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Regular Article

Agricultural strategic partnerships and farmers' capabilities in Tanzania: What has (not) worked and why?

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ABSTRACT

Agricultural Public-Private Partnerships (PPPs) are increasingly promoted as new institutional frameworks to introduce agricultural value chain technologies, transform subsistence farmers into independent commercial producers, and connect them to the global market. Using the case of Tanzania's Southern Agricultural Growth Corridor (SAGCOT) agricultural strategic partnerships, this study questions the role of agricultural PPPs in integrating smallholder farmers into global value chains. It explicitly evaluates the partnership interventions and their contributions to the capabilities of smallholder farmers along the soybean and potato value chains. Through in-depth interviews and focus group discussions with partnership actors, the study found that partnership efforts mainly targeted the production and marketing nodes to boost farm productivity and market access. The partnerships partly improved farmers' capabilities by increasing knowledge and good agronomic practices. However, they had a limited impact on access to and use of quality inputs, modern farming technologies, value addition, and marketing capabilities. The effect on production capabilities was constrained by the unsustainable supply of improved seeds and limited access to fertilizers and pesticides, resulting from the absence of arrangements for aggregating input acquisition. The findings also reveal that the partnerships created new markets; however, most farmers were unable to benefit from them due to a lack of market contracts and collective bargaining power among farmers. The study concludes that for agricultural PPP to transform subsistence farmers into commercial ones, it requires inclusive infrastructure development and strong institutions that promote interactions, facilitate technology flow, and address exploitative market structures.

1. Introduction

Agricultural public-private partnerships (PPPs) in developing countries aim to enhance inclusion, empower subsistence farmers, and strengthen agriculture's role in reducing poverty and promoting sustainable development (Moreddu, 2016; World Bank, 2012). In Africa, PPPs focus on advancing agricultural value chain technologies to connect subsistence farmers to the global market (FAO, 2013; Mangeni, 2019).

The promotion of the PPP model in agriculture supports modernization ideas by transforming traditional farming into modern agriculture through the application of technologies (Schultz, 1964) and innovations (Hayami & Ruttan, 1985). Studies show mixed effects on smallholder farmers. Some report benefits like improved access to irrigation, higher productivity (e.g., Hoang, 2021; Ponnusamy, 2013; Ponnusamy et al., 2014), inputs, finance, and markets (e.g., FAO, 2013; Nakazi et al., 2019; Oxfam International, 2014), linked to knowledge transfer, input credit, and market contracts (e.g., Akullo et al., 2018; Aseete et al., 2023; Hoang, 2021). However, other studies point to failures where PPPs overlook smallholders, focus on high-margin areas, and neglect technology investments like irrigation, credit, and seed supply (e.g., Akullo et al., 2018; Fairtrade Foundation, 2014; Kavoi et al., 2014; Senyolo et al., 2021). The role of PPPs in transforming subsistence farmers to commercial farmers remains debated and needs further study.

This paper examines how strategic partnerships within the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) impact the capabilities of smallholder farmers in the soybean and potato value chains. Launched in 2010 as a 20-year initiative, the SAGCOT PPP aims to boost agricultural output and integrate smallholders into crop value chains in

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southern Tanzania. Its model has shifted from the original Blueprint, the Large-scale Nucleus-Outgrowers Model, which involves large investors, to various models, including the 'Potential Partner,' 'Emergent Farmer,' and strategic crop partnerships (Pauline et al., 2023). These changes necessitate further research to understand the dynamics and impacts of these models, as they involve diverse local actors, realities, priorities, and contexts (West & Haug, 2017). The Nucleus-Outgrowers Model has faced criticism for negatively affecting smallholder livelihoods, food security, and land access (Kaarhus et al., 2010; Paul & Steinbrecher, 2013; Sulle and Hall, 2013; Sulle, 2014). While studies (e.g., Lala et al., 2023; Makundi & Mongula, 2023; Pauline et al., 2023) examine its impact, they mainly focus on outgrower schemes, leaving limited literature on the mechanisms and effects of strategic partnerships across different crops.

To contribute to the ongoing debate about the impacts of agricultural PPPs, this study examines SAGCOT partnerships in potato and soybean value chains to explore their complexity, interventions, actor interactions, and effects on smallholder farmers' capabilities. It addresses criticisms of PPPs, such as companies primarily using partnerships for marketing and making limited development contributions (Reed & Reed, 2009). The study is guided by two questions: 1) What are the strategic partnerships' innovative interventions in the potato and soybean value chains? 2) How have these partnerships improved smallholder farmers' capabilities along the soybean and potato value chains, what has worked, what has not, and why? Our approach employs the innovation systems perspective (Spielman, 2005) to understand innovations and interactions within the partnerships. We also apply the concept of dynamic capabilities (Teece et al., 1997) and Bolo's (2010, p. 11) framework to assess capabilities gained through these collaborations. We argue that farmers' capabilities are essential for successful agricultural interventions, especially in areas where large-scale farming and mechanization are unsuitable due to the dominance of smallholders.

2. Literature review

2.1. Theoretical framework

Strategic partnerships among farmers, corporations, governments, and non-governmental organizations (NGOs) in agricultural value chains aim to achieve shared goals that no single sector can accomplish alone (Boselie et al., 2003). These include improving market access for smallholders through new technologies and standards (Narrod et al., 2009; Bitzer et al., 2013). Effective innovations rely on active interactions among actors and institutions for communication, trust, commitments, and decision-making, crucial for helping subsistence farmers commercialize (Samii et al., 2002; Jamali, 2004). Our framework is based on the Innovation System Perspective (Spielman, 2005) and dynamic capabilities (Teece et al., 1997), emphasizing how interactions influence success or failure.

