frontiers | Frontiers in Sustainable Food Systems

TYPE Original Research
PUBLISHED 09 October 2024
DOI 10.3389/fsufs.2024.1453850

OPEN ACCESS

EDITED BY
Naveed Hayat,
University of Education Lahore, Pakistan

REVIEWED BY
Ghulam Mustafa,
University of Education Lahore, Pakistan
Muhammad Naeem,
University of Education Lahore, Pakistan
Arun Karnwal,
Lovely Professional University, India

*CORRESPONDENCE
Yoshiko Kawabata
✉ yoshikok@cc.tuat.ac.jp

RECEIVED 24 June 2024
ACCEPTED 27 September 2024
PUBLISHED 09 October 2024

CITATION
Taranov I and Kawabata Y (2024) Organic agriculture in Kyrgyzstan: experiences with implementing participatory guarantee systems.
Front. Sustain. Food Syst. 8:1453850.
doi: 10.3389/fsufs.2024.1453850

Organic agriculture in Kyrgyzstan: experiences with implementing participatory guarantee systems

Igor Taranov[1] and Yoshiko Kawabata[2]*

[1]Department of Symbiotic Science of Environment and Natural Resources, Tokyo University of Agriculture and Technology, Tokyo, Japan, [2]Institute of Agriculture, Tokyo University of Agriculture and Technology, Tokyo, Japan

Organic farming plays a pivotal role in the recent initiative to develop a sustainable economy in the Kyrgyz Republic (Kyrgyzstan). Key national policy documents support a green agricultural development path and highlight the potential of organic agricultural production and exports. This study therefore elicited perspectives on organic farming from organic farmers and stakeholders in Kyrgyzstan, focusing on the role of Participatory Guarantee Systems (PGS) in its promotion. Interviews held with these two groups revealed that, whereas organic farmers are primarily motivated by personal and family health concerns despite unfair market prices and insufficient governmental support, stakeholders prioritize environmental protection and view the inclusion of PGS in national legislation as a milestone in organic certification. Also, the recent COVID-19 pandemic has influenced farmers' motivation for organic conversion owing to increased health concerns and food safety. The study's findings highlight the potential of PGS to foster cooperation within local communities and familiarize farmers with organic principles and methods. PGS can be used as a framework to strengthen social and economic links within local farming communities and preserve traditional local knowledge and farming practices that are crucial for climate change mitigation and sustainable agriculture. Moreover, PGS may be applied in business as a model for establishing collaboration with other sectors at both domestic and international levels. The findings underscore the significance of PGS in the sustainable development of organic farming in Kyrgyzstan. However, challenges such as inadequate infrastructure and knowledge need to be addressed through the government's increased involvement and through cooperation among actors within the organic sector. Overall, the PGS approach may be used by policymakers as a relevant and feasible tool for introducing organic principles within agricultural policies and disseminating organic practices across the country.

KEYWORDS

organic farming, participatory guarantee systems, alternative certification, organic conversion, local food system, Kyrgyzstan

1 Introduction

The burgeoning global market for organic agricultural products has been attracting increasing numbers of agricultural producers worldwide (Willer et al., 2023). The growing turnover of organic products is indicative of stable positive dynamics and the establishment of consumers' preferences for organic produce. Unlike most other agroecological approaches, organic farming is a fully recognized legal concept, defined within national legislation along

with operations permitted under this farming category. Thus, organic agriculture exists within the legal and regulatory realm of organics (Seufert et al., 2017). Given the impact of organic labels on consumers' purchasing decisions, organic certification is generally considered a prerequisite for a product to be recognized as organic and marketed internationally (Albersmeier et al., 2009). However, behind the labeling, the issue of the sustainability of organic farming systems remains a subject of heated debates.

Organic certification by itself does not automatically guarantee sustainable agricultural production (Dinis et al., 2015) and, in some cases, may lead organic farmers to shift to conventional farming (Dayet et al., 2024). Non-certified organic farms can also contribute to environmental protection and rural development (UNCTAD, 2006). As pointed out by Scialabba and Müller-Lindenlauf (2010), organic farming entails a complex production and management system, which extends beyond general perceptions of organic operations simply as practices that do not involve the use of synthetic substances. Therefore, heavy reliance on organic certification to ensure financial sustainability inevitably raises questions regarding various types of certification schemes and their suitability for a given country or even a particular farming community within a country.

In general, there are three basic options available to farmers seeking to obtain organic certification: third-party certification (TPC) (usually in the pursuit of a target country's organic standards for export); national certification, which is in compliance with national organic standards; and Participatory Guarantee Systems (PGS) or their equivalent (Farreras and Salvador, 2022; Willer et al., 2023). According to the International Federation of Organic Agriculture Movements (IFOAM), PGS are "locally focused quality assurance systems. They certify producers based on the active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange" (IFOAM, 2018, p. 4). PGS can be viewed as an alternative certification mechanism for local small-scale farmers who cannot afford TPC, but who intend to engage in organic farming (Roggio and Evans, 2022). PGS and TPC differ in terms of verification approaches. The former relies on mutual trust among the farmers and their active participation, whereas the latter is based on the standards and procedures designed by institutions outside a given farming community (and even outside the country) and verified by assigned inspectors (IFOAM, 2018; Ninnin and Lemeilleur, 2024). Therefore, the TPC system is often criticized for neglecting the cultural and social background of local farming communities and for its high certification costs and technical barriers (Farreras and Salvador, 2022; Hruschka et al., 2021; Iannucci and Sacchi, 2021).

Evidently, PGS have gained momentum over the last decade and are attracting smallholders who cannot afford costly TPC (Montefrio and Johnson, 2019), especially in developing countries. Statistics published by IFOAM show that the number of PGS-certified organic producers dramatically increased during the period 2010–2022 from 6,000 to 1,328,496 farmers worldwide (Anselmi and Moura e Castro, 2023). The argument that PGS are pro-poor is supported statistically, as European and North American countries did not register an increase in the number of PGS-certified organic farmers. Canada and the United States reported a slight decrease in numbers, whereas India, which reported a tremendous rise in number of PGS-certified organic farmers, currently represents the overwhelming majority of all PGS-certified farmers (approximately 97%) worldwide (Anselmi and Moura e Castro, 2023).

The global and Asian organic markets are expanding as a result of growing awareness of the importance of healthy diets and partially because of the recent COVID-19 pandemic, which has foregrounded health concerns and the importance of wholesome food (Brata et al., 2022; Ghufran et al., 2022; Raj et al., 2024). A key priority is to ensure the growth of the organic farming sector in the future. Partap (2010, p. 12) has argued that Asian countries should focus on the triangle of "farmers – consumers – private sector" to support the development of organic farming in this region. Against this background, an examination of certification schemes that offer smallholders and family farms in developing countries an affordable alternative to TPC while preserving traditional knowledge (Hruschka et al., 2021) is warranted. One such option is PGS.

Countries that promote organic farming have various reasons for adopting PGS. For instance, the driving forces for pursuing PGS certification include: (1) reduction of certification costs and development of domestic organic markets in the Moroccan, Chilean, and Mexican cases (Hruschka et al., 2021; Kaufmann and Vogl, 2018; Lemeilleur and Sermage, 2020); (2) inclusion of marginal farmers in organic farming and promotion of rural development in the Philippines (Montefrio and Johnson, 2019); and (3) maintenance of agricultural producers' autonomy in France (Niederle et al., 2020). At the other end of the scale, PGS face challenges related to poor institutionalization, insufficient support mechanisms, as noted by Hruschka et al. (2024) in a study of PGS initiatives in Latin American countries, low demand for PGS-certified produce (Jacobi et al., 2023), and a lack of market recognition (Ninnin and Lemeilleur, 2024). A commonly held view is that PGS certification offers an affordable option for farmers. However, this is not always the case. In their recent study on PGS in Costa Rica, Kaufmann et al. (2023) observed an unequal distribution of certification costs among the members of a local PGS initiative, while Jacobi et al. (2023) found that PGS farmers in Bolivia faced costly registration fees.

Despite having relatively small areas of arable land and a limited population compared with neighboring countries, Kyrgyzstan has reported significant progress of PGS. In 2022, almost 2,667 ha of land were PGS-certified and farmed by 1,097 certified producers and 3,000 involved producers (Anselmi and Moura e Castro, 2023). As a result, Kyrgyzstan was ranked third among Asian countries according to the total area of PGS-certified land, following India and Thailand, and sixth in the world by the number of PGS-certified producers. Following the dissolution of the Soviet Union, numerous newly-emerged Kyrgyz smallholders faced economic constraints, with the lack of governmental support greatly impacting the agrarian sector (Lerman and Sedik, 2009). Consequently, small farmers had to revert to traditional ways of farming by reducing their use of chemicals. On the one hand, farmers' livelihoods were undermined, but on the other hand, an impetus for organic farming by default was generated. Traditional and indigenous forms of agriculture can create favorable conditions for a smooth transition to organic agriculture (Aoki, 2014). There may be some overlap between traditional farming and organic agriculture (UNCTAD, 2006), which could facilitate the transition to organic standards and their implementation. Furthermore, as Avasthe et al. (2019) argue, traditional knowledge sets the stage for better management of natural cycles, which are vital for organic farms and their sustainability.

The global call for sustainability facilitated the adoption of the "Concept on the development of organic agriculture production in the Kyrgyz Republic 2017–2022," which is the country's first policy document, introduced in 2017, targeting the development of organic agriculture. This policy highlights the urgent need to introduce transparent and affordable organic certification systems. In 2018, a

long-term national strategy for the period 2018–2040 and the "Concept on green economy in the Kyrgyz Republic" were introduced, signifying that the shift to organic farming was a priority in agricultural development. According to the proposed vision, Kyrgyz agriculture is expected to become a supplier of high-quality organic products for global and regional markets. Simultaneously, the government plans to promote the consolidation of small farms to improve the competitiveness of domestic agricultural produce, while specialized agricultural zones will be established for organic production.

