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Sustaining food security through social capital in agroforestry: a qualitative study from North Luwu, Indonesia

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This research explores the close links between social capital and food security in the rural communities of North Luwu Regency, Indonesia, focusing on the valuable insights gained from agroforestry practices. Using a qualitative approach grounded in social capital theory, the study examines how key indicators—social networks, trust, communal values, and participation—significantly influence regional food production. The findings show that strong social networks, which include relationships with neighbors, family, friends, and farmer groups, positively impact trust, cooperation, and farm efficiency. Trust, often passed down through generations of farming knowledge, remains an important factor, although its dynamics are shifting with changing livelihoods and increasing reliance on agroforestry. Communal values, embodied in agroforestry practices, strengthen individual and collective identities among farmers. Finally, participation in agricultural activities remains essential in understanding social capital's resilience in agroforestry communities, although it is declining among the younger generation. The research highlights the need for targeted interventions to strengthen the social fabric of these rural communities by strengthening networks, fostering trust, preserving communal values, and encouraging active participation. Ultimately, the study provides a clear picture of the close relationship between social capital and food security. It confirms that solid interactions between social structures and agricultural practices are crucial in shaping resilient and sustainable rural communities that meet their food needs.

KEYWORDS

social capital, food security, agroforestry, rural communities, farmer participation, qualitative research, Indonesia

Introduction

Food security is closely tied to the ability of local communities to access safe, sufficient, and socially acceptable food. Several factors influence this local access, including socioeconomic status, community values, and local institutional capacity. One aspect of food security that is often overlooked is the role of certain forms of social capital, which can either enhance or hinder food security at the rural level. While researchers frequently mention the importance of “social practices” (Nosratabadi et al., 2020) or “social tendencies” (Saptutyningsih et al., 2020) as significant factors, published studies often fail to fully address social capital as a key concept. This study specifically examines the relationship between social capital and food security. We define social capital as a collection of concepts, connections, and trust associated with food access and utilization (Heryanto et al., 2020). Our research investigates this relationship through phenomenological research conducted in North Luwu Regency, Indonesia.

The choice of research location is significant in understanding the relationship between social capital and food security, as the area is marked by high levels of poverty, limited employment opportunities, and the critical role of agriculture in rural livelihood strategies. Like many parts of

Indonesia, this region heavily relies on agriculture as the main source of household income. By focusing on agroforestry activities to enhance local food production and distribution, our research aims to explore how social capital is related to food security in North Luwu Regency. Our insights were gained through a qualitative approach, identifying key social capital variables that emerged from the field research. Based on these emerging themes, we developed an operational framework for social capital analysis, which includes social networks, trust, communal values, and participation. Each element of this “social capital framework” provides valuable insights into strategies and challenges for improving food security in North Luwu Regency.

Given the significance of social capital in shaping food security outcomes, this study seeks to address the following research questions:

- 1 How do different forms of social capital (social networks, trust, communal values, and participation) contribute to food security in agroforestry communities in North Luwu Regency?
- 2 In what ways do social networks and trust influence farmers' access to agricultural resources and food security mechanisms?

By addressing these questions, this study aims to provide a nuanced understanding of how social capital functions within agroforestry communities and to identify strategies that can enhance food security through community-based social networks. Before presenting the qualitative findings in detail, the next section introduces the concept of social capital and details the social capital analysis approach used in this study.

An approach to the analysis of social capital

Social capital encompasses a wide range of studies in the social sciences (He et al., 2022). These methodologies cover both tangible and intangible aspects of social structures, including material forms like knowledge and habits, as well as abstract forms such as shared values, norms, and preferences maintained by different groups. These conceptual constructs guide intentions and behavior (Kehinde et al., 2021). Social capital research is seen as a dynamic process within social studies, focusing on ideologies and processes across society. Researchers describe social capital as the knowledge, beliefs, values, culture, and resources adopted or generated by a society in its social and natural environment (Niles et al., 2021). A widely accepted model of social capital emphasizes the importance of processes, specifically social networks, trust, and community perspectives (Craig et al., 2023a). Communities can effectively utilize these variables in various ways. Although the process-oriented approach to analyzing social capital shares similarities with the institutional approach (Malual and Mazur, 2022) this study aims to identify distinct social capital variables that align with this perspective.

When examining techniques, four distinct approaches to analyzing social capital are identified: structural, cognitive, relational, and institutional (Egamberdiev, 2024). This research differentiates between these categories based on the understanding and definition of social capital and the associated methodologies. This study primarily focuses on the relational dimension of patterned sets of variables and the structural methodology that uncovers relationships through networks connecting individuals and groups within society (Egamberdiev, 2024). This application of social capital aims to

understand how social capital is developed through a set of practices followed by farmers, families, or communities, which then systematize the outcomes of social capital (Leddy et al., 2020).

While social capital is widely recognized for its positive contributions to agricultural resilience and food security, several scholars highlight its limitations and unintended consequences. Social capital does not always lead to equitable access to agricultural resources, as some community members may be excluded from key networks. Research in Southeast Asia has shown that smallholder farmers and women often face restricted access to agricultural information and financial resources due to uneven social structures (Kansanga et al., 2020). In many rural communities, networks and trust tend to favor those with higher economic and social capital, leading to an unequal distribution of agricultural benefits. As a result, certain groups, particularly those with less land ownership or financial assets, may have limited influence in decision-making processes related to agroforestry and food security.

Another critique of social capital is the tendency for power concentration within certain groups, particularly among wealthier farmers or community leaders, which can reinforce existing hierarchies rather than fostering inclusive development. In some cases, elite dominance within agricultural networks limits the ability of marginalized farmers to participate in knowledge-sharing and policy discussions (Craig et al., 2023b). Furthermore, a strong reliance on traditional social capital can sometimes hinder the adoption of modern agricultural practices, as collective norms and longstanding relationships may discourage innovation and change (Dumont et al., 2021). Social capital, while facilitating cooperation and trust, can also contribute to conflicts within communities when competition for land, water, or external assistance arises. Disagreements over access to agricultural inputs and government subsidies, for example, have been reported as potential disruptors of community cohesion in agroforestry systems.

Although social capital remains a crucial factor in supporting food security through agroforestry, its implications must be examined critically. Understanding the risks of social exclusion, elite dominance, and resistance to innovation is essential for developing inclusive agricultural policies. Ensuring that social capital benefits all community members rather than just select groups is necessary for achieving equitable and sustainable food security.

