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Article

Bonding, bridging, and linking social capital combinations in maize agribusiness system

Wahyuni Wahid[1], Darmawan Salman[2,*], Eymal Bahsar Demmallino[2]

[1] Agribusiness Study Program, Graduate School, Universitas Hasanuddin, Makassar 90245, Indonesia
[2] Department of Socio-Economics, Faculty of Agriculture, Universitas Hasanuddin, Makassar 90245, Indonesia
*** Corresponding author:** Darmawan Salman, darsalman@agri.unhas.ac.id

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Abstract: The development of the maize agribusiness system is highly dependent on the role of social capital in facilitating interaction among actors in the chain of activities ranging from the provision of farm supplies to marketing. Therefore, this research aimed to characterize the key elements of social capital specifically bonding, bridging, and linking, as well as to demonstrate their respective roles. Data were collected from farmers and non-farmers actors engaged in various activities in the maize agribusiness system. The data obtained were processed using ATLAS Ti, applying open, axial, and selective coding techniques. The results showed the roles played by bonding, bridging, and linking social capital in the interaction between farmers and multiple actors in activities such as providing farm supplies, farming production, harvesting, post-harvest, and marketing. The combination of these social capital forms acted as the glue and wires that facilitated access to resources, collective decision-making, and reduced transaction costs. These results have theoretical implications, suggesting that bonding, bridging, and linking should be combined with the appropriate role composition for each activity in the agribusiness system.

Keywords: bonding social capital; bridging social capital; linking social capital; agribusiness system; maize crop

1. Introduction

The agribusiness system is composed of various interconnected activities ranging from the provision of farm supplies to the marketing of harvested products (Davis and Goldberg, 1957). The concept of agribusiness comprises both large corporations and small farmers (Zylbersztajn, 2017) but in reality, there is a perpetual controversy between the two parties within the agricultural economic structure (Acclassato Houensou et al., 2021; Hernandez and Phélinas, 2012). Therefore, fostering interaction between small-scale and corporate-level business units across all agribusiness activities is crucial.

To establish interconnections between different parties and actors, social capital plays a significant role, with key elements including social trust, shared values, norms, reciprocity, and networks (Coleman, 1988; Putnam, 2000a; Putnam et al., 1993; Szreter, 2002). These attributes knit together different agribusiness actors at various levels. Social capital incorporates two types of resources namely individual and social (Lin, 2001; Lin and Erickson, 2008). Both resources serve to promote entrepreneurship (Alemayehu et al., 2023; Xie et al., 2021) and the development of innovation (Pylypenko et al., 2023). Therefore, social capital not only makes the agribusiness system more inclusive but also accelerates its development through entrepreneurship and innovation.

Maize (Zea mays) is a leading cereal crop grown worldwide (Chekole and Mohammed Ahmed, 2023; Shiferaw et al., 2011). It is the second most traded agricultural commodity (Shimada et al., 2021), and has diverse benefits, serving as animal feed, human food, and an energy source (Tamburaka et al., 2020). Global demand is estimated to increase by 50% in 2050 compared to current levels (Chekole and Mohammed Ahmed, 2023). Typically, the cultivation is managed by smallholder farmers who are part of a community (Coronado, 2023), but the majority of the market is for the livestock feed industry (Leknoi et al., 2023; Leknoi and Likitlersuang, 2020). This condition allows the maize agribusiness system to connect family farming with corporate livestock feed producers.

In Indonesia, dry maize kernel production in 2023 is estimated at 19.56 million tons, with South Sulawesi, one of the leading maize-producing provinces having a production of 1,358,501 tons (Central Bureau of Statistics, 2023a). Across this province, numerous regencies produce maize, including the Maros Regency. In line with the development of the corporate-managed livestock industry, about 60% of production in Indonesia is marketed to feed factories, while approximately 30% is for human consumption, with the remainder used for seeds and other purposes (Ministry of Agriculture Indonesian, 2020).

The development of maize agribusiness is closely tied to the role of farmer groups. In Indonesia, the majority of farmers are members of these groups, which are formed with government support through agricultural extension services. Within these groups, interactions occur among farmers, who build networks with various agribusiness actors, ranging from the provision of production facilities, agricultural production processes, as well as processing and storage of products, to marketing. One of the factors at play when farmers interact with various actors is social capital. The integration with the supply chain this aspect is urgent and competitive advantage have contributed to increased maize production (Karim et al., 2021).

Previous research has reported the various roles of social capital in agribusiness. These roles include assisting farmers in accessing agricultural innovations (Cofré-bravo et al., 2019), adapting to climate change (Saptutyningsih et al., 2020), strengthening livelihood systems in the face of vulnerability (Salman et al., 2021), and gaining access to subsidized input supplies (Kos et al., 2023). Other roles include aiding the adaptation to new agricultural knowledge (Slijper et al., 2022), accessing quality seed sources (Zeleke et al., 2023), active participation in irrigation governance (Mahaarcha and Sirisunhirun, 2023), addressing food insecurity during periods of food vulnerability (Craig et al., 2023), borrowing financial capital through cooperatives (Yu et al., 2023), and even serving as a predictor of farmer happiness (Zhang, 2022). However, there has been no specific research analyzing the combination of bonding, bridging, and linking social capital in the agribusiness activities of a specific commodity.

This research aimed to characterize the key elements of social capital in maize agribusiness, particularly in the categories of bonding, bridging, and linking, as well as to demonstrate their roles. The subsequent section presents a literature review and the research methodology. This is followed by a section on the elements of social capital in various maize agribusiness activities, and then an overview of the benefits

arising from combining the three forms. Meanwhile, the conclusion and limitations are presented in the final section.