These efforts were followed by the enactment of the "Law on organic agricultural production in the Kyrgyz Republic" in 2019 and the establishment of a Department of Organic Agriculture under the Ministry of Agriculture (FAO, 2020). In 2022, the government launched the "Lending to the agro-industrial complex" project to provide financial support to various agricultural sectors, including organic farming, through the promotion of the cluster approach. The new "Law on organic production" was adopted in 2023 and included PGS and group certification as options for organic farmers. The Kyrgyz government fully supports the organic movement and is committed to developing the organic sector through the establishment of organic clusters and organic *aimaks* (administrative territorial units at the subdistrict level) nationwide and the further improvement of PGS (Government of the Kyrgyz Republic, 2017). Organic *aimaks*, as a national model for promoting organic farming, rely on the existing territorial division and the voluntary participation of local farmers. The evolution of the Kyrgyz organic sector at the grassroots level has reached a point where it has created its own model of organic development, complemented by the PGS certification scheme. The institutionalization of the organic movement, characterized by the coexistence of emerging national organic standards and already operational TPC and PGS, has continued up to the present.

The implementation of practical steps as the next phase of the development of this sector requires thorough reflection on what has been achieved, what issues have emerged and remain unresolved, and which organic certification systems are appropriate at this time to advance and strengthen organic principles in Kyrgyzstan. Evidently, the issue of organic certification is a crucial part of efforts to change farmers' mindsets, increase numbers of organic farmers, achieve expected financial benefits, access export markets, and address current environmental issues confronting Kyrgyz agriculture. The recent emergence and progress of PGS in Kyrgyzstan may be indicative of significant untapped potential, which requires a deeper understanding. Focusing on the current status of the organic sector in Kyrgyzstan, this study is, to the best of our knowledge, the first to explore the potential of PGS in Kyrgyzstan. Seeking to contribute to the promotion of organic farming in Kyrgyzstan, it aims to establish a foundation for further scientific discourses on PGS and the promotion of organic systems in Kyrgyzstan. Given these developments, an investigation of PGS is timely.

2 Materials and methods

2.1 Study area

Issyk-Kul Province, which is located in the northeastern part of Kyrgyzstan, was selected as the study area for the following reasons. First, according to Bio-KG, the Federation of Organic Development, as of December 2022, Issyk-Kul Province had the largest community of 398 PGS-certified farmers. Second, there is a wide diversity of cultivated organic plants in this province. Third, Lake Issyk-Kul is a popular tourist destination with significant market potential, as it attracts both domestic and international visitors. Within this province, we purposively selected four organic *aimaks*: Aral, Aksuu, Tosor, and Kun-Chygysh, which are actively participating in the Organic *Aimak* Project (Figure 1).

2.2 Data collection and analysis

We conducted semi-structured face-to-face interviews with PGS-certified organic farmers from the four *aimaks* in Issyk-Kul

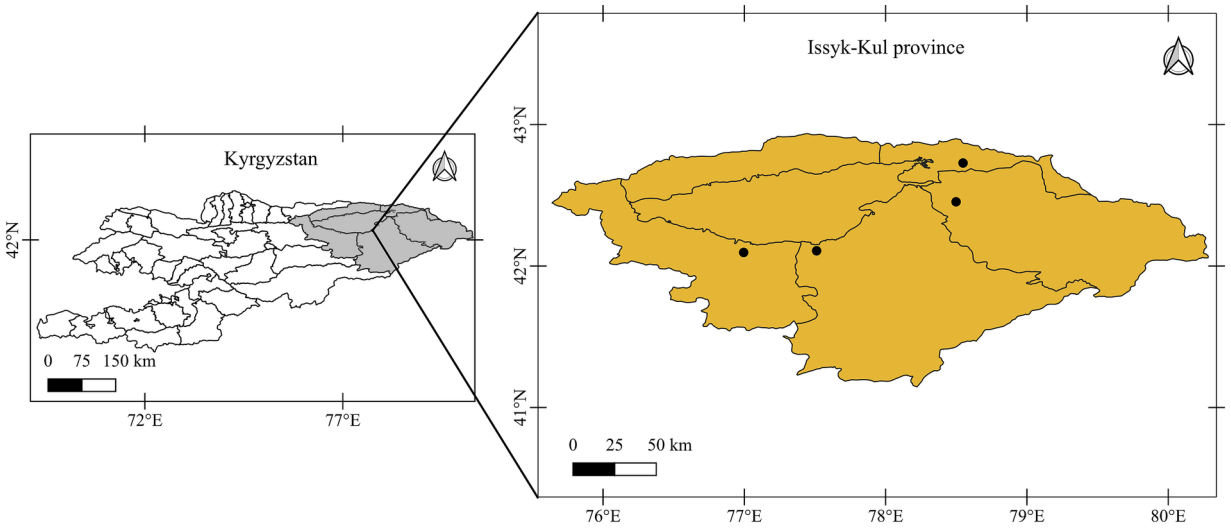

FIGURE 1
Map of the study area. The black dots indicate the locations of the organic *aimaks* (Aral, Aksuu, Tosor, Kun-Chygysh, moving from east to west). Source: Authors' illustration.

Province and other stakeholders. All of the interviews were conducted in June and July 2023. The main criterion for selecting organic farmers for the interviews was their participation in the Organic *Aimak* Project. Considering the diversity of organic farms, we decided to focus on farms specializing in the cultivation of various crops (potatoes, fruits, vegetables, cereals, etc.) and on the period of time since acquiring organic certification (early and late adopters). We used a purposive snowballing sampling technique and face-to-face interview guidelines, as described by Braun and Clarke (2013), to facilitate an in-depth exploration of the topic. This technique is appropriate for identifying participants belonging to a certain group (Farrugia, 2019). However, as Jensen and Laurie (2016) pointed out, snowball sampling has several weaknesses that may lead to the prevalence of one perspective that is shared by the respondents. To overcome limitations, we included farmers from various organic *aimaks* located in different districts, stakeholder groups and organizations.

The sample of organic farmers was based on data supplied by Bio-KG, which oversees the Organic *Aimak* Project, whereas that of stakeholders was obtained by contacting key personnel at the targeted organizations and obtaining their consent to participate in the study. There were three key groups of participants in the study: (1) organic farmers ($n = 28$) representing four organic *aimaks* in Issyk-Kul Province, (2) officials from the Ministry of Agriculture and Melioration of the Kyrgyz Republic ($n = 8$) in charge of organic farming policy, and (3) representatives of non-governmental organizations (NGOs) and international organizations as well as experts ($n = 5$) involved in the promotion of organic agriculture in Kyrgyzstan. The first group of organic farmers was coded as "OF" and the second and third groups of stakeholders were coded as "SH," with consecutive numbering used to identify each participant. Interviews with organic farmers were conducted on their farms and in some cases included tours of the farms. Data saturation was reached after conducting 25 interviews with organic farmers and nine interviews with stakeholders, with no new themes or ideas subsequently emerging. Farrugia (2019) argued that qualitative studies typically include a smaller number of participants to ensure comprehensive analysis. A sample size of 20–30 participants (interviews) is recommended by Creswell (2007) and Marshall et al. (2013). All participants were informed about the study goals, data collection techniques, and data handling procedures prior to being interviewed.

Interviews were conducted in both the Kyrgyz and Russian languages. In most cases, the participants spoke both languages during the interviews. Each interview was audio recorded and transcribed manually. Only relevant excerpts from the interviews that are presented in this paper were translated from the original languages into English. We gathered feedback from English language experts on the translations to ensure translation accuracy and consistency. Also, a uniform terminology was used across the translated texts. To protect personal data and ensure confidentiality, we used general terminology and a coding system applied to the participants. In light of our review of the literature, we identified key aspects of PGS, which we used in a thematic analysis of interview transcripts. Initial codes (categories) were assigned to phrases representing research interest (units of analysis) (Castleberry and Nolen, 2018). The codes were then grouped into broader themes to describe the various aspects of PGS and organic farming. Five main themes emerged: organic conversion, advantages and disadvantages of PGS, the practical aspects of PGS, and organic certification and policies. To obtain an in-depth understanding of the phenomenon investigated, we also applied a hermeneutic method that aimed to interpret textual data and capture latent meanings (Elbanna and Newman, 2022; Macanovic, 2022). In particular, we used the hermeneutic circle, allowing a researcher to actively interact with a text, moving back and forth from a bigger picture to details (Elbanna and Newman, 2022). This approach helped consolidate the textual and socioeconomic aspects of the units of analysis and led to the identification of four additional themes (marketing, current issues, development measures, and future perspectives). Table 1 illustrates the final thematic framework.

3 Results

Here, we present the main ideas expressed by the respondents sequentially in subsections, which focus on the key themes. Table 2 provides an overview of the ideas expressed by the participants.

3.1 Perceptions of organic conversion

Organic farmers and stakeholders have aligned themselves with organic farming for various reasons, with personal and family health and environmental conservation being the most frequently mentioned reasons for doing so. For instance, several farmers emphasized the negative consequences of applying chemical fertilizers and pesticides. For example, one stated:

> *We do not want to eat chemicals.* (OF21).

TABLE 1 Key themes and their frequencies.

Themes	Organic farmers	Stakeholders
Organic conversion (motives and barriers)	19	11
Tendencies and organic policy	13	10
Marketing	25	12
Organic certification	16	11
PGS pros and cons	26	12
PGS in practice	23	12
Current issues	21	10
Development measures	25	11
Future perspectives	22	13

TABLE 2 Descriptive statistics of ideas identified from the interviews.