Social capital and food security

Food security in rural areas focuses on local food systems and ensuring that farming households have access to nutritious and affordable food (Yusriadi and Cahaya, 2022). Local knowledge of food security, including variables such as land, food production, food types, farming equipment, and food storage capabilities, complements this theoretical definition. Recognizing the importance of social capital, which includes knowledge, trust, and networks related to food, is crucial for creating more equitable food systems in rural areas (Kansanga et al., 2020). In essence, understanding food security allows us to gain insight into the diverse realities and knowledge of farming households (Karnik and Peterson, 2023).

Within this perspective, trust is considered a component of social capital that influences food security (Yusriadi et al., 2024b). The relationship between communal values and social patterns that foster

societal balance is also examined when studying food security (Han and Zhai, 2023). Emphasizing social capital factors that support communal values, such as togetherness, mutual aid, and intergenerational knowledge transfer within families and communities, reveals patterns that contribute to food security for rural farming households. These practices and beliefs determine the socioeconomic status of farming households and their access to food, including the “rituals routinely performed to strengthen communal ties” (Quintero-Angel et al., 2019). Social capital plays a crucial role in shaping behavior and developing knowledge that supports food security.

For instance, a study on social capital and food security explored social food security indicators in rural areas (Goodman et al., 2022). This study proposed a set of social capital indicators that interacted with agroecological systems to observe and measure social capital. However, previous studies have recommended further integration of social capital analysis in food security research and have highlighted limitations in its utilization. While this research specifically focused on rural communities, these concerns are applicable to many populations where the fundamental values, traditions, practices, and ways of life are often overlooked in development planning and interventions.

Background to the study area

North Luwu Regency, located in South Sulawesi Province (Figure 1), can be divided into two distinct areas based on its topography. The first is the lowland area, consisting of nine sub-districts with an altitude ranging from 15 to 70 meters above sea level. The second is the highland area, comprised of three sub-districts situated at an altitude exceeding 1,000 meters above sea level. As of 2021, the projected population of the regency is approximately 325,000 people. Over the years, the poverty rates have seen a decline, dropping from 15.52% in 2014 to 13.59% in 2021. The Food Crops Service office

has reported that agricultural production has remained relatively stable. Palm oil production has stayed constant at 386,000 tonnes, while cocoa production has decreased from 30,000 tonnes to 28,000 tonnes in 2021. One notable trend in the region is the growing significance of agroforestry as a source of food production for subsistence farming households (Yusriadi et al., 2024a). Several factors contribute to this shift toward agroforestry, such as past agricultural practices and changing migration patterns (Hernández et al., 2017).

The selection of North Luwu as the study location is based on its unique characteristics as one of the key agroforestry regions in Indonesia. This area serves as an ideal case study due to its reliance on agroforestry practices as a primary means of ensuring food security among rural households. Unlike other regions, North Luwu exhibits a strong tradition of social capital in agricultural practices, where trust, communal values, and knowledge-sharing play an essential role in sustaining food production. Additionally, the region is currently experiencing socio-economic shifts, including labor migration and changes in land tenure, which influence the way agroforestry systems are managed. These factors make North Luwu an important location for investigating how social capital contributes to food security in an evolving rural landscape.

Employment opportunities in the villages are limited, and migrant farmers are well aware of these conditions. As of 2021, out of the total road length of 2240.65 kilometers, only 537 kilometers (24%) were paved. The region has a total of 4,582 trading businesses, including shops, minimarkets, markets, and stalls. The agricultural sector still dominates the Gross Regional Domestic Product, accounting for 47.02% of the total. In light of the current challenges to food security in Indonesia (Vanany et al., 2021), various responses have been observed at the rural level. For instance, government policies include social assistance through family economic strengthening and community social empowerment. This support also extends to Non-Cash Food Assistance, which provides food assistance in non-cash form to low-income families. In order to gain a deeper understanding of social capital and rural food security, this study focuses on agroforestry activities. Agroforestry was chosen due to its direct connection to food security issues and its widespread adoption across the province of South Sulawesi (Yusriadi et al., 2024a).

Compared to previous research, this study provides a novel contribution by focusing on the role of social capital in the agroforestry sector of North Luwu. Most existing studies have examined agroforestry from an economic or ecological perspective, whereas this research highlights the social dimensions of agroforestry-based food security. By emphasizing community networks, trust, and participation, this study offers new insights into how rural households utilize social capital to sustain agricultural practices and adapt to environmental and economic changes.

Indigenous peoples in different parts of Indonesia have historically developed agricultural systems that combine food crops with timber trees. These systems are found in various cultures and tribes, such as mixed garden systems in Kalimantan, community forests in Java, and hamlets in Sumatra. Talun gardens in West Java serve as a prime example of a traditional agroforestry system, where people cultivate different types of food crops, fruits, and perennials on the same land (Okubo et al., 2010). In the 1970s and 1980s, critical land rehabilitation and reforestation programs started incorporating agroforestry concepts to enhance land productivity and prevent erosion (Okubo et al., 2010).

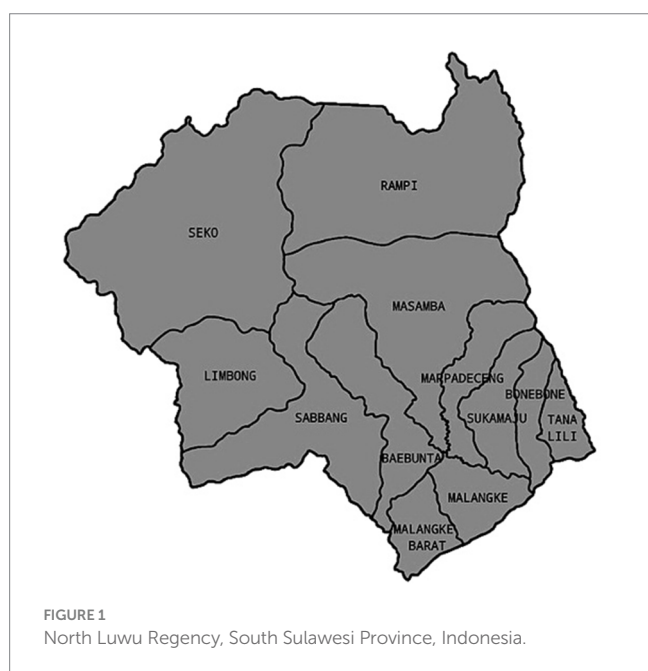


FIGURE 1
North Luwu Regency, South Sulawesi Province, Indonesia.

Agroforestry practices continue to be implemented in rural communities, including North Luwu Regency, where farming households adopt them on their farms and in their home gardens. The aim of agroforestry is to support the production of nutritious food in rural households, meet daily living needs, strengthen livelihoods, and provide a foundation for diversification (Quandt et al., 2017). Additionally, farmers have reported that agroforestry helps reduce soil erosion, improve soil fertility, and maintain the balance of local ecosystems. This demonstrates that agroforestry has a direct impact on food security and contributes to the economic stability and well-being of rural farmers.

