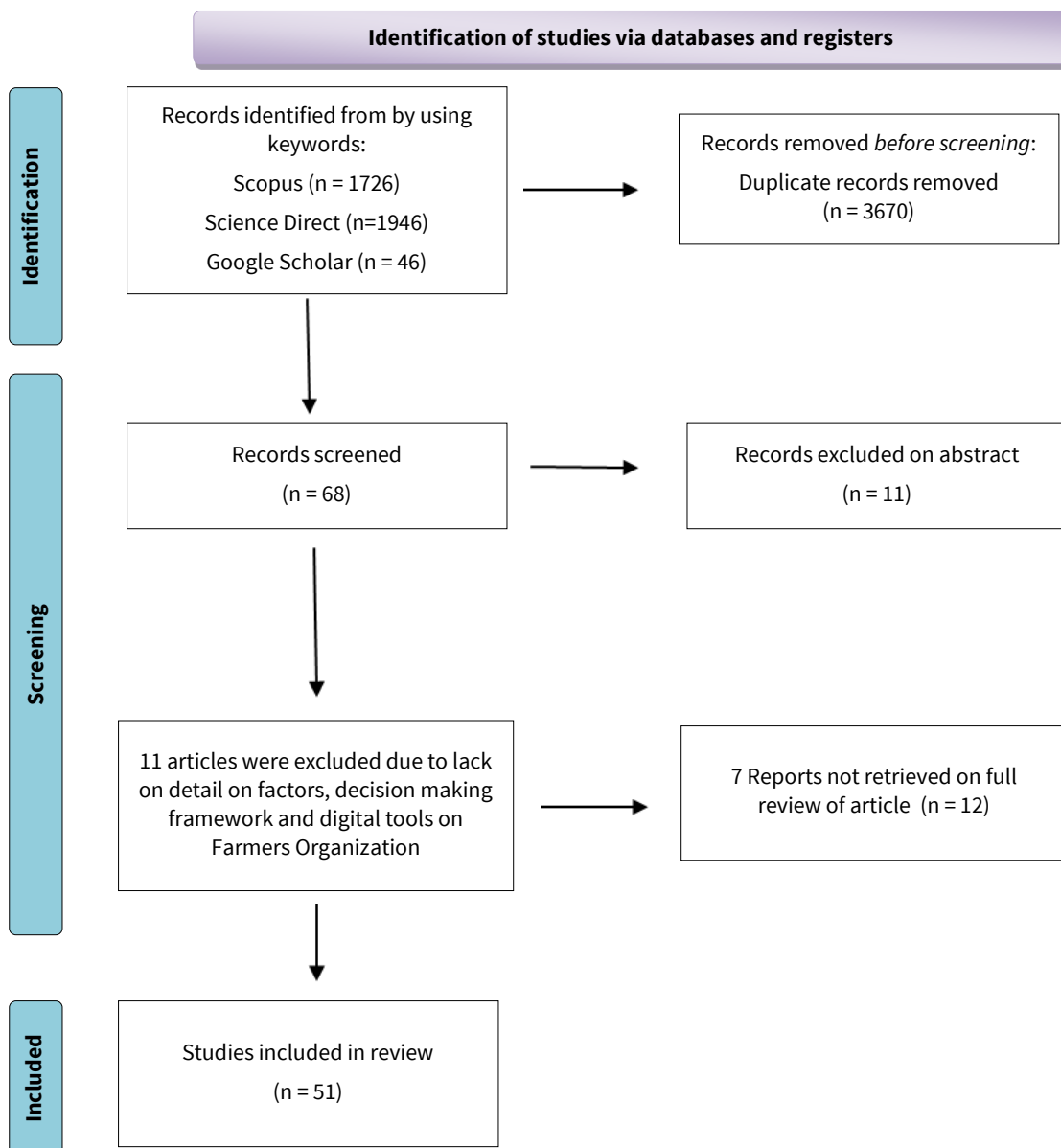


Fig. 1. PRISMA framework for screening of article.