2. Literature review

2.1. Combination of bonding, bridging and linking social capital

The concept of social capital was first introduced by Hanifan as "those tangible substances that count for most in the daily lives of people namely goodwill, fellowship, sympathy, and social intercourse among individuals and families who make up a social unit" (Hanifan, 1916). This perspective was also used several decades later by those who defined social capital as a set of features within social organizations including networks, norms, and social trust that can help achieve shared objectives (Putnam et al., 1993); the existence of trust among people working together for common purposes in a group and organization (Fukuyama, 1995); norms and networks enabling people to act collectively (Woolcock and Narayan, 2000); or connections, shared values, and mutual understanding in a community allowing individuals and groups to trust each other and work collectively (Keeley, 2007). In these definitions, social capital is embedded within the elements of the social structure that facilitates collective functioning.

Other definitions place social capital as a resource inherent in different individuals. In the definition by Bourdieu (1977), it was interpreted as "the sum of actual or potential resources associated with an enduring network of relatively institutionalized relationships focused on mutual understanding and recognition". Coleman (1988) also linked this concept to resources, defining social capital as "the value of the social structure aspects that actors can use in the form of resources to achieve their goals". Furthermore, Lin and Erickson (2008) described this term as 'resources embedded in social networks' assisting individuals in achieving important life goals. Lin (2001) also defined social capital as an investment in social relationships with an expectation of economic benefits in return.

Social capital is multidimensional, consisting of cognitive, relational, and structural dimensions (Nahapiet and Ghoshal, 1998). Structurally, it can be categorized into three forms namely bonding, bridging, and linking. Bonding is characterized by tightly-knit relationships consisting of "inward-looking networks that tend to reinforce exclusive identities and homogeneous groups" (Putnam, 2000b). These relationships often include individuals with the same identity, background, and culture, such as family, neighbors, and friends (Claridge, 2018; Page-Tan, 2021; Szreter, 2002). It provides strong emotional support to group members (Williams, 2006). In contrast, bridging social capital is inclusive and associated with open networks or weak ties that "look outward and consist of people from various social strata" (Putnam, 2000b). It broadens the social horizon, facilitating the opportunity to exchange information and resources (Williams, 2006). These relationships can be found among individuals with unequal power dynamics (Woolcock and Narayan, 2000). According to Woolcock (2002), linking social capital connects communities with more formal economic, political, and social institutions.

Bonding, bridging, and linking social capital do not work in isolation but rather interact with each other (Azad and Pritchard, 2023). Research suggests that the

combination of these three forms strengthens their collective impact, particularly when the social structure provides resources coupled with effective utilization by individuals (Azad and Pritchard, 2023; Cofré-bravo et al., 2019; Craig et al., 2023). As stated by Rustinsyah et al. (2021) and Rustinsyah (2015), the synergy between bonding, bridging, and linking not only enhances the resilience of resulting resources but also generates new ones, termed hybrid social capital. This research focused on how the combination of bonding, bridging, and linking can enhance the integrity of social capital in agribusiness system development.

2.2. Agribusiness system

The concept of agribusiness was first introduced by Davis and Goldberg as "the sum of all operations included in the manufacture and distribution of farm supplies, namely production operations, storage, processing, and distribution" (Davis and Goldberg, 1957). This definition laid the foundation for the development of the Agribusiness System Model, emphasizing the interconnectedness across sectors, transaction costs, contracts, chains, networks, a system perspective, and the introduction of institutions in understanding the relationship between agriculture and other sectors (Zylbersztajn, 2017).

The concept of inclusive agribusiness has evolved, motivated by the need to apply inclusive business ideas to the food and agriculture sector. As cited from the G20 definition by Woodhill (2016), it refers to "an inclusive business model, activity or initiative within agri-food market systems, at local, national, regional or international scales, seeking to achieve pro-poor outcomes while being commercially profitable for the concerned business entities". One characteristic of inclusive agribusiness is that it creates opportunities enabling small-scale farmers, groups, or cooperatives to become economically viable business partners in the food supply chain (Woodhill, 2016).

Inclusive agribusiness is expected to leverage the synergy between the business (smallholders and companies) as well as public actors (governments, civil society organizations, and donors) (Ros-Tonen et al., 2019). By combining their capacities, business and public actors can achieve development goals, which are proven to be challenging when handled independently by each entity (Austin and Seitanidi, 2012). In inclusive agribusiness that targets small farmers, this means recognizing the heterogeneity of the value chain, actors (especially poor farmers), and the associated networks (Ros-Tonen et al., 2019). As actual and potential resources associated with social networks (Bourdieu, 1977; Lin, 2001), the social capital of small farmers plays an essential role in networking with large-scale agricultural companies and the public sector as well as civil society. In general, this interaction serves as a key instrument in realizing inclusive agribusiness.

3. Materials and methods

This research was conducted in the Moncongloe Subdistrict, Maros Regency, South Sulawesi Province. The selection of this subdistrict was due to its significance as a maize production region, despite the urbanization in the surrounding areas, attributed to their proximity to the provincial capital. The subdistrict covers an area of

46.87 km^2 with a population of 20,044 people in 2022 (Central Bureau of Statistics, 2023b).

Astronomically, the subdistrict is located between 119.30 East Longitude and 5.00 South Latitude. The topography ranges from 10 to 122 meters above sea level, and is hilly, with an area of 46.87 km^2 (Central Bureau of Statistics, 2023b). As show in **Figure 1**, the research was conducted in the villages of Moncongloe Bulu (Je'ne Taisa and Bungung Galung farmer groups), Bonto Bunga (Bonto Bunga Jaya and Tunas Harapan farmer groups), as well as Bonto Marannu (Cahaya Bulu Farmer Group). The establishment of farmer groups was based on the Decree of the Regent, following the proposal of agricultural extension officer through the Regional Department of Agriculture.

