



RESEARCH ARTICLE

# Role of family farming in sustaining a resilient food system: A systematic literature review

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## Abstract

Family farming, characterized by integrated agricultural systems managed and operated by men, women and children, forms the backbone of global food production and rural livelihoods. Representing over 80 % of the World's food producers, family farms are deeply embedded within the social, cultural and environmental fabric of rural communities. The United Nations Decade of Family Farming (UNDF) underscores the critical opportunity to strengthen family-based agriculture and advance sustainable development. This systematic literature review, conducted in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2020 guidelines, synthesizes current research on the multifaceted contributions of family farming to food security, sustainable agriculture, rural development and biodiversity conservation. The review highlights family farms' remarkable adaptability to climate change, while also addressing the significant challenges they face, including limited access to resources, volatile markets and the adverse impacts of climate variability. The study explores the indispensable role of family farming in preserving regional economies, safeguarding cultural heritage and promoting sustainable agricultural practices, all of which are integral to achieving the sustainable development goals (SDGs). The findings emphasize the urgent need for robust institutional frameworks and supportive policies that enhance financial support, market access, technological innovation, education and social protection for family farmers. Strategic interventions in these areas are essential to ensure the sustainability and resilience of family-based farming systems worldwide.

**Keywords:** agriculture sustainability; climate; food security; policy; resilience; sustainable development goals

## Introduction

Family farms, the foundation of global agricultural systems, are entwined in all aspects of climate change, acting both as susceptible and active participants in the drama of climate change (1). These are generally small-scale localised farms that are vulnerable to major climate-induced disruptions such as unpredictable rainfall, intense weather, rising temperatures and increasing pest and disease occurrences (2). Climate change threatens agricultural yields, livestock productivity and water availability, making it the most serious threat to food security, livelihoods and rural economies (3-5). Added to this difficulty are the growing consequences of climate-sensitive pests and illnesses, which impede small farmers who lack the expertise or access to new technology from adjusting to quickly changing circumstances (6). However, family farms are more likely to play an important role in climate change adaptation and mitigation, offering the long term and inventive solutions required to construct resilient agricultural systems (7). Offering solutions to certain social issues related to climate change are examples of how family farmers might utilise climate-smart methods to improve resilience (1).

Crop diversification, conservation agriculture, agroforestry and effective water management are a few examples. These sustainable methods will not only improve soil health and water efficiency, among other advantages but will also help to sequester carbon, converting agricultural landscapes into crucial carbon sinks (8-11). Furthermore, family farms often provide low-carbon food systems because they are localised, reducing emissions caused by long-distance transportation and industrial operations. Recognising its contributions to climate action would also help to advance the larger sustainability agenda, including the United Nations sustainable development goals (SDGs).

Family farms' ability to battle climate change and maintain food security is often hampered by a lack of access to financial resources, technical assistance and enabling regulations (12). These are the issues associated with hunger and climate change. It makes family farms more important since it is so serious. With full assistance, family farms might transition from being the most vulnerable to climate change to being active participants in achieving a more sustainable and food-secure future (13). This dual function necessitates integrated and comprehensive solutions that use traditional agricultural knowledge and

technological advances within a larger framework to ensure that family farms remain adaptable in the face of unpredictable climatic circumstances (14). This nexus of family farming and climate change is a critical frontier in the global effort for sustainability, resilience and food security (15).

The United Nations decade of family farming (UNDF) 2019-2028 offers an exceptional chance to promote sustainable development through family-based farming systems. Building upon the momentum generated by the international year of family farming in 2014, this decade aims to mobilize global commitment and support for family farmers (16, 17). They are not only food producers but also stewards of natural resources, custodians of cultural heritage and agents of rural development across both developed and developing nations (18). The farm and the family, food production and domestic life, traditional wisdom and creative solutions, all these connections are intricately woven into the fabric of society. The decade of family farming acknowledges this multifaceted nature and highlights the need to expand family farmers' accessibility to social safety nets, capital, markets, training and prospects of earning money. Empowerment of family farmers can lead us to a world free from hunger and poverty, where the natural resources are maintained sustainably and no one has been left behind a vision consistent with the 2030 agenda for sustainable development (16).

It has long been understood that family farming is essential to both agricultural production and the survival of rural communities. There are around 500 million of family farms, which account for 90 % of farms globally and plays an important role in food production, cultural heritage preservation and the advancement of sustainable farming practices (19). Family farming is not a mere means of food production, but it is a way of life that incorporates agricultural methods with the social and cultural fabric of rural communities (20). The agricultural biodiversity that sustains the global food system is dependent on these farms, many of which are operated by families who live on the land they cultivate.

The wide array of crop varieties and livestock breeds maintained by family-based farms are essential for food security, particularly considering climate change and market fluctuations. Family farmers, with their extensive knowledge of the local ecosystems, use both traditional methods and cutting-edge techniques to improve soil health, water management and insect control resulting in more productive and sustainable farming system (21).

Family farms have a critical role in maintaining rural communities, fostering local economies and generating employment possibilities. Millions of people depend on them for their livelihoods, which lowers rural-urban migration and preserves the social cohesion of rural communities (22). Within family farming communities, the generational transfer of knowledge and skills guarantees the continuation of farming practices that are culturally significant and environmentally sustainable.

This comprehensive review highlights the vital role that family farming plays in maintaining food system. It explores the contribution of family farms to sustainable agriculture, rural development, biodiversity conservation and their resilience in the face of climatic change (23). The paper further addresses the various challenges that family farmers encounter, including

resource availability, market volatility and the effect of climate change. Additionally, it suggests tactical steps to strengthen family farmers' ability to ensure food production and contribute to broader development goals. Through a detailed analysis, this review emphasizes the indispensable contribution of family farming to a resilient and sustainable agricultural future.