Method

This study employs a qualitative research design, incorporating data collection through field observations, semi-structured interviews, focus group discussions (FGDs), secondary literature analysis, and data analysis techniques aligned with the approach outlined by Sundler et al. (2019).

Participants

Participants in this study were 20 key informants actively engaged in agroforestry practices in North Luwu, Indonesia. The participant pool consisted of 10 women, ranging from young adults to elderly farmers, and 10 men, including five young farmers and five elders. In addition, a focus group discussion was conducted with 20 female farmers involved in agroforestry. Women play a crucial role in household food production, market interactions, and knowledge-sharing within rural communities, making their perspectives essential to the study. The selection of 20 individual interviews and one FGD was based on theoretical saturation, where additional data collection was unlikely to yield new insights. The sample size was chosen to ensure sufficient variation in perspectives while maintaining the depth of qualitative data analysis. This approach aligns with qualitative research principles that emphasize capturing rich, context-specific narratives rather than statistical representativeness.

A purposive sampling method was used to ensure a diverse representation of perspectives across different demographic groups. Selection criteria included active involvement in agroforestry, experience in community farming, and knowledge of traditional agricultural practices. To avoid bias, efforts were made to include participants from various socioeconomic backgrounds, ensuring that findings reflect the experiences of different levels of access to social capital. To establish a strong rapport between researchers and participants, initial contact was made through local farmer associations and community networks. This approach facilitated open communication and trust-building, ensuring the collection of rich and authentic data. Before data collection,

we conducted preliminary discussions to assess participant eligibility. All selected participants provided informed consent and were briefed on the study's objectives and procedures. The focus group discussions were conducted without local interpreters to ensure direct and unfiltered responses, preserving the authenticity of participants' perspectives.

Prior to commencing data collection, we submitted the research proposal to the Research Institute of Universitas Cahaya Prima for ethical and legal review. The proposal outlined the research design and data collection methods in detail. Additionally, we personally distributed a clear and concise information sheet to participants, explaining the study's objectives, procedures, and benefits. The consent form was also presented directly to each participant to ensure they fully understood their rights and voluntarily agreed to participate. To maintain confidentiality and create a comfortable environment for participants to express their views openly and honestly, pseudonyms were used throughout the study. Ethical research practices were adhered to, ensuring participant security, privacy, and confidentiality, including the option to withdraw from the study at any time.

The demographic breakdown of participants is presented in Table 1.

This table highlights the diversity of participants in terms of age and gender, ensuring that the study captures intergenerational perspectives on agroforestry and social capital. The inclusion of both younger and older farmers was crucial for analyzing how social capital is transferred across generations and how different age groups engage in food security strategies.

Data collection and procedures

Data collection was conducted over 4 months, from October 2024 to January 2025, to allow researchers to observe seasonal agricultural cycles and in-depth community interactions. This study employed a qualitative research design that integrated field observations, semi-structured interviews, focus group discussions (FGD), and secondary literature analysis. These methods were selected to capture different dimensions of social capital and its impact on agroforestry-based food security while ensuring data triangulation for enhanced validity and reliability.

The study began with field observations at agroforestry sites, where researchers documented farming practices, community engagement, and social interactions. Observations were recorded through field notes and supplemented with photographic documentation. This phase provided an overview of agroforestry techniques, social networks among farmers, and the role of cooperation in managing agricultural activities. Observing farmers in their natural settings allowed researchers to identify key themes that later informed the interview and FGD questions.

Following the field observations, semi-structured interviews were conducted with 20 farmers, consisting of 10 men and 10 women.

TABLE 1 Participant demographics.

Category	Number of participants	Age range	Primary occupation
Male farmers	10	18–65 years	Agroforestry-based farming
Female farmers	10	20–70 years	Agroforestry-based farming
FGD participants	20	22–68 years	Small-scale agroforestry farming

Participants were selected through purposive sampling based on their active involvement in agroforestry, experience in community farming, and knowledge of traditional agricultural practices. The interviews aimed to explore individual perspectives on social capital, trust, cooperation, and knowledge-sharing mechanisms. Each interview lasted between 45 and 60 min and was conducted in a familiar setting, such as participants' homes or farming fields, to ensure a relaxed atmosphere. The sessions were recorded with participant consent and later transcribed for analysis. Open-ended questions were used to encourage participants to express their thoughts freely, and follow-up questions were posed based on emerging themes.

A focus group discussion was conducted with 20 female farmers engaged in agroforestry. Women play a crucial role in household food security, market interactions, and agricultural knowledge-sharing. The FGD was designed to encourage interaction and discussion among participants, providing a richer understanding of shared experiences. The session was conducted in an informal setting, ensuring that participants felt comfortable and willing to share their perspectives. The discussion followed a semi-structured format but was kept flexible to allow participants to highlight issues they considered important. The moderator facilitated the discussion by using open-ended questions and ensuring that all participants had the opportunity to contribute. The session was recorded and transcribed, with key discussion points categorized into emerging themes.

Recognizing that participants' understanding of social capital might influence their responses, the researchers carefully designed the approach to minimize potential bias. Before the interviews and FGD, participants were provided with a brief overview of the study's objectives and the importance of agroforestry in food security. The discussion was guided by pre-prepared questions, but spontaneous exchanges among participants were encouraged to capture deeper insights. The study also incorporated secondary literature analysis by reviewing policy documents, academic research, and government reports related to agroforestry and social capital. This step helped contextualize the findings within broader theoretical and policy discussions, ensuring a robust analysis of the collected data.

To ensure a structured approach to data collection, [Table 2](#) outlines the questions asked during data collection.

The multi-method approach allowed researchers to gain a comprehensive understanding of social capital's role in food security

within agroforestry communities. The combination of field observations, interviews, FGDs, and literature analysis provided a well-rounded perspective on how knowledge-sharing, cooperation, and social networks contribute to sustainable food production. This detailed and structured data collection process ensured that diverse perspectives were captured while maintaining methodological rigor. By integrating different qualitative methods, the study was able to explore both individual and collective dimensions of agroforestry-based food security.

Data analysis

To guide the data analysis process, this study adopted a thematic approach based on [Sundler et al. \(2019\)](#), allowing for the identification of key themes and patterns emerging from the interviews, focus group discussions, and photographic data. The analysis was structured to capture the interconnections between social capital and food security in agroforestry communities while ensuring methodological rigor and transparency.