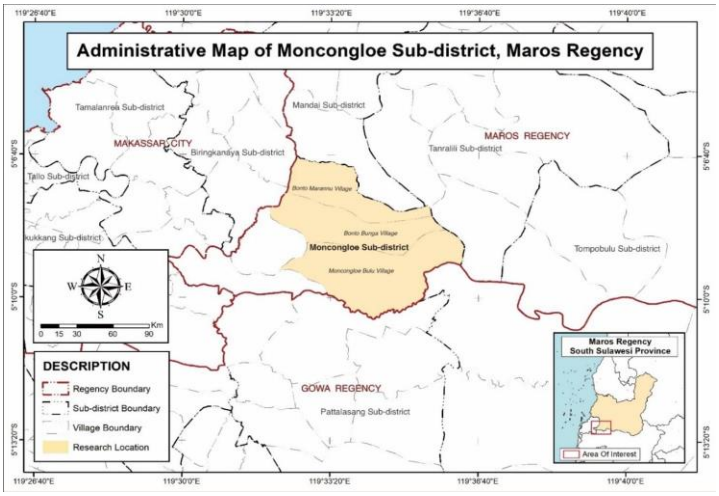

Figure 1. Administrative map of site location.

This research used the grounded theory method, which allowed direct engagement in social reality and the construction of a theory based on the collected data. The procedures followed included data collection and categorization based on the theoretical concepts to be developed, as well as theory formulation (Strauss and Corbin, 1998).

Data collection was carried out through in-depth interviews, characterized by profound social interaction based on conversation (Rubin and Rubin, 2012). Theoretical sampling was used as a characteristic of the grounded theory research method (Strauss and Corbin, 1998). The concept explored was social capital, hence the selected sample consisted of maize farmers and related actors who interacted accordingly. Sampling was stopped after interviewing a sufficient number of samples. The selected samples included 35 maize farmers, with 23 belonging to farmer groups, and 12 not affiliated to such groups. Other samples included three agricultural extension officers, one subdistrict government employee, three collector traders, three input suppliers, two Village-Owned Enterprises officials, and one livestock feed company employee (PT. Jiva Agriculture). The interview process was conducted face-to-face, with a duration of 40-60 minutes, and some actors were interviewed multiple times. Moreover, observation was performed on the daily activities of the farmers and their interactions with the actors engaging in the maize agribusiness.

All interview results in the form of field note transcriptions were processed using the ATLAS Ti qualitative data analysis software (Bohren et al., 2016; Tolinggi et al., 2023), and the categorized data results are presented in Appendix 1.

4. Results and discussion

This research found that bonding, bridging, and linking social capital comprise various elements such as social trust, reciprocity, norms, and networks. These elements were embedded in interactions among fellow farmers as well as between farmers and other actors in the chain of maize agribusiness activities. These activities include the provision of farm supplies, the farming process, harvesting, post-harvest, and marketing.

4.1. Social capital in the provision of farm supplies

Various elements facilitate the activities of farmers in the provision of farm supplies as presented in **Table 1**.

Table 1. Social capital in the farm supplies activities.

Agribusiness activities	Social capital types	Elements of social capital in operation
Farm supplies provision	Bonding social capital	• Social trust: Mutual trust between farmers to lend production facilities and share information. • Reciprocity: Mutual assistance to fellow farmers in providing production inputs and building farming facilities.
-	Bridging social capital	• Networks: Farmers access innovation from agricultural extension workers and capital loans from Village-Owned Enterprises. • Norms: Farmers, farmer group administrators, Village-Owned Enterprises, agricultural extension workers, and village government agree on norms for using village funds for capital for farmers.
-	Linking social capital	• Networks: Farmers access seed assistance through their network of government institutions (research institutions, police and military institutions). • Social trust: The head of the farmer group is trusted by the poultry feed company to obtain financial capital for the farmer group.

Bonding social capital in the farm supplies subsystem entailed elements of social trust and reciprocity in interactions among fellow farmers. These elements became resources for farmers to access and utilize various types of farm supplies. This was evidenced in the statements below.

> The landowner lent me his field for free to plant maize. I just ensured the cleanliness of the field to maintain his trust in me (LDS, farmer, 61 years).
>
> We maize farmers borrow pesticide sprayers from other farmers (JR, farmer, 47 years old).
>
> I was assisted by relatives who are also members of the farmer group in clearing and preparing the land... I also helped prepare their land (SDB, farmer, 42 years old).
>
> Fellow farmers and I cooperated every year to improve the mountain road leading to our farm locations. (JR, farmer, 47 years old).
>
> Information about seed prices, fertilizers, pesticides, and herbicides was entrusted to my child... the information from my child also served as a reference for other

> members of our farmer groups in deciding to purchase various farm supplies… (LDR, maize farmer, 71 years old).

Bridging social capital in these activities allowed farmers to access various farm supplies items through their interactions with actors outside their group but with similar socio-demographic backgrounds. These actors included agricultural extension officers, village government, Village-Owned Enterprise officials, fertilizer distributors, and others. Elements of social capital such as networks and norms underlie the interactions of farmers with various actors. This was supported by the following statements.