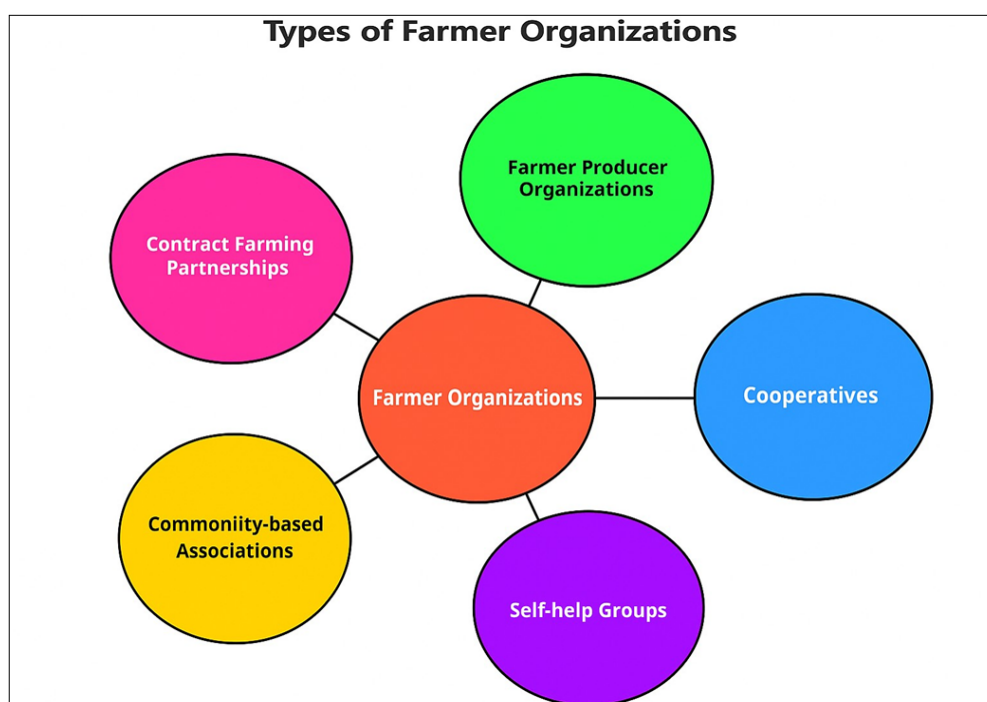


Fig. 2. Types of farmer organizations.

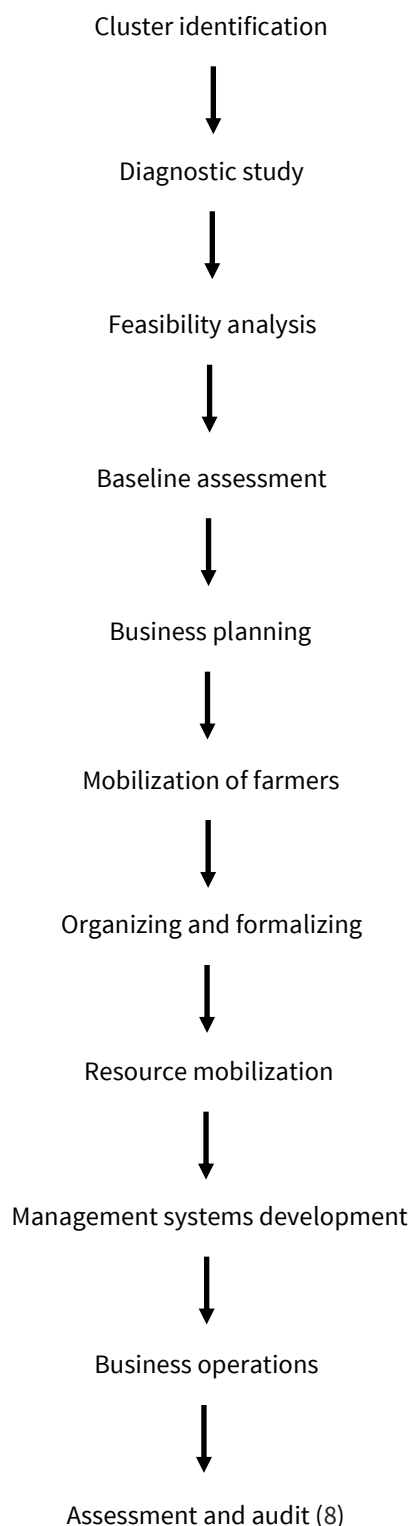


Fig. 3. Steps in establishing FPO.

standards (4).

Contract farming and partnerships

Contract farming refers to pre-agreed arrangements between farmers and agribusiness firms, retailers, or exporters, where production conditions, quality standards and prices are determined in advance. These agreements offer farmers guaranteed markets and stable income while ensuring buyers receive consistent supplies of agricultural products (16). Contract farming, a method for agribusiness development, faces methodological weaknesses and future literature evolution (17). However, concerns exist regarding power imbalances between

smallholder farmers and large agribusiness firms, making regulatory frameworks crucial for protecting farmers' interests (18).

Key factors farmers should consider

When selecting a farmer organization, various economic, institutional and social factors play a crucial role in determining its effectiveness and sustainability. Understanding these factors can help farmers make informed decisions that align with their individual and collective farming needs. The key factors influencing farmers' participation in organizations include economic benefits, access to resources and services, governance and leadership, social capital and sustainability.

Economic benefits

The primary motivation for farmers to join organizations is often the potential for increased income and improved market access (15). Studies indicate that cooperative membership significantly enhances farmers' ability to negotiate better prices for their produce, thereby reducing price volatility and market risks (1). Farmers participating in organized marketing structures, such as FPOs, achieve higher profit margins than individual sellers due to collective bargaining and reduced transaction costs (19). Moreover, the adoption of digital technologies further enhances income for high-quality farmers by improving market access and optimizing resource use, leading to greater economic benefits (20).

Access to resources and services

Membership in farmer organizations facilitates access to critical agricultural inputs, technical knowledge, credit and extension services. Collective action through farmer organizations enhances smallholders' access to essential resources, thereby improving productivity (21). Such organizations improve access to agricultural technologies and extension services, enabling farmers to adopt modern practices more effectively (22). Moreover, access to market information and financial services is crucial for making informed decisions, as highlighted previously (23).

Governance and leadership

Effective governance and leadership are crucial for the long-term success of farmer organizations. Poor governance can lead to inefficiencies, mismanagement of funds and low member participation (7). Transparent and accountable governance fosters trust among members and enhances organizational performance (5). Strong leadership structures ensure that organizations function efficiently and align their objectives with members' needs. Farmer organizations with clear decision-making processes and democratic governance structures are more likely to sustain long-term engagement and economic success (24).