Key themes	Representative ideas	Number of farmers (% of all farmers)	Number of stakeholders (% of all stakeholders)
Motives for organic conversion	Personal and family health	6 (21.4)	1 (7.7)
	High prices for chemicals	3 (10.7)	–
	Environmental protection	2 (7.1)	7 (53.8)
Barriers to organic conversion	Farmers' mentality	–	2 (15.4)
	Unfair market prices for organic produce	7 (25.0)	1 (7.7)
	Mountainous landscape	1 (3.6)	–
Tendencies and organic policy	Growing popularity of organic farming in Kyrgyzstan	7 (25.0)	4 (30.8)
	Development of PGS certification	3 (10.7)	4 (30.8)
	Lack of understanding of the cluster concept	–	2 (15.4)
	Slow pace of formulation of policy documents	3 (10.7)	–
Marketing	Poor marketing infrastructure	16 (57.1)	4 (30.8)
	Opportunities for tourism	3 (10.7)	2 (15.4)
	Intermediaries	2 (7.1)	1 (7.7)
	Need for marketing skills	4 (14.3)	5 (38.5)
Organic certification	Trust over organic certification	16 (57.1)	–
	Familiarizing farmers with organic farming over organic certification	–	6 (46.2)
	Development of certification market and delineation between standards	–	3 (23.1)
	Role of the Department of Organic Farming in certification	–	2 (15.4)
PGS pros and cons	Being unsuitable for export	12 (42.9)	6 (46.2)
	Trust as the biggest asset	9 (32.1)	1 (7.7)
	Uniqueness of organic *aimak* approach	2 (7.1)	3 (23.1)
	Doubts over peer regulation	3 (10.7)	2 (15.4)
PGS in practice	PGS process	16 (57.1)	8 (61.5)
	Punitive measures	4 (14.3)	2 (15.4)
	Abandonment of certified organic farming	3 (10.7)	2 (15.4)
Current issues	Availability of organic inputs	8 (28.6)	1 (7.7)
	Sufficiency/lack of agricultural extension services	7 (25.0)	–
	Lack of storage and processing facilities	6 (21.4)	2 (15.4)
	Prevention from breaking the rules through laboratory control	–	7 (53.8)
Development measures	Forming associations	5 (17.9)	2 (15.4)
	Consolidation of donors' financial aid	–	1 (7.7)
	Proactive governmental measures	7 (25.0)	4 (30.8)
	Need for marketing information	10 (35.7)	3 (23.1)
	Leading role of the central government	3 (10.7)	1 (7.7)
Future perspectives	Significant potential for organic farming in Kyrgyzstan	11 (39.3)	3 (23.1)
	Understanding of food as a prerequisite for healthy life	5 (17.9)	1 (7.7)
	Further expansion of organic farmlands	–	2 (15.4)
	Philosophy of organic farming	2 (7.1)	–
	Food safety requirements	–	4 (30.8)
	PGS as a driving force of international cooperation	4 (14.3)	3 (23.1)

The COVID-19 pandemic brought the issue of health and healthy lifestyles to the fore, as evidenced by the respondents' clear articulation of the logical connection between food quality and health.

> *In particular, after the pandemic, many people paid attention to health and turned to organics.* (SH12).

While the prices of organic and conventionally grown products are the same, cost–benefit considerations, notably the high prices of imported chemicals, influenced farmers' decisions on adopting organic farming. As one farmer noted:

> *Instead of buying chemicals I would rather grow crops myself.* (OF23).

The interviewed organic farmers did not overtly express strong environmental concerns, specifically regarding Lake Issyk-Kul. However, several stakeholders (SH1, SH3, SH5, SH6, SH7, SH8, and SH9) highlighted environmental issues.

> *[The] ecological factor is the most influential [in organic conversion], as it is a safer way of farming.* (SH9).

Notably, an increasing influx of information on climate change, the green economy, and organic farming and its potential benefits has prompted a shift in farmers' mindsets toward greener agriculture.

> *All over the country we can observe the change in farmers' attitudes. Because of greater awareness, farmers are turning to sustainable methods of crop cultivation*. (SH1).

Barriers impeding the organic transition were another common theme raised by the respondents. Typical obstacles constraining the conversion to organic farming that they mentioned were unfair market prices for PGS-certified products and poor access to the domestic market.

> *Lack of guaranteed sales impedes organic conversion; farmers are not interested in [a] transition.* (SH10).

Some stakeholders also touched upon the issue of farmers' mentality:

> *Farmers are reluctant to join and undertake cooperative actions.* (SH4).
>
> *Farmers come and go at the organic aimak, as some expectations are not met.* (SH1).

A further influential factor is the mountainous terrain, which affects not only trade routes but also impacts farmers' willingness to unite and become members of organic *aimaks*.

> *The number of PGS farmers is growing, but slowly. The size of a settlement and its location could be the reason. It is not an easy task to mobilize farmers in a big village compared with a small one*. (OF9).

3.2 Current tendencies and organic policies

Global and regional trends favoring wholesome foodstuffs have also influenced farmers' decisions. Majority of the interviewed organic farmers and stakeholders unequivocally stated that organic farming is gaining in popularity among farmers. One stakeholder (SH4) emphasized that an increasing number of farmers are purchasing biological pesticides. Another stakeholder (SH12) provided the following estimation:

> *Approximately 40–50% of farmers have heard about organic farming. Farmers are becoming more rational [and are] adding organic fertilizers to chemical ones.*

Thus, a non-certified, informal market for organic products is evolving, which is expected to become institutionalized and gradually evolve into a formal market over time (SH11). Some stakeholders (e.g., SH9) also asserted that a section of consumers consciously purchase only organic products. A number of smallholding Kyrgyz farms cater to these consumers.

Another trend in organic production mentioned by the respondents was the development of PGS certification. In general, most of the interviewed farmers and stakeholders believed that despite some disadvantages relating to its recognition, PGS should be promoted as an alternative method of organic certification. These systems are being promoted worldwide, especially in Southeast Asia. One of the stakeholders expressed his aspirations for a bright future for PGS in Kyrgyzstan and Asia:

> *If this trend [development of PGS in Asia] continues, there will be no need for third-party certification in these countries. They will be able to trade with each other without restrictions. There is a discussion about creating a PGS market platform for Asian countries. An equivalence process [mutual recognition] will be carried out.* (SH2).

National legislation on organic farming in Kyrgyzstan supports a pluralistic approach to certification. The recently adopted "Law on Organic Production" includes PGS certification, thereby formalizing it as a government-recognized certification option. The next step, adopting the necessary bylaws, will facilitate the practical implementation of these legislative norms. PGS certification in organic *aimaks* follows IFOAM standards, which can offer additional benefits to local farmers seeking to export their produce. Moreover, PGS-certified farmers are now eligible to participate in government programs supporting organic farming, with their certification officially recognized.

According to SH7, options for ecological agriculture are also under consideration. This method differs from organic agriculture in that the use of chemicals is minimized but not completely prohibited. The provision of such options may give farmers the opportunity to experience the organic approach. However, respondents stressed their dissatisfaction with the slow pace of formulation of strategic documents and enactment of the relevant legislation.

> *In order to develop organic agriculture, it is necessary to have legal acts that create favorable conditions. Simultaneously, it is necessary*

> *to provide financial support through preferential loans and the allocation of land for organic farmers. Support [provided] in the first five years is especially important.* (SH8).

One of the stakeholders (SH6) suggested that the government could promote PGS through the control of pesticides to strengthen trust in the system.

Organic farmers are aware of the current governmental initiative to introduce clusters as a form of cooperation.

> *Our voices reached the president, and we can obtain support that we have never had before*. (OF1).

When questioned, however, most of the farmers showed little understanding of the cluster concept. Furthermore, these farmers expressed doubt regarding the capability of the cluster approach to assist organic farmers, as farmers may find it difficult to access the credit allocated within the clusterization framework. Nevertheless, the emergence of a new state initiative to expand small-scale farms presents an alternative top-down approach to uniting organic farmers.

3.3 Farmers' perceptions about marketing

Reflecting on marketing, most of the interviewed farmers stated that selling their products and obtaining fair prices was their biggest hurdle. Several farmers, for example OF2 and OF9, stated that unfair prices accounted for the slow development of PGS. Another farmer pointed out:

> *Farmers should be spared the headache of marketing. There should be logistics centers that purchase organic products from our territory and interact with distribution centers. Physically we do not have [the] time. We do not have a well-developed supply chain.* (OF4).

Issyk-Kul Province is a popular tourist destination known for its scenic lake, surrounding mountains, and picturesque landscapes. Visiting tourists can significantly influence marketing strategies.

> *We supply jam to guest houses, [and it is] mostly tourists [who] buy it from us. Because of the tourists, we could raise our prices. We found that we were selling our jam cheap. Now, as the demand increases, we do not have enough capacity to produce more.* (OF1).

However, intermediaries still dominate marketing and obtain a larger portion of income compared to farmers.

> *It is difficult to sell in the village. We are poor farmers working for intermediaries. We tried [selling by] organic shelves. But they [supermarkets] are all intermediaries. The government has not yet launched such a system, so organic farming is not developing properly*. (OF1).

So far, organic fairs and exhibitions appear to be the only platforms for organic marketing that offer fair selling prices. Some farmers also pointed to the limited production capacities of organic farms, which is a factor constraining the production of sufficient volumes of organic products.

> *There are unique products, but what can you do with two buckets of products? We mainly grow for ourselves, and if there is a surplus, we sell it.* (OF20).
>
> *Chain stores are willing to cooperate, but they need constant volumes.* (OF12).

Despite these common complaints and expressions of dissatisfaction, there are indications of a growing understanding among organic farmers of the importance of developing marketing skills.

> *We also study the market and try to approach each client individually. Previously, we did not know much, we developed blindly, and we experienced many failures. Now we are learning little by little.* (OF3).

3.4 Perceptions of organic certification

Organic certification is directly linked to marketing. PGS offer an alternative to the more expensive TPC. While some farmers are able to work with international organizations to certify their land and produce according to internationally recognized organic standards, this option is unaffordable for most Kyrgyz farmers. Moreover, several farmers underestimated the role of certification, as they believed that their regular buyers would trust the quality of their produce without requiring a special organic label.

> *We do not have our own brand. …Within the country, our people know which area is famous for particular products. People are ready to buy even without a certificate.* (OF13).

One of the stakeholders pointed to the current stage of organic development in Kyrgyzstan:

> *Nowadays, certification itself is less important. More important is the issue of familiarizing and attracting farmers to organic farming.* (SH11).

It is noteworthy that given its potential, the Kyrgyz organic market is attracting foreign investors and certification bodies.

> *The market for certification services is developing. Even international companies are coming. This means that they have seen the potential of organic agriculture in the Kyrgyz Republic and want to take their place now.* (SH12).

Several stakeholders questioned the role of the Department of Organic Agriculture under the Ministry of Agriculture and Melioration in providing organic certification.