> We have a good relationship with agricultural extension officers, making it easier for us to access farm supplies. Agricultural extension officers collect identity cards from the members of the farmer group and then manage the purchase of subsidized fertilizer from the distributor (H, farmer, 59 years old).
>
> We received capital assistance from the Village-Owned Enterprise, hence we are no longer dependent on middlemen with high-interest rates... this was made possible because of the regulations agreed upon by the village government, Village-Owned Enterprise officials, farmer group officials, and most of the village residents to improve village fund management (S, farmer, 43 years old).

Linking social capital in this subsystem enabled farmers to interact with actors of higher socioeconomic status, such as research institutions, the police, the military, and large-scale farming corporations. It was found that elements of networks and social trust played a dominant role in these interactions, facilitating access to superior seeds, fertilizers, and medicines. This was expressed in the following statements.

> Apart from growing maize for livestock feed, I also run a seed breeding business. This is because of the network between agricultural extension officers and the government-owned Cereal Research Institute. I provide the land, and the Cereal Research Institute offers the parent seeds. They also purchase the seeds I produce at a good price (LDS, farmer, 61 years old).
>
> Some time ago, we received maize seed assistance from the South Sulawesi Provincial Police... the assistance was given because our farmer group was deemed eligible to manage the assistance (Dr, farmer, 60 years old).
>
> …We once received assistance from the Regional Military Command of Maros in the form of maize seeds. The assistance was distributed through the village head (AR, farmer, 43 years old).
>
> In this village, maize farmers obtain loans from private companies to purchase fertilizers, seeds, and pesticides. The network between the company and the farmers was established through me as the head of the farmer group (AD, head of farmer group, 52 years old).
>
> We used subsidized government-provided fertilizers distributed through farmer groups. The fertilizer distributor only sells subsidized fertilizer to farmer groups (B, farmer, 42 years old).

4.2. Social capital in farming production activities

In the farming production activities, various elements of social capital operate in the activities and interactions of farmers with different actors. Reciprocity, social trust,

and networks were identified as elements that played a role in bonding, bridging, and linking social capital, as summarized in **Table 2**.

Table 2. Social capital in the farming production activities.

Agribusiness activities	Social capital types	Elements of social capital in operation
Farming production activities	Bonding social capital	Reciprocity: members of farming groups help each other in various farming production activities
-	Bridging social capital	Networks: farmers utilize their networks for the farming production process with other groups of relatively the same socio-economic status
-	Linking social capital	Networks: farmers utilize their networks for the farming production process with institutions of higher socio-economic status.

Bonding social capital primarily entailed mutual assistance among members of the farmer group, who were mostly relatives and neighbors. This cooperation occurred during planting, fertilization, and pest control as illustrated in the following statements.

> My relatives and I, as part of the same farmer group, take turns helping each other in planting maize... (S, farmer, 50 years old).
>
> We farmers take turns guarding the fields at night to drive away wild boar pests. (TD, farmer, 48 years old).
>
> Since my husband passed away, my child has helped with planting and transporting fertilizer to our hillside farm location. (H, female farmer, 59 years old).

Bridging social capital was found in the networks of farmers with agricultural extension officers for adopting innovations and pest control, as expressed by the following statements.

> …I rarely visit the agricultural extension office, but during planting, the officer visits to provide information about good planting patterns (SM, farmer, 47 years old).
>
> The agricultural extension officer directs and recommends suitable pesticides to eliminate maize borer pests... we consider the officer as part of our community (TD, maize farmer, 48 years old).
>
> I happened to receive information from a farmer regarding the pest infestation in their fields. I advised that we should conduct pesticide spraying together because maize borers should be eliminated simultaneously (HM, agricultural extension officer, 48 years old).

Linking social capital was found in the network with the Regional Agricultural Office, the Subdistrict Agricultural Extension Office, and poultry feed companies. In these interactions, farmers gained access to attention and resources as expressed in the statements below.

> …The staff of the Regional Agricultural Office often visit our fields to monitor the growth of our maize plants. We feel valued due to these visits (TD, farmer, 48 years old).
>
> We received liquid fertilizer assistance from the Subdistrict Agricultural Extension Office and were taught how to use it (AK, farmer, 46 years old).
>
> We downloaded an application on our smartphones to report the care we give to our crops. Through the information we provide, the poultry feed company

managing the application can coordinate with agricultural extension officers if there are farming practices that need improvement (A, farmer, 38 years old).

4.3. Social capital in harvest and post-harvest activities

The elements of social capital in the harvesting and post-harvest activities were identified to be reciprocity and networks. These elements operated in the bonding, bridging, and linking social capital, as shown in **Table 3**.

Table 3. Social capital in the harvest and post-harvest activities.

Agribusiness activities	Social capital types	Elements of social capital in operation
Harvest and post-harvest activities	Bonding social capital	Reciprocity: mutual support between members of farmer groups in harvest and post-harvest activities.
-	Bridging social capital	Networks: farmers utilize their networks for harvest and post-harvest activities in interaction with other groups of the same socio-economic status.
-	Linking social capital	Networks: farmers utilize their networks for harvest and post-harvest activities with other groups of higher socio-economic status.

Bonding social capital, with the element of mutual support among relatives and members of the farmer groups, was found in various activities as illustrated by the following statements.

During the maize harvesting, I was assisted by my child and his wife, hence, all the crops were harvested on time. My child is also a member of the farmer groups (H, farmer, 59 years old).

When husking the maize, I was assisted by four of my children and their spouses, as well as my grandchildren... my children also work as farmers (MA, farmer, 65 years old).

If rain is expected, I ask neighboring farmers to help transport the dried maize to the storage area to prevent it from getting wet. Also, I helped them transport their maize to the storage area. (SDB, farmer, 42 years old).