Social capital

Social capital, defined as the networks, relationships and mutual trust among members, plays a significant role in determining the effectiveness of farmer organizations. High levels of social capital in cooperatives lead to increased member participation and overall organizational success (11). Strong social ties facilitate knowledge-sharing and collaboration, improving farmers' ability to adapt to market and climate changes (2). Additionally, social capital strengthens collective decision-making and enhances the resilience of farmer organizations (25).

Sustainability

Sustainability is an essential factor when evaluating farmer organizations, as it influences their long-term viability. Organizations that integrate sustainable agricultural practices are better positioned to withstand environmental and economic shocks (26). Sustainable farming practices also play a critical role in enhancing resilience to climate change and market fluctuations (27). The organizations with a strong focus on sustainability attract and retain members more effectively, as they offer long-term benefits such as stable income, improved soil fertility and reduced dependence on chemical inputs (28).

Decision-making framework for farmers

Choosing the right farmer organization is a critical decision that can significantly impact a farmer's economic and social well-being. There are many types of organizations for farmers, like cooperatives, FPOs, self-help groups and contract farming. Farmers should carefully compare these options to choose what works best for them. This section provides a structured framework for farmers to make informed decisions, incorporating key factors such as economic benefits, governance, market access and sustainability. The framework consists of five key steps: personal needs assessment, criteria evaluation, research on organizations, risk assessment and making an informed choice.

Personal needs assessment

Farmers must begin by evaluating their specific agricultural needs, goals and challenges. These may include access to credit, technical support, market linkage, or risk mitigation. Farmers' decision-making should be tailored to their production scale, financial capacity and long-term objectives. For instance, smallholder farmers looking for financial inclusion may benefit from joining a SHG, while those interested in collective bargaining power may find cooperatives more suitable (22).

Farmers assess their household resources, landholding size and cropping patterns before selecting an organization. Identifying whether they require short-term assistance (e.g., input supply, training) or long-term engagement (e.g., value addition, contract farming) is a crucial first step (23).

Criteria evaluation

Once farmers understand their needs, they should establish selection criteria to evaluate different organizations. This includes assessing factors such as:

Economic benefits - Does the organization provide price premiums, subsidies, or cost-sharing mechanisms. Governance and transparency - Is the leadership accountable? Are decision-making processes democratic? (24). Market access - Does the organization facilitate access to local, national, or international markets? (2). Sustainability - Does the organization promote environmentally friendly practices and long-term stability? (27). Social capital - Does the organization foster collaboration, trust and knowledge-sharing among farmers? (11). Farmers who conduct a thorough criteria evaluation are more likely to make choices that lead to increased profitability and resilience (2).

Research on organizations

Farmers should gather detailed information about potential organizations by:

Engaging with current members - Understanding member satisfaction levels, governance structures and economic benefits (10). Reviewing organizational performance reports - Evaluating financial health, transparency and success rates. Consulting agricultural extension services and cooperatives - Seeking expert recommendations on reliable farmer organizations. The role of peer learning and networking in helping farmers assess the credibility and impact of an organization (1). Additionally, digital skills play a crucial role in enhancing farmers' agricultural entrepreneurship, enabling better access to information, markets and services, which strengthens their ability to evaluate and engage with farmer organizations (29).

Risk assessment

Farmers must evaluate potential risks before committing to an organization. Risks may include:

Governance risks - Poor leadership, mismanagement of funds, or corruption (5). Understanding governance challenges is key to avoiding unreliable organizations (30). Similarly, the farmers evaluate external risks such as climate change, policy shifts and trade barriers, which can impact an organization's stability (31).

Making an informed choice

After conducting a thorough evaluation, farmers should select an organization that aligns with their needs and long-term goals. Well-informed decisions lead to higher market access, improved financial stability and increased productivity (32). Aligning organizational choice with a farmer's production model and economic objectives enhances farm efficiency and sustainability. Farmers should also periodically reassess their membership, ensuring that their chosen organization continues to provide benefits in the face of evolving agricultural and market conditions (33).

Challenges faced by farmer organizations

While farmer organizations play a crucial role in improving smallholder farmers' livelihoods, they also face several challenges that can limit their effectiveness and sustainability. These challenges arise due to economic, governance, market and external factors, making it difficult for organizations to achieve their intended goals. Understanding these challenges is essential for policymakers, researchers and development agencies seeking to strengthen farmer organizations. The major challenges faced by farmer organizations include financial constraints, governance issues, low member participation, market access difficulties and external environmental factors.

Financial constraints

Research shows that inadequate funding restricts farmer organizations' ability to provide credit, purchase agricultural inputs in bulk, or offer extension services to their members (34). Furthermore, financial mismanagement and corruption within some organizations worsen the situation, leading to decreased trust and participation among members (2). Without a stable financial base, many farmer organizations struggle to survive in competitive agricultural markets, especially when external funding sources such as government subsidies or donor grants are unavailable (4). Additionally, economic, political and social factors, such as limited infrastructure and high initial costs, significantly hinder the

adoption of digital technologies by small-scale farmers, further exacerbating financial challenges for farmer organizations (35).