> *Department of Organic Agriculture should only implement policies and refrain from issuing certificates to avoid conflicts of interest. Even in the case of national standards, certification bodies must be private organizations, including international. We hope that the certification services market will develop. There are plans to create local certification companies.* (SH7).

Organic conversion is voluntary, and organic certification is pluralistic or multi-layered under Kyrgyz legislature. In other words, farmers are the only decision-makers when it comes to choosing the farming methods and certification schemes. Coexistence of national standards, TPC, and PGS therefore require clear delineation.

> *For the domestic market, the national standard will do. A stricter standard is needed for exports. But third-party certification is a big business, whereas PGS are a business in which everyone is involved.* (SH2).

Another respondent (SH3) suggested that the government should promote a national standard, taking into account membership in the Eurasian Economic Union.

3.5 PGS pros and cons

The respondents actively discussed the advantages and disadvantages of PGS. Typically, organic farmers pointed out that PGS were not suitable for export and received less recognition abroad compared with TPC. Interviewed farmers demonstrated a clear understanding of PGS as a tool for promoting organic farming domestically at the earliest stage, with potential to export organic produce in the future.

> *PGS are oriented to the domestic market. We have not yet entered [the stage of] export markets with PGS. During the training [period], international experts mentioned that we could establish trade relations with other central Asian countries when we reach an agreement on mutual recognition of PGS standards. For instance, Uzbekistan has an interest, as they allocated funds for berry production in Kyrgyzstan.* (OF4).

Some farmers and stakeholders opined that reliance on trust and peer control is one of the biggest assets of PGS, extending beyond a simple regulatory routine and developing into strong social ties required for consolidation.

> *The positive aspect of PGS is that farmers control each other, share seeds, and use warehouses together.* (SH13).

> *The first advantage of PGS is community engagement. Those who become members of the organic aimak receive support in marketing their products. They have an opportunity to sell by participating in fairs or selling through retail chains. The second advantage is the ease of certification [and] minimal bureaucracy. You can even find distribution channels abroad. Compliance with IFOAM standards may be sufficient.* (SH7).

At the same time, several respondents acknowledged the reverse side of peer regulation expressing doubts about the honesty of some farmers and emphasizing the difficulty of engaging local farmers.

> *In this sense, we need to change the PGS process. In our aimak, we had a sort of natural selection [process]. We keep working only with those farmers who proved their commitment to go organic. We have our own production of organic fertilizers, and we know the farmers who buy these fertilizers. Therefore, we understand who is who.* (OF3).

> *Some farmers, although considered organic on paper, only come to lectures. I consider them 'dead weight'."* (OF7).

> *The problem is that our farmers cannot wait; they are impatient. Farmers will simply give up if they have to wait several years. Organic farming requires teamwork; one person cannot start it on their own. We need people to work together and trust each other, but we do not always succeed in this either. This can be seen in the example of cooperatives. Only a few are actually cooperatives.* (SH8).

> *Any farmer can join us. Those who do not want to [will] remain without certification. People ask why join PGS, if we still sell at the same price.* (OF28).

Several stakeholders questioned the PGS certification process:

> *Regarding PGS, I believe that this system is not entirely suitable, taking into account the mentality of people. PGS are based on self-control, but farmers can negotiate. Human relationships may prevail over rules and regulations.* (SH8).

> *PGS are based on trust. There is, of course, a great risk of the predominance of family and personal relationships over organic principles. … This is the biggest risk. But our farmers have already crossed this line; they feel a collective responsibility. If even a single farmer does something unacceptable, trust in the entire aimak will be lost.* (SH1).

The same stakeholder compared PGS with TPC:

> *In addition, the decision to issue a certificate is not made by [any] one person; there is a board there [in PGS]. Counter question: when a third-party inspector comes, is there not also an opportunity for corruption?*

One of the stakeholders supported PGS despite the human factor:

> *I view PGS positively. Even PGS can contribute to organic farming. Some people believe that PGS will fail in Kyrgyzstan because of close family ties. But I disagree. Sooner or later, farmers will realize that they made a mistake by breaking the organic rules and correct it. I support PGS because we need organic products in our domestic market too. If we export everything, what do we have for ourselves and for future generations?* (SH12).

Several stakeholders emphasized the uniqueness of the organic *aimak* approach in Kyrgyzstan.

> *We have our own local specifics of PGS, such as women's jamaats [communities], councils of the elders, [and] youth clubs, which are included in the PGS system. [The] organic aimak is our model for the development of the agricultural sector. It is a mixture of ethnic and international.* (SH2).

> *We have one important characteristic, namely traditions, local specifics, being indigenous. Within the framework of PGS, traditions can become the engine of development. If there is an international platform, the PGS will develop.* (SH10).

3.6 PGS in practice

Practical aspects of PGS were primarily discussed by the participating farmers and NGOs, with respondents mainly focusing on the issues of certification and mutual trust. One respondent, OF6, provided an in-depth explanation of the PGS process:

> *We have the following system: a revision committee, a chairman elected for three years, a general assembly, which is the highest managerial entity, and an executive board. There are leaders in each community. In our aimak we have ten communities and one cooperative. Every [year in] August, we conduct field visits. Members of the executive board undertake field investigations. If chemicals are identified, then the community leader will bear responsibility. … The executive board makes a decision to issue a certificate for one year. We check farmers randomly; not all farmers.*
>
> *PGS are based on trust. When a farmer becomes a member of an organic aimak, he/she takes an oath and has guarantors among other organic farmers. In this sense, the procedures are similar to third-party certification. The difference is that instead of inspectors, farmers who are peers come and check. One farmer whose compliance with organic standards has been verified checks another farmer, and so there is mutual regulation.* (SH2).

Farmers emphasized the importance of trust and were inclined to implement harsh punitive measures against those who purposefully broke the rules.

> *If a farmer violates the organic standard, this farmer must be excluded from the organic aimak. Because of such farmers, we may lose our reputation, and the whole produce will be wasted.* (OF11).
>
> *We are all closely tied [together]. If someone applies chemicals, all neighbors will bear losses.* (OF13).

Organic conversion does not guarantee that an organic farmer will continue organic practices in the future. Some farmers may be disappointed for various reasons and change their mind. PGS-certified farmers are no exception, and there are instances of some of these farmers abandoning certified organic farming. However, future farming patterns are influenced by previous experiences.

> *I would not say that reverted farmers are completely moving away from organics. They opt out of organics, but in reality, they continue to be organic. It is just that they are not registered in the database, but in fact, they continue to cultivate their farmlands organically, though unofficially.* (SH2).

3.7 Perceptions of current issues

Organic farmers reported multiple issues that they face. In addition to those mentioned earlier, one of the main obstacles is availability of organic seeds and planting materials, with farmers having to look for reliable seed producers or retain a portion of seeds that they have harvested.

> *I buy seeds from the market, but no one gives me a guarantee that they are not GMO. If only we had organic seeds, but there are no organic seed farms.* (OF25).

Another issue relates to agricultural extension. Surprisingly, when asked about access to needed information, farmers from one organic *aimak* answered that they had sufficient knowledge.

> Various *projects come to us and mainly offer training courses. We have been trained for a long time; even visiting coaches learn from us. Each project teaches in its own way, and they are not interested in whether it suits us or not. For example, we were taught how to use green manure. But we are a livestock-raising country; few people want to bear the costs of growing and plowing green manure. There is waste-free manure production in animal husbandry. We studied for three hours, and in the end, no one sowed green manure.* (OF3).

Organic farmers from another *aimak*, however, mentioned that a lack of information impedes the growth of organic farming.

> *The number of organic farmers is not growing because there is no information. Farmers do not understand the difference between what does and does not do harm.* (OF22).

Most farmers and stakeholders felt that lack of storage and processing facilities is one of the most acute concerns for the organic sector in Kyrgyzstan.

> *We need processing facilities. There are no processed products in our organic aimak; we sell only fresh ones. As a result, we lose a part of our harvest.* (OF9).

The need for facilities specifically designed for organic produce is becoming increasingly urgent.

> *There are storage facilities. We try to store only organic products there. But this turned out to be difficult. Sometimes the owners of the storage facility allow their friends, relatives, and acquaintances to store non-organic products.* (OF4).

> *There are almost no processing facilities. There is a potato storage facility, but everyone uses it without separating organic and conventional products.* (OF19).

Trust is the main advantage of the PGS certification process but also its main weakness. To prevent some farmers from breaking the rules, some of the respondents suggested that laboratory control should be included in the certification process. However, those respondents also complained that Kyrgyz laboratories are not properly equipped.

> *The PGS are based on trust, but the state can also participate in terms of control, for example, of pesticide residues. But such work, unfortunately, is not being carried out. The Department of Chemicalization and Plant Protection has laboratories, but they only identify two types of pesticides and cannot identify new types of pesticides. Monitoring systems do not work. Branches of the laboratories are only [located] in Osh and Bishkek.* (SH6).

3.8 Development measures

Participants suggested multiple measures for overcoming current issues and successfully promoting organic farming in Kyrgyzstan. Forming associations of organic farmers was a recurring theme mentioned by respondents:

> *We need to move in one direction. Not like the swan, crayfish, and pike [a reference to the Russian parable of animals pulling a cart in different directions]. This is exactly how we are now: one is pulling there; another is pulling here. We will not go far this way. We ourselves are already an organic country, we only need to add some spices like in shorpo [a traditional Kyrgyz soup]. When this happens, we become ready-made shorpo.* (OF2).

Other farmers and stakeholders emphasized the need to unite organic farmers through different types of associations, such as clusters, cooperatives, and organic *aimaks*. While the emergence of new project initiatives oriented toward the promotion of organics is seen as a positive sign, lack of coordination undermines overall efforts to channel the development of organic farming in a particular direction. For example, OF4 observed that each project defends its interests and "hides" its farmers from other projects and even from the state. Another stakeholder emphasized the importance of consolidating donor organizations' financial aid (SH11). A large majority of farmers felt that the government should proactively take steps to strengthen the end links of the organic supply chain. A key argument they raised was that a lack of processing capacities causes unnecessary losses and creates unfavorable conditions for smallholders, who are forced to sell their produce to middlemen.

Many farmers noted that information support is vital for organic farming, as the latter differs from conventional agriculture and requires a distinct set of skills and methods. Apart from the required agricultural information, they also noted the need for marketing information.