I use the maize sheller owned by the farmer group. Only members of the farmer group are allowed to use the equipment (M, farmer, 38 years old).

Bridging social capital was found in the networks of farmers with agricultural extension officers and village-level organizations to learn better harvesting and post-harvest techniques. This was in line with the statements of the following farmers.

…I and other members of the farmer groups were also taught methods to improve the quality of the harvest by the agricultural extension officers, such as the right age for harvesting and the impact of moisture content on maize quality (S, farmer, 38 years old).

Through the farmer groups, we can collaborate with the Village-Owned Enterprises to obtain funding for the purchase of maize drying facilities (AD, head of farmer group, 52 years old).

In this research, linking social capital was found in the use of farmer networks to adopt innovations and post-harvest-related equipment from some actors of higher socioeconomic status. This was evidenced in the statements.

…last year, I represented the farmer group to attend training on the technique of converting maize waste into compost at the Provincial Food Security Office... I

applied this knowledge and also conveyed it to other group members (SDB, farmer, 42 years old).

There was a training session here on making maize cakes and juice for the wives of farmers. This was conducted by the Polytechnic for Agricultural Development (M, farmer, 38 years old).

My fellow farmers and I, as partners of the poultry feed company, received a moisture content measuring device from the company. This allows us to check the moisture content of the harvested yield before selling it (A, farmer, 38 years old).

4.4. Social capital in marketing activities

The social capital elements operating in the marketing activities included social trust and networks. The related activities where these elements operate in the forms of bonding, bridging, and linking social capital are shown in **Table 4**.

Table 4. Social capital in marketing activities.

Agribusiness activities	Social capital types	Elements of social capital in operation
Marketing activities	Bonding social capital	Social trust: mutual trust between farmers and collecting traders where their interactions are based on friendship and neighborliness.
-	Bridging social capital	Networks: farmers utilize their networks for marketing activities in interaction with other groups from the same socio-demographic background.
-	Linking social capital	Networks: farmers utilize their networks for marketing activities in interaction with other social units from different socio-demographic backgrounds.

Bonding social capital in marketing activities included an element of mutual trust between maize farmers and specific collection traders, who often share personal friendships or neighborly relationships. This was illustrated in the statements.

I sold maize to collector Y because he was a friend of my late husband. We have trusted each other, so I entrust him with the sale of maize. He brings his own maize sheller and bags, and the price is reasonable as well… (H, maize farmer, 59 years old).

My collector (Mr. S) is my neighbor, and he is also my uncle... I obtained the seeds from him, and after the harvest, he deducts his payment from the sale of my maize. (KH, farmer, 43 years old).

Bridging social capital entailed the element of networks between the farmers and a social unit outside their group with the same socio-demographic background, namely the Village-Owned Enterprises. The farmer groups collaborated with Village-Owned Enterprises to obtain food security funds. With this funding, farmers were able to meet their needs for seeds, fertilizers, and pesticides without relying on middlemen. When farmers are not indebted to specific middlemen, there is freedom to sell their maize to collection traders offering the best prices. This was illustrated in the statement.

It is great now because we are no longer dependent on middlemen acting as loan sharks. This has been the case since receiving capital assistance from the Village-Owned Enterprises facilitated by agricultural extension officers and the village chief. The agricultural extension officers and the Village-Owned Enterprises

executives also provide information about collection traders who offer high buying prices (MI, farmer, 25 years old).

Linking social capital in marketing was found in the interaction of farmers with the poultry feed companies, who served as one of the primary buyers of the harvested maize. The company has representatives who invite farmers to join as company partners. Through this partnership, farmers were provided with financial resources and innovation for production improvement, while the company purchased their products. Most partner farmers believed that marketing to the poultry feed company was quite profitable, as evidenced in the statement below.

I feel supported by the partnership with the poultry feed company. We are gathered under the network called "Sahabat Jiva" and provided with capital assistance for the procurement of farm supplies. After the harvest, the payment for the farm supplies is deducted from the sale of our maize. The purchase price of the company is quite competitive compared to other buyers (D, farmer, 35 years old).

4.5. Social capital as the glue and wires in the maize agribusiness system

This section analyzes how social capital functions within the maize agribusiness system, using two analogies "the glue" and "the wires". Serving as glue means that social capital played a role in bonding relationships, while the wires function implied acting as a conduit for resources from one actor to another. These functions apply to interactions among actors with similar (horizontal interaction) or different (vertical interaction) socio-demographic backgrounds.

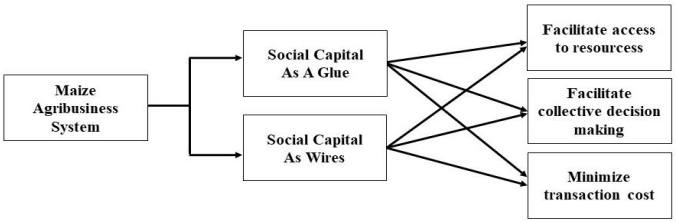

Figure 3. Function and role of social capital in the maize agribusiness system.

Categorization was also conducted on the three operational roles within the maize agribusiness system operating alongside the functions of social capital acting as glue and wires. These roles including facilitating resource access, collective decision-making, and reducing transaction costs are schematically presented in **Figure 3**.

Regarding the facilitation of resource access, bonding, bridging, and linking social capital acted as both glue and wires. Bonding strengthened the connection among farmer groups, facilitating the flow of resources in the provision of farm supplies, planting, fertilization, pest control, harvesting, post-harvest, and marketing. For instance, farmers within a group can borrow maize shelling equipment provided by the local government, while non-members cannot. The groups serve as a platform for cooperation and learning for farmers with contiguous land. Furthermore, farmer groups are encouraged by the government to better coordinate the distribution of agribusiness assistance.