The thematic analysis followed an iterative process, beginning with the transcription of all recorded interviews and FGDs. Researchers carefully reviewed each transcript to familiarize themselves with the data, ensuring that key ideas and recurring themes were accurately captured. The initial phase of analysis involved open coding, where textual data were examined line by line to identify meaningful units of information. Each statement was assigned a descriptive label that reflected its thematic significance, allowing researchers to identify recurring patterns across different participant narratives.

During the coding phase, particular attention was given to expressions related to trust, cooperation, and knowledge-sharing in agroforestry communities. Statements such as "We rely on each other to share planting techniques" were categorized under "Knowledge Exchange," while phrases like "Farming together makes our work easier" were labeled as "Collaborative Farming." This systematic approach enabled researchers to group similar ideas and establish connections between different dimensions of social capital.

Following the initial coding, researchers proceeded with thematic categorization by clustering related codes into broader themes. For

TABLE 2 Questions asked during data collection.

Items	Themes	Questions
Field observations	Agroforestry practices	What types of agroforestry techniques are commonly used in your community?
	Social interactions	How do farmers collaborate and share knowledge with one another?
	Food security challenges	What are the key challenges you face in maintaining food security?
Semi-structured interviews	Individual experiences	How does social capital influence your farming practices?
	Trust and cooperation	In what ways do trust and cooperation impact food security?
	Knowledge sharing	How do farmers exchange farming techniques and agricultural knowledge?
Focus group discussion (FGD)	Collective strategies	How do women contribute to knowledge-sharing and decision-making in farming?
	Intergenerational knowledge transfer	How is farming knowledge passed down from older to younger generations?
	Gender roles in agroforestry	What specific roles do women play in ensuring food security in your community?
Secondary literature analysis	Policy context	What policies impact agroforestry and food security in your region?
	Theoretical framework	How do research and government reports align with your farming experiences?

instance, codes related to cooperation, resource-sharing, and farmer-to-farmer knowledge transfer were grouped under the overarching theme of “Community Networks in Agroforestry.” The process was conducted through iterative discussions among researchers, ensuring that the thematic framework was comprehensive, internally consistent, and reflective of the participants’ lived experiences. Any discrepancies in coding or thematic categorization were resolved through collaborative review and consensus, reinforcing the reliability of interpretations.

Photographic data were analyzed using content analysis, focusing on visual representations of agroforestry practices and their relation to social networks and food security. Images depicting communal farming, knowledge transfer sessions, and market interactions were categorized according to their relevance to the identified themes. This approach provided additional validation by triangulating visual evidence with verbal narratives from interviews and FGDs.

Triangulation was a crucial aspect of the data analysis process, enabling cross-validation of findings from different sources. Insights gained from interviews, FGDs, and photographic observations were systematically compared to ensure consistency and strengthen the reliability of the study. To further enhance the credibility of findings, participant validation was conducted, where selected participants were asked to review summarized results to confirm the accuracy of interpretations and contextual relevance.

Table 3 summarizes the step-by-step data analysis process.

This structured approach ensured a rigorous and transparent data analysis process, allowing for an in-depth exploration of how social capital mechanisms contribute to agroforestry-based food security. The thematic findings that emerged from this process are further elaborated in the following section, with direct participant quotes illustrating key insights from the study.

Limitations

While this study provides rich qualitative insights, some limitations must be acknowledged. The relatively small sample size and purposive selection limit the generalizability of findings to broader agroforestry communities. The study’s reliance on self-reported data may introduce recall bias, and power dynamics within communities may have influenced participant responses. Additionally, since data were collected over a four-month period, seasonal variations in farming activities could not be fully captured. Despite these limitations, the study contributes valuable knowledge on the intersection of social capital and food security in agroforestry communities. Future research could build on these findings by employing a longitudinal design or incorporating a comparative analysis across different agroforestry settings.

Results

Social networks

Interviewees identified different ways in which social networks influence agroforestry farmers in North Luwu. A notable example can be seen in the relationships between various social networks, including neighbors, family, friends, and farmer groups. Participants pointed out that these relationships impact trust and cooperation, strengthen social ties, and enhance farm efficiency and productivity. Additionally, participants discussed similarities in terms of who can benefit from support and resources, as summarized in Table 4.

The percentages in Table 4 were derived from aggregating responses from all 20 interviewed farmers, where participants were asked to identify their primary sources of agricultural information. Each respondent was allowed to select multiple sources, and the total percentage reflects the proportion of responses indicating each source as a key information provider. For example, if 7 out of 20 farmers mentioned family as a primary source, this was calculated as $(7/20) \times 100 = 35\%$. The final figures were then rounded to the nearest whole number to ensure clarity in reporting.

These findings align with research results (Olawuyi, 2019), which discusses how social networks facilitate smallholder farmers’ access to valuable information and improve crop yields. This study explores the challenges smallholder farmers in Nigeria face in accessing agricultural information that can improve their productivity and food security. Olawuyi argues that social networks are crucial in building resilience to food insecurity among rural farmers, as they help farmers access resources, share information, gain financial and moral support, and adapt to climate change.

The dynamics of social networks within communities are also revealed in the more intimate relationships of individuals, such as among neighbors, family members, and friends. These relationships often form the primary foundation for mutual support in agricultural activities. For example, those with large landholdings, particularly cocoa farmers, often turn to friends or neighbors for help in planting and harvesting. In many cases, this involves physical assistance and the sharing of tools and knowledge on effective farming techniques. Cocoa farmers may share information on the best ways to deal with pests or plant diseases, as well as techniques to increase land productivity.

An interview with four men tending cocoa fields revealed that three of them were close friends of the landowner. In return for their help in tending the land, they were loaned farming tools by the landowner’s family, as they lacked their own resources. This suggests that while the home gardens system (Yusriadi et al., 2024a), as an aspect of farmer culture, may not be as popular today as it was in the past, it still retains its role in food security. Affluence and access to agricultural resources remain closely linked to the persistence of this practice. The situation

TABLE 3 Data analysis process.

Step	Description
Transcription and initial review	All recorded interviews and focus groups were transcribed verbatim. Researchers reviewed transcripts to familiarize themselves with the data
Coding and thematic identification	Key concepts and patterns related to social capital and food security were coded using a qualitative data analysis approach
Cross-validation through triangulation	Findings from interviews, FGDs, and photographic observations were cross-validated to ensure accuracy
Interpretation and contextualization	Results were analyzed within the broader context of social capital theory and agroforestry-based food security

TABLE 4 Sources of agricultural information in North Luwu.