2.1.1. Innovation system perspective

From an innovation system perspective, an innovation system refers to a "set of interrelated agents, their interactions, and the institutions that condition their behaviour concerning the common objective of generating, diffusing, and utilizing knowledge and/or technology" (Spielman, 2005). According to this perspective, capabilities evolve and grow through interactions between actors over time (Carlsson et al., 2002). Strategic partnerships aim to jointly achieve innovations (OECD, 1999) that cannot be achieved by individual sectors or organizations (Bitzer and Bijman, 2014). Thus, partnerships drive innovation in agricultural value chains by combining diverse knowledge and resources (Biggs, 1990; Sumberg, 2005), supporting participatory spaces where actors collaborate (Lundvall et al., 2002) and enabling market-based strategies for inclusivity). Based on this perspective, we assume that PPP would introduce interventions along value chains through actor interactions, thereby shifting and improving the capabilities of smallholder farmers. Below, we describe the concept of capability adopted in this paper.

2.1.2. Dynamic capabilities

Capabilities are the knowledge set that differentiates and confers a competitive advantage (Leornard-Barton, 1992); Teece et al., 1997; Teece et al. (1997) define 'dynamic capabilities' as "the ability to sense and then seize new opportunities, and to reconfigure and protect knowledge assets, competencies, and complementary assets and technologies to achieve sustainable competitive advantage." Based on this concept, we argue that dynamic capabilities should determine farmers' ability to reconfigure their activities and adapt to the changing production and market environment.

2.2. Analytical framework

Our analytical framework guides exploration across various domains. The partnership innovations domain focuses on technological and market solutions for challenges faced by smallholder farmers in potato and soybean value chains. Innovation dimensions include process, product, organizational, and marketing innovations (Tidd et al., 2005). Process innovation involves changes in creating new or improved products/services (OECD, 2005), linked to higher farm productivity. Product innovation involves developing and marketing new products to boost customer satisfaction and quality (OECD, 2005; Tidd et al., 2005). Marketing innovation refers to changes in how goods/services are introduced, focusing on consumer needs (OECD, 2005). Organizational innovation involves changes in mental models shaping activities (OECD, 2005; Tidd & Bessant, 2021). The actors' interactions domain explores whether formal or informal interactions affect farmers' capabilities.

In the capability domain, we utilize Bolo's (2010, p. 11) three key capabilities: 'production', 'value addition', and 'marketing'. 'Production capabilities' include knowledge for pre-harvest activities such as crop selection, planting, inputs, and timing. 'Value addition capabilities' encompass knowledge from harvest to market. 'Marketing capabilities' involve understanding how crops reach final consumers, helping farmers access markets for export or domestic use. Finally, we analyze institutional frameworks, input access, and market structures that enable or limit partnerships, addressing challenges faced by smallholders and identifying what works and why.

2.3. Agricultural PPPs mechanisms and impact on smallholder farmers' inclusion in value chains

Existing studies suggest that PPPs can promote innovation or develop innovation capabilities, knowledge, and transfer technologies among farmers (Trotsenko and Slukin, 2020; Akullo et al., 2018). Some research reports positive impacts, including increased productivity of farm enterprises (Ponnusamy, 2013; Ponnusamy et al., 2014). Notably, combining knowledge transfer, seed credits, and market contracts has been found to enhance small farm productivity (Aseete et al., 2023; Hoang, 2021). They also show increased access to irrigation technologies, better access to inputs and finance, and the provision of predetermined prices and ready markets (FAO, 2013; Nakazi et al., 2019; Oxfam International, 2014). Furthermore, studies indicate that PPPs provide market contracts to smallholder farmers, improving their access to competitive markets for their produce and helping to overcome marketing bottlenecks, thereby encouraging increased production (Aseete et al., 2023; Akullo et al., 2018).

Other studies highlight challenges of agricultural PPPs, such as failing to reach smallholders, focusing only on high-end technologies, prioritizing high-profit areas, and lacking partner agreement (Fairtrade Foundation, 2014; Oxfam International, 2013; Ponnusamy, 2014). While PPPs can introduce new agricultural innovations, their long-term impact on farmers' adoption of technology is debated. Several studies report PPPs' failure to effectively improve smallholder farming

technology uptake (e.g., Akullo et al., 2018; Kavoi et al., 2014; Senyolo et al., 2021). Factors behind such failure include an unsustainable seed supply and lack of interventions to help farmers adopt technologies, such as PPP investing in irrigation, credit, and microcredits (Senyolo et al., 2021). Farmers also complain about poor seed quality and unstable seed and grain prices (Akullo et al., 2018). Other issues include a focus on agro-processing and export schemes that benefit only a few capable of input-intensive models, neglecting smallholders' needs (Oxfam International, 2014; HLPE, 2013; World Vision International, 2014; Fairtrade Foundation, 2014).

We contribute to the existing literature by examining strategic partnership interventions and actor interactions in the soybean and potato value chains, and how they influence smallholders' production, value addition, and marketing capabilities.

3. Research methods

3.1. Description of a case study

The SAGCOT PPP, launched in 2010, is a twenty-year partnership aimed at boosting agricultural production and integrating smallholder farmers into crop value chains in the Southern corridor. Its goals are to address food insecurity, reduce poverty, and promote environmental sustainability through models like strategic partnerships within the crop value chain. Unlike other PPPs, SAGCOT's approach emphasizes the inclusion of smallholder farmers in decision-making and involves the government, private sector, NGOs, research institutions, and farmers (SAGCOT, 2011). Using SAGCOT as a case study provides insights into successful strategies and challenges, with recommendations for improving effectiveness.