## Methodology

The preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2020 standards were followed in the systematic literature review (SLR) that was carried out in order to develop a conceptual framework for fostering food security and sustainable development in the context of family farming (24, 25). A PRISMA flow diagram was used to illustrate the document selection process and a completed PRISMA checklist is provided as supplementary material (supplementary Fig. 1). The review protocol was not registered in a public database, as registration is not mandatory for non-health-focused systematic reviews.

The PRISMA criteria were selected because of their rigorous and transparent methodology for conducting SLR, which reduces the potential for bias and boosts trust in the study's findings and their repeatability (1). The SLR was guided by a study methodology that was created. The data was collected by extensively examining 2 databases, including Scopus and Google Scholar using the keywords such as family farming, food security, sustainability and sustainable development. Using Boolean operators such as "AND" and "OR" and including more keywords in the search parameters helped to improve the search approach.

The review covers the period 2001–2024 to offer a comprehensive, long-term perspective on the evolution of family farming research. The early part of this range 2001–2014 captures the foundational discourse on smallholder farming, sustainability and food security that shaped later policy and research priorities. Key global milestones including the 2014 international year of family farming, the adoption of the SDGs in 2015 and the 2017 declaration of the UNDF catalysed a significant increase in empirical and policy-focused studies. While studies from the full period were screened, most included publications are from the post-2014 period due to their stronger thematic alignment, methodological rigor and relevance to the review's objectives on resilience, sustainability and SDG linkages. Only Scopus and Google Scholar were used as the primary databases for literature retrieval, other relevant databases such as Web of Science, CAB abstracts and AGRIS were not included due to access limitations and overlap in indexed journals. As a result, there may be a risk of literature omission bias. Efforts were made to mitigate this by including cross-referenced studies from selected articles and verifying thematic coverage during full-text screening.

The inclusion/exclusion criteria for the selection of relevant research publications were:

- Open access, peer-reviewed paper published in English language between January 2001 and July 2024.
- The articles addressing family farming, food security and sustainable development in agriculture.
- The empirical research-based works that highlighted family farming in the context of food security.

- The research paper which was not available in full text was not selected for the study. These were used to make sure that the study only contained readily accessible pertinent literature.

Screening of the articles was done in two steps: screening of the title and abstract and screening of the whole text. Two unbiased examiners thoroughly reviewed the titles and abstracts of the publications to determine whether the papers found by the search strategy fulfil the inclusion requirements. Only papers matching the predetermined inclusion criteria were chosen for the ensuing full-text review. An MS Excel spreadsheet was used to manage and analyse the data from the selected publications. From each study, methodology, results and findings were extracted and added to the data spreadsheet.

A thematic synthesis approach was used to analyse the data collected on family farming in terms of food security and sustainable development, aiming to create a conceptual framework. The history and concept of family farming, its impact on food security, multidimensionality, challenges and policy support were the major data extracted from the documents. Additionally, during data extraction, the relationship between family farming and SDGs is highlighted. To guarantee the validity of the conclusions, a thorough quality assessment was carried out. Excluded studies did not adhere to our methodological requirements. Cross-referencing with publications from the international agricultural organization was done to improve the review and deal with any biases.

### Selection of documents

During the study documents were selected through the PRISMA approach. The selection was carried out in four phases: identification, screening, eligibility and inclusion. There are 310 documents found initially from Scopus and Google Scholar databases in the first phase of identification. During the screening phase 172 publications were excluded based on the titles and abstracts of the paper and duplicate articles were also removed and 138 publications were further evaluated. In the eligibility phase, 103 publications were excluded after the evaluation of full

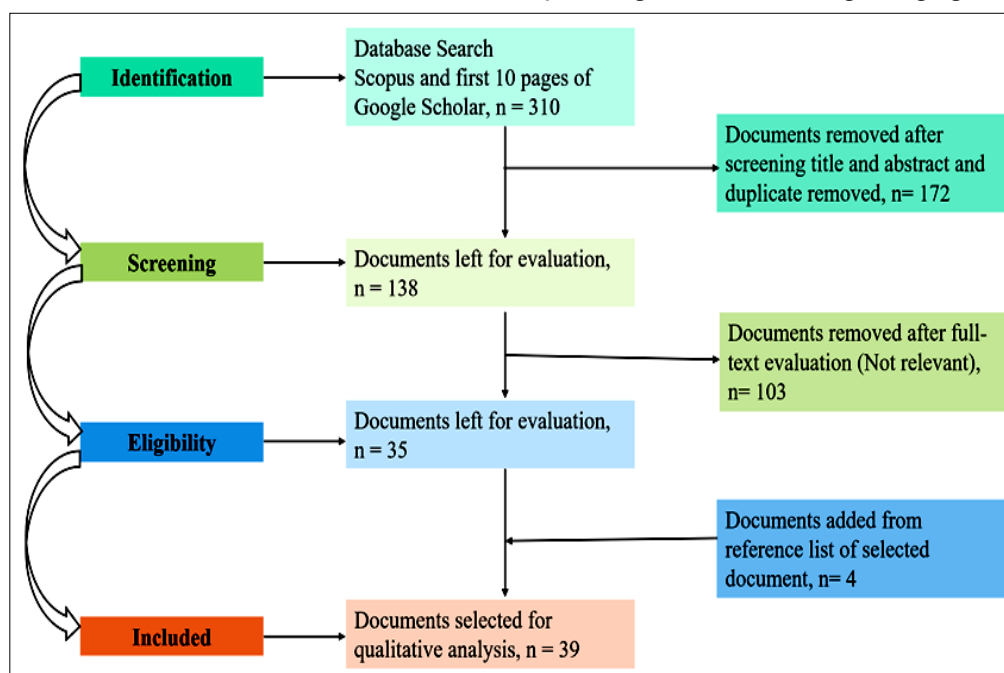
text. The papers were excluded due to the unavailability of full text, lack of relevance to the research question and scant attention to family farming and resilient food security. After that 35 publications were left for further evaluation. In the final inclusion phase total 4 publications were added from the reference list of selected papers and total 39 papers were selected for final qualitative analysis. Among the criteria applied in the selection process were quality, relevance and compatibility with the topic of the study. The data extracted from the chosen publications were subjected to a rigorous and methodical document selection procedure that included several screening measures and evaluations to determine eligibility. This process allowed for the identification of significant themes and patterns and included the steps of classifying, categorizing and synthesizing the data. This procedure also made sure that only the best quality and most relevant papers were included in the final analysis (Fig. 1).