> *The issue of sales is acute; no one keeps track of how much needs to be produced [for the market] in order to avoid overproduction. A lot of information is needed. The very first thing [required] is knowledge.* (OF17).

Despite the numerous actors engaged in organic farming, all of the respondents acknowledged the role of the central government as a leading entity responsible for promoting organic farming. The following needed governmental interventions were mentioned: a comprehensive public policy and strategic plan specifically targeting organic farming and marketing of organic products, provision of organic seeds, intensive targeted support of small settlements, increased production of organic fertilizers and biopesticides, support during the transition period, and intensification of international cooperative ties with potential partner countries.

3.9 Future perspectives

Proponents of an organic ideology posited that organic farming has significant potential in Kyrgyzstan.

> *Our lands are not very polluted. We do not have mineral fertilizer factories, so mineral fertilizers are expensive for farmers. Organic markets in Central Asia have not yet been established. But there is a high potential [for them] because people's purchasing power is increasing. It is this long-term perspective that we must focus on. The trend for purchasing our organic products will only grow. We can become beneficiaries, but we must take care of the formation of the domestic market.* (SH11).

> *People are becoming more educated and informed. I am absolutely confident that farmers will go organic, at least for themselves. Healthy food is a must.* (OF10).

The future of the organic movement in Kyrgyzstan is directly linked to an evolving understanding of food being important for health.

> *Organic farming has a bright future. Because of pollution and its negative impact, health is becoming the number one priority.* (OF16).

SH1 emphasized the need to focus on the production of healthy products. Furthermore, as noted by SH8, Kyrgyzstan has an obligation to meet certain commitments to ensure food safety. Therefore, internal procedures and certification will have to be designed and implemented.

Many respondents perceived a gradual expansion of organic farmlands, but their views on the scale of such expansion varied.

> *In principle, the whole country could switch to organic farming. We could become a country with organic status in the next decade. We have, for example, forest products, which are categorized as non-certified organic. Taking into account small areas, a complete transition to organic farming on a national scale is possible.* (SH12).

SH11 claimed that approximately 20–30% of farmers could obtain organic certification given factors such as the consolidation of farms. One of the stakeholders was less optimistic.

> *We have no choice but [to practice] organic agriculture. This factor is positive. This is not a panacea, but an option for export. If we bring the number of organic farmers up to 5% of the total number of farmers in the next 10 years, it will be a success.* (SH6).

> *Taking into consideration global experience, I believe that the optimal ratio is a maximum of 10%. A complete transition is very difficult [to achieve]. There are situations in which you cannot do without pesticides.* (SH8).

SH9 mentioned the case of Sri Lanka, where the government recklessly adopted a so-called green agenda, which eventually led to a severe economic and political crisis. In the same vein, Gamage et al. (2023) note that the organic production system has its limitations and may fail to meet long-term expectations in terms of food security and environmental sustainability due to lower productivity. Therefore, they advocate for a more flexible approach.

Some respondents also brought up the philosophy of organic farming.

> *We [organic farmers] were united not by land, but by ideas. Those farmers who want to grow organic crops for themselves and for the people, these are the farmers who have united. […] Our work is menial, but our souls are pure. Previously, young people went abroad. But now people have realized that gold can be created from earth with their own labor. The youths are returning. We want to preserve the gene pool of the nation.* (OF3).

> *The most important thing is honesty, and if you are not honest, then you can secretly use chemicals.* (OF28).

SH10 criticized the excessive attention paid to organic standards.

> *Awareness, understanding and responsibility are needed before talking about technical issues. Becoming an organic country should be our ideology.*

Several stakeholders elaborated on international cooperation as a driver of PGS development.

> *At this point, we do not need the EU market. The Asian market is larger. First, we would like to develop PGS certification in Kyrgyzstan. Then, based on intergovernmental agreements, for example, between India and Kyrgyzstan, we could reach [a] mutual [agreement concerning] recognition of PGS to export our PGS-certified produce to other countries without [requiring] third-party certification.* (SH1).

Another stakeholder (SH10) suggested:

> *If we have an international marketing platform at a regional scale, it will contribute to the promotion of PGS too.*

4 Discussion

4.1 Motivations for organic conversion

In agreement with Fairweather (1999), organic farmers who participated in this study could be broadly divided into two subgroups: those motivated by income considerations (pragmatic farmers) and those who care about human health and future generations' needs (ethical farmers). It could be argued that farmers' initial motivations influenced conversion patterns. We found that Kyrgyz organic farmers were primarily motivated by personal and family health considerations. The COVID-19 pandemic has prompted increased concerns about health, emphasizing the direct link between food quality and personal well-being. Farmers mentioned the negative consequences of chemicals on their health, which reinforced their commitment to organic practices. These findings are consistent with those of Kociszewski et al. (2020) and Rani et al. (2023).

Financial considerations played a secondary role as the share of pragmatic farmers was evidently lower, given that the market prices of organic and conventional products are largely the same. Farmers emphasized the difficulty they faced in procuring fair prices and the dominance of intermediaries in the organic supply chain. Pragmatic farmers typically remain in the organic sector until they achieve financial benefits (Madelrieux and Alavoine-Mornas, 2013). Several farmers mentioned that they were motivated by the opportunity to economize on chemicals. Importantly, despite unfair prices, health considerations were the primary motivation behind the intention of organic farmers to continue to farm organically. Whereas organic farmers did not overtly express concerns about the environment, the stakeholders highlighted environmental protection as a significant factor influencing organic conversion. Nevertheless, the interviews revealed a shift in farmers' mindsets toward more ecological forms of agriculture given increased awareness of climate change, land degradation, soil and water pollution, and the benefits of organic farming for their health.

Governments play a crucial role, as key actors, influencing farmers' decisions to adopt organic farming (Sapbamrer and Thammachai, 2021; Tien et al., 2022). However, respondents did acknowledge that unfair market prices and insufficient governmental policies were barriers that impeded the development of organic farming. This underscores the significant impact that government policies can have on the transition to organic practices. In the Kyrgyz context, respondents noted that the government must play a leading role in promoting organic farming and anticipated proactive actions and various supportive measures. Under the "Law on Organic Production" adopted in 2023, the government supports the organic sector by providing relevant information, promoting both domestic and international trade, facilitating exports, and allocating financing (credits and subsidies) with favorable interest rates. Despite temporary issues related to the implementation phase, it is evident that the government has established a solid foundation for the further institutionalization of organic agriculture and made a long-term commitment to organic principles. This can be considered as a key prerequisite for scaling up organic farming in Kyrgyzstan.

4.2 Role of PGS

Global and regional trends favoring healthy food have positively influenced decisions to engage in organic farming in Kyrgyzstan. The statistics indicate that PGS constitute the main option for developing countries, especially within Asia. The developmental trajectory of organic standards and principles indicates that they were initially formulated by practitioners of organics (Meredith et al., 2018) and subsequently recognized by governments. In the case of PGS, an organic brand is developed, managed, and promoted by local communities, thereby receiving a high level of support from farmers (Lemeilleur and Sermage, 2020). As Leitner and Vogl (2020) have

pointed out, the certification process is a decisive factor affecting farmers' decisions to choose one certification process over another. Therefore, local organic initiatives are a potent tool for promoting an organic ideology and standards in countries with short histories of organic movements. The initial versions of these standards should target local markets (Partap, 2010). For this reason, NGOs typically promote organic standards at local scales. In addition, NGOs can contribute greatly to the promotion of PGS and advisory services to facilitate the transition to organic standards (Shi-ming and Sauerborn, 2006).

Furthermore, grassroots efforts to facilitate organic conversion are sustainable (Kristiansen and Merfield, 2006), and can address the main issues related to access to organic farm inputs and information (Bottazzi et al., 2023). As this study has shown, PGS were viewed by the participants as a reasonable alternative to TPC and as a first step toward the development of export markets. While underscoring the need for TPC to enable foreign organic markets to be accessed, UNCTAD (2006) acknowledged that farmers in developing countries can hardly afford to undergo the annual certification process. Moreover, Albersmeier et al. (2009) argued that TPC has its flaws and may not be completely reliable. Accordingly, reliance on a single certification scheme may entail some risk for the Kyrgyz organic sector during the early stages of the transition. Therefore, the recent inclusion of PGS in the national legislation on organic production is a milestone in the development of a pluralistic organic certification system.

Overall, the development of PGS certification was acknowledged by the respondents to be a suitable option. PGS can serve to familiarize rural communities with organic principles and methods without requiring substantial financial investments, thereby preparing farmers for a future possible transition to TPC, if the need for organic export arises. PGS can be used as a framework for building cooperation within a given local community and solidifying local values and experiences (Montefrio and Johnson, 2019). Furthermore, several studies reported the following benefits of PGS: better communication between the organic farmers belonging to a particular PGS group, openness of governing bodies, transfer of knowledge, and trust (Hruschka et al., 2021); easier market access for members of PGS groups, fair prices for organic produce, and the opportunity to participate in policy-making (Winkler et al., 2024); lower certification costs and bureaucracy, and building of trust (Cuéllar-Padilla et al., 2022; Kaufmann et al. Willer et al., 2023); marketing, improved profitability, and agroecological performance (Grovermann et al., 2024); shared views and accountability (Sanderson Bellamy et al., 2023). As Scialabba and Müller-Lindenlauf (2010) emphasized, organic farmers are capable of adapting to climate change and its negative consequences for a specific territory by applying customary practices and growing local cultivars. In this context, ecological practices are effective at the grassroots level when care for land becomes a long-term commitment (Ahnström et al., 2009).

Several respondents touched upon philosophical and ethical aspects of organic farming at its ideological core. Dinis et al. (2015, p. 44) pointed out that there are three main elements of "deep organic farming," namely "a high level of biodiversity, a relatively small external input dependence and a strong integration in local community." According to De Wit and Verhoog (2007), superficial and deep organic farming are the two extremes on a spectrum, with the latter striving to defend inherent organic values in the face of conventionalization. These authors emphasize the importance of organic values and principles, noting that PGS are an opportunity for organic farmers themselves to take the initiative and put organic values into practice.