The study was carried out in the Ihemi cluster, one of six clusters in the SAGCOT region (SAGCOT, 2015). Located within the Njombe and Iringa regions, Ihemi was selected as the case study site. It encompasses six districts, including Iringa Municipality, Iringa District Council, Kilolo, Mufindi, Wanging'ombe, Njombe District, and Njombe Town Council. Ihemi is a vital agricultural zone with diverse land uses, including large-scale commercial tea, pulpwood and timber production, and smallholder farms. It was chosen because it was the first to launch and has operated for five years (by 2020), involving more experienced actors. The study explored partnerships in potato and soybean value chains, as SAGCOT (2011) notes, potatoes are suitable for the Ihemi cluster and can improve food and economic security, offering higher returns and demand. Soybeans, a new cash crop, also face high demand both locally and internationally. These partnerships promote production by adopting new technologies and connecting farmers to global markets.

3.2. Identification of study participants and data collection

We used purposive sampling to select knowledgeable participants from various categories, as shown in Table 1, prioritizing key actors in strategic partnerships. The sample size followed the principle of theoretical saturation, stopping data collection when no new insights appeared (Cleary et al., 2004). Various qualitative methods gathered detailed views on the partnership's performance and benefits to smallholders. Data also came from secondary sources, including newsletters and SAGCOT strategy documents like the Inclusive Green Growth Tools, the Action Green Growth Blueprint, and the SAGCOT Investment Blueprint.

We conducted 13 key informant interviews (KIIs) with staff from SAGCOT Center Ltd, TARI-Uyole, the Ministry of Agriculture, TOSCI, and regional agricultural extension officers involved in the SAGCOT PPP initiative. Additionally, we carried out 20 semi-structured interviews with smallholder farmer leaders, SAGCOT Ihemi Cluster staff, and partners, including private companies, NGOs, and field officers. When in-person meetings were not possible, we conducted phone interviews. Furthermore, eight focus group discussions (FGDs) involving 94 farmers—five with soybean producers and three with potato producers, each with 8–12 participants, including men, women, and youth. Before conducting interviews, all participants gave their informed consent to participate in this study.

Table 1
Categories of participants and data collection methods used.

Data collection method	Type of actors	Organization	Number
Key informant interview	State Actors	Ministry of Agriculture	2
		Regional Extension officers	2
		District Extension officers	2
		Government regulatory agencies	2
		Tanzania Agricultural Research Institute (TARI-Uyole)	2
	Non-state Actors	SAGCOT Center Limited	3

Data collection method	Organization	Type of strategic Crop engaged	Number
Individual interviews	CDI	soybean	2
	BRITEN	Soybean	2
	Care International	Soybean	2
	NADO	Soybean and potato	1
	CARITAS	soybean	2
	Silverlands Tanzania Ltd	Soybean and potato	3
	Mtanga Foods Ltd	Potato	1
	Beula Seed Co	Potato	1
	STAWISHA	Potato	1
	Tanzanice Agrofood Ltd	Potato	1
	Europlant	Potato	1
	Yara International	Soybean and Potato	1
	Syngenta	Soybean and potato	1
	farmers groups' leaders	Potato	10

Data collection method	District	Location	Number
FGD with Potato farmers	Njombe	Lusitu village	1
		Nganda Village	1
		Isowelu Agricultural Marketing Cooperative Society (AMCOS)	1
FGDs with Soybean farmers	Njombe	Maduma village	1
		Itongolo village	1
	Iringa	Tagameda village	1
	Kilolo	Luganga, village	1
	Wanging'ombe	Wanging'ombe	1

3.3. Data analysis

The study employed thematic analysis to analyze and interpret the data, as it is an efficient method for identifying common themes in the responses (Creswell & Creswell, 2017). In our analysis, we followed the phases outlined by Terry et al. (2017), which began during data collection. The study participants shared their experiences and opinions regarding the strategic partnership interventions and their perceived impacts. The transcripts were systematically coded to develop similarities and patterns within the participants' responses (Braun et al., 2016). The potential themes were reviewed and refined in light of our research questions (Terry et al., 2017). The results are presented in narrative form, with quotes used to illustrate the findings.

4. Findings and discussions

4.1. Description of soybean and potato strategic partnerships

A soybean strategic partnership was established in 2015 with Silverlands Company as a take-off driver (processor). The company joined the partnership to ensure its access to soybeans produced by smallholder farmers in Iringa, Njombe, and Songea. Other non-partner companies involved in the partnership include Alfa Agrovet and International Tanfeeds Ltd, which purchased soybeans from the farmers. Thus, the role of these companies was to provide reliable markets for the soybeans produced by farmers. Other formal partners included NGOs like Care International, Caritas, the Clinton Development Initiative (CDI), and BRITEN. Their main roles were to mobilize and build farmers' capacity in soybean production and processing, and to connect them with private companies. While these roles aligned with their donor-funded project goals, their primary objective in the partnership was to help farmers find profitable markets. The partnership also involved government stakeholders like regional and district agricultural extension officers (SAGCOT contacts), TOSCI for seed certification, and TARI-Uyole, an agricultural research institution. Interviews with farmers, NGOs, and SAGCOT Ihemi Cluster management showed that some partners, including Caritas and International Tanfeeds Ltd, had left. It was unclear if Silverlands Company still participated, as it stopped buying soybeans from smallholder farmers in 2017.

