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Dialogues of Knowledge for Agroecology: Participatory Strategies for Peasant Strengthening in Boyacá

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ABSTRACT
Beginning to migrate from conventional agriculture to agroecology was a strategy implemented from the planning of strategies based on the exchange of actions that promoted the sharing of knowledge, know-how, and experiences, which led to the strengthening of traditional knowledge. The objective of the article was to encourage the adoption of sustainable agroecological production systems in the municipalities of Panqueba, Soatá, Sogamoso, and Nobsa, through the exchange and appropriation of agroecological knowledge using the Farmer-to-Farmer methodology and technical and research support. Participatory methodologies of PRA, including interviews, participatory workshops, and knowledge appropriation, were employed to identify the main traditional practices and peasant knowledge. As a result, a significant exchange of experiences among farmers and the transmitted knowledge was achieved, which strengthened the implementation of agroecological practices.
Keywords: Agroecology; Agroecological Transition; Exchange of Experiences; Rural Development; Traditional Knowledge

1. INTRODUCTION:

Agriculture has played a significant role throughout history, as the transition from nomadism to sedentism facilitated social organization and territorial control. However, from its beginnings, agriculture also generated important social and environmental impacts, such as the overexploitation of natural resources and the deterioration of biodiversity, leading to new forms of domination over labor and nature. The evolution of agriculture clearly demonstrates the interaction between humans and nature in the process of food production (Plazas-Leguizamón & García-Molano, 2014). As Altieri & Nicholls (2022) point out, "the expansion of industrial agriculture tends to displace traditional ecological knowledge and local practices adapted to the environment."

Nevertheless, agriculture initially developed under an artisanal approach, oriented towards self-consumption and closely linked to natural cycles. In this context, the evolution from manual and artisanal farming to the use of draft animals consolidated traditional agriculture focused on the conservation of local knowledge and respect for natural cycles. However, this model has been replaced by mechanized practices and modern technologies, which has implied a profound transformation of peasant knowledge and rural production dynamics. Alcalá (2025) states that "the integration of technologies in the agricultural sector is not limited to optimizing efficiency but also responds to the urgency of transforming a production model that has historically been vulnerable."

Agroecology, therefore, allows for the reinterpretation of these knowledges in response to current challenges, promoting ecosystem conservation, food sovereignty, and comprehensive rural development (Sevilla & Soler, 2010). "The preparation of organic fertilizers constitutes a pedagogical tool that promotes collaborative and experiential learning across multiple areas from an interdisciplinary approach" (Ramírez-Iglesias, 2022, p. 4). In Latin America, this approach has facilitated the revaluation of knowledge historically displaced by the conventional model, paving the way for practices such as organic fertilizer production, vermicomposting, and other community-driven appropriate technologies.

In Colombia and Latin America, between 1960 and 1990, two major problems arose: unemployment and the agrarian problem. As noted by Jaramillo, Perfetti & Ramírez (1991), cited by Cárdenas & Vallejo (2016), these pressing issues led to the implementation of basic programs to address rural poverty, as the consequences of the social situation fell predominantly on rural communities. Among these initiatives was the formulation of agrarian reform. Thus, the historical traceability of agrarian and social problems faced by peasants in Colombia and Latin America is evident.

In the department of Boyacá, agriculture has evolved from the use of manual tools and animals to the incorporation of modern technologies. This transition has transformed production dynamics but has also weakened the intergenerational transmission of peasant knowledge (Clavijo, 2018). Peasants generally cultivate primarily for self-consumption, using traditional agriculture practices, which are currently merging with agroecology. This situation allows new rural generations to access and transform inherited agricultural knowledge (Clavijo, 2018).

Agroecological transformation is not only technical but also cultural and political, as it involves fostering a sense of community, collective territorial management, and the empowerment of farmers. As Vincent-Fequiere et al. (2024) point out, these processes must be accompanied by environmental education strategies, since conscious adoption requires training, technical advice, and continuous motivation. One of the key elements in this agroecological transition process is the strengthening of social networks and local capacities.

In this regard, Arciniega & Fontalvo (2024) highlight that agroecology requires training and education processes which, through technical support, provide additional motivation to farmers, empowering them as protagonists of their own transition toward more sustainable agriculture that enhances and protects the social, cultural, and productive legacy of national agriculture (Acevedo Osorio & Schneider, 2021).

Thus, the objective of this study was to understand which agroecological practices are being incorporated into peasant agriculture in the municipalities of Panqueba, Soatá, Nobsa, and Sogamoso, Boyacá, through the participatory Farmer-to-Farmer methodology and a territorial approach. The study analyzes the appropriation of knowledge and the role of agroecology in strengthening practices and promoting the agroecological transition.

Characterization of the Municipalities

The selection of the four municipalities and the 40 participants was based on technical, territorial, and productive criteria, with the aim of reflecting the diversity of existing agri-food systems in the department. As shown in Table 1, notable contrasts were observed among the studied municipalities in terms of productive variety, the presence of tree species, and the integration of agricultural and livestock activities. The municipalities of Soatá and Panqueba stood out for having broader and more diversified systems, integrating grains, vegetables, fruit trees, and forest species, which enhanced the resilience and multifunctionality of the territory. In both cases, poultry, sheep, goats, and cattle were included, generating agroecological interactions that promoted nutrient recycling. Sogamoso, in turn, exhibited intermediate diversification, focusing on cold-climate crops complemented by native trees and beekeeping, while Nobsa displayed marked specialization in onion and tomato production, accompanied by lower tree diversity and a more intensive production structure.

Table 1. Main characteristics by municipality

Source: Authors' own elaboration

Municipality	Number of Participants	Área (ha)	**Main crops**	**Main tree species**	**Livestock**	**Inputs for fertilizer production**
Soata	Ten (10)	five (5)	Maize (*Zea mays*); Common bean (*Phaseolus vulgaris*); Pea (*Pisum sativum*); Wheat (*Triticum aestivum*); Onion (*Allium cepa*); Green bean (*Phaseolus vulgaris*); Lettuce (*Lactuca sativa*)	Avocado (*Persea americana*); Mango (*Mangifera indica*); Orange (*Citrus sinensis*); Peach (*Prunus persica*); Pine (*Podocarpus oleifolius*); Alder (*Alnus acuminata*)	Chickens; Cattle; Sheep; Goats	Goat manure; Cattle manure; Lime; Organic kitchen waste
Panqueba	Ten (10)	five (5)	Maize (*Zea mays*); Common bean (*Phaseolus vulgaris*); Pea (*Pisum sativum*); Wheat (*Triticum*	Avocado (*Persea americana*); Mango (*Mangifera indica*); Orange (*Citrus sinens*	Chickens; Sheep; Goats; Sheep (hair sheep); Dairy cows	Lime; Goat manure; Cattle manure; Plant residues

			aestivum); Onion (*Allium cepa*); Potato (*Solanum tuberosum*); Cassava (*Manihot esculenta*)	*is*); Peach (*Prunus persica*); Alder (*Alnus acuminata*); Linden (*Tilia americana*)		
Sogamoso	Ten (10)	five (5)	Maize (*Zea mays*); Common bean (*Phaseolus vulgaris*); Pea (*Pisum sativum*); Potato (*Solanum tuberosum*)	Fruit trees; Native species: Oak (*Quercus humboldtii*); *Chicala*	Chickens; Sheep; Goats; Cattle; Beekeeping	Goat, sheep, and rabbit manure; Organic residues
Nobsa	Ten (10)	five (5)	Onion (*Allium cepa*); Tomato (*Solanum lycopersicum*)	Fruit trees; Native trees: Oak (*Quercus humboldtii*); Encenillo (*Weinmannia tomentosa*)	Cattle	Cattle manure; Organic residues