Governance issues

Weak governance structures and poor leadership negatively impact the performance and longevity of farmer organizations. Studies have shown that organizations with poor transparency, lack of accountability and inefficient leadership experience high dropout rates among members (5). Governance issues often lead to internal conflicts, misallocation of resources and decision-making inefficiencies (36). Well-functioning farmer organizations require clear decision-making structures, democratic leadership and active member engagement to ensure fair distribution of benefits. In contrast, organizations with autocratic leadership or unequal power distribution often face internal disputes that weaken their effectiveness (24). Governance challenges are particularly severe in cooperatives due to elite capture, where a small group of influential members controls decision-making and resources, excluding marginalized farmers from equal benefits (31).

Low member participation

The success of farmer organizations depends largely on active participation and commitment from members. However, many organizations struggle with low levels of engagement due to a lack of awareness, mistrust and dissatisfaction with services (9). Research indicates that cooperatives with low levels of trust and weak social cohesion experience declining membership, reducing their bargaining power and ability to sustain collective action (11). Many farmers also perceive that participation in organizations does not provide immediate economic benefits, leading to passive involvement or withdrawal (4). Additionally, cultural and social barriers sometimes limit women's participation in farmer organizations, further affecting inclusivity and long-term sustainability (12). Poorer farmers often avoid participating in organizations, despite indirectly benefiting from them and when they do, they are often excluded from decision-making processes in Ethiopia (2).

Market access challenges

Limited access to profitable markets is a major challenge for many farmer organizations, particularly those in rural areas. Organizations often face difficulties in finding consistent buyers, negotiating fair prices and ensuring quality control (1). Additionally, many farmer organizations struggle to compete with large agribusiness firms and intermediaries, who often have greater bargaining power and market dominance (15). Farmers engaged in contract farming sometimes face exploitative agreements, where buyers impose unfair contract terms, reject produce due to quality issues, or delay payments (16). Developing stronger supply chain partnerships, direct market linkages and fair-trade certification programs can help mitigate these challenges and improve farmers' profitability.

External environmental factors

External factors, including climate change, fluctuating government policies and economic instability, pose significant risks to the sustainability of farmer organizations. Climate-related challenges such as droughts, floods and pest outbreaks can disrupt agricultural production and reduce farmers' incomes, making it difficult for organizations to remain viable

(37). Similarly, in sub-Saharan Africa, smallholder farmers face challenges such as limited digital literacy and inadequate policy support, which impede the adoption of digital technologies critical for organizational resilience (38). Policy changes, such as subsidy reductions, tax increases, or trade restrictions, can also negatively affect farmer organizations. For example, abrupt government decisions to cut agricultural subsidies or impose new trade tariffs can make it difficult for organizations to maintain stable operations (39).

Similarly, fluctuations in global commodity prices impact farmers' earnings, influencing their ability to contribute financially to their organizations (40). To cope with these external pressures, farmer organizations need adaptive strategies, such as climate-smart agriculture practices, insurance mechanisms and diversified income sources (27).

Digital tools for researching farmer organizations

Farmers often struggle to find reliable information on the benefits, risks and operational efficiency of farmer organizations. Digital platforms such as agricultural databases, mobile applications and web portals now provide farmers with critical insights into different organizations, including their governance structures, financial stability and market access performance (1).

Technological support within farmer organizations

Farmer organizations increasingly rely on digital communication tools, mobile applications and data management systems to streamline their operations.

Technology adoption within organizations leads to: Higher participation rates - members can access meeting notes, financial reports and policy decisions through mobile apps, increasing engagement. Improved training programs - digital platforms allow organizations to conduct online training on best agricultural practices, input usage and financial literacy. Reduced dependency on physical infrastructure with mobile-based platforms, farmer organizations can operate more efficiently, even in remote areas (41). For example, the e-Choupal initiative in India allows farmer organizations to access weather forecasts, price trends and agricultural training through an internet-based platform, reducing dependency on middlemen and improving decision-making (42). Additionally, digital tools facilitate direct connections between farmers and consumers, fostering shorter supply chains and enhancing sustainability through real-time crop traceability, which allows farmers to secure higher prices for sustainable practices (43). Furthermore, artificial intelligence (AI) enhances sustainable agriculture by optimizing resource use and reducing waste through automation and data analytics, enabling farmers to improve efficiency and environmental outcomes (44).

Enhanced market access and value chain integration

Technologies such as e-commerce platforms (e.g., AgriBazaar) and mobile apps (e.g., Esoko) connect farmers directly to buyers.

Blockchain-enabled traceability solutions allow farmer organizations to negotiate better prices, access larger markets and ensure fair trade practices (4).

E-commerce platforms help farmer organizations integrate into regional and global value chains, increasing

profitability (40). Moreover, AI-driven precision farming, including robotic automation and predictive analytics, significantly advances crop productivity and sustainability by enabling data-driven decisions and reducing resource waste (45). Additionally, blockchain technology ensures transparency in transactions, reducing fraud and securing farmers' earnings (46).

Improved governance and accountability

One of the critical challenges faced by farmer organizations is governance inefficiencies and corruption. Digital tools such as blockchain, mobile banking and e-voting systems enhance governance by providing transparent and immutable records of financial transactions and decision-making processes (39).