The Potato Strategic Partnership initially aimed to introduce high-quality potato seeds to increase productivity. The partnership has evolved, engaging different companies at different times. Later, it introduced new potato markets. In 2015, Mtanga Foods Company joined a partnership aimed at supplying high-quality potato seeds to farmers. It multiplied seeds (third generation) using Basic seeds produced by TARI-Uyole. However, the company ceased operations in 2017 due to the poor performance of its investment, and it withdrew from the partnership in the same year. Other stakeholders involved in this partnership from 2015 to 2017 included TARI Uyole, which was responsible for researching and producing potato seeds, and Kilimo Trust, an NGO focused on building the capacity of farmers. In 2018, Tanzanice and Silverlands Companies, under the STAWISHA initiative, joined the partnership with the same objective of supplying higher-quality potato seeds produced by Europlant, a foreign company. STAWISHA was a non-profit company in the Mbeya region, formed by foreign companies, including Europlant, which collaborated with TARI-Uyole to experiment with and produce varieties of potato seeds introduced by foreign companies. Other non-partner actors included Yara International, a supplier of fertilizers, and Syngenta, a supplier of pesticides, as well as the Njombe Agricultural Development Organization (NADO), a community-based organization focused on capacity building.

Since 2020, the two strategic partnerships have operated independently without close SCL supervision. A key informant said the partners strengthened trust, believing it was sufficient to sustain the partnership. However, interviews with smallholder farmers and partners showed weak or no interaction with business partners in the value chains, mainly due to the lack of contractual arrangements for input supply and crop purchases, as discussed in the section on successes and failures. The findings suggest SAGCOT's partnerships are still evolving as new partners join.

4.2. Strategic partnerships' interventions in the potato and soybeans value chains

4.2.1. Production: success in knowledge transfer, but unsustainable quality inputs supply

First, strategic partnerships introduced improved soybean and potato seed varieties to smallholder farmers as a production innovation (OECD, 2005) to increase farm yields. In the potato partnership, Mtanga Farm Company supplied four improved potato seed varieties to smallholder farmers: Tengeru, Asante, Sherekea, and Meru. The company multiplied basic seeds purchased from TARI-Uyole and had them certified by TOSCI. All four varieties produced higher yields than the local ones. As an FGD participant in Lusitu village stated:

> For CIP [local variety], regardless of whether you follow the recommended farming practices, such as using fertilizers and spraying on time, most of us harvest 20 to 30 bags of CIP from one acre. However, for Tengeru, Meru, Asante, or Sherekea, if you follow all the required farming practices, you can obtain 80 to 90 bags of 100kg per acre.[1]

Mtanga Food Ltd stopped supplying seeds to farmers in 2017 due to low demand from smallholder farmers who could not afford potato seeds each season, leading some farmers to recycle seeds. In 2018, Silverlands and Tanzanice supplied higher-quality potato seeds, introduced by Europlant. Some farmers who adopted them achieved higher yields than the four varieties from Mtanga Farm. One FGD participant narrated:

> STAWISHA brought 12 varieties of potato seeds. In 2018, we operated a one-acre demonstration farm run by STAWISHA for training purposes. STAWISHA introduced new seeds, including Sagitta, Panamera, Jerry, Rumba, Manitu … [2]

In the Soybean strategic partnership, the CDI introduced a soybean project in which it collaborated with TARI-Uyole to produce two soybean varieties (Soya 2 and Soya 4) during the project's first year. TARI-Uyole stopped production due to financial issues. SCL then facilitated the importation of improved soybean seeds by SeedCo Tanzania, which had higher yields. However, the importation lasted only two years because SCL was unable to secure a foreign seed import permit. As a result, farmers continued using low-yield, over-recycled seeds, leading the soybean-buying company to import soybeans from Zambia to meet its chicken feed manufacturing capacity. These findings confirm previous studies showing agricultural partnerships often fail to supply improved seeds to smallholders due to funding issues or private companies ceasing input provision (e.g., Akullo et al., 2018; Senyolo et al., 2021), indicating a failure in PPP innovation goal.

Second, the partnerships linked smallholder farmers to fertilizer and pesticide suppliers, such as Yara, Syngenta, and Alfa Agrovet, which was innovative in ensuring access to inputs. However, these firms weren't formal partners and sold inputs at market prices. Only Isowelu AMCOS members bought high-priced inputs on credit in bulk. One FGD participant noted, "*I benefited from AMCOS because, in 2019/2020, I purchased seeds through loans and other inputs.*"

Soybean farmers did not purchase fertilizers due to their high cost. They only purchased pesticides from agro-input shops in their local areas at higher prices, as there was no market arrangement between soybean producers and agro-input suppliers. An FGD participant shared, "*The cost of pesticides and fertilizers is very high. I wish I could produce more than I do, but it requires a big investment … while the market is unreliable.*"[3]

The findings highlight the importance of contract farming (FAO, 2001) that includes market contracts and input credits or subsidies to improve farmers' access to affordable inputs. Contract schemes can facilitate technology transfer, ensure predetermined prices, and secure market access (Eaton & Shepherd, 2001; Stessens et al., 2004). Proper arrangements, like improved access to quality seeds (Aseete et al., 2023; Hoang, 2021), are crucial.

Third, partnerships successfully helped build the capacity of farmers to produce potatoes and soybeans. As part of production innovation (Van Es and Woodard, 2017) NGOs established demonstration plots to train farmers and improve their knowledge and skills. During FGDs, farmers reported being trained in good agronomic practices (GAPs) for

[1] Participant #6, Focus group discussion, Lusitu village 1st October 2020.
[2] Participant #4, Focus group discussion, Isowelu AMCOS, 5th October 2020.
[3] Participant #3, Focus group discussion, Luganga village 10th October 2020.

potato and soybean production, including selecting high-quality seeds, effective farm management, identifying diseases, selecting and applying pesticides and fertilizers, and knowing when to use them. An FGD participant in Lusitu village said, "*We no longer suffer from fake inputs because whoever received training knows well what kind of pesticides/fertilizers and from which company. Training has opened our eyes regarding fake and genuine products.*"[4]

The findings show partnerships can boost production innovation, supporting earlier research (e.g., Bolo, 2010, p. 11; Ponnusamy et al., 2014; FAO, 2013; Oxfam International, 2014) on agricultural PPPs transferring technologies to smallholders. They also confirm that strategic, well-coordinated, sustainable partnerships along value chains can modernize traditional farming (Bitzer and Bijman, 2014; Aseete et al., 2023; Hoang, 2021). As SAGCOT partnerships evolve and engage diverse actors, inclusive investments (Ros-Tonen et al., 2019) are crucial to benefit marginalized farmers.