Through bridging social capital, members of farmer groups were connected with agricultural extension officers, Village-Owned Enterprises executives, and collection traders, providing access to agricultural innovations, capital assistance, and price information. Meanwhile, linking social capital established a connection with various actors of higher socioeconomic status, such as the Regional Department of Agriculture, the Provincial Food Security Agency, institutions of higher education, the Cereal Research Institute, and the Jiva Agriculture Company. In this connection, linking social capital acted as a conduit providing access to subsidized fertilizers, maize shelling equipment, post-harvest knowledge and equipment, maize moisture meters, and the assurance of product marketing.

In the context of facilitating collective decision-making, social capital primarily served as glue. This was evident in the collective decisions made by farmers regarding the scheduling of wild boar and fall armyworm pest control (bonding). In the form of bridging social capital, collective decision-making was observed in agreements between the village government, Village-Owned Enterprises executives, agricultural extension officers, and farmer groups when allocating village funds. Agreements between farmers and several non-farmer actors in the community regarding the improvement of the road leading to the hilly planting location also fell under bridging social capital. These collective decisions were easier to reach due to the presence of social trust among interacting actors, both within the same (bonding) and between different groups but with similar socio-demographic backgrounds (bridging). The ease of reaching collective decisions made joint problem-solving actions more effective.

Regarding the reduction in transaction costs, social capital acted more dominantly as wires, similar to electrical wires through which current flows. This was found in the form of bridging, where networking with Village-Owned Enterprises allowed farmers to access capital at lower costs than borrowing from middlemen. Furthermore, agreements did not require notarial services, which often incur significant costs. Since farmer groups and Village-Owned Enterprises trust each other, these agreements were formalized with a simple signed document. Lower transaction costs also resulted from networks with agricultural extension officers that bridge farmers to specific collection traders offering higher maize purchase prices than middlemen. Furthermore, through linking social capital, interactions with Jiva Agriculture Company led to a reduction in the costs of purchasing farm supplies and fairer selling prices.

Membership in the farmer groups became a differentiating factor in the strength of social capital compared to non-members. This strength was attributed to the ability of the groups to foster more extensive networks, especially regarding linking social capital with government actors. With this connection, farmers were able to access subsidized fertilizer and borrow maize shelling equipment. Meanwhile, bridging enabled group members to access capital assistance from Village-Owned Enterprises due to their networks, resulting in lower capital expenditures and more profitable production.

Maize farmers who were not part of the groups faced difficulties in accessing subsidized fertilizer assistance, resulting in higher costs when purchasing directly from the market. These individuals also struggled to obtain guidance related to various aspects of the maize agribusiness, as most information was disseminated through the

groups. This comparison underscores the significance of network elements in the agribusiness system, which do not solely arise from individual capacities but also through membership in associations.

4.6. Discussion

This research explored the elements of social capital operating in the combination of bonding, bridging, and linking within the maize agribusiness system. Additionally, it examined the roles of their combination in various development aspects, both as glue and wires.

The results showed that elements such as social trust, reciprocity, networks, and norms were applicable in the combination of bonding, bridging, and linking social capital in the advancement of maize agribusiness. This was consistent with Cofré-bravo et al. (2019) stating that the combination played a role in the progress of fruit farmers in Chile. Furthermore, the results demonstrated that on a more fundamental level, social capital assisted farmers in accessing seeds, as similarly reported by Zeleke et al. (2023) in Ethiopia. The benefit was also evident in getting financial loans, in line with the research by Yu et al. (2023) conducted in China. In general, farmers who belonged to groups enjoyed more benefits compared to non-members. These groups foster social trust and networks to access various resources from both the government and maize buyers. This discovery was consistent with the observations of Chamola et al.(2022) regarding producer companies, showing that social capital had a positive and significant relationship with the trust of members, thereby enhancing their benefits. In addition, exploration was conducted on various social capital roles with a dual functionality perspective as both glue (Serageldin, 1996; Viswanathan et al., 2014 ; Fine, 2010; Owot et al., 2023).

Another interesting result was the relationship between social capital and the conceptualization of inclusive agribusiness. Linking acted as glue, vertically integrating smallholders with poultry feed companies, public policy makers, and research institutions. This vertical integration promoted the flow of innovation and entrepreneurship to smallholders and could be part of the foundation for a more inclusive maize agribusiness system. This result supports the research of Schoneveld (2022) and Ros-Tonen et al. (2019) on inclusive agribusiness through smallholder integration into agricultural value chains.

5. Conclusion

In conclusion, elements such as social trust, reciprocity, networks, and norms were found to play a significant role in the development of bonding, bridging, and linking social capital within the series of activities in the maize agribusiness system. The combination of these three dimensions functioned as both glue, facilitating interactions among actors, and wires, through which resources flow among actors. This dual role enabled farmers to access resources, make collective decisions, and reduce transaction costs.

In this context, the maize agribusiness system has integrated smallholders, including poor households, with private companies and public policymakers. The presence of social trust, networks, reciprocity, and norms transcending different

socioeconomic statuses provided a strong foundation for an inclusive agribusiness system. This research hypothesizes that when bonding, bridging, and linking social capital are well combined under conditions where farmers organize themselves into association memberships, social capital can contribute to the development of an inclusive agribusiness system.