Source of information	Percentage (%)
Family	30
Farmer groups	35
Neighbors	15
Social media	10
Government	10

illustrates a positive expression of social networks, where those with resources are expected to assist those without.

This system strengthens solidarity and social cohesion within the community, ensuring that all members can sustain their agricultural activities despite disparities in resource ownership. The lending of farming tools by more affluent families to their less affluent peers increases agricultural productivity and strengthens social relationships. The mutual exchange of support reinforces the interdependence at the core of the farmer culture. Farmers also receive different types of support within their social networks, which play a key role in enhancing food security. Table 5 provides an overview of the types of support exchanged among farmers.

The percentages in Table 5 were calculated based on responses from all 20 farmers, where participants were asked to indicate the types of support they receive or provide within their agricultural networks. Since multiple types of support could be selected by each respondent, the percentages were determined by calculating the frequency of each support type relative to the total number of selections across all participants. For example, if 8 farmers mentioned “Information Exchange” as a key support mechanism, the calculation was $(8/20) \times 100 = 40\%$. The percentages were then rounded for consistency in reporting.

These various forms of support facilitate agroforestry-based food security by ensuring that farmers have access to essential knowledge, resources, and financial assistance. The role of social networks in these exchanges reflects a broader system of reciprocity, where trust and cooperation create a sustainable environment for agricultural collaboration.

Trust

Trust plays a crucial role in maintaining social capital practices and norms related to food, not only in agroforestry but also in food preparation, care, and harvesting. Among the 10 interviewees asked about their sources of knowledge on agriculture and food, seven indicated that they first learned from their parents. This indicates the significant role that trust plays in the food sector. However, these trust dynamics have also changed with the shift in livelihoods within the community, including reduced ownership of livestock and farmland and increased reliance on agroforestry. Some individuals now require a deeper understanding of trust as they assume greater responsibility for food provision and ecological stewardship.

“Nowadays, everyone in the family goes to the farm. However, in the past, it was only the father who would go, while the children would go to play and the wife would stay at home. But now, all the members of the household actively participate in farm activities (interview with a farming family).”

TABLE 5 Types of support in social networks of farmers.

Type of support	Percentage (%)
Information exchange	40
Sharing tools	20
Joint purchases	15
Labor exchange	15
Financial help	10

Most organizational structures within the studied communities are influenced and managed by beliefs, and agroforestry farmers are no different. The importance of trust is often acknowledged and valued as a strong factor in building social capital and identity, or as a means of overcoming the stresses and challenges that communities face (McLennan et al., 2021). There appears to be unrestricted agricultural activity in villages where farming households are the main participants or drivers. According to the participants, the role of trust in agriculture, traditionally the domain of farming households, is still being applied to agricultural activities. Nowadays, all family members are involved in agricultural activities due to the impact of climate change on agriculture and the out-migration of young people in search of work. Additionally, health factors such as men falling ill and needing treatment in the city result in other family members becoming involved in farming activities. One of the farmers interviewed in North Luwu stated that in a close-knit community, trust encourages household members to help each other in emergencies or difficulties, motivating farming households to work in the fields.

“In families, trust is also crucial. For example, when one of the family members is sick and has to be treated in town, other family members will take over the work on the farm. We trust each family member will do their best to keep the farm work going. This trust allows us to face challenges better and maintain food security (interview with a farming family).”

The tendency of farming households to be key participants in community groups is not unique among farming communities (White, 2020). When farming households were asked about their inclination toward action on food security initiatives, they indicated a continuing responsibility to take care of the household and provide food for the family. Interviewees also reported that farming households continue to participate in agricultural activities as they did in the past.

“Every member of the household is responsible for all tasks. If someone wants to offer assistance, they can simply ask for help. The men typically work in the fields, while the children attend school and often join in helping in the fields after school. This belief has been passed down from our parents' generation (interview with a farming family).”

This raises the question of whether the roles taken on by farming households represent an opportunity for empowerment or add to the existing imbalance of male dominance in the community's power structure (Giller et al., 2021). Although there is no clear answer to this question, there are indications that the entrusted responsibilities have fostered a level of independence for farming households and that the agroforestry system has contributed to this. For example, in a focus

group discussion, the role and importance of generating income from selling crops were discussed. The group, who all identified themselves as wives, explained how this contributed to their livelihoods.

“All family members participate in the agricultural activities. My husband typically takes care of cultivating heavier crops, such as fruit trees and perennials, whereas my children and I primarily focus on tending to the vegetable crops. The children assist during post-school hours by engaging in tasks such as harvesting vegetables and preparing them for sale (interview with a farming family).”

By engaging in agroforestry activities and cultivating their food, farming households embody the traditional role of primary providers while simultaneously challenging the notion that only those with significant assets can achieve food security. These households serve as crucial examples within the community, highlighting the significance of their social capital within the agricultural sector and the role of trust therein. Their efforts establish a nutritional safety net and provide a means to adapt to societal changes and challenges. This direction holds promising implications for fostering trust.

Communal values

The purpose of considering agroforestry as a potential contributor to social capital identity is not to define “traditional social capital” or “true social capital identity” since these concepts are ambiguous and subjective. Instead, we explored the connection between the agroforestry farming practices carried out by the participants and how these actions fostered a sense of identity in various significant ways. Some interview participants expressed that farming activities reinforced their identity and self. The interviews highlighted the notion of farming as part of their social capital as a fundamental aspect of their communal values.

“Our communal values include teaching the younger generation about the importance of land and its productivity. We believe every child must understand that their true asset lies in the land. This is the fundamental principle of our communal values (interview with a farming family).”

Agroforestry can be understood as supporting and building communal values for its participants, especially in the face of significant social capital in the community. Farming becomes an expression of social capital for those who participate in it and a way to connect with what they perceive as elements of communal values—in his study on multicommunal approaches to developing agricultural resilience, mapped out strategies for community capacity building in innovative farming techniques and improved infrastructure and public spaces (Malual and Mazur, 2022). Likewise, agroforestry can act as a conduit of communal values, thus providing a greater chance for its success and sustainability. A shared sense of communal values creates purpose and satisfaction beyond the practical food production service by the farm households participating in it.

“We highly value traditional knowledge and sustainable agricultural practices. In this village, we prefer to grow different types of crops for diversification. Growing various crops can reduce the risk of crop failure and increase resilience to weather changes (agroforestry farmers).”