Regarding the use of local inputs for the production of organic fertilizers, the four municipalities had sufficient resources, although with differences in their availability. Soatá and Panqueba had a greater variety of manures, organic residues, and plant materials, which allowed the preparation of different types of fertilizers and supported the agroecological transition. In Sogamoso, rabbit manure and organic residues from beekeeping were incorporated, expanding the range of available inputs, while Nobsa maintained a more basic scheme, focused on cattle manure and household waste. Overall, the analysis showed that Soatá and Panqueba have more favorable conditions for comprehensive agroecological systems, Sogamoso offers possibilities for diversification through beekeeping, and Nobsa requires strategies to reduce dependence on agricultural specialization and strengthen territorial sustainability. In summary, the characterization by municipality provided the foundation for understanding the socio-economic dynamics of the agri-food system.

Study Location

Geographically, the municipalities of Nobsa and Sogamoso are located at altitudes ranging between 2,400 and 2,500 meters above sea level (m a.s.l.), with a temperate–cold climate favorable for agricultural systems dominated by short-cycle annual crops. In contrast, as shown in Image 1, Soatá and Panqueba are situated between 1,800 and 2,100 m a.s.l.; at these lower elevations, crops such as coffee, sugarcane for panela production, and fruit trees are more prevalent. These conditions confer a temperate–warm climate suitable for the production of annual, perennial, and timber crops, as well as certain forest species.

Due to their geographic location, climatic conditions strongly influence production systems, while topography and soil diversity represent natural factors that farmers manage according to the specific production systems of each municipality. Consequently, variables such as climate, resource availability, and farmers' productive strategies are shaped by these environmental conditions, directly influencing agricultural practices in each territory.

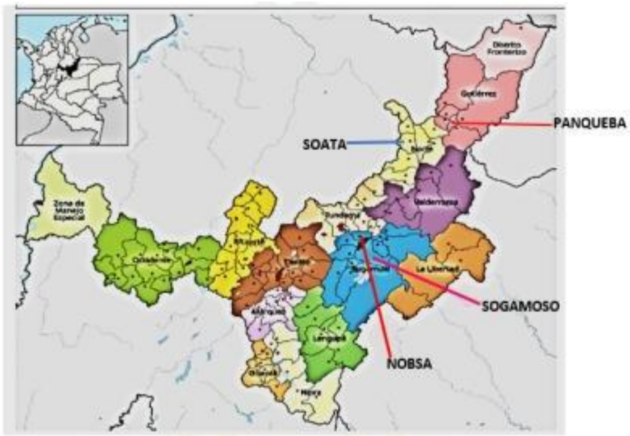

Figure 1. Geographical location of the four municipalities where the study was conducted Source: Adapted from File: Mapa de Boyacá (subregiones).svg

Theoretical Framework

Reference Framework

This theoretical framework is based on promoting community empowerment through the strengthening of capacities, organization, and active participation of community members in all processes that contribute to the individual and collective well-being, thereby improving the quality of life of farmers in each municipality. It also helps address issues such as economic problems and conflicts that hinder associativity and community organization.

Cruz (2007) states that, from the perspective of human development theory, the priority is the production of social capital, which strengthens the organization and interaction of community members. Likewise, to develop human capital in communities, it is necessary to create spaces for the active participation of marginalized individuals, as this broadens the concept of community and facilitates the identification of ideas, problems, and needs. In the same way, values of solidarity are acquired, social cohesion is consolidated, and individualism and disunity are overcome, preparing individuals to act collectively in favor of the development of all.

According to Barranco (2002), the quality of life of a population involves the satisfaction of social needs, access to welfare systems aimed at human development, and environmental sustainability. It also requires the promotion of participatory and cooperative processes that integrate public administrations, social organizations, the community, and the productive sector. Furthermore, it implies addressing contemporary challenges from a complex and dynamic perspective, under the principle of "think globally, act locally." When discussing quality of life, particularly in communities and rural areas, the economic aspect is often emphasized, but a holistic view is necessary—considering the well-being of the individual: emotional, physical, economic, and environmental well-being.

For Cortés (2013), associativity is an alternative that proposes a re-signification of the collective nature of associativity, allowing the incorporation of values such as participation, equity, trust, and shared responsibility, based on social and cultural identity components. This approach creates a link between the economy and culture, highlighting the associative values of solidarity and cooperation. The constitutive elements of associativity are empowerment and traditional practices through collective management and action. Promoting associativity enables communities to project themselves from both individual and productive perspectives for the purpose of progress.

2. LITERATURE REVIEW

The Farmer-to-Farmer methodology is based on the exchange of knowledge among farmers through continuous communication and comprehensible language. Promoters, who are farmers experienced in agroecological practices, share their results with other farmers, while facilitators, such as technicians or specialists, support the training and promotion process (Roque Jaime, 2021). The farm is conceived as the main space for experimentation, where the principle of "seeing is believing" allows the results of each practice to be observed and validated.

Alemán & Santillán (2022) explain that the farmer is the driving force of agroecology, promoting it through ancestral empirical knowledge and daily observation of nature, creating agricultural technologies adapted to their environment (such as terraces and stone embankments) and diversified production systems (montubio farms). This demonstrates that sustainability and resilience are built through experience, knowledge dialogue, and social organization to address environmental challenges and ensure food autonomy.

Machín (2017) explains that the Farmer-to-Farmer method provides participatory procedures and techniques that facilitate processes of exchange and learning among families, management personnel, technicians, and researchers. It enables the identification and recognition of productive leaders and individual and collective vocations, who, equipped with the methodological tools, develop as promoters and facilitators of a process that unfolds differently depending on degree and profile.