Certain limitations were associated with this research, first, the outcomes of social capital roles on production, productivity, and income indicators were not quantitatively measured. Second, a more in-depth comparison was not conducted on the characteristics of social capital between group members and non-member farmers, indicating the need for more research. Further investigation is also needed to establish the extent of contribution to the development of an inclusive agribusiness system.

Policy implications of these results include the need to promote and sustain a combination of bonding, bridging, and linking social capital based on farmer association membership. Furthermore, efforts are required to strengthen linking social capital between smallholders, agricultural companies, and public institutions, enabling the transfer of entrepreneurship and the diffusion of innovations that allow smallholders to scale up their economic activities.

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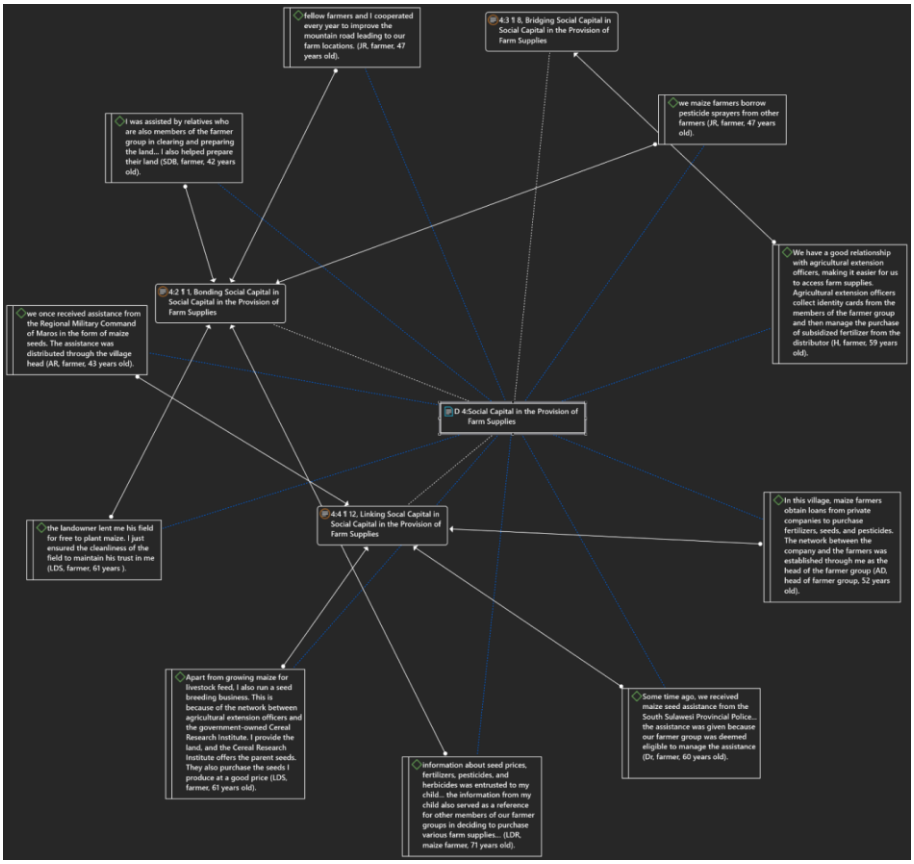
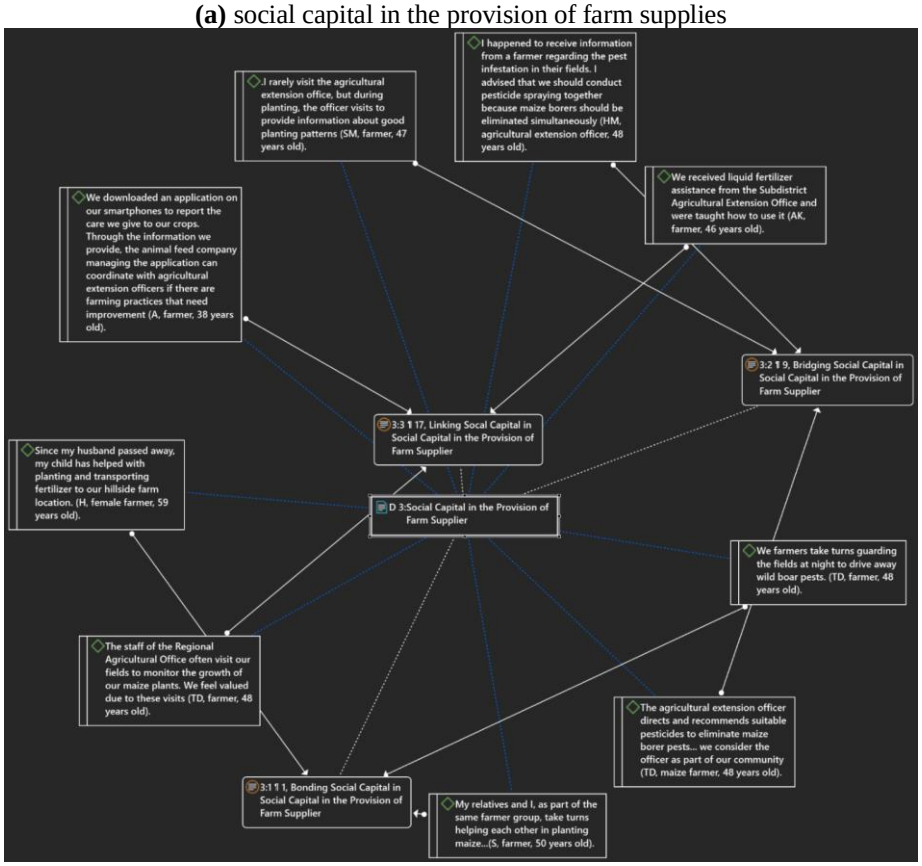
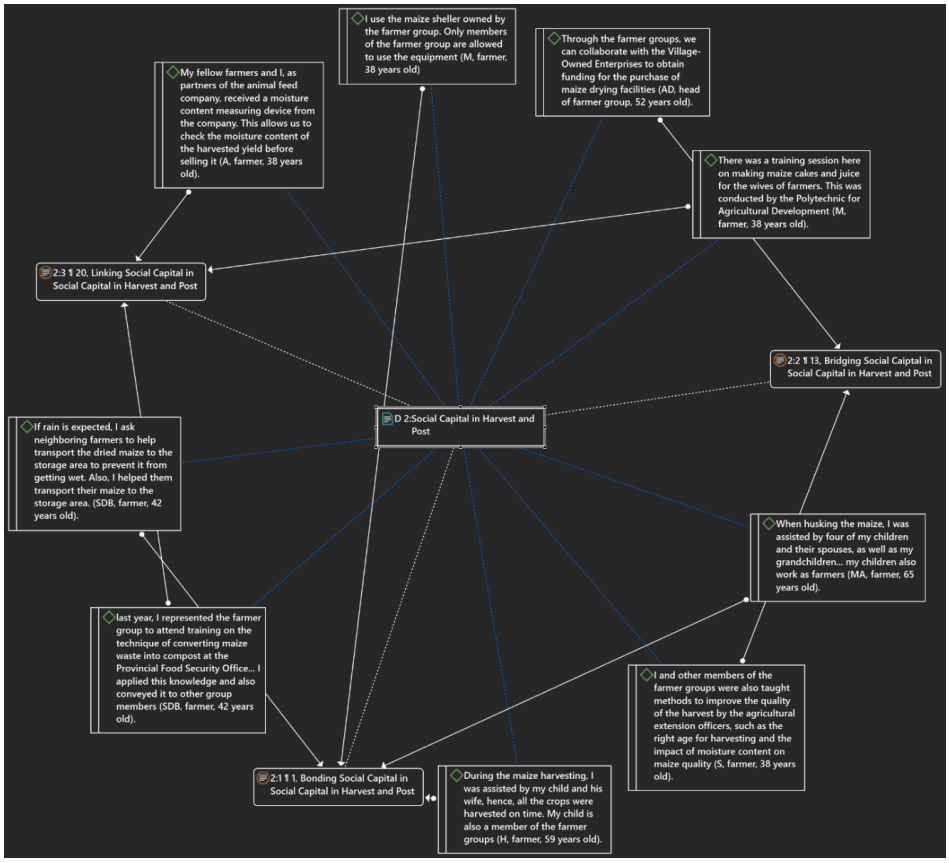
Appendix