## Results and Discussion

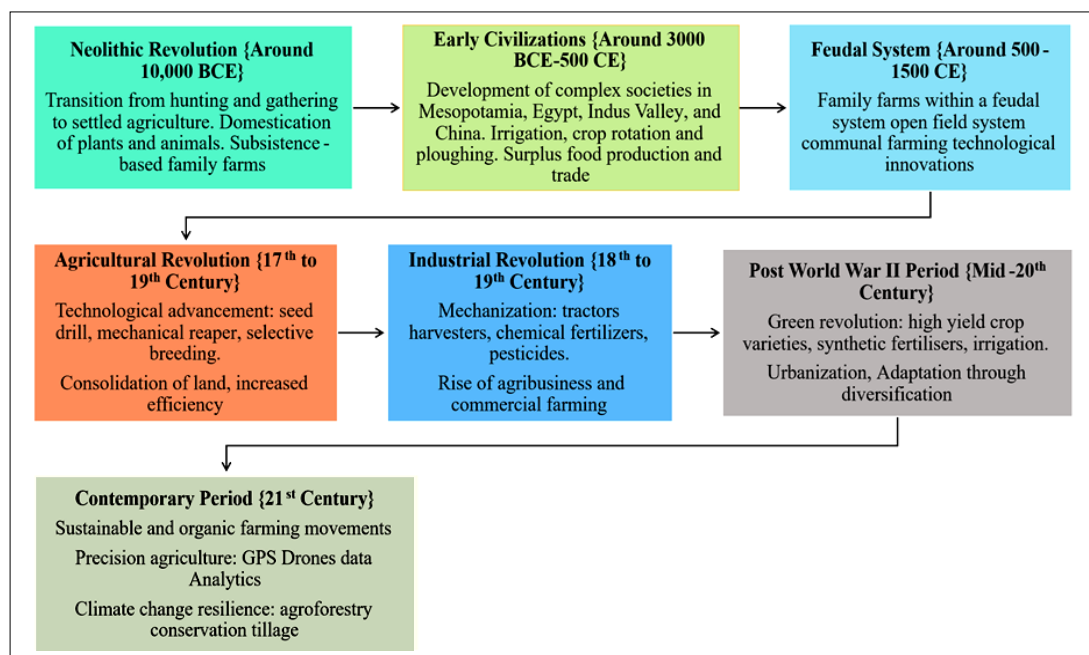
### History and concept of family farms

The idea of agriculture was ingrained about 10000 years ago and since then, farming has evolved through various stages, from the Neolithic revolution to the feudal system in medieval Europe. Technological innovations like enclosure movement and seed drills increased output but drove out small farmers. The Industrial Revolution and Green Revolution further automated farming, while family farms today embrace sustainable methods, digital technology, climate change effects and resilience (Fig. 2).

A universal definition of family farming does not exist. There are several definitions in the literature according to cultural traditions and national context and setting as shown in Table 1. A family's ownership and management of the farm, family habitation of the farm and a preponderance of family labour are among the common key elements that define family farming (16). The definition established in 2014 by the international steering committee of the international year of family farming is as follows: family farming is "a means of organizing agricultural, forestry,



**Fig. 1.** Document selection through PRISMA approach.



**Fig. 2.** Evolution of family farm.

**Table 1.** Concepts of family farming.

Authors	Definitions	Year	Reference
Altieri et al.	Family farming is essential to agroecological food production practices, prioritizing social justice, ecological sustainability and food sovereignty.	2012	(26)
Holt-Gimenez and Aitieri	Family farming is a diverse, small-scale agricultural approach characterized by a strong connection to the land and community, utilising family resources and labour.	2013	(27)
Ploeg	Family farms focus on local markets, variety of crops and conservation of the environment while retaining family ownership and control over the land and farming practices.	2014	(28)
Lamine	Family farming is defined as the feeling of responsibility and care towards the farm and the generational transfer of skills and knowledge.	2015	(29)
Graeb et al.	As a predominant form of agriculture, family farming is often considered smallholder farming, which is an important factor in enhancing food security and nutritional goals and hence reduces global poverty.	2016	(30)
Galdeano et al.	Compared to other agricultural businesses, family farming is more multifunctional, with one of the most important aspects being the conservation of the environment while producing goods for both market and non-market.	2017	(31)
Das and Mishra	Family Farming emphasizes its role in income security, poverty reduction and rural economic development.	2019	(32)
Mutea et al.	Family farming encompasses small-scale, community-oriented agricultural practices that are crucial for household food security and rely on social networks for support.	2020	(33)
Beluhova-Uzunova et al.	Family for me continue to be a vital component of the rural economy and are essential to both social development and the preservation of biodiversity.	2021	(34)
Martinez et al.	Family farming is integral to the agricultural landscape, contributing to food security, economic stability and community well-being.	2023	(35)
Chao	Family farming is a collaborative, sustainable agricultural practice that plays a crucial role in local economies and food systems, while also contributing to climate resilience.	2024	(1)

fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on family labour, including both women's and men's. The family and the farm are linked, co-evolve and combine economic, environmental, reproductive social and cultural functions" (18).