These communal values can play an essential role in shaping farming practices and strategies and determining the level of solidarity and support within farming communities. For example, interviews showed that farming households have a strong sense of collective responsibility and cooperation, with farmers willing to share resources, knowledge, and labor to ensure other farmers' food production. By fostering a sense of mutual assistance and collaboration, farmers in rural North Luwu can collectively work to overcome challenges such as climate change, market fluctuations, and limited resources. Furthermore, communal values can also influence the types of crops grown and farming methods used. For example, as interview results emphasize sustainable farming practices and preserving traditional knowledge, farmers may prioritize crop diversification and apply agroecological techniques. These practices contribute to food security by reducing dependence on a single crop, increasing resilience to environmental shocks, and promoting long-term sustainability and preservation of local food systems.

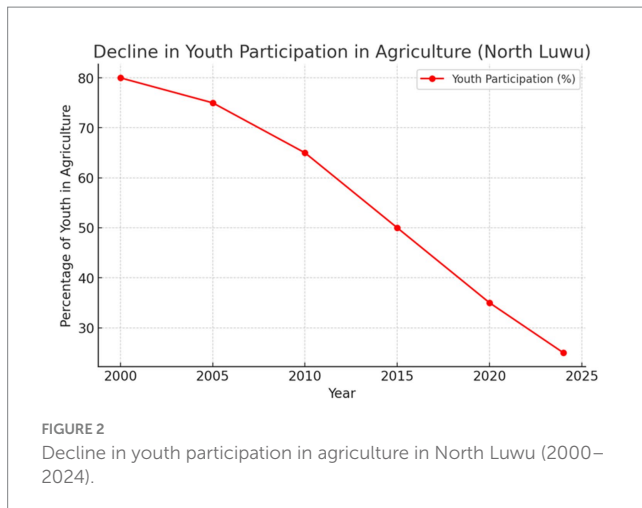
Participation

Participation is a crucial theme in understanding the resilience of social capital in agroforestry communities. However, findings indicate that youth participation in agriculture has significantly declined over the past two decades. Figure 2 illustrates the decline in youth engagement in farming in North Luwu from 2000 to 2024, based on data compiled from interviews, focus group discussions (FGDs), and secondary sources, including local agricultural reports and statistical records from the North Luwu Agricultural Office (2023).

The data for Figure 2 were obtained from multiple sources. Qualitative insights were gathered through interviews with older farmers, who recalled past levels of youth involvement in farming, while FGDs with community members provided additional perspectives on intergenerational shifts in agricultural participation. These qualitative data were supplemented with statistical records from the North Luwu Agricultural Office (2023), which tracks demographic trends in farming communities, as well as previous research on rural labor shifts in Indonesia. The combination of qualitative and quantitative sources enhances the reliability of the findings and allows for a more comprehensive interpretation of the decline in youth participation.

The data indicate a steady decline in youth involvement in agriculture, from 80% in 2000 to only 25% in 2024. Interviewees expressed concerns about the younger generation's preference for urban employment over farming, which threatens the future of agroforestry and local food security. Several interviewees explained that younger individuals often view agricultural work as unstable and less prestigious than urban jobs. Fears of declining agricultural activities were highlighted as a primary concern for the sustainability of agroforestry. The migration of youth to urban areas in search of employment has led to labor shortages in the farming sector, further exacerbating food security challenges.

Youth participation in agriculture is essential to ensure food security in the face of limited resources and urbanization (Karnik and Peterson, 2023). By actively engaging young people in agriculture, we can address the gap between land and people, reconnect individuals with their food, and encourage community and environmental responsibility (Bless et al., 2023). Improving infrastructure and public spaces in rural areas can also attract more young people to farming by creating an environment conducive to agricultural activities (Schulte et al., 2022). The challenge of youth participation in agriculture for food security requires a multi-faceted approach that includes



reconnecting individuals with their food, empowering youth through capacity building, promoting agricultural initiatives, improving infrastructure, and utilizing technology (Gordon et al., 2022).

These statements around participation reflect the struggle between a past way of life where livelihoods revolved around self-sufficient food production and the increasingly powerful influences of modernization making their way into rural communities. All these aspects of social capital (social networks, trust, communal values) interact in complex ways to foster an atmosphere that informants understood as irreversible, but with the hope that ongoing participation would once again make local agricultural activities an enduring aspect of local social capital.

Discussion

This study observes the relationship between social capital and food security in the local context through key elements of social capital. Applying this social capital lens to agroforestry demonstrates the extent of rural food security and highlights the ways in which social capital offers “relationships” that farm households can use to navigate, respond to, and cope with food insecurity. In this section, we examine the dimensions of social capital and then discuss the implications of the social capital framework for understanding farm households’ responses to food security.

First, social networks impact agroforestry activities through the relationships among individuals, families, and neighbors. These relationships can enhance or limit farmers’ access to resources and market opportunities. Furthermore, social networks are also reflected in the relationships and wealth within farmer households, with those with more assets often having more robust social networks. In line with the social network dimension (Daverkosen et al., 2022), it can be observed that social networks are frequently formed to support farmers, such as by facilitating the sharing of agricultural knowledge and other resources. The study has empirically documented the second dimension of social networks, which pertains to the matters open for discussion and decision-making within the community. This dimension is evident in the ongoing cultural practices of farming that hold significant importance in rural farming households.

However, while social capital plays a crucial role in strengthening local food security through agroforestry, it is not always an inclusive

or equitable mechanism. One key limitation is the risk of social exclusion, where individuals or groups with weaker social ties may find themselves marginalized within agricultural networks. Farmers with strong connections to community leaders and dominant agricultural groups often have greater access to market opportunities, financial capital, and government support, while those outside these networks—such as landless farmers, women, and migrant workers—struggle to secure similar advantages (Claassen and Lemke, 2019). This study identifies instances where social capital reinforces inequalities, particularly when certain groups monopolize access to critical agricultural resources.

The Indonesian government has implemented various food security programs, such as *Bantuan Pangan Non-Tunai* (BPNT) and fertilizer subsidies, aimed at supporting smallholder farmers. However, findings from this study indicate that these policies often fail to reach the most vulnerable farming households, particularly those lacking formal land ownership or social ties with local agricultural officials. Additionally, government-led modernization programs tend to prioritize large-scale agribusiness investments over smallholder agroforestry initiatives. This has, in some cases, led to monoculture expansion, reducing biodiversity and increasing farmers’ dependency on external inputs, which contradicts the sustainability principles embedded in agroforestry practices. To improve policy effectiveness, a more decentralized and participatory approach is needed, ensuring that community-led agroforestry receives stronger institutional support.

Another critical limitation of social capital is the potential for elite dominance within agricultural networks. While trust-based relationships foster collaboration, they can also consolidate power within a small group of influential farmers or community leaders, creating hierarchical structures that benefit the privileged few (Miller-Klugesherz and Sanderson, 2023). Findings from this study suggest that decision-making in agroforestry is often influenced by established community figures, who determine resource allocation and market access. While such leadership can provide stability, it may also lead to resource capture, where more powerful actors control access to agricultural inputs, funding opportunities, or land rights at the expense of marginalized farmers.