Blockchain technology, in particular, has been adopted in farmer cooperatives to:

Track financial transactions in real-time - preventing fund mismanagement. Ensure fair distribution of profits - increasing trust among members. Enhance supply chain traceability - ensuring farmers receive fair prices for their products (46). For example, the Agrichain blockchain platform has been successfully used in cooperatives to digitize supply chain transactions, ensuring farmers receive payments on time and preventing price exploitation by middlemen (47).

Access to financial services and risk management

Mobile banking solutions (e.g., M-Pesa, EcoCash, Paytm) allow farmer organizations to facilitate payments, receive subsidies and disburse loans securely. AI-driven credit scoring models analyze farmers' transaction histories and provide instant credit assessments, enabling them to access loans without traditional collateral (6). Agricultural insurance platforms (e.g., ACRE Africa, Pula Insurance) use satellite data to offer weather-based insurance policies, protecting farmers from crop failures and climate risks (48). Similarly, AI applications, such as smart sensors and automation, optimize irrigation and pesticide use, reducing environmental impact and improving resource efficiency for farmer organizations (49). These innovations significantly reduce financial exclusion and income instability among smallholder farmers, ensuring they can reinvest in their agricultural activities sustainably.

Research gaps and future directions

Despite the extensive research on farmer organizations, several critical gaps remain that need to be addressed to enhance their efficiency, sustainability and impact on smallholder farmers. Future research should focus on longitudinal studies on sustainability, technology adoption, gender dynamics in leadership, member participation and policy frameworks to provide deeper insights into the functioning of these organizations. Addressing these gaps is essential for improving governance structures, increasing farmer engagement and designing policies that support sustainable agricultural development.

Longitudinal studies on sustainability

Most existing studies on farmer organizations focus on short-term outcomes such as income improvements, market access and production efficiency (1). However, there is a lack of long-term studies assessing how different organizational models sustain themselves over time under varying market and policy conditions.

Future research should

Conduct longitudinal impact assessments to examine how farmer organizations evolve and adapt to climate change, economic fluctuations and policy shifts (5). Investigate the role of cooperative resilience strategies in ensuring long-term success, particularly in low-income and resource-constrained regions (2).

The role of technology in strengthening farmer organizations

While digital tools are increasingly being adopted, there is limited empirical research on how technology affects governance, financial management and market access in farmer organizations.

Future research should explore

Future research should explore the influence of digital platforms on decision-making and participation. Specifically, does access to tools like mobile banking and block chain technology enhance transparency and trust (46). Future research should examine how digital training programs influence knowledge dissemination and adoption of sustainable farming practices (42).

Gender dynamics in leadership and participation

Although women play a crucial role in agriculture, their participation in farmer organizations remains disproportionately low due to cultural and structural barriers (12). There is limited research on how increased female representation in leadership positions influences governance, decision-making and organizational success.

Future research should

Assess the impact of female leadership on farmer organizations' performance. Does having more women in executive roles improve financial transparency, social cohesion and member engagement? (11). Investigate gender-responsive policies that encourage women's participation while addressing socio-cultural barriers. Analyze how digital financial services (mobile banking, micro-loans, digital savings groups) facilitate active participation of women to engage in farmer organizations (50).

Member participation and engagement

One of the persistent challenges faced by farmer organizations is low member participation (9). There is limited research on behavioural factors that influence farmers' decisions to remain actively engaged in organizations.

Future research should

Identify effective member retention strategies, such as performance-based benefits, profit-sharing mechanisms and social recognition. Study the impact of peer influence and social networks on participation levels - Do farmers who see their peers benefiting from organizations engage more actively? (4).

Policy analysis and advocacy

While farmer organizations are often supported by government initiatives, there is a lack of research on how specific policies influence their success and sustainability (28).

Future research should

Conduct comparative policy analyses to identify best practices in regulatory frameworks supporting farmer organizations in different regions. Additionally, future research should investigate

the potential of digital extension services, leveraging mobile phones and GPS-enabled smartphones to deliver customized agricultural advice, thereby enhancing productivity and supporting farmer organizations (51). Evaluate the impact of subsidies, tax incentives and trade policies on the financial viability of farmer organizations (40). Explore public-private partnerships that enhance farmer organizations' integration into agricultural value chains (39).

Conclusion

By following steps in Fig. 4 the farmer can choose the best farmer organization for him. For smallholder farmers, farmer organizations are essential because they improve knowledge sharing, market access and financial security. However, regulatory backing, technology uptake, governance and financial stability are all necessary for their viability. Filling key research gaps in digital innovation, inclusivity and policy design is critical for developing sustainable farmer organization models. Future studies should concentrate on behavioral factors impacting farmer engagement, gender inclusion and long-term effects. Farmer organizations can be powerful drivers of economic growth, food security and sustainable agriculture when supported by the right policy interventions. It is imperative that researchers generate evidence-based insights and policymakers

act decisively to design and implement robust support systems that empower these organizations to thrive.

Acknowledgements

The authors are grateful to the Department of Agricultural Economics, AC & RI, Tamil Nadu Agricultural University, Coimbatore for providing support for long term is fully acknowledged.

Authors' contributions

PB designed the study framework and drafted the manuscript. KRJ participated in the article collection, contributed to the analysis of the results and assisted in drafting the manuscript. SS and CS provided insights into the farmer producer organisation and helped with the literature review. KRJ and PS 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.