4.2.2. Value addition: 'the overlooked yet important'

No major interventions helped farmers add value to their crops. An unfinished building in Lusitu village, built by SCL, was intended for farmers to sort and label potatoes before sale. Due to a lack of quality innovations, farmers sell ungraded potatoes, hurting their market competitiveness. One FGD participant shared, "*When I took potatoes to Mabibo Market, I learned buyers complained that Njombe potatoes were not graded; one bag can have more than two potato varieties. We, farmers from Njombe, could sell our potatoes if no trucks were coming from other places like Mbeya and Kenya*."[5]

These findings diverge from earlier research showing that agricultural PPPs affected high-end technologies and processing (Bolo, 2010, p. 11; Ponnusamy, 2013). The innovation system framework highlights the importance of infrastructure in enabling smallholder farmers to access various nodes along the value chain (Devaux et al., 2009; Narrod et al., 2009; Bitzer et al., 2013). However, the design of the two strategic partnerships lacked interventions to include smallholders in value-added nodes. The soybean partnership involved a processor, while the potato partnership focused on improved seeds; however, investments in crop value addition were not prioritized.

4.2.3. Marketing: 'unsustainable market linkages, non-inclusive new markets, and exploitative middlemen persist'

Partnerships opened new markets for soybeans and potatoes. In Njombe, Silverlands and CARITAS arranged to buy soybeans from farmers in CARITAS's *Soya ni Mali* project. Other NGOs linked farmers to private buyers, like Tanfeeds Limited, approached by CDI. Interviews showed Silverlands only bought soybeans in 2016 and 2017, and Tanfeeds did not buy in 2017, discouraging farmers. For potatoes, SCL identified buyers in Dar es Salaam and Zanzibar, but only benefited a few farmers able to transport potatoes to these regions. One FGD participant claimed, *"There is no agreement among farmers to meet and negotiate the price. The middlemen are the ones who make the decisions. Sometimes, you can agree with middlemen to harvest, but once you're finished harvesting, they say the size of the potatoes is small and they do not buy*".[6]

Findings show that partnerships' market interventions, such as exploring new potato and soybean markets, did not benefit most farmers or were not sustainable. While previous research highlights the importance of partnerships in securing markets through contract farming (Nakazi et al., 2019; Bitzer and Bijman, 2014), SAGCOT's partnerships lack this advantage, relying on trust without established institutional frameworks or effective monitoring.

5. Farmers' capabilities—what has worked, not worked, and why: unpacking the influence of institutions and actors' interactions

5.1. Actors' interactions, institutions, structural gaps and actors' bottlenecks

Actors in two strategic partnerships had different relationships influencing their impact on smallholder farmers. In the soybean partnership, NGOs had strong ties with farmers, mainly due to training and mediation between farmers and the private sector. They also directly connected with soybean buyers, negotiating prices. Conversely, links between private buyers and farmers were weak (see Fig. 1), often mediated by NGOs, lacking formal contract farming, and often dysfunctional after NGO projects ended. Fragmented relationships also existed with fertilizer and pesticide suppliers due to a lack of input credits.

In the potato partnership, initial strong links between private seed suppliers and smallholders faded after Mtanga Food Ltd withdrew (see Fig. 2). Other seed companies then focused on large AMCOS members, creating dysfunctional ties with most farmers. Similar patterns appeared between TOSCI and seed distributors, as interactions stopped after Mtanga Food Ltd left. New seed companies also did not engage with TARI-Uyole. Connections between farmers and private fertilizer and pesticide suppliers also fragmented, partly due to lack of input credits in a market-based approach. As shown in Fig. 2, weak links with new potato buyers led farmers to sell mainly to middlemen.

In both partnerships, there was no interaction between private companies and the Ministry of Agriculture or extension officers. Instead, these companies connected directly with SCL, which serves as a coordinator. Additionally, there were no activities among actors aimed at forming contractual market arrangements between farmers and buyers, promoting value-added crops, or organizing financial services like input credit schemes. Overall, these findings indicate that the actors' network was initially dense at the production stage but became fragmented or disappeared in the marketing and value-addition nodes. The withdrawal of key private actors, such as Mtanga Foods Ltd. in the potato strategic partnership and Silverlands in the soybean strategic partnership, had a negative effect on the networks.

5.2. Structural gaps and actors' bottlenecks

An analysis of actors' interactions along crop value chains and institutions reveals gaps and bottlenecks affecting performance and sustainability. Table 2 below outlines the specific challenges and causes faced by each actor.

In the next section on capabilities, we explain how the structural gaps and actors' bottlenecks impacted farmers' capabilities at different nodes for two crops.

5.3. Production capabilities

The strategic partnerships achieved significant milestone in imparting production capabilities in terms of knowledge and skills to farmers, enabling them to produce potatoes and soybeans. This was achieved through several trainings on good agronomic practices (GPAs) in both crops, organized by the NGO partners and SCL. As a female producer of potatoes from Ngaranga village said, *"Since I received training, I can no longer buy fake pesticides because I check the label and the manufacturer's information. In the past, we didn't know the right pesticides to use, and by the time we applied them, the farms were already infected …"*.[7]

[4] Participant #5, Focus group discussion Lusitu Village, 1st October 2020.
[5] Participant *#7,* Focus group discussion, Lusitu Village, 1st October 2020.
[6] Participant *#7,* Focus group discussion, Lusitu Village, 1st October 2020.
[7] In-depth interview, farmers group leader, Ngaranga village, 30th September 2020.