3. METHODOLOGY

Type of Research

The research was conducted by integrating participatory tools with the implementation of the Participatory Rural Appraisal (PRA), which was fundamental for the contextualized analysis of local socio-productive conditions. Additionally, it served as an active pedagogical tool for agroecological training in rural settings (López, 2024). To comprehensively understand agroecological dynamics in family production units, semi-structured interviews were conducted before and after the process to measure knowledge appropriation in terms of perceptions and agroecological practices. As Torres et al. (2023) evidenced in research conducted in the four municipalities of Boyacá, polyculture systems offered superior advantages in productive, environmental, and socio-economic terms compared to monoculture models. For the implementation of the methodology (F2F) in each of the municipalities, 10 group meetings were held, totaling 40 group meetings, with the participation of 58 men, 50 women, 20 youth, and 20 children, in which the following four steps were carried out: **Step 1 (first group meeting) – Recognition of a Farmer:** Farmers carried out the activity through collective meetings based on knowledge dialogue and structured interviews (Gelfus, 2002; Exposito, 2003). **Step 2 (second group meeting) – Awareness of Peasant Identity:** Individually and collectively, farmers manually expressed, through a drawing of the farmer, the meaning of the following parts (hat, hands, feet, shoulders, and head), in which the feeling and peasant experience could be reaffirmed (Giraldo, 2023). **Step 3 – Initiating the Farmer-to-Farmer Path:** In community group meetings, each farmer marked in a participatory chart which agroecological practices they carried out and which they did not (Val & Rosset, 2020). This step focused on seven meetings that allowed participants to acquire knowledge about some agroecological practices and implement them, identify peasant leadership, and strengthen group trust through cultural and gastronomic activities, highlighting the empowerment of the farmer in each meeting or farmer-sharing session. **Step 4 (tenth meeting) – Farmer-to-**

Farmer Appropriation: Through semi-structured surveys, appropriation was reflected from a comparative analysis of before (first Farmer-to-Farmer meeting) and after (last Farmer-to-Farmer meeting), where it was possible to observe the impact of the knowledge acquired and the strengthening of rural promotion through the generation of the Farmer-to-Farmer methodology as an instrument for the development of agroecological transitions in peasant agri-food systems.

The incorporation of the Farmer-to-Farmer (F2F) methodology strengthened processes of horizontal knowledge exchange, collective construction of learning, and community resilience, key dimensions for the strengthening of sustainable agroecological systems. This comprehensive methodological framework was complemented with interdisciplinary protocols for rapid assessments in agroecological innovation systems, which recommend the combination of participatory approaches with rigorous analytical tools to address the socio-ecological complexity of rural territories (Lindemann et al., 2024).

In line with participatory tools and the F2F methodology, Chambers (1994), Pretty et al. (1995), and Rojas, Pérez-Alarcón, & Fontalvo-Buelvas (2023) state that "participatory tools promote the construction of knowledge and the exchange of know-how based on the direct experience of participating farmers" (p. 76), which reaffirms that the integration of these dynamics contributes to farmer empowerment and the consolidation of agroecological transition processes.

Data Integration

The results were organized in Microsoft Excel (v. 2019) and analyzed using the non-parametric Wilcoxon test for related samples. Flores-Tapia & Flores-Cevallos (2021) indicate that it is appropriate for ordinal data and non-normal distributions, which allowed the identification of significant differences between the evaluated groups. Complementarily, ATLAS.ti software (v. 23) was used to code, categorize, and interpret narratives related to agroecological practices, local knowledge, and sustainability criteria. Sánchez & Vizcaíno (2023) highlight its versatility for integrating qualitative information and enriching the interpretation of quantitative findings.

Results and Discussion

Results

In the four municipalities where the research was conducted, the Farmer-to-Farmer (F2F) methodology was applied, where, through meetings with peasant farmers, it was possible to understand traditional knowledge and how it can be part of an agroecological approach based on agroecological practices.

These strategies contributed to soil fertility, biodiversity, and food autonomy, consolidating more sustainable production models based on natural cycles and the reduction of chemical inputs, in line with Gallegos et al., 2025, regarding the centrality of territory and ancestral knowledge in building agriculture oriented toward environmental care and life. Likewise, as highlighted by Rojas, Pérez-Alarcón & Fontalvo-Buelvas et al. (2023), participatory work promotes the construction of knowledge and the exchange of know-how from direct experience with farmers, reinforcing collective learning and the consolidation of robust agroecological processes.

Recognition of a Farmer

Through a process of collective and participatory work with the 40 farmers, initial community meetings were held in which, through a close, affective, and cultural dialogue, a deep recognition of the peasant being and feeling was carried out. In Figure 2, the semantic network allowed recognizing the farmer as a central axis that integrates inherited knowledge, productive tasks, and tensions between generations. The findings showed that rural knowledge has been shaped through transmission processes linked to ancestors, daily tasks, and the use of tools, becoming pillars of peasant identity.

Concerns regarding youth migration were also evident, in contrast to the trust placed in generational succession as an option to maintain the rural system. Within this framework, cultivation practices revealed a division between conventional and agroecological agriculture: the former understood as a technological model in which the farmer is not considered a central actor, and the latter linked to the recovery of ancestral practices. As Perez-Alarcon, Fontalvo-Buelvas & Restrepo et al. (2025) state, knowledge is generated through participatory processes that allow the creation of awareness, community development, and processes that lead to territorial co-construction

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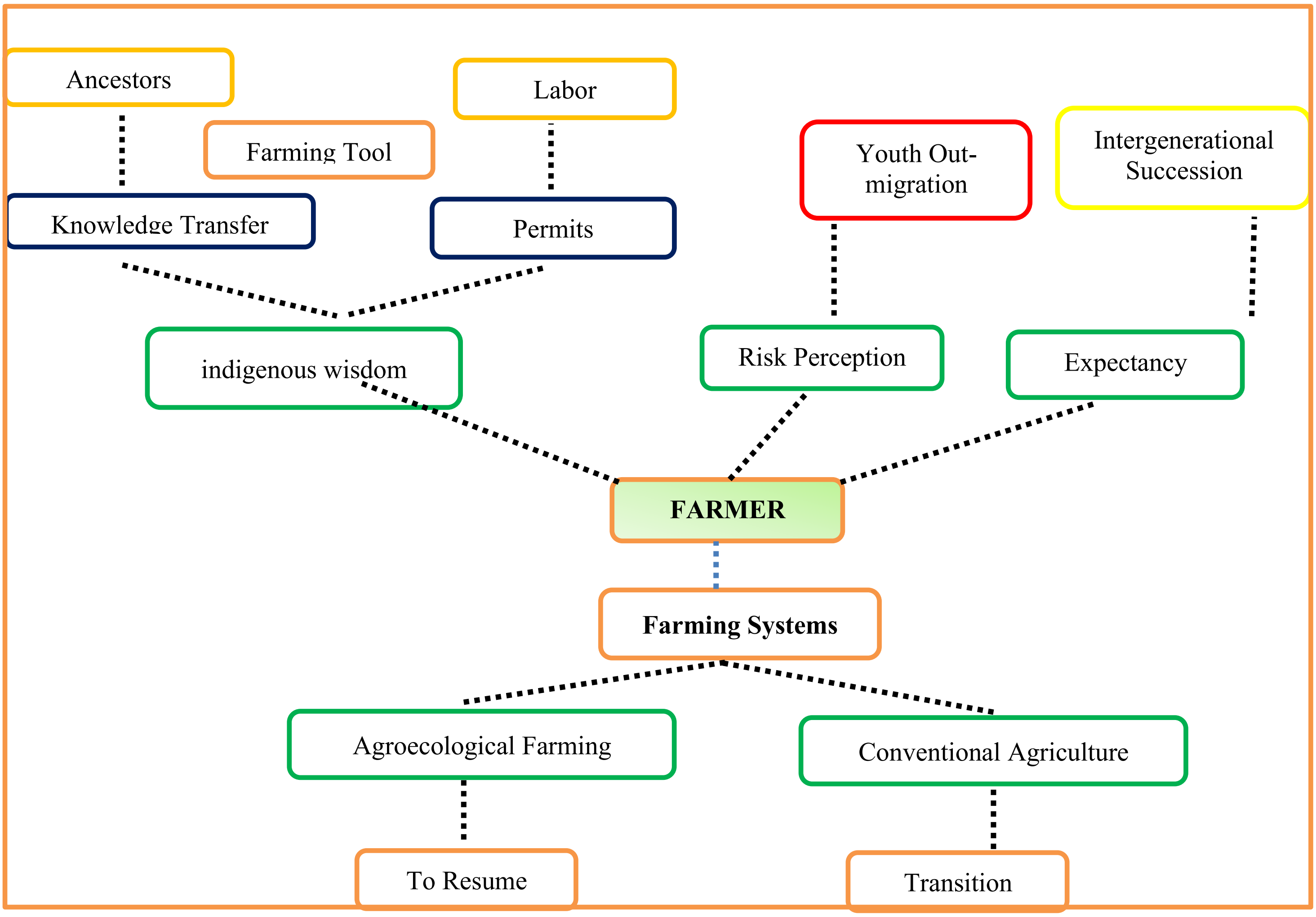
Figure 2. Farmer perception