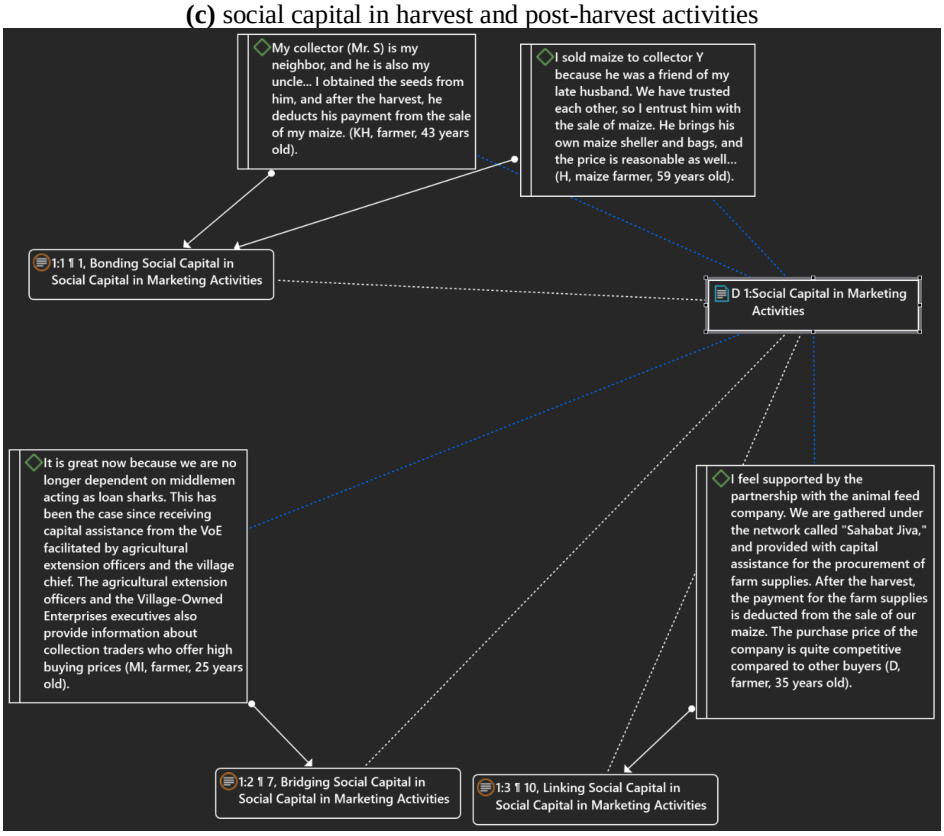
(a) social capital in the provision of farm supplies



(b) social capital in farming production activities



(c) social capital in harvest and post-harvest activities



(d) social capital in marketing activities

Figure A1. ATLAS Ti analysis of bonding, bridging, and linking social capital combinations in maize agribusiness system development.