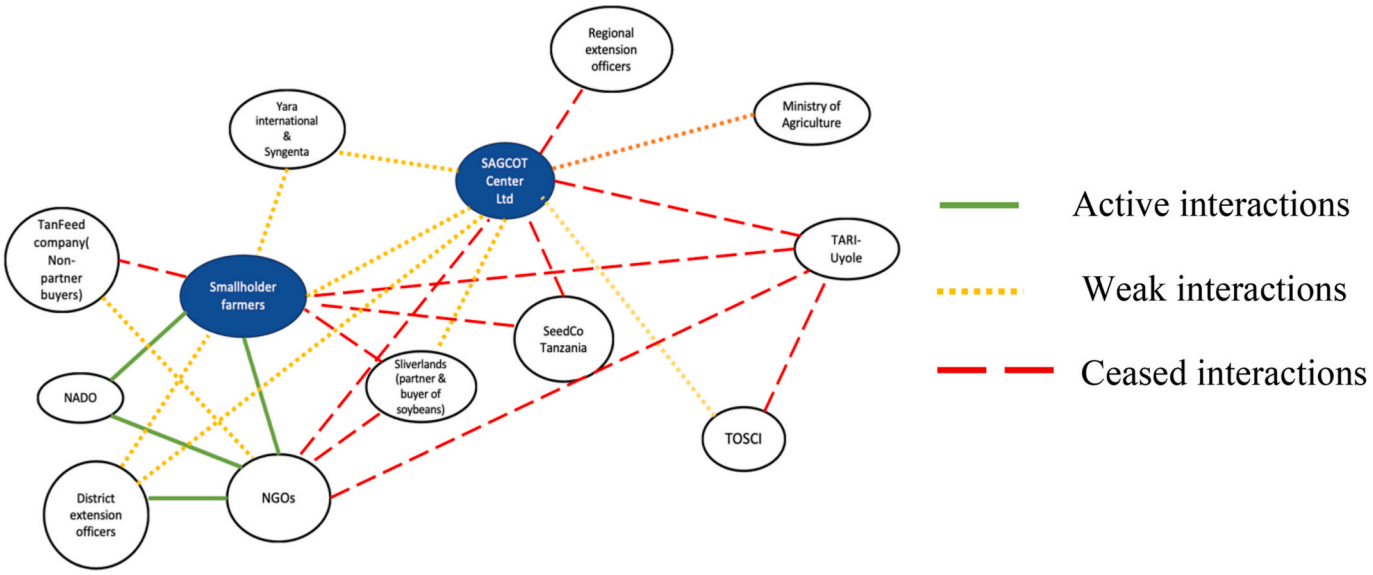

Fig. 1. Actors' network in soybean strategic partnership.

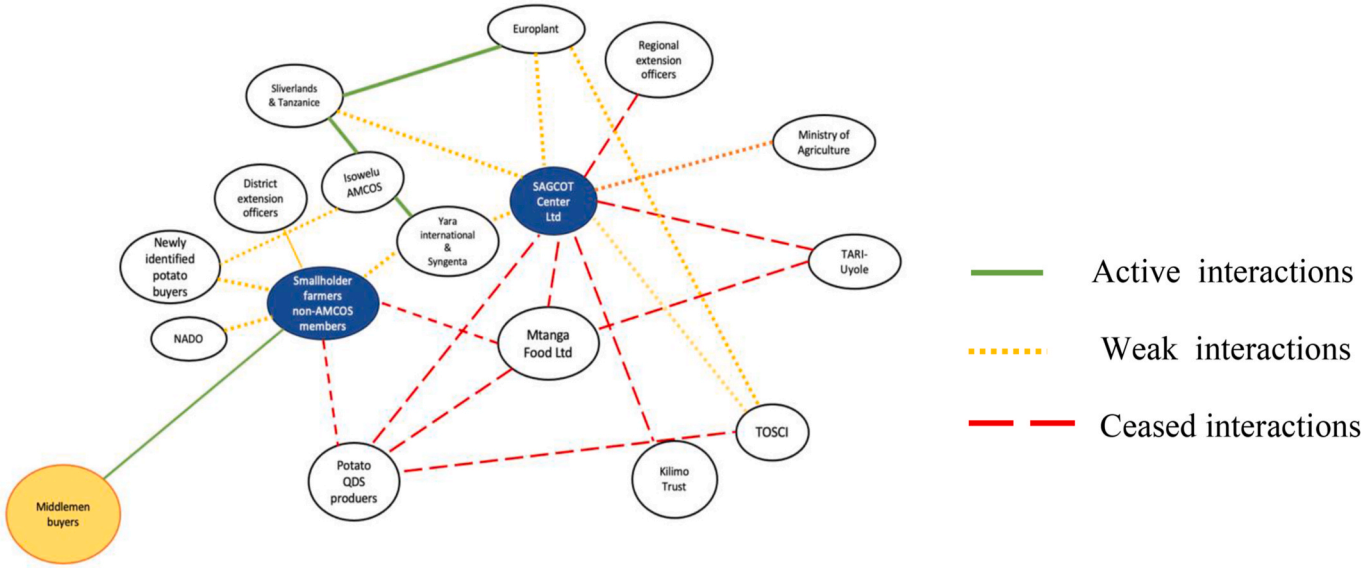

Fig. 2. Actors' network in potato strategic partnership.

Similar responses were captured during the FGDs with soybean farmers. A participant explained, "*The training we received focused on planting soybeans properly, applying pesticides, and harvesting when appropriate. The training has given us confidence in producing soybeans because we have all the skills needed.*".[8] Applying GAPs and adopting improved seed varieties increased crop production per unit area. For example, the FGD participants in Njombe reported increased potato production per unit area from 50 bags of local seeds to at least 80 bags of improved varieties per acre. For high-quality imported potato seeds, such as Sagitta, AMCOS members reported an increase of over 200 bags of potatoes per acre.