Source: Authors' own elaboration



This scenario motivates peasants to reconsider their production methods, moving from conventional agriculture toward agroecology. This involves linking the recovery of practices based on traditional knowledge with a more balanced relationship with nature. For this reason, conventional agriculture becomes a reflection of high dependence on chemical inputs, where the farmer is used within a technological package, and this reflects a transition toward other types of agriculture based on the management of natural resources and good living.

The farmer recognizes that knowledge comes from ancestors, who allowed them to carry out work based on know-how transmitted from generation to generation, with the hope of advancing and returning to agriculture that is friendly to society, which above all impacts new generations, so as to continue sharing and replicating the knowledge acquired through experiences lived in the field. As Giraldo (2023) states, the farmer can take advantage of the knowledge inherited from their grandparents, trusting in ancestral wisdom, which has led to the selection and conservation of seeds, variations in cultivation methods, crop associations, the promotion of water source conservation, and the integration of a concept that speaks of Agri-Culture as a combination of human beings, the land, culture, and life.

Awareness of Peasant Identity

Subsequently, individual work was carried out, where, through an image (the illustration of the farmer), the word cloud in Figure 3, obtained from the perception of the farmer, shows that the words most frequently mentioned were *land* and *life*, named by the farmers approximately 21 times, reflecting the strong connection that agriculture is the main occupation, a way of life, and sustenance for the peasant family. Meanwhile, the words *nature*, *water*, *God*, and *sun* were mentioned with medium frequency, around 12 times, which indicates a development of community protection and awareness regarding the management and care of natural resources.

On the other hand, the words *knowledge*, *balance*, *support*, *food*, and *creation* appeared with low frequency (x times) in the term cloud, as this relates to the need to strengthen these processes through the development of Farmer-to-Farmer work.

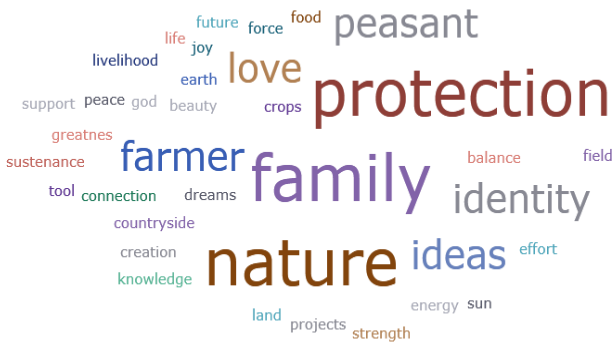


Figure 3. Farmer self-recognition

Source: Authors' own elaboration

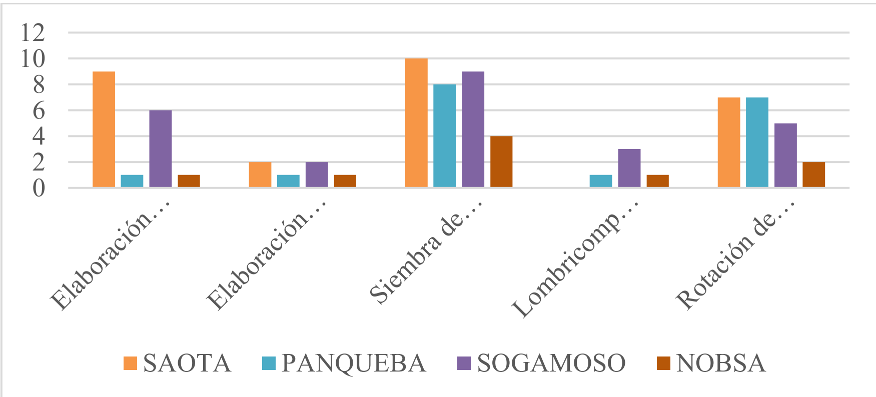
The link between the producer, the body, and the environment favors a harmonious relationship with the land, associated with the reconstruction of social fabric and the defense of traditional knowledge (Fontalvo-Buelvas, Pulido-Silva, Escalona-Aguilar & Falfán, 2025). Likewise, the role of peasants as custodians of ancestral knowledge was reaffirmed, as well as the importance of intergenerational succession for the management of agri-food systems, in accordance with the conception of agriculture as an integral practice with social, economic, and environmental dimensions (Rizo, Vuelta & Lorenzo, 2015).

Initiating the Farmer-to-Farmer Path

In the initial stage of the research, a participatory assessment of the agroecological practices applied by the producers was carried out through a collective exercise that, using a board and a record, allowed the consensual identification of current practices in the four municipalities. The findings in Table 2 show that the planting of native, fruit, ornamental, and conservation trees was the most widespread action across the four municipalities, while the preparation of *bioles* and the use of vermicompost had lower acceptance, mainly due to the lack of technical knowledge. In this context, training, specialized support, and the learn-by-doing methodology stand out as essential pillars to consolidate the agroecological transition (FAO, 2023; Ministry of Agriculture, 2023).

Table 2. Currently implemented agroecological practices

Source: Own elaboration



At the territorial level, variations were observed in the incorporation of agroecological practices. In Nobsa, tree planting and crop rotation stood out, although the use of bioinputs was limited; in Soatá, a broader use of organic fertilizers and greater productive diversification was recorded, even though vermiculture still represents a technical challenge; in Sogamoso, growing interest in the use of vermicompost, crop rotation, and fertilizer preparation was notable; and in Panqueba, crop rotation together with tree planting was consolidated, although there are still opportunities to advance in the diversification of bioinputs.