Family farming has been more well-known over the past few years because of its vital role in promoting sustainable agriculture and rural development. Family farms have an important role in protecting and improving rural lives and guaranteeing environmental conservation by using sustainable land practices. World agriculture watch (WAW) operationalizes family farming as "a form of agricultural operation in which domestic and farming activities are intrinsically linked. Family farms rely solely on family workers and do not have any permanently hired labour. Productive assets and family heritage are deeply rooted in family farms" (27).

To support the thematic synthesis and enhance transparency of findings, a summary of selected key studies is presented (Table 2). These articles were chosen based on their relevance to major dimensions such as climate resilience, gender roles, policy frameworks and sustainable agricultural practices in family farming systems. The table highlights the methodological diversity and regional spread of the reviewed literature, reinforcing the global significance of family farms in building resilient food systems.

### Role of family farming in ensuring food security

In view of the growing global population, food security is a major challenge of the 21<sup>st</sup> century (36). Along with the growing population, cultivable lands are getting fragmented and agricultural resources are becoming scarce, which in turn leads to food insecurity. In this context, smaller, more localized producers

**Table 2.** Summary of key findings.

Author(s)	Region	Methodology	Focus area	Key findings	Year	Reference
Chao	Global	Literature review	Climate resilience in family farming	Highlights how family farms apply agroecological practices and water-saving methods to build climate resilience.	2024	(1)
Ncoyini et al.	South Africa	Case study	Climate information access	Small-scale sugarcane farmers face limited access to climate data, impacting adaptation to weather variability.	2022	(2)
Maitra et al.	India	Review	Soil and nutrient management	Legume-based intercropping improves soil quality and sustainability in smallholder systems.	2024	(4)
Jena et al.	India	Field survey	Climate-resilient practices adoption	Financial access, education and institutional support influence farmers' ability to adopt resilient practices.	2023	(12)
Alam & Shrestha	South Asia	Policy analysis	Regional action plan	Advocates inclusive strategies for family farming as a tool for climate-resilient food systems.	2021	(21)
Galdeano-Gómez et al.	Spain	Empirical study	Socio-economic sustainability	Family farms support employment, rural cohesion and land conservation.	2024	(31)
Martinez et al.	Brazil	Case study	Policy and school feeding programs	Government policies linking family farming to school nutrition programs improve local food security.	2023	(35)
Beltran-Peña et al.	Global	Modelling study	Food self-sufficiency	Emphasizes the role of family farming in sustainable intensification to achieve global food self-reliance.	2020	(36)
Tittonell et al.	Latin America	Narrative review	COVID-19 and food systems	Community-based family farms showed higher resilience to supply chain disruptions during COVID-19.	2021	(37)
Unay-Gailhard & Bojnec	Europe	Survey study	Gender and environment	Young women farmers are more inclined toward eco-friendly practices on family farms.	2021	(38)

should manage food production rather than bigger ones to boost food security both locally and nationally. This will also help to cut food prices and promote greater local development. Family farmers have been recognized as the primary providers of food security and nutrition, resource management, cohesiveness among rural communities and cultural legacy (30).

#### **Food production in food-insecure regions**

Family farming is prevalent in diverse geographical areas, some of which are vulnerable to food insecurity. Because they live in these areas, they contribute directly to the local food systems by supplying fresh, nutritious and culturally appropriate food (39). This local production is essential because it lessens reliance on imported food, which may be expensive and unreliable, particularly during periods of instability or crises in the world market. Family farmers keep a consistent supply of food produced locally, acting as a buffer against these shocks. They can continue to produce even under challenging circumstances because of their flexibility and resilience. For instance, many areas with robust local food systems fared better during the corona virus disease 2019 (COVID-19) epidemic than severely import-dependent areas in terms of handling supply chain disruptions (37).

#### **Sustainable and climate resilient agriculture practices**

Sustainable farming methods that are adapted to their particular settings are frequently used by family farmers. Crop diversification, agroforestry, organic farming and water conservation strategies are some of these methods. By preserving the region's natural resources and biodiversity, these techniques contribute to long-term agricultural output (23). Additionally, using sustainable agricultural methods improves water retention, lowers erosion and improves the health of the soil. These environmental advantages are especially important in areas

where there is a shortage of food since the deterioration of natural resources can have disastrous effects on food production (40).

Family farmers are vital allies in the battle against global climate change. Their profound acquaintance with local surroundings enables them to use adaption techniques unique to areas. Agroecological practices that absorb carbon and lower greenhouse gas emissions are among these measures, along with diversifying crop species to boost resilience against climatic variability (16). Compared to corporate or industrial farms, family farms frequently have a lower carbon impact, according to various scientific studies. This is due to their reliance on traditional and organic farming practices, which reduces the use of chemical fertilizers and pesticides (41).