In these examples, social network relationships at the micro-scale play a crucial role in shaping the local norms that impact farmers. On one hand, looking through the “social capital lens” helps us understand the dynamics at the local level (Gordon et al., 2022). Moreover, it offers valuable insights into the relationships within different community and local governance levels. The local agricultural production systems are deeply intertwined with the underlying social network relationships, which can be observed and manifested through the informal rules that govern these relationships. The social capital lens reveals that at the individual level, direct kinship influences agroforestry activities involving friends, neighbors, or family (Kehinde et al., 2021). These kinship dynamics contribute to forming social networks within communities and play a role in agroforestry success, which may not be visible at the community level but influences the functioning of the system as a whole.

Findings from this study suggest that agroforestry offers a viable and sustainable pathway for improving rural food security. However, its implementation in other regions requires an enabling institutional framework and supportive policies. The following recommendations can guide the adoption of agroforestry-based food security models in other communities:

- 1 Strengthening local farmer networks through formally structured organizations, reducing reliance on informal social ties, and ensuring marginalized groups have equal access to resources.
- 2 Providing technical assistance and capacity-building programs on sustainable farming techniques tailored to regional conditions.
- 3 Developing market linkages for agroforestry products through cooperatives that negotiate fair prices and expand access to national and international markets.
- 4 Integrating agroforestry into national food security policies, including financial incentives such as low-interest credit, land tenure security programs, and tax exemptions for sustainable farming.
- 5 Encouraging youth involvement in agriculture by incorporating modern technology, agribusiness education, and digital farming tools to attract younger generations to sustainable farming.

By implementing these strategies, agroforestry can serve as a replicable model for enhancing food security in other rural areas while ensuring long-term sustainability and social inclusivity. However, while household-based agricultural systems contribute to food security, they remain vulnerable to structural constraints, such as land tenure insecurity, labor shortages, and market volatility (Tittonnell et al., 2022). Without addressing these underlying challenges, social capital alone may not be sufficient to sustain long-term food security.

Conclusion

Looking more pragmatically at the measures of success and failure of farm household endeavors, such as agroforestry activities, using standardized measures, we can conclude that this farm is not a success story. It lacks coordination and a definite funding source to support many groups of farming households. However, through the lens of social capital, we can see that this agroforestry has enjoyed a degree of success in several ways: (1) it has brought more knowledge sharing, awareness raising, and discussion about agriculture to the community; (2) it has contributed to farmers' sense of identity against a dramatic low in youth participation; (3) it has created forums and opportunities to address challenges at the community level. These challenges include intergenerational dialog and communal value in their ability to provide for themselves and their families. Previous research has suggested that agroforestry is an adaptive strategy or a social capital tool for dealing with new challenges and seizing opportunities. The resources available to farming households, crucial for creating food security, shape their actions to adjust to evolving circumstances. Farmers selectively leverage components of their social capital to form supportive agricultural groups, fostering a sense of self-reliance among themselves. All farmers report that their reasons for farming include growing fresh food, cost savings, and a genuine enjoyment of the activity. This study underscores the potential role of social networks in bolstering local food security, highlighting an element of public policy and developmental initiatives that might need to be adequately acknowledged. Future research would benefit from a greater emphasis on the impacts of climate change, particularly as the North Luwu Regency adjusts to shifts in its agricultural "social capital" and faces new challenges related to local food security.

Ethics statement

The studies involving humans were approved by Research Institute of Cahaya Prima University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