Farmer-to-Farmer Appropriation

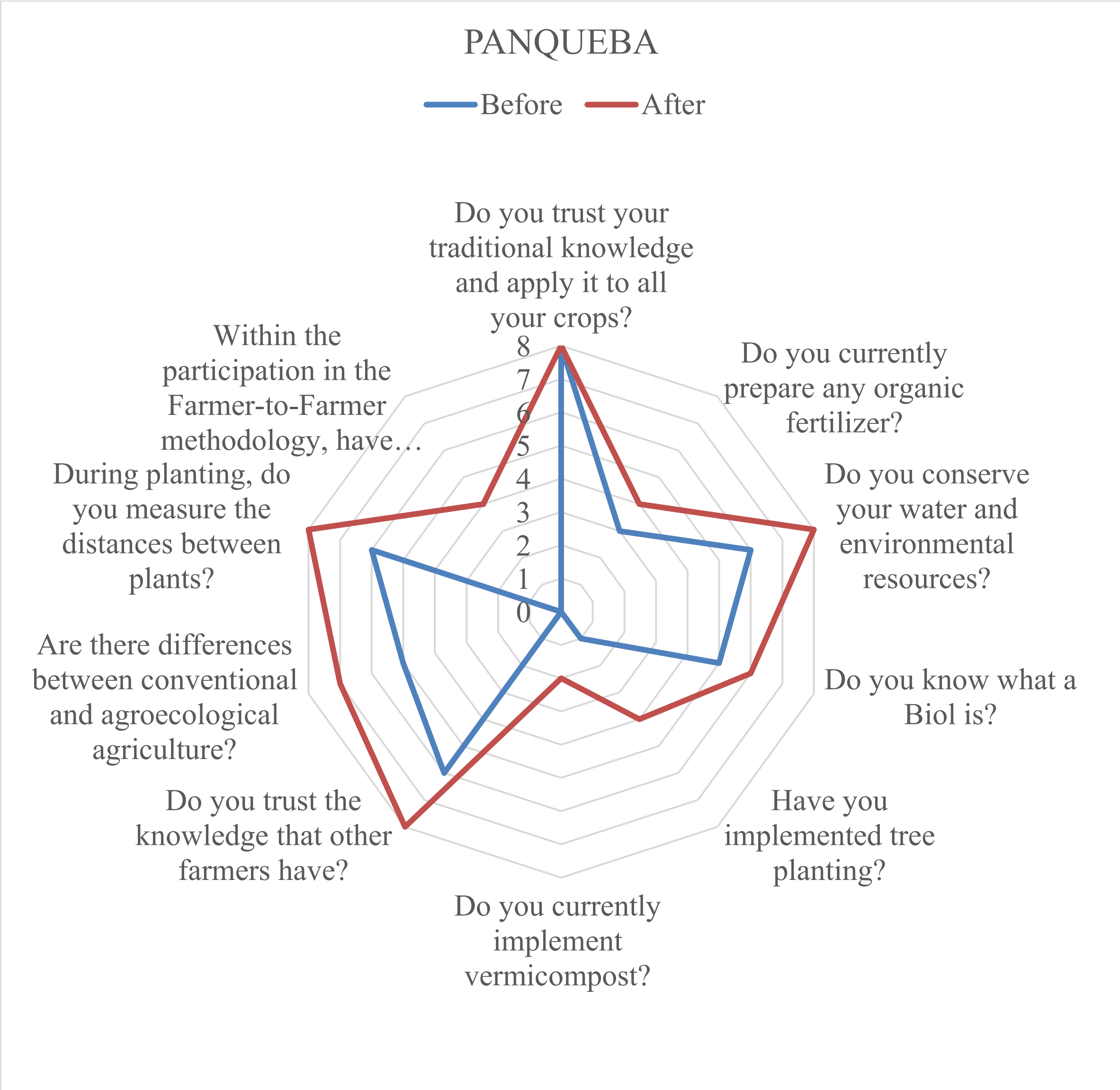
The appropriation of knowledge, following the implementation of the Farmer-to-Farmer methodology, led to the sustainability of rural territories. Likewise, it reflects adaptation strategies in response to environmental and economic changes, where producers are active agents in the construction of sustainable productive solutions. Practices such as the preparation of organic fertilizers and ecosystem conservation demonstrate how valued and strengthened local knowledge contributes to productive resilience and the autonomy of rural communities.

Figure 4. Percentage (%) of positive responses regarding knowledge, Sogamoso, 2025.

Source: Own elaboration

From the comparative analysis between before and after, a sustained and general increase was observed in all the indicators reviewed following the intervention, which evidences a strengthening both in knowledge and in the practical application of agroecological approaches. As shown in Figure 4, trust in traditional knowledge increased from 70% to 100%, representing a 30% rise and reflecting a marked revaluation of peasant knowledge. The production of organic fertilizers increased from 40% to 70%, with an improvement of 30 percentage points, while the protection of water sources rose from 20% to 70%, achieving a progress of 50 points, considered one of the most significant changes. Proficiency in the use of *Biol* grew from 10% to 30%, with a 20-point increase, and the practice of tree planting went from 30% to 80%, i.e., 50 additional points, demonstrating the appropriation of concrete environmental actions. Likewise, the increase in confidence regarding individual and collective knowledge, together with a better distinction between conventional and agroecological agriculture, points to a transition from implicit knowledge toward more organized technical capacities, in line with participatory training processes aimed at agroecological transition.