Nevertheless, most farmers did not improve production capabilities beyond skills and knowledge. Declines in improved seed supply by private companies and lack of input credit schemes for agro-chemicals led to unsustainable access issues. A participant in Mngate village, Wanging'ombe district, complained:

> We like to produce soybeans, but we are discouraged by the scarcity quality of seeds. We have been recycling these seeds for more than four years. I have learned that yields reduce season after season. Now, where to buy the seeds … ?[9]

Generally, the partnerships' contribution to farmers' access to agro-inputs was limited due to few input-access arrangements with suppliers. By the study, Silverlands and Tanzanice supplied new high-quality potato seeds, but only Isowelu AMOCS members in Njombe could access them. Silverlands and Tanzanice reported dealing with disorganized smallholders was costly. Partnerships also failed to improve access to financial services and modern tech like irrigation and equipment. Smallholders kept using local tools and rain-fed farming, limiting production. As one FGD participant in Mngate village claimed:

[8] Participant #4, Focus group discussion, Mngate village, 7th October 2020.

[9] Participant #3, Focus group discussion, Mngate village, 7th October 2020.

Table 2
Actors and the bottlenecks they faced, and actors or factors they pointed out to be the cause.

crop	Actor	bottlenecks they faced	Actors or factors they pointed out to cause the bottlenecks
Soybean	Private partner (buyers)	• Demand of high price by the smallholder farmers • Low production by smallholder farmers	• High production costs by farmers caused by high price of inputs and small farms • No collective farming
	Company supplier of improved soybean seeds	• Short-term seed importation permission • Inability to establish a sustainable seed market	• Unfavorable country regulation on seed importation
	NGOs	• Private actors driven by profit maximization • Unreliable private actors • Involvement based donor-funded projects	• Donor funded project limiting the sustainability • Difference in terms of logics used by private companies (maximizing profit) and NGOs (serving the community interests)
	Agricultural research institute	• Unable to sustain soybean seed production due to lack of financial resources	• Unsustainable funding from the NGO
	Smallholder farmers	• High price of pesticides and fertilizers • Unsustainable supply of soybean seeds • Low price of soybeans by private companies • Unreliable buyers	• Lack of market contracts between farmers and private companies • NGOs temporal involvement
Potato	Private supplier of potato seeds	• Low demand of potato seeds	Low capacity of farmers to buy potato seeds
	Agricultural research institute	• Inactive engagement in production of high quality of imported seeds introduced by STAWISHA	• Production and supply of potato seeds to farmers by private companies
	Foreign company supplier of basic potato seeds to multiplier companies	• Low supply of high-quality potato seeds • Lack of a business model that work in the local context	• Low uptake of high-quality potato seeds by farmers due to low capacity
	Private suppliers of high-quality potato seeds to smallholder farmers	• Low demand by smallholder farmers	• Low purchasing power • Lack of reliable profitable market for produced potatoes
	Smallholder farmers	• Exploitative middlemen • High price of high-quality potato seeds introduced by foreign companies • High production cost of high-quality potato varieties as they need fertilizers and pesticides	• Lack direct contact with company buyers of potatoes • Lack of contractual arrangement between buyers of potatoes and suppliers of inputs • Unorganized farmers/lack of strong farmers associations
Potatoes and soybean	Private suppliers of pesticides and fertilizers	• Low purchase of such inputs by smallholder farmers	• Lack of agro-input access aggregation among farmers

> We would like to produce soybeans if we had inputs and simple machines. I saw some farming machines during the Nane-Nane Exhibition that can be used to plant and peel soybeans, but I have no idea where to buy them. We have acquired production skills but we cannot produce much because we lack capital and simple machines[10].

Additionally, farmers reported low production due to poor returns caused by exploitative market structures. Factors restricting the impact of partnerships included fragmented and poorly coordinated investments in agricultural inputs from private companies. These issues, highlighted in the 2017 SAGCOT forum, still remain (SAGCOT, 2017). The gap between PPPs and smallholder priorities has been noted before (e.g., Fairtrade Foundation Previous research shows input microcredits, credits, and insurance help smallholder farmers adopt new technologies, boosting production (Aseete et al., 2023; Hoang, 2021). Our findings confirm that without proper partnership designs and institutional frameworks addressing smallholder farmers' challenges, agricultural partnerships may primarily benefit private actors (Savas, 2000).

5.4. Value addition capabilities

The strategic partnerships did not impact value-adding capabilities among smallholder producers of soybeans and potatoes. The failure of partnership to contribute to this kind of capabilities along the value chains was attributed to the absence actors' interactions in the value-addition nodes. As indicated in the previous section, there were not any partnerships' interventions or investments that targeted the inclusion of smallholder farmers in the value-addition nodes. Our findings diverge from earlier research, which reports that agricultural PPPs contributed to facilitating the development of high-end technologies and processing (Ponnusamy, 2013).

5.5. Marketing capabilities

Smallholder potato farmers received training on commercial production, including cost and benefit calculations, and were informed about buyers in Dar es Salaam, Dodoma, and Zanzibar. One participant reported, *"SAGCOT educated us and connected us to different buyers. Before SAGCOT, I knew nothing about the market, for example, that of Masasi … I also was able to take potatoes to Mabibo market in Dar es Salaam. I packed them in the truck and transported them to Dar es Salaam myself*".[11]

FGDs showed most farmers struggle to access new markets individually. Smallholders face challenges like failing to negotiate fair prices and dealing with exploitative middlemen. One FGD participant from Lusitu village reported, "*You can bargain with the middlemen to come and harvest, but after harvest, the middle can change the price, saying the market price has dropped. Sometimes, they do not pay all the money. The middlemen are torturing us*."[12] The persistence of middlemen was linked to limited direct contact between potato buyers and farmers. Few farmers who attempted to sell potatoes in Mabibo market, Dar es Salaam, encountered an established middlemen system. A Lusitu village FGD participant explained.