#### **Integration of traditional and modern knowledge systems**

The resilience and sustainability of food systems overseen by family farmers are improved by combining traditional wisdom with cutting-edge technological know-how. Generations of traditional knowledge has been accumulated, including information about specific crop types in the area, sustainable agricultural practices such as crop rotation and polyculture and methods for coping with climate change like soil management and water conservation. Complementing this knowledge are contemporary technological developments, which include drought-resistant and high-yielding crop varieties, sensors and drones for precision agriculture and sustainable inputs such as biodegradable fertilizers and efficient irrigation systems (42).

There are several advantages to this fusion of contemporary and old methods. Precision farming techniques optimize conventional crop rotation procedures to preserve soil health and increase yields, resulting in enhanced production (41). Combining conventional agroforestry and organic farming

methods with cutting-edge conservation technology promotes environmental stewardship and results in increased biodiversity, decreased carbon footprints and the preservation of natural resources (16). The capacity of family farms to endure catastrophic weather events is increased by merging traditional knowledge of climate adaptation with modern climate models and robust crop types. One such example of this integration is community seed banks, which integrate the traditional knowledge of seed-saving techniques with modern genetic conservation technology. It assists in protecting a diverse range of crop varieties and enables protection against crop failure driven by climate change.

Family farming is not merely a source of food production. It generates employment and drives economic development while also fulfilling environmental, social and cultural goals. It safeguards and maintains biodiversity; conserves landscape and fosters the growth of communities and cultural heritage (43). Family farming makes a substantial contribution to attaining food security, as it is demonstrated the ability to adopt highly productive, resilient, sustainable, creative and dynamic agricultural techniques, resulting in the production of nutrient-dense and culturally acceptable food (29).

Family farming is distinguished by the close connection between the farm and the family, which is deeply intertwined and forms a symbiotic connection. Most of the labour force on the farm is provided by the family (44). Several studies on family farming align closely with the sustainable livelihoods framework (SLF), which emphasizes the interplay between five types of capital that is natural, human, social, physical and financial, in building resilient rural livelihoods. Family farming systems, as evidenced across the reviewed studies, contribute to multiple livelihood assets, enhancing food and income security (financial capital), preserving agro-biodiversity (natural capital), sustaining indigenous knowledge (human capital), strengthening rural institutions (social capital) and utilizing basic infrastructures (physical capital) (45). Policies and institutional support targeting family farms thus play a central role in expanding these livelihood assets and promoting adaptive capacity in the face of climate and economic pressures.

### Gender dynamics in family farming

Gender plays a critical role in shaping the structure and sustainability of family farming systems across the globe. Women contribute significantly to agricultural labour, food production, processing and household nutrition, yet they remain underrecognized in formal agricultural policies and extension programs. Despite making up nearly 43 % of the global agricultural workforce, women farmers often lack access to land ownership, institutional credit, quality inputs, technology and training services (38, 46). This gender gap in access to resources restricts their ability to make decisions, adopt innovations and improve farm productivity.

The persistent gender-based disparities in family farming are rooted in structural and legal barriers. In many developing countries including India, women rarely hold legal titles to agricultural land, which affects their eligibility for government schemes and financial services. Only 13 % of women in India own land, despite contributing extensively to farming operations. Most agricultural extension programs are designed with a male-centric approach, failing to reach or engage women effectively (16). This

exclusion limits the potential of family farms to become fully inclusive, resilient and productive. While recent global frameworks such as SDG 5 (gender equality) and national policies acknowledge the need for women's empowerment, but its implementation remains weak. Most agricultural policies still lack gender-responsive budgeting, inclusive representation or tailored interventions for women farmers (17). Institutional support mechanisms must be redesigned to provide women with secure land rights, leadership training, representation in cooperatives and access to digital advisory platforms. Bridging gender gaps is not merely a social objective but a strategic factor to boost household food security, diversify livelihoods and increase climate resilience in family farming.

### Multidimensionality of family farming

Family farming has diverse roles and it is important to know its multidimensionality to understand its impact on socioeconomic, environmental and other contexts (Fig. 3). Some key dimensions are:

#### Economic dimension

It is a primary source of income for rural people who have farming as their profession. The economic viability depends on many factors like market accessibility, resource availability and general economic conditions. It provides job opportunities to family members as well as seasonal and permanent labourers. In the areas of less employment availability, family farming can be responsible for providing employment and economic stability as shown in Fig. 3 (47).