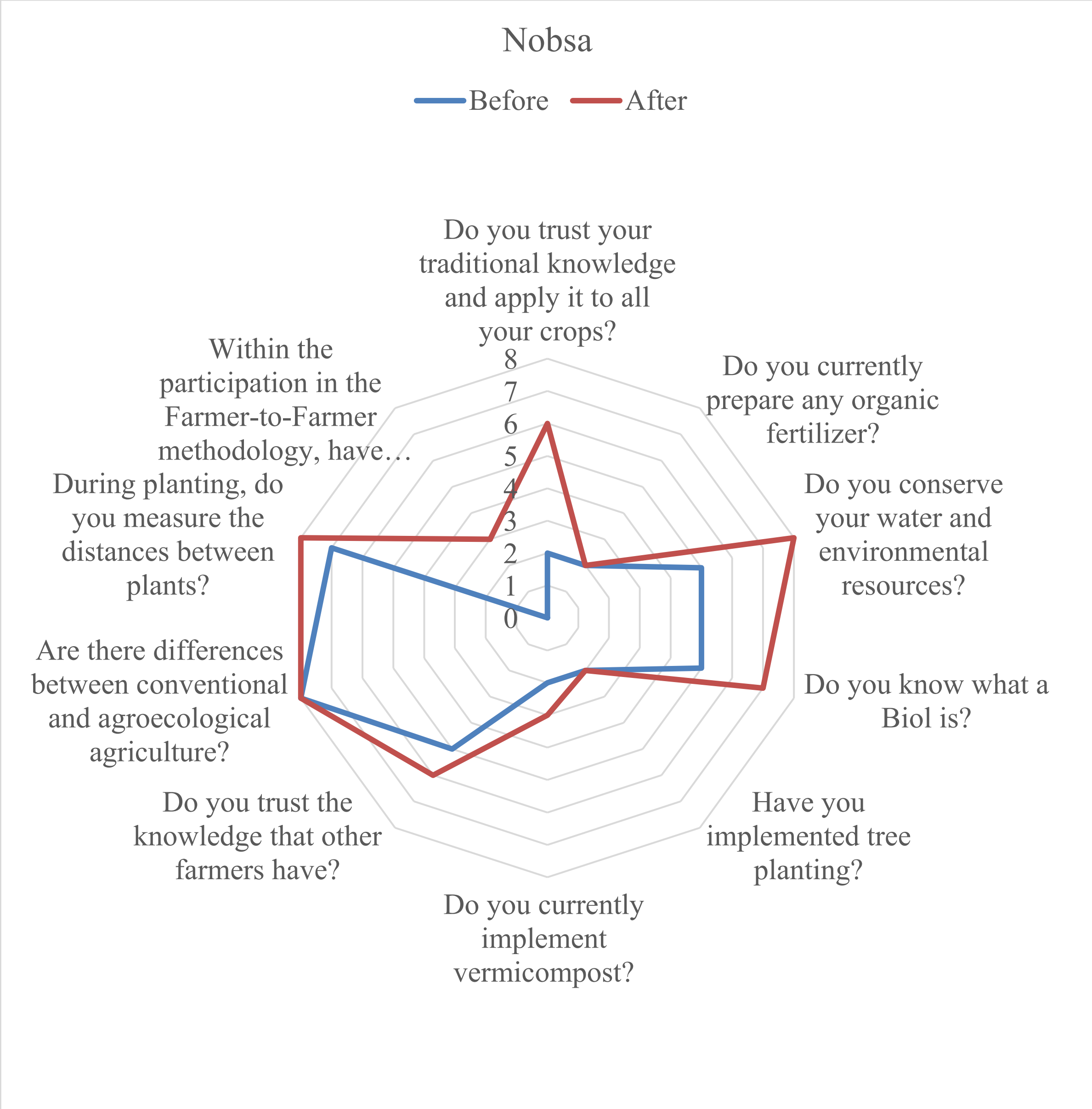
Figure 5. Percentage (%) of positive responses regarding knowledge, Panqueba, 2025
Source: Own elaboration



In Figure 5, significant advances in the productive domain following the intervention are highlighted. The use of vermicompost, which was nonexistent at the outset (0%), reached 50%, demonstrating the effective incorporation of an agroecological practice previously unimplemented. The measurement of planting distances showed the most notable progress, increasing from 10% to 90%, an 80-percentage-point gain, reflecting a clear improvement in crop organization, efficiency, and technical management. At the social level, trust in knowledge transmitted by other farmers rose from 20% to 60% (+40 points), while the ability to differentiate between conventional and agroecological agriculture increased from 20% to 40%, indicating a gradual process of conceptual appropriation. Finally, participation and knowledge exchange through the farmer-to-farmer methodology grew from 20% to 90%, with a 70-point increase, evidencing community strengthening and greater dynamism in the collective construction of knowledge.

Figure 6. Proportion of positive responses regarding knowledge, Nobsa, 2025

Source: Own elaboration



The findings presented in Figure 6 demonstrate a consistent strengthening of traditional knowledge and environmental practices. Confidence in ancestral knowledge increased from 70% to 100%, consolidating its role as a foundation of the production system. The preparation of organic fertilizers rose from 30% to 60%, a 30-percentage-point improvement, reflecting an enhanced autonomous capacity to manage soil fertility. Regarding natural resource conservation, progress was observed from 20% to 60%, a 40-point increase, demonstrating tangible transformations toward sustainable environmental management. Knowledge of Biol usage grew from 10% to 40%, while tree planting practices expanded from 20% to 80%, a 60-percentage-point increase. These results indicate an expansion of the agroecological approach and a stronger integration of actions aimed at environmental protection and the resilience of the production system.