4.3 Challenges, opportunities, and recommendations

This study also underscores the impact of tourism on marketing strategies in Issyk-Kul Province. Findings suggest that organic fairs and exhibitions could play a crucial role in establishing fair prices. Kuo et al. (2006) argue that organic farming and agro-ecotourism can produce positive synergetic effects and contribute to local economies by developing the service sector, linking local food supply chains with tourist facilities, and establishing direct linkages between organic farmers and tourists. Moreover, growing concerns about healthy and safe food may accelerate the amalgamation of the tourism sector and organic farming to form a hybrid model of the economy, such as wellness tourism (Xue and Shen, 2022). Unlike other parts of Kyrgyzstan, Issyk-Kul Province enjoys favorable conditions for selling agricultural products directly to international tourists and has the potential to benefit from collaborative efforts from the organic and tourism sectors. Nonetheless, multiple agribusiness opportunities remain to be discovered.

Another finding was the coexistence of national standards, TPC, and PGS. As several respondents argued, the current organic certification structure may be conceived as having evolved sequentially from locally-based PGS to national certification and TPC. However, initial motives are decisive factors determining the pursuit of a particular type of certification, whether for export or because of environmental considerations. A variety of accessible certification options could contribute to increasing the number of organic farmers. This requires concrete policies to ensure harmonious functioning of these certification approaches and appropriate governmental support according to the needs of organic farmers. Organic farmers reported various issues, including the lack of organic seeds, insufficient agricultural extension services, and the absence of storage and processing facilities. Specifically, respondents frequently mentioned the lack of warehouses, refrigeration units for storing produce, and dryers for fruits and berries. This unresolved issue results in significant food and income losses. These findings are in line with those of Górska-Warsewicz et al. (2021), who identified lack of knowledge, and of suitable infrastructure, as major impediments within the organic food sector.

In light of the above discussion, we may conclude that organic standards create a framework for organic farmers' interactions with the environment, or, stated differently, with local knowledge and nature. Vogl et al. (2005) emphasized the role of organic farming in providing a link to traditional knowledge accumulated over centuries, which is unique to a given area. Generally speaking, any agro-production approach is an outcome of its historical development (Third World Network and Sociedad Científica Latinoamericana de Agroecología, 2015). From this perspective, locally-based systems are more flexible and less bureaucratic compared with a national certification system and may ensure timely adoption of new scientific achievements and responses to local market fluctuations (Roggio and

Evans, 2022). Given that PGS are primarily driven by local initiatives, fostering grassroots leadership is crucial for the viability of organic farming and any collective approach aimed at scaling up sustainable agriculture. Observations from interviews revealed a high demand for strong local leadership. The enthusiasm expressed by group leaders emerged as one of the most powerful factors in ensuring the cohesion and sustainability of PGS groups in the research locales.

Integrating organic farmers within associations in Kyrgyzstan is a priority for the development of the organic sector (Taranov et al., 2019). Van Dijk et al. (2016) proposed the concept of environmental cooperatives that unite farmers around the common goal of environmental protection. Organic *aimaks* may perform a similar role. The principles of organic agriculture, which constitute its "software," may benefit substantially from the implementation of PGS projects promoted at the local level, as farmers' knowledge of ecological cycles and organic principles will accelerate a smooth shift toward a sustainability mindset, which may lead to an enduring commitment to sustainable farming. Kaczocha and Sikora (2016) have argued that local environmental initiatives may strongly influence levels of awareness of ecological issues. Thus, PGS are likely to contribute to the promotion of an organic ideology, stimulate knowledge exchange, foster links among local farmers, boost the market turnover of organic produce, and simultaneously strengthen democratic processes within farming communities through active social interaction and participation (Enthoven and Van Den Broeck, 2023; Kaufmann and Vogl, 2018; Sanderson Bellamy et al., Willer et al., 2023). Policymakers may employ PGS as a relevant tool for introducing organic principles into agricultural policies, disseminating organic practices across the country, and scaling up organic farming. PGS market research could substantially facilitate the decision-making process by providing policymakers with the necessary information (Hruschka et al., 2024). Recent government initiatives to introduce a cluster approach to organic farming may be seen as a positive development. However, as we found, participants were skeptical due to difficulties in accessing financing. The top-down nature of clusterization may undermine local efforts, such as the Organic *Aimak* Project or other grassroots initiatives, and may confuse farmers. Further investigation is needed to assess the compatibility of both initiatives.

The importance of informational support tailored to farmers' needs was also emphasized. Timely, participatory, and demand-driven agricultural extension and education have a significant impact on farmers' intentions to adopt ecological farming practices, including organic and conservation agriculture (Bui and Nguyen, 2021; Prodhan et al., 2023; Squalli and Adamkiewicz, 2023; Tama et al., 2021). This emphasizes the importance of customized outreach and education programs in promoting sustainable farming practices. Organic agriculture is more knowledge-intensive compared with conventional agriculture. For instance, within the Bio Cotton Project implemented with the support of a Swiss donor in Kyrgyzstan, organic farming was found to be more labor intensive than conventional farming, requiring additional skills and knowledge (Kaegi et al., 2017). Unlike conventional agriculture, which relies mostly on chemicals to solve the main problems arising during the production cycle, local knowledge and its application is maintained within organic farming. UNCTAD (2006) too views the need for additional knowledge transfer as one of the constraints hindering organic conversion and calls for area-specific advisory services for prospective and existing organic farmers. Knowledge gaps among the interviewed organic farmers varied by territory and may be attributed to different stages of adopting organic farming. Some organic *aimaks* were established earlier, leading to farmers with more extensive experience in applying organic practices and fewer needs for extension services compared to those in other *aimaks*. This suggests that the information needs of organic farmers differ, highlighting the need for demand-driven extension services. At the same time, cooperation between organic *aimaks* and neighboring communities should be intensified to create communication channels for knowledge sharing, as peer influence is an important conversion factor (Tran-Nam and Tiet, 2022).

Proponents of organic farming argue that it has significant potential in Kyrgyzstan given unpolluted lands and the increasing purchasing power of the population. Moreover, the gradual expansion of organic farmland is possible, with opinions varying on the scale of such expansion. Scaling up can bring various benefits to farming communities, such as healthier food and diversified sources of income, if accompanied by adequate information campaigns, financial incentives to support organic conversion, and comprehensive policies (Squalli and Adamkiewicz, 2023). Respondents highlighted the need for unity among organic farmers, international cooperation, and governmental support to ensure the sustainable development of organic farming in the country. Several contributions (e.g., Dayet et al., 2024; Sapbamrer and Thammachai, 2021) show that active participation and collective actions are crucial for organic certification process. As one of the most well-developed conceptualizations of an eco-friendly approach, organic farming relies on the economic and sociocultural context of a particular territory. From this perspective, organic *aimaks* and PGS are likely to be sustainable, as this model is inherently participatory and can be adapted to the specific conditions of a given area.

5 Conclusions and implications

The findings of this study illuminate the motivations for organic conversion, challenges, and future prospects of PGS and organic farming in Kyrgyzstan, providing valuable insight for farmers and other stakeholders involved in the organic sector. They reveal that organic farmers prioritize their personal health. Despite the challenges they face, most organic farmers remain committed to organic practices, motivated by health considerations. Stakeholders, however, emphasized the importance of environmental protection as a significant factor in organic conversion, particularly in light of increasing awareness of ecological issues.

The coexistence of national standards, TPC, and PGS reflects a diverse certification landscape, offering farmers various options according to their initial motives and target markets. Results suggest that the provision of information on marketing and management in organic agriculture may become a driving force for further development of the organic movement in Kyrgyzstan. Our findings also highlight the role of tourism in Issyk-Kul Province in shaping strategies for marketing organic products. Organic fairs and exhibitions could play a crucial role in establishing fair prices. While PGS certification is seen as suitable for the domestic market, concerns about its recognition abroad and challenges related to trust and peer control were raised.

The findings of the study carry important implications for agricultural policies. PGS are considered a useful and feasible tool for

promoting an organic farming ideology and farming methods. The inclusion of PGS in national legislation is a milestone in the development of a pluralistic approach to organic certification, offering a viable alternative to TPC. Taking into consideration the current organic policy in Kyrgyzstan, PGS are seen as a feasible tool for the government to implement plans to expand organic farmlands and increase the number of organic farmers. PGS as a cooperative framework can strengthen social and economic ties among the members of local farming communities and to preserve local knowledge and traditional farming practices that have proven effective. Moreover, PGS are a business model that can be used to establish collaboration with other sectors (e.g., the service sector, education, trade) at both domestic and international levels. The growing Asian organic market can potentially reach mutual recognition to facilitate the formation of a regional organic market that relies on PGS-certified farmers. Additionally, PGS can be instrumental in stimulating the growth of local demand for PGS-certified organic produce and boosting the domestic organic market. New dietary preferences for healthy food and local organic brand recognition can drive these trends.

In this context, PGS can serve as an affordable tool for promoting organic practices and principles essential for changing the mindset of Kyrgyz farmers and consumers. However, promoting the cluster approach may complicate the organic sector's policy landscape and potentially overlap with the collective efforts of the Organic *Aimak* Project. A mutual adaptation of both approaches could help mitigate contradictions and create synergies. If viewed as individual territorial and economic units, organic *aimaks* can be incorporated into a larger organic cluster that spans several districts. Central and local governments should recognize the high policy relevance of the PGS approach for rural development and international cooperation, and incorporate local certification schemes into agricultural policies to support the collective actions of organic farmers. As one of the few key players in the Kyrgyz organic sector, PGS-certified organic *aimak*s can actively participate in policy formulation and implementation, representing the interests of organic farmers and bridging communication gaps between government bodies and farming communities. Overall, the study underscores the potential of PGS to familiarize rural communities with organic principles and methods, foster cooperation within local communities, and promote organic principles.

Organic agriculture can substantially reduce dependency on imported chemicals, which is crucial for Kyrgyzstan. However, challenges such as the lack of organic inputs, insufficient agricultural extension services, and inadequate storage and processing infrastructure for organic produce must be addressed through increased collaboration among stakeholders within the framework of the organic cluster and organic *aimak* approaches, along with comprehensive public policies, to ensure the sustainable development of organic farming in Kyrgyzstan. Grassroots efforts should be complemented by centralized supportive measures, such as subsidies for newly converted organic farmers, the establishment of laboratories to ensure the quality of organic produce, and the promotion of a national organic brand internationally.