#### Social dimension

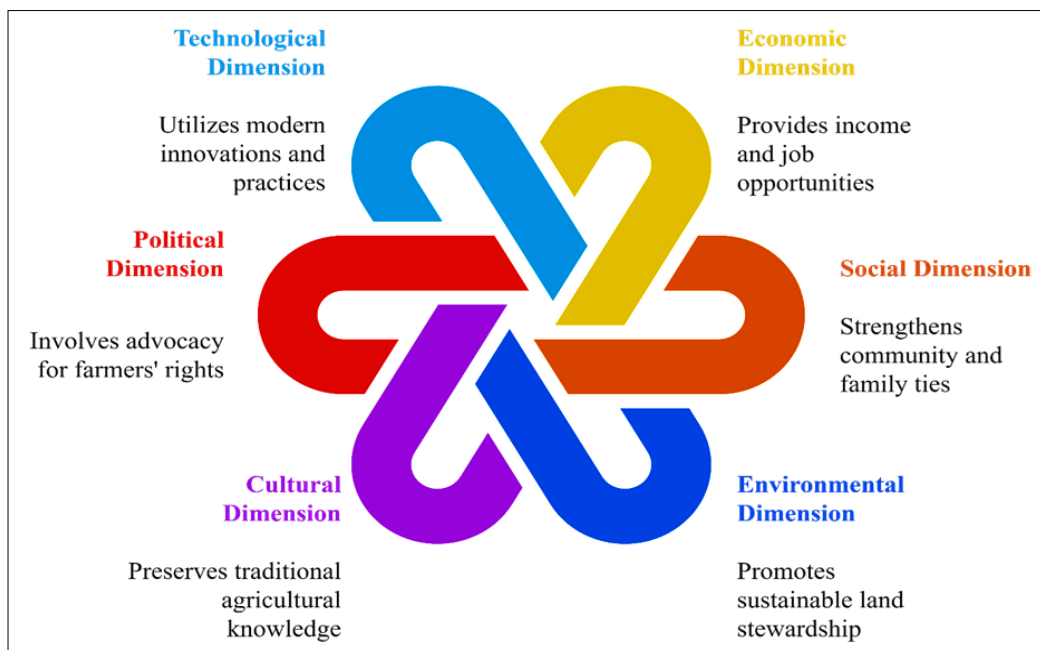
Community and family relationships are strengthened by family farming. Family members frequently work together on it, which promotes accountability, collaboration and continuity between generations (48). Cultural history and customs are preserved through the generational transfer of information and skills needed for farming (Fig. 3). They generate a large amount of the food that is consumed worldwide, particularly in underdeveloped nations. Family farms frequently vary their crop production, which benefits the local community's nutrition and can result in a more balanced diet for the farming family (49).

#### Environmental dimension

Sustainable farming methods that are suitable for the natural circumstances of the area are frequently used by family farmers. Crop rotation, agroforestry and organic farming are some of these methods. Family farmers take care of the land like stewards, preserving it for the benefit of the next generations (Fig. 3). This long-term view promotes actions that improve or preserve the land's fertility and production, which benefits the state of the environment (50).

#### Cultural dimension

A wealth of traditional agricultural knowledge and methods may be found in family farms. Sustainable agricultural techniques may greatly benefit from this information, which is frequently tailored to local situations. Family farming has a rich cultural legacy that includes customs, celebrations and other activities that promote togetherness and a sense of community as illustrated in Fig. 3 (51).



**Fig. 3.** Multidimensionality of family farming.

#### Political dimension

Family farmers frequently take part in advocacy to defend their rights and interests. This might involve advocating for laws that will help, resources that are available and equitable market circumstances. Their combined voice plays a critical role in influencing agricultural policies and guaranteeing that small-scale farmers' demands are met. Concerns about land ownership, access to water, seeds and other agricultural inputs are also included in the political component (Fig. 3). Policies and rules have a big influence on family farmers' access to these vital resources, which affects their sustainability and productivity (52).

#### Technological dimension

While some may stick to conventional practices, others could use cutting-edge innovations like enhanced seed types, smartphone applications for market access and precision farming. The viability of family farms is significantly impacted by the accessibility of infrastructure, including storage facilities, roads and extension services (Fig. 3). Through information sharing, technical support and education, extension services may offer vital assistance to farmers looking to upscale their production and embrace best practices (53).

#### Family farming and the sustainable development goals (SDGs)

Family farming is the most prominent type of agriculture in the World and it is very crucial in achieving the SDGs. It includes all family-run agricultural operations that are overseen and run by a family and primarily depend on family labour. Due to its inherent connections to sustainable agricultural methods, rural development and food security, family farming is essential to the achievement of several SDGs. Helping family farmers to actively carry out their vital role can substantially accelerate the growth of SDGs. Family farming and SDGs are linked and complement each other to foster growth and development (54, 55). A bidirectional mapping that highlights how family farming both contributes to and benefits from the SDGs. Family farming plays a central role in advancing SDGs related to poverty alleviation (SDG 1), food security (SDG 2), gender equality (SDG 5), climate resilience (SDG

13) and sustainable land use (SDG 15), among others. Targeted SDG-aligned policies such as improved access to land, credit, infrastructure and social protection are essential in enabling family farmers to thrive. This dual perspective emphasizes the interdependence between family farming and the global development agenda (Table 3).

One of the main goals of the UN decade of family farming is to recognize the potential of prosperous, sustainable family farming as a development accelerator for the SDGs (57). It offers a chance to mobilize broader support from governments, civil society, private actors, philanthropic organizations and other development actors to enable family farmers to realize their contribution to achieving the goals of the 2030 agenda for sustainable development. Food and agriculture organization (FAO) and international fund for agricultural development (IFAD) are already actively involved with family farmers and their organizations (16).

#### Challenges and future scope

Family farming, which consists of small-scale farms run by family members, is essential to world agriculture but it also presents multiple challenges (58). These farms frequently face financial difficulties because of their restricted access to markets, finance and other necessary resources. Family farms typically lack the financial resources to invest in cutting-edge agricultural technology and infrastructure, in contrast to huge agribusinesses that can take advantage of economies of scale. Their inability to compete in an increasingly globalized market where larger organizations dominate is a result of their financial constraints, which also restrict their production and efficiency (30). Climate change is posing significant challenges to family farmers, threatening crop yield stability and livestock wellbeing. Extreme weather events like storms, floods and droughts can deplete water resources, erode soil and reduce agricultural productivity. Soil deterioration due to intensive farming methods can also hinder productivity (59). Water shortages and biodiversity loss are also pressing issues, as family farms rely on conventional irrigation techniques, making them more susceptible to drought. The decline in biodiversity due to monoculture and heavy