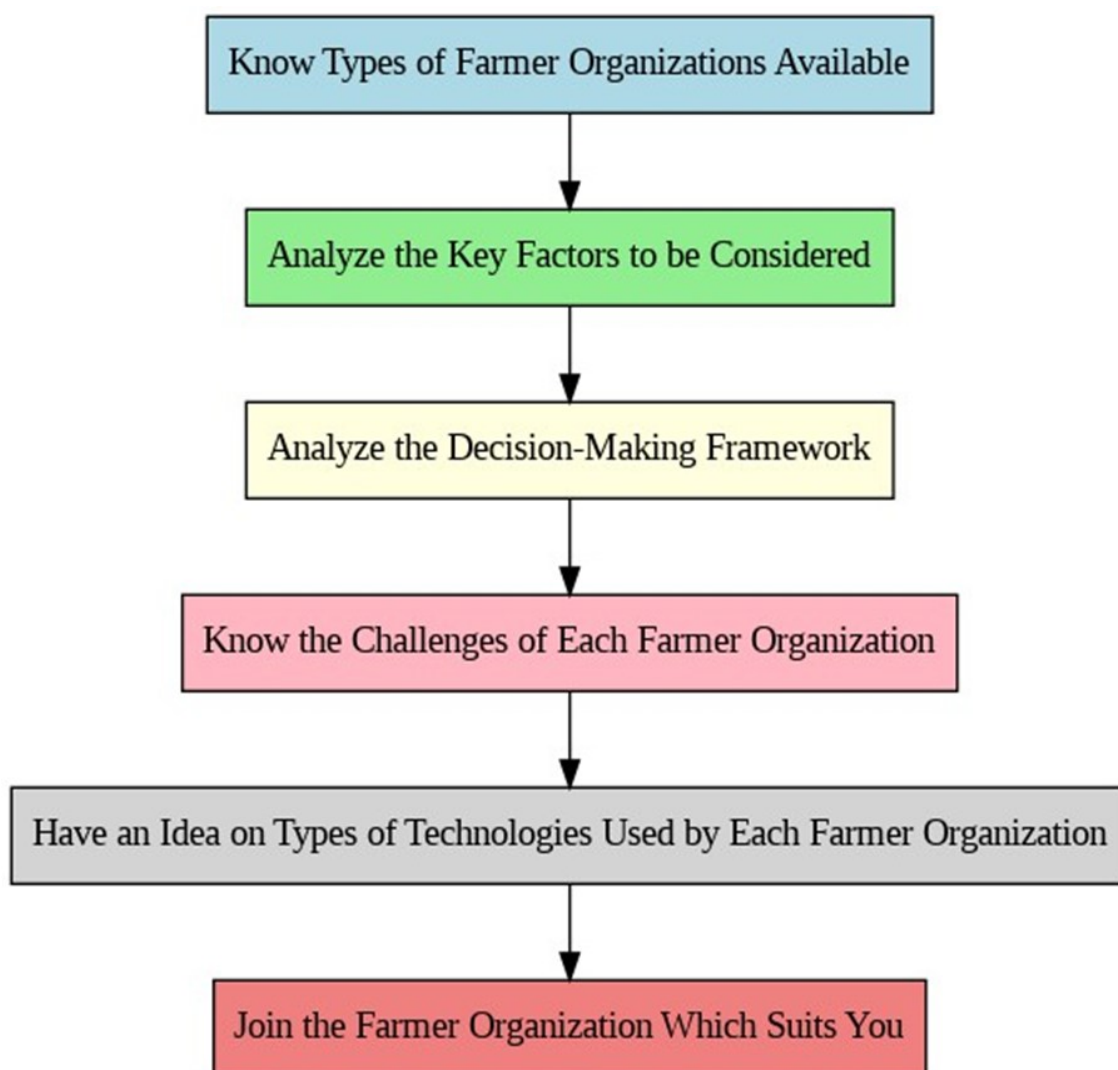


Fig. 4. Steps involved in choosing right farmer organizations.