Some studies on organic agriculture *a priori* praise organic practices for their positive effects on the environment and farmers' incomes, while leaving the challenging aspects of organic systems unaddressed. Thus, despite the growing international market turnover, a rational and comprehensive approach to scaling up organic practices should be upheld. Kyrgyz policymakers should be mindful of the inherent limitations of organic farming and rely on objective, area-specific scientific facts and evidence, rather than on political agendas or the growing popularity of green technologies in agriculture. In light of these limitations, a balanced approach to land management, incorporating both conventional and organic practices, is likely to be more sustainable and viable for developing nations, including Kyrgyzstan. This also means that organic agriculture policies should be regularly evaluated and adjusted to the constantly changing environment of both the global and local agrarian sectors, in order to maximize benefits, mitigate risks for farmers, and ensure food security.

This study had several limitations, which could affect the validity of some of its findings. First, it only covered PGS-certified organic farmers residing in Issyk-Kul Province. PGS-certified organic farmers from other provinces and those operating according to non-PGS organic standards may hold different views, which need to be captured. Second, access to reliable statistical data on organic farming in Kyrgyzstan, and on PGS in particular, continues to be an issue confronting policymakers and researchers. According to Anselmi and Moura e Castro (2023), IFOAM is the only entity that compiles statistics on PGS. Finally, given time constraints, we did not cover the views of some other important actors within the organic sector (e.g., within eco-clusters and organic shops) which would enhance the credibility of our findings. The short history of organic standards in Kyrgyzstan raises questions regarding their long-term adaptability and viability. Therefore, further studies on PGS in other provinces of Kyrgyzstan can shed light on these issues and contribute to the promotion of alternative certification schemes.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

The studies involving humans were approved by the Ethics Review Committee of Tokyo University of Agriculture and Technology. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin because this study is based on oral interviews among farmers and other stakeholders. Therefore, oral consent to join the study was recognized as sufficient. Participation in the interviews confirms the respondents' agreement to join the study.

Author contributions

IT: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. YK: Data curation, Funding acquisition, Project administration, Resources, Supervision, Validation, Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research, authorship, and/or publication of this article. This study was supported within the framework of the Agri-Net Program by the Japan International Cooperation Agency, Tokyo, Japan.

Acknowledgments

We thank Bio-KG (the Federation of Organic Development) at Bishkek, Kyrgyzstan for their cooperation in this study. We are also grateful to all PGS-certified organic farmers and stakeholders who participated and shared their views. In addition, we thank Edanz (https://jp.edanz.com/ac) for editing a draft of this manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

Ahnström, J., Höckert, J., Bergeå, H. L., Francis, C. A., Skelton, P., and Hallgren, L. (2009). Farmers and nature conservation: what is known about attitudes, context factors and actions affecting conservation? *Renew. Agr. Food Syst.* 24, 38–47. doi: 10.1017/S1742170508002391

Albersmeier, F., Schulze, H., Jahn, G., and Spiller, A. (2009). The reliability of third-party certification in the food chain: from checklists to risk-oriented auditing. *Food Control* 20, 927–935. doi: 10.1016/j.foodcont.2009.01.010

Anselmi, S., and Moura e Castro, F. (2023). "Participatory guarantee systems in 2022" in The world of organic agriculture: Statistics and emerging trends 2023. eds. H. Willer, B. Schlatter and J. Trávníček (Frick, Switzerland: Research Institute of Organic Agriculture FiBL, Frick, and IFOAM – Organics International, Bonn), 157–163.

Aoki, M. (2014). Motivations for organic farming in tourist regions: a case study in Nepal. *Environ. Dev. Sustain.* 16, 181–193. doi: 10.1007/s10668-013-9469-6

Avasthe, R., Saini, J. P., and Ahamad, S. (2019). "Organic agriculture: export, entrepreneurship and employment opportunities" in Integrated transformation of agriculture. ed. J. P. Sharma (New Delhi: New India Publishing Agency), 301–322.

Bottazzi, P., Seck, S. M., Niang, M., and Moser, S. (2023). Beyond motivations: a framework unraveling the systemic barriers to organic farming adoption in northern Senegal. *J. Rural. Stud.* 104:103158. doi: 10.1016/j.jrurstud.2023.103158

Brata, A. M., Chereji, A. I., Brata, V. D., Morna, A. A., Tirpe, O. P., Popa, A., et al. (2022). Consumers' perception towards organic products before and after the COVID-19 pandemic: a case study in Bihor county, Romania. *Int. J. Environ. Res. Public Health* 19:12712. doi: 10.3390/ijerph191912712

Braun, V., and Clarke, V. (2013). Successful qualitative research: A practical guide for beginners. London: SAGE Publications Ltd.

Bui, H. T. M., and Nguyen, H. T. T. (2021). Factors influencing farmers' decision to convert to organic tea cultivation in the mountainous areas of northern Vietnam. *Org. Agric.* 11, 51–61. doi: 10.1007/s13165-020-00322-2

Castleberry, A., and Nolen, A. (2018). Thematic analysis of qualitative research data: is it as easy as it sounds? *Curr. Pharm. Teach. Learn.* 10, 807–815. doi: 10.1016/j.cptl.2018.03.019

Creswell, J. W. (2007). Qualitative inquiry and research design: Choosing among five approaches. Thousand Oaks, CA: SAGE Publications, Inc.

Cuéllar-Padilla, M., Haro-Pérez, I., and Begiristain-Zubillaga, M. (2022). Participatory guarantee systems: when people want to take part. *Sustain. For.* 14:3325. doi: 10.3390/su14063325

Dayet, A., Diepart, J.-C., Castella, J.-C., Sieng, S., Kong, R., Tivet, F., et al. (2024). Can organic rice certification curb the pressure of the agrarian transition in Cambodia? A farming system approach. *Agric. Syst.* 217:103953. doi: 10.1016/j.agsy.2024.103953

De Wit, J., and Verhoog, H. (2007). Organic values and the conventionalization of organic agriculture. *NJAS* 54, 449–462. doi: 10.1016/S1573-5214(07)80015-7

Dinis, I., Ortolani, L., Bocci, R., and Brites, C. (2015). Organic agriculture values and practices in Portugal and Italy. *Agric. Syst.* 136, 39–45. doi: 10.1016/j.agsy.2015.01.007

Elbanna, A., and Newman, M. (2022). The bright side and the dark side of top management support in digital transformaion – a hermeneutical reading. *Technol. Forecast. Soc. Change* 175:121411. doi: 10.1016/j.techfore.2021.121411

Enthoven, L., and Van den Broeck, G. (2023). How to boost the local trade of participatory guarantee system (PGS)-certified produce? A value chain perspective in Huánuco, Peru. *Ecol. Econ.* 212:107929. doi: 10.1016/j.ecolecon.2023.107929

Fairweather, J. R. (1999). Understanding how farmers choose between organic and conventional production: results from New Zealand and policy implications. *Agr. Hum. Values* 16, 51–63. doi: 10.1023/A:1007522819471

FAO (2020). Overview of organic agriculture development in Europe and Central Asia. Hungary: Budapest.

Farreras, V., and Salvador, P. F. (2022). Why do some participatory guarantee systems emerge, become effective, and are sustained over time, while others fail? An application of the Ostrom social-ecological system framework. *Land Use Policy* 118:106134. doi: 10.1016/j.landusepol.2022.106134

Farrugia, B. (2019). WASP (write a scientific paper): sampling in qualitative research. *Early Hum. Dev.* 133, 69–71. doi: 10.1016/j.earlhumdev.2019.03.016

Gamage, A., Gangahagedara, R., Gamage, J., Jayasinghe, N., Kodikara, N., Suraweera, P., et al. (2023). Role of organic farming for achieving sustainability in agriculture. *Farming Syst.* 1:100005. doi: 10.1016/j.farsys.2023.100005

Ghufran, M., Ali, S., Ariyesti, F. R., Nawaz, M. A., Aldieri, L., and Xiaobao, P. (2022). Impact of COVID-19 to customers switching intention in the food segments: the push, pull and mooring effects in consumer migration towards organic food. *Food Qual. Prefer.* 99:104561. doi: 10.1016/j.foodqual.2022.104561

Górska-Warsewicz, H., Żakowska-Biemans, S., Stangierska, D., Świątkowska, M., Bobola, A., Szlachciuk, J., et al. (2021). Factors limiting the development of the organic food sector – perspective of processors, distributors, and retailers. *Agriculture* 11:882. doi: 10.3390/agriculture11090882

Government of the Kyrgyz Republic (2017). Концепция развития органического сельскохозяйственного производства в Кыргызской Республике на 2017–2022 [Concept on development of organic agriculture production in the Kyrgyz Republic 2017–2022]. Bishkek: Government of the Kyrgyz Republic.

Grovermann, C., Hoi, P. V., Yen, N. T. B., Schreinemachers, P., Hai, M. N., and Ferrand, P. (2024). Impact of participatory guarantee systems on sustainability outcomes: the case of vegetable farming in Vietnam. *Int. J. Agr. Sustain.* 22:2338028. doi: 10.1080/14735903.2024.2338028

Hruschka, N., Kaufmann, S., and Vogl, C. R. (2021). The benefits and challenges of participating in participatory guarantee systems (PGS) initiatives following institutional formalization in Chile. *Int. J. Agr. Sustain.* 20, 393–407. doi: 10.1080/14735903.2021.1934364

Hruschka, N., Kaufmann, S., and Vogl, C. R. (2024). The right to certify – institutionalizing participatory guarantee systems (PGS): a Latin American cross-country comparison. *Glob. Food Sec.* 40:100748. doi: 10.1016/j.gfs.2024.100748

Iannucci, G., and Sacchi, G. (2021). The evolution of organic market between third-party certification and participatory guarantee systems. *Bio-based Appl. Econ.* 10, 239–251. doi: 10.36253/bae-10470

IFOAM. (2018). IFOAM policy brief on how governments can recognize and support participatory guarantee systems (PGS). Bonn: IFOAM – Organics International, 4. Available at: https://www.ifoam.bio/sites/default/files/2020-03/policybrief_how_governments_can_support_pgs.pdf (Accessed August 10, 2024).