**Table 3.** Linkage between family farming and SDGs.

SDGs	Family farming supports SDGs	SDGs support family farming	References
SDG 1 and 10	Modest family farmers can shift from subsistence farming to income-generating activities in rural areas.	Resilient livelihoods and social protection programs are essential for getting free from poverty traps and generating avenues.	(16, 54)
SDG 2	Family farmers can implement resilient and extremely productive farming techniques that open up income-generation opportunities.	Policies to improve their access to natural resources, productive inputs and tailored services unleash their productive potential.	(55)
SDG 3, 4, 6 and 7	Family farmers and their organizations may provide inclusive rural services and contribute to territorial development.	Increased access to fundamental amenities and capacity development in rural areas is essential to turning family farmers into change agents.	(15, 16)
SDG 5	Women farmers are crucial to create a sustainable, fruitful and inclusive food system.	Gender equality is essential for better access to resources, technology and a greater voice in decision-making is a crucial step in building the future we desire.	(55, 56)
SDG 8 and 9	Family farmers make varied food systems possible, which can improve rural-urban mobility, especially for young people and open up work prospects in rural regions.	Access to technology, infrastructure and specially designed inventions that suit their requirements is what they need in order to improve our shared future.	(16, 56)
SDG 11	Family farmers can foster food systems that improve long-term, sustainable integration of rural and urban communities.	With creative market solutions, people residing in both rural and urban locations can enjoy safe, wholesome food.	(16)
SDG 12	Family farmers can help to improve the sustainability of food systems by transforming them.	Policies ought to assist family farmers in decreasing food loss and effectively and sustainably managing environmental assets.	(57)
SDG 13	Family farmers can foster food systems which are more resilient to climate change.	Unleashing the potential of family farmers requires improving their capacity to adjust to climate-related shocks.	(55, 57)
SDG 14 and 15	Family farmers are able to protect the environment, culture and biodiversity.	Protecting their natural and cultural heritage lies at the core of this change.	(16, 54)
SDG 16 and 17	Family farmers are better able to assist their communities when their organizations and members are strengthened.	Acknowledgment, a voice and a supportive atmosphere can help them fulfil their potential as change agents.	(16)

**SDG 1:** no poverty; **SDG 2:** zero hunger; **SDG 3:** good health and wellness; **SDG 4:** quality education; **SDG 5:** gender equality; **SDG 6:** clean water and sanitation; **SDG 7:** affordable and clean energy; **SDG 8:** decent work and economic growth; **SDG 9:** industry innovation and infrastructure; **SDG 10:** reduced inequalities; **SDG 11:** sustainable cities and communities; **SDG 12:** responsible consumption and production; **SDG 13:** climate action; **SDG 14:** life below water; **SDG 15:** life on land; **SDG 16:** peace, justice and strong institutions; **SDG 17:** partnerships for the goals.

chemical inputs increases vulnerability to illnesses and pests, further reducing output (60).

Family farming has a lot of future potential because of its adaptability and contributions to sustainable agriculture, even in the face of these huge challenges. Family farms can adopt sustainable methods that are adapted to their particular settings since they are frequently well-ingrained in the local communities and customs (61). They frequently employ a variety of cropping techniques, which can improve long-term sustainability and ecological balance by lowering reliance on chemical inputs and increasing resistance to climate change. Policies and government initiatives that encourage family farming and technology breakthroughs also help to expand the future of family farming (62). In Brazil, the government's Programa de Aquisição de Alimentos (PAA) has strengthened local food markets by guaranteeing institutional procurement from family farms, improving both income stability and community nutrition (63). In India, policies such as the Paramparagat Krishi Vikas Yojana (PKVY) and the national mission on sustainable agriculture (NMSA) promote climate-resilient and organic practices among family farmers. These policies emphasize local knowledge and biodiversity. These examples highlight the diverse pathways through which national governments are promoting family farming to achieve the SDGs and build resilient food systems.