Figure 7. Percentage (%) of positive responses on knowledge, Soatá, 2025

Source: Own elaboration

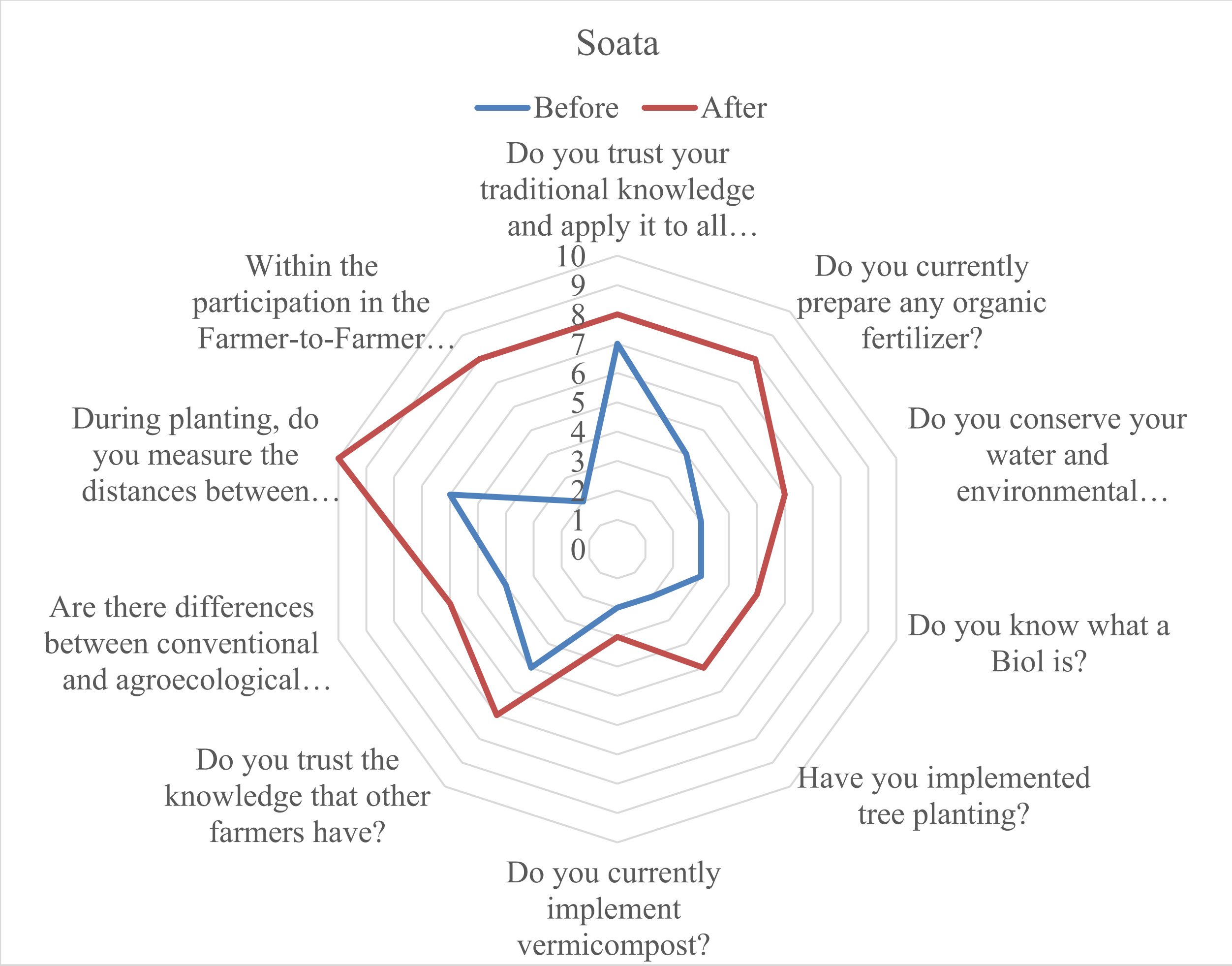


Figure 7 illustrates comprehensive progress that links technical and social aspects within the agroecological process. The measurement of planting distances showed the most significant increase, rising from 10% to 90% (+80 points), directly impacting crop efficiency, uniformity, and yield. Meanwhile, the use of vermicompost, which was nonexistent at the initial stage (0%), reached 50%, demonstrating the gradual adoption of practices aimed at improving soil fertility. At the social level, trust in knowledge shared by other farmers increased from 20% to 60%, strengthening collective learning processes. Similarly, participation and knowledge exchange through the farmer-to-farmer methodology grew from 20% to 90%, a 70-point increase, reflecting a more robust social fabric and broader circulation of local knowledge. In summary, these advances indicate a transition toward more organized, participatory production systems aligned with agroecological principles.

Across the four municipalities, one of the main observed gains was the exchange of knowledge and expertise among producers. The Farmer-to-Farmer methodology enabled farmers to receive training and also assume the role of trainer, transmitting teaching-learning knowledge, which reinforced confidence in their skills and promoted added value to local wisdom.

4. DISCUSSION

The peasant family becomes a transformative element in the countryside, where each member plays a fundamental role that complements agricultural work. According to Giraldo (2019), thinking about agriculture beyond the technical dimension includes social, cultural, and power relations. Although his work is not exclusively focused on the family, it addresses how productive processes and community practices are intertwined with the social life of farmers. Women carry out household tasks, childcare, food preparation, plant and animal care, and in many cases, they also support their husbands or engage directly in agricultural work. Young people assist their parents while balancing academic studies, and some serve as the primary workforce in the form of laborers. Men are generally recognized as the main labor force, organizing and leading agricultural activities. This finding aligns with Bonatti et al. (2018) and Acevedo-Osorio (2021), who highlight that gender equity and generational succession are essential pillars of rural sustainability.

Although the knowledge inherited and generated by communities is sometimes rendered invisible, it has always been present, as evidenced in everyday decision-making. Therefore, it must be shared, while also allowing access to knowledge from other sources (Agrosavia, 2024). According to Contreras (2000), the transmission of technical knowledge and capacity-building in communities should not be limited to productive or organizational aspects, as this alone does not guarantee the formation of genuine social and political actors.

Being protagonists and agents of change within the research process is reflected in the diverse and complementary participation of women, men, and youth in the adoption of agroecological practices. In this regard, women and youth stood out as drivers of transformation: women maintained their essential role as caretakers of biodiversity and defenders of food sovereignty, while youth expanded their presence in training spaces and agroecological experimentation, actively contributing to the transmission and renewal of peasant knowledge. These results are consistent with the observations of Bonatti et al. (2018) and Acevedo-Osorio (2021), who emphasize that gender equity and generational succession are fundamental for rural sustainability and the continuity of peasant production systems.

Although in certain contexts the knowledge constructed and inherited by rural communities is often rendered invisible, it remains present and is consistently reflected in the daily decisions of those who hold it. Hence, its recognition, exchange, and strengthening are essential (Agrosavia, 2024). Within this framework, the *Boyacá Siembra Sostenible* project was conceived as an initiative aimed at promoting the agroecological transition in the four municipalities, based on horizontal knowledge exchange, experimental practice, and the valuation of local knowledge. However, as Contreras (2000) warns, training and technical transfer processes should not be restricted solely to productive or organizational dimensions; they must also contribute to the development of social and political capacities that empower communities as active agents in their own territorial development.

Recognition of the Peasant Farmer

In participatory spaces, the peasant farmer stood out as an essential figure in the construction, transmission, and reinterpretation of knowledge, demonstrating that inherited ancestral knowledge remains relevant through intergenerational processes linked to daily agricultural practices. This knowledge, understood as both practical and symbolic resources, supports cultivation methods that integrate ecological balance, respect for nature, and food production, constituting a solid foundation for agroecological agriculture. The results show that traditional knowledge is not static but is collectively renewed within community dynamics, favoring the reduction of agrochemical use and promoting more harmonious relationships with ecosystems, in line with Vincent-Fequiere et al. (2024).

The analysis also revealed a tension between conventional and agroecological farming practices. While the conventional model is associated with ongoing transitional processes, agroecology is recognized as a practice that peasants consider essential to recover, being closely linked to their knowledge, values, and ways of life. This finding supports the arguments of Giraldo and Rosset (2018), who emphasize that agroecology is inseparably tied to peasant autonomy and social struggles, as well as those of Mier, Terán, and Rosset (2021), who highlight that participatory methodologies strengthen the appropriation, circulation, and multiplication of local knowledge, thereby increasing community resilience and sustainability.

Furthermore, youth migration emerged as a constant concern, associated with the weakening of generational succession and the risk of losing peasant knowledge. However, the active participation of young people connected to the family legacy emerged as a source of hope for the territory, reinforcing local attachment, the continuity of knowledge, and the appreciation of agricultural work. Complementarily, rural women's leadership was consolidated as a pillar in biodiversity management and food security, reaffirming the importance of incorporating a gender perspective into agroecological processes (Altieri & Toledo, 2011). Collectively, these elements confirm that the agroecological transition goes beyond the technical and productive dimensions and is configured as a social and political process that involves defending the territory and building more equitable and solidaristic relationships, as proposed by Tittonell (2019).

Generation of Agroecological Practices

The most implemented and developed agroecological practices were the preparation of organic fertilizers, Bokashi, Biols, and forage production. Through the Farmer-to-Farmer methodology, farmers trained others, and the practices were strengthened through capacity-building efforts. Consequently, these practices were the most widely implemented and those about which producers had the greatest knowledge. As Rosset (2018) notes, the Farmer-to-Farmer approach serves as a legitimate method of peasant innovation by validating these practices on individual plots before broader dissemination.