Jacobi, J., Toledo Vásquez, D. G., Solar Alvarez, J. M., and Bürgi Bonanomi, E. (2023). "First we eat and then we sell": participatory guarantee systems for alternative sustainability certification of Bolivian Agri-food products. *Agroecol. Sustain. Food Syst.* 47, 72–99. doi: 10.1080/21683565.2022.2131692

Jensen, E. A., and Laurie, C. (2016). Doing real research: A practical guide to social research. London: SAGE Publications Ltd.

Kaczocha, W., and Sikora, J. (2016). Ecological ethics. Values and norms in local rural communities. *J. Agribus. Rural Dev.* 10, 69–78. doi: 10.17306/jard.2016.8

Kaegi, S., Bischof, A., and Luethi, R. (2017). Organic cotton experiences – Learnings and recommendations from Mali, Burkina Faso and Kyrgyzstan. *1st* Edn. Switzerland: HELVETAS Swiss Intercooperation.

Kaufmann, S., Hruschka, N., and Vogl, C. R. (2023). Participatory guarantee systems, a more inclusive organic certification alternative? Unboxing certification costs and farm inspections in PGS based on a case study approach. *Front. Sustain. Food Syst.* 7:1176057. doi: 10.3389/fsufs.2023.1176057

Kaufmann, S., and Vogl, C. R. (2018). Participatory guarantee systems (PGS) in Mexico: a theoretic ideal or everyday practice? *Agr. Hum. Values* 35, 457–472. doi: 10.1007/s10460-017-9844-2

Kociszewski, K., Graczyk, A., Mazurek-Łopacinska, K., and Sobocińska, M. (2020). Social values in stimulating organic production involvement in farming – the case of Poland. *Sustain. For.* 12:5945. doi: 10.3390/SU12155945

Kristiansen, P., and Merfield, C. (2006) in "Overview of organic agriculture" in organic agriculture: A global perspective. eds. P. Kristiansen, A. Taji and J. Reganold (Collingwood, Australia: CSIRO Publishing), 1–23.

Kuo, N. W., Chen, Y. J., and Huang, C. L. (2006). Linkages between organic agriculture and agro-ecotourism. *Renew. Agric. Food Syst.* 21, 238–244. doi: 10.1079/RAF2006148

Leitner, C., and Vogl, C. R. (2020). Farmers' perceptions of the organic control and certification process in Tyrol, Austria. *Sustain. For.* 12:9160. doi: 10.3390/su12219160

Lemeilleur, S., and Sermage, J. (2020). Building a knowledge commons: evidence from the participatory guarantee system for an agroecology label in Morocco. *Int. J. Commons* 14, 465–480. doi: 10.5334/ijc.1020

Lerman, Z., and Sedik, D. (2009). Agrarian reform in Kyrgyzstan: Achievements and the unfinished agenda. Budapest, Hungary: FAO Regional Office for Europe and Central Asia.

Macanovic, A. (2022). Text mining for social science – the state and the future of computational text analysis in sociology. *Soc. Sci. Res.* 108:102784. doi: 10.1016/j.ssresearch.2022.102784

Madelrieux, S., and Alavoine-Mornas, F. (2013). Withdrawal from organic farming in France. *Agron. Sustain. Dev.* 33, 457–468. doi: 10.1007/s13593-012-0123-8

Marshall, B., Cardon, P., Poddar, A., and Fontenot, R. (2013). Does sample size matter in qualitative research?: a review of qualitative interviews in IS research. *J. Comput. Inf. Syst.* 54, 11–22. doi: 10.1080/08874417.2013.11645667

Meredith, S., Lampkin, N., and Schmid, O. (2018). Organic action plans: Development, implementation and evaluation. *2nd* Edn. Brussels: IFOAM EU.

Montefrio, M. J. F., and Johnson, A. T. (2019). Politics in participatory guarantee systems for organic food production. *J. Rural. Stud.* 65, 1–11. doi: 10.1016/j.jrurstud.2018.12.014

Niederle, P., Loconto, A., Lemeilleur, S., and Dorville, C. (2020). Social movements and institutional change in organic food markets: evidence from participatory guarantee systems in Brazil and France. *J. Rural. Stud.* 78, 282–291. doi: 10.1016/j.jrurstud.2020.06.011

Ninnin, P., and Lemeilleur, S. (2024). Common property regimes in participatory guarantee systems (PGS): sharing responsibility in the collective management of organic labels. *Glob. Environ. Chang.* 86:102856. doi: 10.1016/j.gloenvcha.2024.102856

Partap, T. (2010). "Emerging organic farming sector in Asia: a synthesis of challenges and opportunities" in *organic agriculture and agribusiness: innovation and fundamentals*. Eds. T. Partap and M. Saeed (Tokyo: Asian Productivity Organization), 8–20.

Prodhan, F. A., Afrad, M. S. I., Haque, M. E., Hoque, M. Z., Rokonuzzaman, M., Mohana, H. P., et al. (2023). Factors driving the adoption of organic tea farming in the northern region of Bangladesh. *Res. Glob.* 7:100145. doi: 10.1016/j.resglo.2023.100145

Raj, V. A., Rai, S. S., and Jasrotia, S. S. (2024). Sustainable purchase intentions towards organic food during Covid-19 pandemic: an exploratory study on Indian consumers. *Soc. Responsib. J.* 20, 243–260. doi: 10.1108/SRJ-01-2022-0022

Rani, M., Kaushik, P., Bhayana, S., and Kapoor, S. (2023). Impact of organic farming on soil health and nutritional quality of crops. *J. Saudi Soc. Agric. Sci.* 22, 560–569. doi: 10.1016/j.jssas.2023.07.002

Roggio, A. M., and Evans, J. R. (2022). Will participatory guarantee systems happen here? The case for innovative food systems governance in the developed world. *Sustain. For.* 14:1720. doi: 10.3390/su14031720

Sanderson Bellamy, A., Gomes, M., Mülling Neutzling, D., and Kumar, V. (2023). The role of the state for managing voluntary food sustainability standards democratically. *J. Rural. Stud.* 103:103126. doi: 10.1016/j.jrurstud.2023.103126

Sapbamrer, R., and Thammachai, A. (2021). A systematic review of factors influencing farmers' adoption of organic farming. *Sustain. For.* 13:3842. doi: 10.3390/su13073842

Scialabba, N. E., and Müller-Lindenlauf, M. (2010). Organic agriculture and climate change. *Renew. Agric. Food Syst.* 25, 158–169. doi: 10.1017/S1742170510000116

Seufert, V., Ramankutty, N., and Mayerhofer, T. (2017). What is this thing called organic? – how organic farming is codified in regulations. *Food Policy* 68, 10–20. doi: 10.1016/j.foodpol.2016.12.009

Shi-ming, M., and Sauerborn, J. (2006). Review of history and recent development of organic farming worldwide. *Agr. Sci. China* 5, 169–178. doi: 10.1016/S1671-2927(06)60035-7

Squalli, J., and Adamkiewicz, G. (2023). The spatial distribution of agricultural emissions in the United States: the role of organic farming in mitigating climate change. *J. Clean. Prod.* 414:137678. doi: 10.1016/j.jclepro.2023.137678

Tama, A. R. Z., Ying, L., Yu, M., Hoque, M. M., Adnan, M. K., and Sarker, S. A. (2021). Assessing farmers' intention towards conservation agriculture by using the extended theory of planned behavior. *J. Environ. Manag.* 280:111654. doi: 10.1016/j.jenvman.2020.111654

Taranov, I. N., Semenov, S. R., and Ajibekov, A. A. (2019). Organic agriculture in the Kyrgyz Republic: a search for a development vector. *Bullet. Kyrgyz National Agrarian Univ. Named Skryabin K.I.* 1, 30–35.

Third World Network and Sociedad Científica Latinoamericana de Agroecología (2015). Agroecology: key concepts, principles and practices. Main learning points from training courses on agroecology in Solo, Indonesia (5–9 June 2013) and Lusaka, Zambia (20–24 April 2015). Penang, Malaysia: Jutaprint, 11–13.

Tien, D. N., Hoang, H. G., and Sen, L. T. H. (2022). Understanding farmers' behavior regarding organic rice production in Vietnam. *Org. Agric.* 12, 63–73. doi: 10.1007/s13165-021-00380-0

Tran-Nam, Q., and Tiet, T. (2022). The role of peer influence and norms in organic farming adoption: accounting for farmers' heterogeneity. *J. Environ. Manag.* 320:115909. doi: 10.1016/j.jenvman.2022.115909

UNCTAD (2006). "Organic agriculture: a trade and sustainable development opportunity for developing countries" in UNCTAD trade and environment review. (New York and Geneva: United Nations), 142–223.

Van Dijk, W. F. A., Lokhorst, A. M., Berendse, F., and de Snoo, G. R. (2016). Factors underlying farmers' intentions to perform unsubsidised Agri-environmental measures. *Land Use Policy* 59, 207–216. doi: 10.1016/j.landusepol.2016.09.003

Vogl, C. R., Kilcher, L., and Schmidt, H. (2005). Are standards and regulations of organic farming moving away from small farmers' knowledge? *J. Sustain. Agric.* 26, 5–26. doi: 10.1300/J064v26n01_03

Willer, H., Schlatter, B., and Trávníček, J. (Eds.). (2023). The world of organic agriculture. *Statistics and emerging trends 2023*. Frick and Bonn: Research Institute of Organic Agriculture FiBL, and IFOAM – Organics International.

Winkler, G., Kaufmann, S., Hruschka, N., and Vogl, C. R. (2024). Participatory guarantee systems: structure, benefits and reasons for participation – insights from the Italian case study of Campi Aperti. *Front. Sustain. Food Syst.* 8:1388853. doi: 10.3389/fsufs.2024.1388853

Xue, L., and Shen, C. (2022). The sustainable development of organic agriculture: the role of wellness tourism and environmental restorative perception. *Agriculture* 12:197. doi: 10.3390/agriculture12020197