Ethical issues: None

References

- Hellin J, Lundy M, Meijer M. Farmer organization, collective action and market access in Meso-America. *Food Policy*. 2009;34(1):16–22. <https://doi.org/10.1016/j.foodpol.2008.10.003>
- Bernard T, Spielman DJ. Reaching the rural poor through rural producer organizations? A study of agricultural marketing cooperatives in Ethiopia. *Food Policy*. 2009;34(1):60–9. <https://doi.org/10.1016/j.foodpol.2008.08.001>
- Barrett S. The incredible economics of geoengineering. *Environ Resour Econ*. 2008;39:45–54. <https://doi.org/10.1007/s10640-007-9174-8>
- Markelova H, Meinzen-Dick R, Hellin J, Dohrn S. Collective action for smallholder market access. *Food Policy*. 2009;34(1):1–7. <https://doi.org/10.1016/j.foodpol.2008.10.001>
- Francesconi GN, Heerink N. Ethiopian agricultural cooperatives in an era of global commodity exchange: does organisational form matter?. *J Afr Econ*. 2011;20(1):153–77. <https://doi.org/10.1093/jae/ejq036>
- Trebbin A, Hassler M. Farmers' producer companies in India: a new concept for collective action?. *Environ Plan A*. 2012;44(2):411–27. <https://doi.org/10.1068/a44143>
- Kumar S, Kumar R, Meena PC, Kumar A. Determinants of performance and constraints faced by Farmer Producer Organizations (FPOs) in India. *Indian J Extension Education*. 2023;59(2):1–5. <https://doi.org/10.48165/IJEE.2023.59201>
- Marbaniang EK, Chauhan JK, Kharumnuid P. Farmer Producer Organization (FPO): the need of the hour. *AGRICULTURE & FOOD: e-Newsletter*. 2019;2581–8317.
- Birchall J, Simmons R. What motivates members to participate in co-operative and mutual businesses?. *Ann Public Cooperative Econ*. 2004;75(3):465–95. <https://doi.org/10.1111/j.1467-8292.2004.00259.x>
- Wanyama FO, Develtere P, Pollet I. Reinventing the wheel? African cooperatives in a liberalized economic environment. *Ann Public Cooperative Econ*. 2009;80(3):361–92. <https://doi.org/10.1111/j.1467-8292.2009.00390.x>
- Verhofstadt E, Maertens M. Smallholder cooperatives and agricultural performance in Rwanda: do organizational differences matter?. *Agric Econ*. 2014;45(S1):39–52. <https://doi.org/10.1111/agec.12128>
- Nair TS, Tankha A. Inclusive finance India report 2014. New Delhi: Oxford University Press; 2015.
- Kadiyala S. Scaling up Kudumbashree-collective action for poverty alleviation and women's empowerment. 2004.
- Schneider K, Gugerty MK. Gender and contract farming in sub-Saharan Africa-Literature review. Seattle: Evans School of Public Affairs, University of Washington; 2010.
- Fischer E, Qaim M. Linking smallholders to markets: determinants and impacts of farmer collective action in Kenya. *World Dev*. 2012;40(6):1255–68. <https://doi.org/10.1016/j.worlddev.2011.11.018>
- Silva CD. The growing role of contract farming in agri-food systems development: drivers, theory and practice. 2005;30.
- Bellemare MF, Bloem JR. Does contract farming improve welfare? A review. *World Dev*. 2018;112:259–71. <https://doi.org/10.1016/j.worlddev.2018.08.018>
- Key N, Roberts MJ. Nonpecuniary benefits to farming: implications for supply response to decoupled payments. *Am J Agric Econ*. 2009;91(1):1–8. <https://doi.org/10.1111/j.1467-8276.2008.01180.x>
- Roy D, Thorat A. Success in high value horticultural export markets for the small farmers: the case of Mahagrapes in India. *World Dev*. 2008;36(10):1874–90. <https://doi.org/10.1016/j.worlddev.2007.09.009>
- Lei X, Yang D. An analysis of the impact of digital technology adoption on the income of high quality farmers in production and operating. *PloS One*. 2024;19(9):e0309675. <https://doi.org/10.1371/journal.pone.0309675>
- Dorward A, Kydd J, Morrison J, Urey I. A policy agenda for pro-poor agricultural growth. *World Dev*. 2004;32(1):73–89. <https://doi.org/10.1016/j.worlddev.2003.06.012>
- Moustier P, Tam PT, Anh DT, Binh VT, Loc NT. The role of farmer organizations in supplying supermarkets with quality food in Vietnam. *Food Policy*. 2010;35(1):69–78. <https://doi.org/10.1016/j.foodpol.2009.08.003>
- Kaganzzi E, Ferris S, Barham J, Abenakyo A, Sanginga P, Njuki J. Sustaining linkages to high value markets through collective action in Uganda. *Food Policy*. 2009;34(1):23–30. <https://doi.org/10.1016/j.foodpol.2008.10.004>
- Chaddad FR, Cook ML. Understanding new cooperative models: an ownership-control rights typology. *Appl Econ Perspect Policy*. 2004;26(3):348–60. <https://doi.org/10.1111/j.1467-9353.2004.00184.x>
- Woolcock M, Narayan D. Capital social: implicaciones para la teoría, la investigación y las políticas sobre desarrollo. *World Bank Res Obs*. 2000;15(2):225–49. <https://doi.org/10.1093/wbro/15.2.225>
- Bockstaller C, Girardin P, van der Werf HM. Use of agro-ecological indicators for the evaluation of farming systems. *Dev Crop Sci*. 1997;25:329–38. [https://doi.org/10.1016/S0378-519X\(97\)80032-3](https://doi.org/10.1016/S0378-519X(97)80032-3)
- Pretty J. Agricultural sustainability: concepts, principles and evidence. *Philos Trans R Soc B Biol Sci*. 2008;363(1491):447–65. <https://doi.org/10.1098/rstb.2007.2163>
- Mazzucato M, Parris S. High-growth firms in changing competitive environments: the US pharmaceutical industry (1963 to 2002). *Small Bus Econ*. 2015;44(1):145–70. <https://doi.org/10.1007/s11187-014-9583-3>
- Cheng C, Gao Q, Ju K, Ma Y. How digital skills affect farmers' agricultural entrepreneurship? An explanation from factor availability. *J Innov Knowledge*. 2024;9(2):100477. <https://doi.org/10.1016/j.jik.2024.100477>
- Getnet K, Anullo T. Agricultural cooperatives and rural livelihoods: evidence from Ethiopia. *Ann Public Cooperative Econ*. 2012;83(2):181–98. <https://doi.org/10.1111/j.1467-8292.2012.00460.x>
- Mwangi LW, Makau MS, Kosimbei G. Relationship between capital structure and performance of non-financial companies listed in the Nairobi Securities Exchange, Kenya. *Glob J Contemp Res Account Audit Bus Ethics*. 2014;1(2):72–90. <https://doi.org/10.47672/ajf.125>
- Latynskiy E, Berger T. Networks of rural producer organizations in Uganda: what can be done to make them work better?. *World Dev*. 2016;78:572–86. <https://doi.org/10.1016/j.worlddev.2015.10.014>
- Michalek J, Ciaian P. Capitalization of the single payment scheme into land value: generalized propensity score evidence from the European Union. *Land Econ*. 2014;90(2):260–89. <https://doi.org/10.3368/le.90.2.260>
- Chirwa EW. Adoption of fertiliser and hybrid seeds by smallholder maize farmers in Southern Malawi. *Dev South Afr*. 2005;22(1):1–2. <https://doi.org/10.1080/03768350500044065>
- Mazzucato M. Mission-oriented innovation policy: challenges and opportunities. London: Institute for Innovation and Public Purpose; 2017.
- Smidt HJ, Jokonya O. Factors affecting digital technology adoption by small-scale farmers in agriculture value chains (AVCs) in South Africa. *Inf Technol Dev*. 2022;28(3):558–84. <https://doi.org/10.1080/02681102.2021.1975256>
- Kilelu CW. Unravelling the role of innovation intermediaries in