The review of agroecological practices in the studied municipalities revealed both advances and limitations in their implementation. According to Pérez-Alarcón, Fontalvo-Buelvas, and Restrepo (2025), spaces for knowledge dialogue are fundamental for promoting recognition of agroecological practices. Agroecology has gained relevance as a strategic approach to address environmental, climatic, and food challenges through sustainable agricultural practices (Morales, 2024).

Consequently, reviewing agroecological practices not only reveals the degree of transition toward more sustainable systems but also underscores the need to align public policies and educational processes that strengthen peasant autonomy. Terry, González, and Martínez (2023) demonstrate that the implementation of agroecological practices, such as the use of organic fertilizers, bioproducts, and crop diversification, significantly contributes to increased agricultural productivity and local food sovereignty.

Differences observed among municipalities suggest that the degree of agroecological transition depends directly on social capital, technical support, and organizational cohesion. In territories with higher levels of association, such as Panqueba, agroecological practices are consolidated more stably, whereas in contexts with lower coordination, such as Soatá or Nobsa, initiatives remain fragmented. This trend aligns with the observations of Gómez & López (2024) and López-Gómez & Rojas (2022) regarding the relationship between social organization and agroecological resilience, and is consistent with López, Rebollo Contreras, & Cárdenas Camargo (2024), who note that implementing agroecological practices strengthens soil quality by increasing organic matter, improving soil structure, and promoting edaphic biodiversity, which translates into greater long-term agricultural sustainability and productivity.

The results reaffirm that the agroecological transition is not merely a technical process of input substitution but a profound socio-cultural transformation. As such, agroecology constitutes a set of agronomic practices and knowledge related to climate and edaphic and phytogenetic conditions, enabling peasant communities to create resources, fertilizers, biols, and technologies adapted to ecological, economic, social, and cultural realities. Agroecology involves reconstructing the link between territory, community, and nature. As highlighted by Cruz Ríos (2024, p. 23), "Agroecological practices seek to restore soil ecological processes, regenerating its fertility and capacity to sustain life."

Development of the Farmer-to-Farmer Methodology

The Farmer-to-Farmer (F2F) methodology (CaC) was consolidated as a fundamental strategy to promote agroecological practices, generating a dialogue of knowledge based on active and horizontal participation. Through monthly community meetings, farmers shared experiences and local knowledge, which allowed them to reaffirm and reinterpret learning through processes of collective construction. This approach aligns with Duarte et al. (2022), who emphasize that CaC fosters the exchange of technical and empirical knowledge among rural producers, strengthening agroecology, community autonomy, and knowledge appropriation from an educational and political perspective, as also noted by Ortiz (2024).

The implementation of this methodology across the four municipalities enabled peasant organizations to utilize meeting spaces to resolve internal tensions and consolidate their organizational processes. In this sense, CaC functioned as a mechanism to transmit traditional knowledge and collectively build knowledge, as proposed by Martínez, Bakker, and Gómez (2010). These findings are consistent with Quirá Ordóñez et al. (2025), who highlight that the appropriation of knowledge in rural contexts depends on community trust, cultural relevance, and the capacity to generate tangible transformations in the productive life of communities.

Similarly, as a horizontal and participatory strategy, CaC promoted broad co-construction and greater empowerment of farmers. During the meetings, participants expanded their voices and understood that their role was not merely to receive knowledge from extension agents or trainers, but to recognize and value their own peasant knowledge and experiences. This process favored soil health, sustainable natural resource management, and the consolidation of cooperative networks. As noted, CaC drives the local adaptation of ecological technologies, strengthens community organization, and promotes food sovereignty—not only as a productive goal but as a transformation of social and productive relations in rural areas. Complementarily, Andrade, Hernández, and Ruiz (2025) highlight that the articulation between peasant knowledge and scientific criteria contributes to productive diversification, the strengthening of rural labor, and the promotion of agroecological education processes, access to fair markets, and investment in community infrastructure.

Knowledge Gains

It is noteworthy that 70% of beneficiaries adopted new agroecological practices, primarily related to the production of compost, Bokashi, and vermicompost, as well as the utilization of organic waste. This process reflected an expansion of knowledge, as several participants reported sharing what they had learned with family members, neighbors, and local peasant organizations. In this regard, greater awareness was observed regarding the reduction of agrochemical use and the incorporation of agroecological practices, consistent with Correa & Prado (2022), who argue that the social appropriation of knowledge in rural contexts facilitates the integration of local and scientific knowledge, strengthening the capacity for analysis and action in response to environmental and social challenges.

Knowledge appropriation was also manifested through processes of continuous improvement fostered by meetings, workshops, and "juntanzas," which contributed to both individual and collective strengthening across the four municipalities. These spaces enabled an understanding of agroecology as a process of cultural and social transformation, beyond mere input substitution, as highlighted by Altieri and Nicholls (2020). Within this framework, participants began to recognize the agroecological transition as an "agroecological beacon," a guide for gradual changes in productive and organizational practices. As Perez-Alarcón et al. (2024) note, processes of self-recognition and self-management by peasants open opportunities for the ecology of knowledge, community integration, and the generation of rural promoters, enabling the scaling and territorialization of agroecology.

Complementarily, an 80% level of knowledge appropriation was recorded for practices such as the production of organic fertilizers, Bokashi, Biols, and the planting of trees and allelopathic plants. As a practical and experiential approach, the Farmer-to-Farmer (CaC) methodology facilitated significant appropriation of knowledge applied to the territory. In line with this, the appropriation of knowledge allows communities to identify territorial opportunities and develop collective conservation projects, promoting environmental awareness and sustainable entrepreneurship, particularly among younger generations. Furthermore, Cardona et al. (2025) emphasize that educational processes based on the exchange of local knowledge strengthen the transfer and appropriation of knowledge related to food security practices.

5. CONCLUSION

The characterization of rural communities in Nobsa, Sogamoso, Soatá, and Panqueba allowed for the recognition of farmers as active social actors, playing a central role in the transmission, adaptation, and conservation of traditional knowledge. The conducted meetings demonstrated that peasants do not remain static in the face of change; rather, they integrate ancestral knowledge with contributions from modern agroecology, creating a synergy that strengthens cultural identity and the sustainability of their territories (Schmelkes, 2006). These practices contribute to the reduction of agrochemical use, soil restoration, and diversification of production systems.

The Farmer-to-Farmer methodology positioned the farmer not only as a recipient but also as a multiplier of knowledge, consolidating their role as a trainer within the community. Consequently, a high level of knowledge appropriation among producers was evident. Peer-to-peer training and active participation in exchanges strengthened empowerment, promoting autonomy, confidence in local capacities, and the joint construction of sustainable solutions.

In the municipalities of Panqueba, Soatá, Nobsa, and Sogamoso, it is evident that innovation in agroecology emerges from knowledge exchange and the communities' ability to reinvent or revive their own practices. Participatory work was consolidated through knowledge appropriation, highlighting that rural innovation does not rely solely on new technologies but on the strengthening of peasant identity and knowledge, aiming to transform territories toward more agroecological and resilient agriculture.

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