YY: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

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

Generative AI statement

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References

- Bless, A., Davila, F., and Plant, R. (2023). A genealogy of sustainable agriculture narratives: implications for the transformative potential of regenerative agriculture. *Agric. Hum. Values* 40, 1379–1397. doi: 10.1007/s10460-023-10444-4
- Claasen, N., and Lemke, S. (2019). Strong ties, weak actors? Social networks and food security among farm workers in South Africa. *Food Secur.* 11, 417–430. doi: 10.1007/s12571-019-00902-5
- Craig, A., Hutton, C., Lewis, L. A., Musa, F. B., and Sheffield, J. (2023a). Linking household access to food and social capital typologies in Phalombe District, Malawi. *Sustain. Sci.* 18, 1721–1737. doi: 10.1007/s11625-023-01329-w
- Craig, A., Hutton, C., Musa, F. B., and Sheffield, J. (2023b). Bonding, bridging and linking social capital combinations for food access; A gendered case study exploring temporal differences in southern Malawi. *J. Rural. Stud.* 101:103039. doi: 10.1016/j.jrurstud.2023.103039
- Daverkosen, L., Holzknecht, A., Friedel, J. K., Keller, T., Strobel, B. W., Wendeberg, A., et al. (2022). The potential of regenerative agriculture to improve soil health on Gotland, Sweden. *J. Plant Nutr. Soil Sci.* 185, 901–914. doi: 10.1002/jpln.202200200
- Dumont, A. M., Wartenberg, A. C., and Baret, P. V. (2021). Bridging the gap between the agroecological ideal and its implementation into practice. A review. *Agron. Sustain. Dev.* 41:32. doi: 10.1007/s13593-021-00666-3
- Egamberdiev, B. (2024). Social capital effects on resilience to food insecurity: evidence from Kyrgyzstan. *J. Int. Dev.* 36, 435–450. doi: 10.1002/jid.3826
- Giller, K. E., Hijbeek, R., Andersson, J. A., and Sumberg, J. (2021). Regenerative Agriculture: An agronomic perspective. *Outlook Agric.* 50, 13–25. doi: 10.1177/0030727021998063
- Goodman, M. L., Elliott, A., Melby, P. C., and Gitari, S. (2022). Water insecurity, food insecurity and social capital associated with a group-led microfinance programme in semi-rural Kenya. *Glob. Public Health* 17, 3399–3411. doi: 10.1080/17441692.2022.2095656
- Gordon, E., Davila, F., and Riedy, C. (2022). Transforming landscapes and mindscapes through regenerative agriculture. *Agric. Hum. Values* 39, 809–826. doi: 10.1007/s10460-021-10276-0
- Han, G., and Zhai, Y. (2023). The association between food insecurity and social capital under the lockdowns in COVID-hit Shanghai. *Urban Stud.* 61, 130–147. doi: 10.1177/00420980231172403
- He, R., Guo, S., Deng, X., and Zhou, K. (2022). Influence of social capital on the livelihood strategies of farmers under China's rural revitalization strategy in poor mountain areas: A case study of the Liangshan Yi autonomous prefecture. *J. Mt. Sci.* 19, 958–973. doi: 10.1007/s11629-020-6395-6
- Hernández, M. Y., Macario, P. A., and López-Martínez, J. O. (2017). Traditional agroforestry systems and food supply under the food sovereignty approach. *Ethnobiol. Lett.* 8, 125–141. doi: 10.14237/eb1.8.1.2017.941
- Heryanto, Dassir, M., and Mas'ud, E. I. (2020). Social capital of forest management: A case study of village forest in north Luwu, South Sulawesi. *IOP Conf. Ser. Earth Environ. Sci.* 575:012064. doi: 10.1088/1755-1315/575/1/012064
- Kansanga, M. M., Luginaah, I., Bezner Kerr, R., Lupafya, E., and Dakishoni, L. (2020). Beyond ecological synergies: examining the impact of participatory agroecology on social capital in smallholder farming communities. *Int. J. Sustain. Dev. World Ecol.* 27, 1–14. doi: 10.1080/13504509.2019.1655811
- Karnik, H., and Peterson, H. H. (2023). Food security among low-income immigrant households and the role of social capital: A case study of Somali-American households in the Midwestern United States. *Food Policy* 117:102456. doi: 10.1016/j.foodpol.2023.102456
- Kehinde, A. D., Adeyemo, R., and Ogundeyi, A. A. (2021). Does social capital improve farm productivity and food security? Evidence from cocoa-based farming households in southwestern Nigeria. *Heliyon* 7:e06592. doi: 10.1016/j.heliyon.2021.e06592
- Leddy, A. M., Whittle, H. J., Shieh, J., Ramirez, C., Oforokun, I., and Weiser, S. D. (2020). Exploring the role of social capital in managing food insecurity among older women in the United States. *Soc. Sci. Med.* 265:113492. doi: 10.1016/j.socscimed.2020.113492
- Malual, J. D., and Mazur, R. E. (2022). Social capital and food security in post-conflict rural Lira District, northern Uganda. *Disasters* 46, 80–94. doi: 10.1111/disa.12465
- McLennon, E., Dari, B., Jha, G., Sihi, D., and Kankarla, V. (2021). Regenerative agriculture and integrative permaculture for sustainable and technology driven global food production and security. *Agron. J.* 113, 4541–4559. doi: 10.1002/agj2.20814
- Miller-Klugesherz, J. A., and Sanderson, M. R. (2023). Good for the soil, but good for the farmer? Addiction and recovery in transitions to regenerative agriculture. *J. Rural. Stud.* 103:103123. doi: 10.1016/j.jrurstud.2023.103123
- Niles, M. T., Rudnick, J., Lubell, M., and Cramer, L. (2021). Household and community social capital links to smallholder food security. *Front. Sustain. Food Syst.* 5:583353. doi: 10.3389/fsufs.2021.583353
- Nosratabadi, S., Khazami, N., Abdallah, M. B., Lackner, Z., Band, S. S., Mosavi, A., et al. (2020). Social capital contributions to food security: A comprehensive literature review. *Food Secur.* 9:1650. doi: 10.3390/foods9111650
- Okubo, S., Parikesit Harashina, K., Muhamad, D., Abdoellah, O. S., and Takeuchi, K. (2010). Traditional perennial crop-based agroforestry in West Java: the tradeoff between on-farm biodiversity and income. *Agrofor. Syst.* 80, 17–31. doi: 10.1007/s10457-010-9341-8
- Olawuyi, S. O. (2019). Building resilience against food insecurity through social networks. *Int. J. Soc. Econ.* 46, 874–886. doi: 10.1108/IJSE-11-2018-0624
- Quandt, A., Neufeldt, H., and McCabe, J. T. (2017). The role of agroforestry in building livelihood resilience to floods and drought in semiarid Kenya. *Ecol. Soc.* 22, 351–368. doi: 10.5751/ES-09461-220310
- Quintero-Angel, M., Mendoza, D. M., and Quintero-Angel, D. (2019). The cultural transmission of food habits, identity, and social cohesion: A case study in the rural zone of Cali-Colombia. *Appetite* 139, 75–83. doi: 10.1016/j.appet.2019.04.011
- Saptutyningsih, E., Diswandi, D., and Jaung, W. (2020). Does social capital matter in climate change adaptation? A lesson from agricultural sector in Yogyakarta, Indonesia. *Land Use Policy* 95:104189. doi: 10.1016/j.landusepol.2019.104189
- Schulte, L. A., Dale, B. E., Bozzetto, S., Liebman, M., Souza, G. M., Haddad, N., et al. (2022). Meeting global challenges with regenerative agriculture producing food and energy. *Nat. Sustain.* 5, 384–388. doi: 10.1038/s41893-021-00827-y
- Sundler, A. J., Lindberg, E., Nilsson, C., and Palmér, L. (2019). Qualitative thematic analysis based on descriptive phenomenology. *Nurs. Open* 6, 733–739. doi: 10.1002/nop2.275
- Tittonell, P., El Mujtar, V., Felix, G., Kebede, Y., Laborda, L., Luján Soto, R., et al. (2022). Regenerative agriculture—agroecology without politics? *Front. Sustain. Food Syst.* 6:844261. doi: 10.3389/fsufs.2022.844261
- Vanany, I., Hajar, G., Utami, N. M. C., and Jaelani, L. M. (2021). Modelling food security for staple protein in Indonesia using system dynamics approach. *Cogent Eng.* 8:2003945. doi: 10.1080/23311916.2021.2003945
- White, C. (2020). Why regenerative agriculture? *Am. J. Econ. Sociol.* 79, 799–812. doi: 10.1111/ajes.12334
- Yusriadi, Y., and Cahaya, A. (2022). Food security systems in rural communities: A qualitative study. *Front. Sustain. Food Syst.* 6:987853. doi: 10.3389/fsufs.2022.987853
- Yusriadi, Y., Cahaya, A., Umanailo, M., and Bin Tahir, S. (2024a). Perspectives of rural farming households on home gardens as an agroforestry for food security: a qualitative study in Indonesia. *Afr. J. Food Agric. Nutr. Dev.* 24, 25645–25661. doi: 10.18697/ajfand.127.23365
- Yusriadi, Y., Junus, D., Wijayanti, R., Hasnawati, H., and Cahaya, A. (2024b). Perspectives of rural farmer households on food security through a qualitative study in Indonesia. *Afr. J. Food Agric. Nutr. Dev.* 24, 25450–25467. doi: 10.18697/ajfand.127.23510