- smallholder agricultural development: case studies from Kenya. Wageningen: Wageningen University and Research; 2013.
38. Reardon T, Timmer CP. The economics of the food system revolution. *Annu Rev Resour Econ.* 2012;4(1):225–64. <https://doi.org/10.1146/annurev.resource.050708.144147>
 39. Choruma DJ, Dirwai TL, Mutenje M, Mustafa M, Chimonyo VG, Jacobs-Mata I, et al. Digitalisation in agriculture: a scoping review of technologies in practice, challenges and opportunities for smallholder farmers in sub-Saharan Africa. *J Agric Food Res.* 2024;101286. <https://doi.org/10.1016/j.jafr.2024.101286>
 40. Birner R, Davis K, Pender J, Nkonya E, Anandajayasekeram P, Ekboir J, et al. From best practice to best fit: a framework for designing and analyzing pluralistic agricultural advisory services worldwide. *J Agric Educ Ext.* 2009;15(4):341–55. <https://doi.org/10.1080/13892240903309595>
 41. Misaki E, Apiola M, Gaiani S, Tedre M. Challenges facing sub-Saharan small-scale farmers in accessing farming information through mobile phones: a systematic literature review. *Electron J Inf Syst Dev Ctries.* 2018;84(4):e12034. <https://doi.org/10.1002/isd2.12034>
 42. Goyal A. Information, direct access to farmers and rural market performance in central India. *Am Econ J Appl Econ.* 2010;2(3):22–45. <https://doi.org/10.1257/app.2.3.22>
 43. Finger R. Digital innovations for sustainable and resilient agricultural systems. *Eur Rev Agric Econ.* 2023;50(4):1277–309. <https://doi.org/10.1093/erae/jbad021>
 44. Mana AA, Allouhi A, Hamrani A, Rehman S, El Jamaoui I, Jayachandran K. Sustainable AI-based production agriculture: exploring AI applications and implications in agricultural practices. *Smart Agric Technol.* 2024;7:100416. <https://doi.org/10.1016/j.atech.2024.100416>
 45. Aijaz N, Lan H, Raza T, Yaqub M, Iqbal R, Pathan MS. Artificial intelligence in agriculture: advancing crop productivity and sustainability. *J Agric Food Res.* 2025;101762.
 46. Ganne E. Can Blockchain revolutionize international trade?. Geneva: World Trade Organization; 2018:152. <https://doi.org/10.1016/j.jafr.2025.101762>
 47. Food and Agriculture Organization of the United Nations (FAO). E-agriculture in action: blockchain for agriculture - opportunities and challenges. Bangkok: FAO and International Telecommunication Union. 2019:66. <https://www.fao.org/3/ca2906en/CA2906EN.pdf>
 48. Food and Agriculture Organization of the United Nations (FAO), International Telecommunication Union (ITU). Digital agriculture report: rural e-commerce development - experience and best practices. Rome: FAO and ITU. 2021:46–7. <https://openknowledge.fao.org/items/044e20f8-3299-4eca-b92f-824850955092>
 49. Talaviya T, Shah D, Patel N, Yagnik H, Shah M. Implementation of artificial intelligence in agriculture for optimisation of irrigation and application of pesticides and herbicides. *Artif Intell Agric.* 2020;4:58–73. <https://doi.org/10.1016/j.aiia.2020.04.002>
 50. Food and Agriculture Organization of the United Nations (FAO). Empowering women in agriculture: reducing gender gaps through digital innovation. Rome: FAO. 2021:11–7. <https://openknowledge.fao.org/server/api/core/bitstreams/fc6a7499-1285-43f1-89b2-a7fef24500f4/content>
 51. Fabregas R, Kremer M, Schilbach F. Realizing the potential of digital development: the case of agricultural advice. *Sci.* 2019;366(6471):eaay3038. <https://doi.org/10.1126/science.aay3038>

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Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

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Publisher information: Plant Science Today is published by HORIZON e-Publishing Group with support from Empirion Publishers Private Limited, Thiruvananthapuram, India.