> When you enter the Mabibo market, the middlemen handle the track because when you arrive, you don't even know the trending price … the prices fluctuate. For example, at 5 am, the price is Tsh 45,000 per kipeto, but when it reaches 8 am, the price reduces. Also, the middlemen are the ones who bargain the price..[13]

Additionally, a persistent challenge with middlemen was buying potatoes in bags with extra weight (l*umbesa*). Standard bags weigh 75 kg, but those with *lumbesa* weigh about 90 kg. One FGD participant

[10] Participant #4, Focus group discussion, Mngate village, 7th October 2020).

[11] In-depth interview, farmers group leader, Ngaranga village, 30th September 2020.

[12] Participant #1, Focus group discussion, Lusitu village, 1st October 2020.

[13] Participant *#7,* Focus group discussion, Lusitu village, 1st October 2020.

stated, "*The major challenge is lumbesa, because if you do not put lumbesa you cannot sell in the market. As you stay in the market with potatoes, even the price goes down, so in the end, you find that you get much loss…*"[14]

Regarding soybean markets, the partnership involved a soybean buyer, with NGOs seeking other buyers to ensure market availability. Farmers had no direct contact with buyers as NGO implementers and farmers' leaders handled price negotiations. Most FGD participants said they never negotiated prices with buyers. They wanted to sell soybeans at a minimum price of TZS 1000 per kilo, but the partner company's price ranged from TZS 500 to 700 per kilo. FGD participant in Kilolo lamented, "*We produced soybeans but we never even met the buyers. We just receive information that the price this year is this much but we cannot negotiate the price. We sell out our soybeans at a very cheap price. How can we buy expensive inputs in this case*?"[15]

The lack of direct interaction affected farmers and buyers. NGO-led market initiatives, such as CARITAS's soybean project, ended after a phase-out as the company stopped buying soybeans in 2018. Similarly, soybean farmers in the CDI project in Iringa did not sell after the company's 2017 withdrawal. The findings indicate how failure to established strong farmers' associations limited their ability to voice concerns and negotiate better prices. Most farmers remained marginalized, disorganized and unable to access inputs or profitable markets. This contrasts with earlier studies that found agricultural PPPs helped farmers access markets at set prices (Nakazi et al., 2019; Bitzer; Bijman, 2014; Ponnusamy, 2013). Our findings highlight the importance of formal farmers' associations, which connect farmers to private companies (Bolo, 2010, p. 11).

Additionally, the absence of contracts between private companies, NGOs, and smallholder farmers leads to unreliable crop buyers. Contract farming offers markets at predetermined prices (Nakazi et al., 2019; Bitzer & Bijman, 2014), addressing Reed and Reed's (2009) concern that corporations pursue partnerships for their interests. Therefore, formal institutions are necessary to facilitate and regulate interactions.

6. Conclusions and recommendations

This study examined agricultural partnerships within the SAGCOT PPP initiative and their effects on smallholder farmers in soybean and potato value chains. The findings are mixed, influenced by actor interactions, fragmented efforts, and institutional factors. Partnerships improved skills and yields by providing quality seeds and best practices; however, unsustainable investments and a lack of input credit schemes limited their durability. Contributions to value addition and marketing capabilities remained limited. Although new markets emerged, without mechanisms such as contracts and collective bargaining, interactions were weak, leaving smallholders vulnerable to exploitation.

This study shows that strategic partnerships alone do not ensure inclusive innovation or benefit smallholder farmers. Continuous interactions (Carlsson et al., 2002; Lundvall et al., 2002), institutional setups, and resource flows are crucial for developing farmers' capabilities within value chains. Without these, partnerships may favor private interests over transforming subsistence farmers. The research highlights that the legitimacy of the PPP model in transforming subsistence farmers into commercial ones depends on solid institutions, such as cooperatives and formal agreements, which are crucial for effective partnership support.

The study has limitations in replicability and generalizability. It employed qualitative methods, capturing the subjective experiences of specific actors and farmers at a particular point in time. As SAGCOT's partnerships are dynamic and involve new actors, repeating the study may yield different results due to changing partnership dynamics, market conditions, and perspectives. These findings can't be generalized to other crops, regions, or partnerships in Tanzania and sub-Saharan Africa, where different contexts matter. Future research should combine qualitative and quantitative methods with larger, diverse samples across regions and crop value chains to improve replicability and generalizability.

Based on these findings, we recommend the SACGOT PPP initiative develop input-credit schemes and adopt contract farming with clear roles, prices, and dispute mechanisms. These contracts should provide smallholder farmers access to affordable seeds, inputs, and secure markets. They should also establish the SAGCOT Strategic Partnerships Coordination Unit to formalize agreements, monitor compliance, and manage exit plans. Partnerships should support farmers' associations for input procurement, price negotiations, and market access, including capacity building. Investments in storage, sorting centers, and irrigation are also essential.

CRediT authorship contribution statement

Judith S Kahamba: Writing – original draft, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Xiuli Xu:** Review-original draft, Validation, Supervision, Conceptualization.

Data availability statement

Data is available upon request.

Ethics statement

Not applicable.

Declaration of the use of AI assisted technologies

AI was not used.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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[14] Participant #1, Focus group discussion, Nganda village, 2nd October 2020.
[15] Participant #4, Focus group discussion, Luganga village, 10th October 2020.

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