### Policy and institutional support

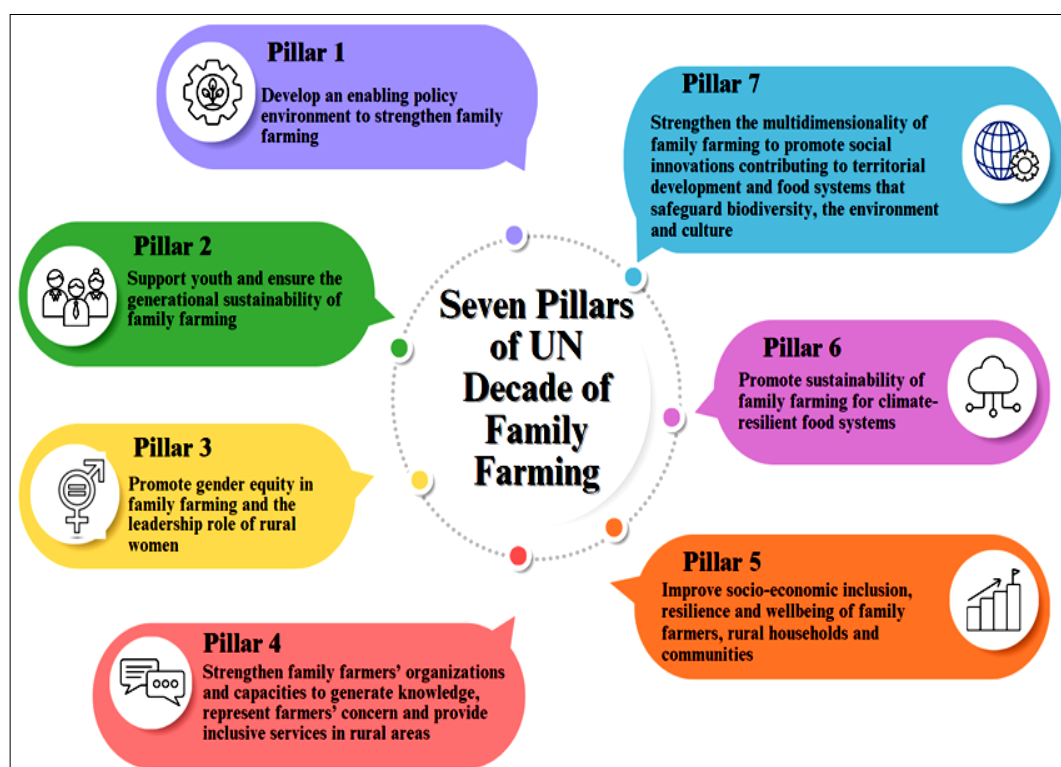
Family farming is crucial for global food security, environmental sustainability and rural development requires policies and institutional support for its sustainability. These include financial support, market access, technological innovation, education and training and social protection (64). Financial support can be provided by governments and international organizations through subsidies, grants and low-interest loans, enabling farmers to invest in infrastructure, technology and agroecological inputs that improve productivity and sustainability. Creation of rural microfinance schemes for smallholder farmers can promote family farming among them. Market access can be enhanced through policies that facilitate the creation of local and regional markets, reduce transaction costs and improve supply chain efficiency. Technological innovation can be promoted through research and development of agricultural technologies, such as drones, sensors and mobile apps. Education and training programs are crucial for building farmers' capacity to adopt new technologies and sustainable practices. Social protection policies can provide a safety net for farmers during economic shocks, natural disasters and health emergencies. Institutional support is necessary for the effective implementation and coordination of these policies (65). Governments and organisations should invest in green technology subsidies, climate-resilient infrastructure and access to climate-resilient seeds and inputs to help family farmers (66).

The global action plan was presented by the UN decade of family farming 2019-2028 to develop and execute policies at the international, regional and local levels to help family farmers. It acts as a tool to establish links between existing policies and suggested approaches, where family farming, rural development and sustainable living have long been closely intertwined as presented in Fig. 4 (15). It provides a thorough tool to assist in the pursuit of the SDGs within the framework of the steadily advancing achievement of the right to adequate food (67). The global action plan comprises seven pillars, each focusing on different aspects of the farming process. The first pillar emphasizes the need for a strong policy environment to support family farming, ensuring political commitment and collaboration. The second pillar emphasizes youth engagement and generational sustainability by providing young farmers with essential resources like land, financial services, infrastructure and markets. The third pillar advocates for gender equity and women's leadership in agriculture, advocating for equal rights and opportunities for women. The fourth pillar empowers family farmer organizations by enhancing their capacity to adopt sustainable practices, develop entrepreneurial skills and engage in policymaking (15, 56). The fifth pillar calls for comprehensive support, including financial assistance, sustainable agricultural practices and better access to essential services. This integrated approach fosters resilient and thriving rural communities. The sixth pillar emphasizes the importance of sustainability in family farming to build climate-resilient food systems. It advocates for the adoption of sustainable techniques such as crop diversification, organic farming, efficient water management and climate-smart technologies. To build resilience and improve socio-economic inclusion, family farmer organizations must be strengthened to equip members with knowledge of sustainable practices, entrepreneurial skills, policymaking and market access. Communication technologies are crucial for knowledge dissemination and engaging young farmers in innovative farming methods.

The seventh pillar highlights the multidimensional role of family farming in driving social innovation and territorial development (Fig. 4). Cooperative models and community-based resource management are vital in safeguarding biodiversity, preserving cultural heritage and strengthening local economies (56). By integrating these approaches, family farming can drive sustainable food systems and ensure the long-term resilience of rural communities.

## Conclusion

The study highlights the prospects of family farming in fostering a sustainable food system in rural communities as it significantly supports local food production and the sustainable development of family farms and their cultural heritage. The UNDF 2019-2028 emphasizes the need to empower family farmers by giving them better access to the market, funding, social safety nets and possibilities for income generation and training. Family farmers provide major contributions to rural development, biodiversity protection and climate resilience while confronting several obstacles like climate change, market instability and few resources. The international community may use family farming to achieve SDGs, build a resilient and sustainable agriculture system and eventually create a world free from poverty and hunger by supporting inclusive cooperative and cogent solutions. Future research should focus on different integrated approaches such as the SLF to holistically address the multifaceted role of family farming in enhancing rural resilience. To enhance the growth of family farming UN highlights the need for integrated policies and joint efforts, eventually bolstering inclusive and sustainable global agriculture.



**Fig. 4.** Seven pillars of UN decade of family farming.

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## Authors' contributions

The conceptualization of the study was carried out by SS and AD, while the methodology was designed by SS and AKP. Validation of the work was performed by SS, AD and OAO and the analysis was undertaken by AD and AKP. Data curation was handled collaboratively by AD, AKP and OAO. The original draft of the manuscript was prepared by SS, AD and AKP, whereas the review and editing were conducted by SS, AD and OAO. Supervision of the research was provided by AD and AKP. All authors have read and agreed to the published version of manuscript.

## Compliance with ethical standards

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

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## Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT (GPT-4) to enhance the clarity, grammar and overall readability of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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