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Unseen catalyst: How networking facilitation and brokerage drive agri-food innovation amidst growing innovation support service diversification in the global south

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Abstract

This paper examines the role of networking service activities in fostering sustainability-oriented innovations in agriculture and in the agri-food sector. It focuses on case studies from Cameroon, Madagascar, and Burkina Faso. While existing current research on networking for innovation has focused on management and business issues, this study introduces and uses the novel concepts of "service situation" and "Innovation Support Services (ISS)" to analyse the role of networking service activities in agri-food innovation processes. The findings reveal that networking activities were not prioritised as key services by service providers instead, the focus was on resource access and capacity-building services. Additionally, institutional support for niche innovations and demand articulation services were observed to be lacking. The study underscores the necessity for a more comprehensive service portfolio that extends beyond technical training, advocating for the deliberate incorporation of networking, institutional support, advisory, consultancy, and backstopping services into innovation processes. The study further proposes a categorisation of networking activities into two distinct types: managed (intentional) and informal (unintentional). This categorisation is intended to facilitate a more precise assessment thereby enhancing their role in promoting innovation. The paper further postulates that networking services, although invisible, are pivotal for the success of innovations by providing adaptable support throughout different phases. By strategically delineating networking approaches for each innovation phase, service providers and beneficiaries can enhance the effectiveness and outcomes of innovation efforts in the agri-food sector.

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Keywords

networking activities – Innovation Support Services (ISS) – innovation – innovation support providers – agriculture – Agri-food sector

1 Introduction

> Although networks and innovation are everywhere and dozens of diverse disciplines have worked in this field, the scientific production has mostly concentrated on management and business subjects. (Cárdenas, 2021, p. 14)

Within the context of research and development projects, including policy instruments in the European Union (EU) and EU-African partnership forums, there has been a growing interest in the support of interactive innovations in agriculture through targeted services (Fieldsend et al., 2021; Wielinga et al., 2017). To better capture such services, recent studies have proposed the need for re-conceptualising and complementing advisory services with innovation support services (ISS) (Audouin et al., 2021; Faure et al., 2019; Kilelu et al., 2014a; Mathé et al., 2016). One such ISS function which includes specific activities such as improving relationships between actors, and strengthening collaborative and collective action has been referred to as "networking facilitation and brokerage" (Basile, 2011; Liebowitz, 2007; Pittaway et al., 2004a; Wielinga et al., 2008). It is derived from the term "networks" used in business management sciences as a structure or place where actors within one or between several related industrial sectors interact and collaborate to add value for the customer (Omta, 2004). On the other hand, networking refers to the activity or process of identifying and acting on complementary interests with or without a formal means of cooperation. Though networks and innovation are everywhere and dozens of diverse disciplines have worked in this field, current scientific publications have mostly concentrated on management and business topics (Cárdenas, 2021, p. 14).

In the context of sustainability-oriented innovations in agriculture, this activity plays an important role in the adoption and diffusion of innovations, by increasing the information flow and connection between the actors involved. Studies have highlighted the important role of networking as a service activity toward the success of interactive innovations (Faure et al., 2019; Ndah et al., 2018). Specifically, Kroma (2006) and Moschitz (2015) stated that networking activities allow for interactions and the exchange of new knowledge, unlock problematic situations, find new opportunities, and foster learning situations. Again, DeBresson and Amesse (1991) in their study confirmed that innovators and innovative organisations that succeed are mostly those able to connect with other circles of influence as well as get access to new resources and information outside their locality. In a study, focused on analysing 43 innovation cases across 13 EU countries, Faure et al. (2019) and Ndah et al. (2018) revealed in their findings the significant role of networking service activity on the success of innovations. Besides, they argued that different forms of networking service activities are required for different types of innovations and at different phases of the innovation processes to overcome specific problems towards enhancing the innovation process (Faure et al., 2019; Ndah et al., 2018).

Despite these observed emphases and the importance of networking service activity, its role within the innovation process has been poorly explored. So far little research has addressed the diverse roles played by networking in processes of innovation (Robertson et al., 2003). Questions such as 'who offers networking services and when?' have not been addressed. Again, a comparative diagnosis of the extent and importance of networking services to other pluralistic service functions or in combination is yet to be closely examined. In summary, in one of our latest studies (Ndah et al., 2021), we postulate that, when examined alongside other service activities, networking activities are often seen as invisible but necessary service activities towards enhancing innovation processes.

Inspired by these knowledge gaps, this paper examines the role of networking service activities in fostering innovation from two perspectives: 1) Dynamic Perspective i.e., the timing and providers of networking activities throughout an innovation process. It investigates when these activities occur and identifies who is responsible for delivering them. 2) Relative Perspective i.e., interplay of networking service activities with other Innovation Support Services (ISS).

To achieve these objectives, we identified, described, and analysed critical service situations where i) the conditions for effective performance were clearly defined, and ii) the need for networking activities was evident and successfully addressed. The study focuses on six innovation cases across three Global Southern countries (Cameroon, Madagascar, and Burkina Faso). Through

this analysis, the paper aims to enhance our understanding of how networking services contribute to the innovation process.

2 Theoretical and Conceptual Basis

2.1 *Innovation support services and service situation*

Based on the conceptual discussions in economics and agricultural extension literature (Faure et al., 2011; Labarthe and Laurent, 2013a) about the nature of services, we adopt the definition of an innovation support service (ISS) as an activity, which is immaterial and intangible. Building upon previous publications we postulate that a service by its nature "*involves one or several support service providers and one or several beneficiaries in activities in which they interact to address an explicit demand emerging from a problematic situation formulated by the beneficiaries and to coproduce the services aimed at solving the problem*" (Mathé et al., 2016, p. 6). A service as an interaction therefore aims at achieving one or several beneficiaries' objectives based on the willingness to enhance an innovation process, i.e., fostering technical and social design, enabling the appropriation and use of innovations, facilitating access to resources, helping transform the environment and strengthening the capacities to innovate (Mathé et al., 2016; Ndah et al., 2023; Toillier et al., 2018). The context in which the above ISS takes place illustrates what we refer to as a "service situation" and we use this frame to represent both the structural and dynamic elements underpinning the functioning of the Innovation support service providers (ISP), and respective clients or beneficiaries (Figure 1).

A service situation captures the interaction between one or several service provider organisations (ISP) and one or several beneficiaries of services at a specific moment in time (t) in the innovation process e.g., initiation, implementation or dissemination phase. For service provision to take place (Figure 1), the service provider (ISP) [through its agent] does interact with the beneficiaries' organisation(s) (A1, A2, A3. A4 ..... N) or directly with individual beneficiaries to coproduce one or several services which solve(s) the problem of the beneficiary (Gadrey, 1994; Hoffmann et al., 2009; Labarthe and Laurent, 2013b). Ideally, the interaction between the service provider and the beneficiaries results in an ISS. However, the co-creation of services does not apply in all situations. This is especially true where traditional extension systems involving the linear transfer of technology (ToT), training and visits (TandV)

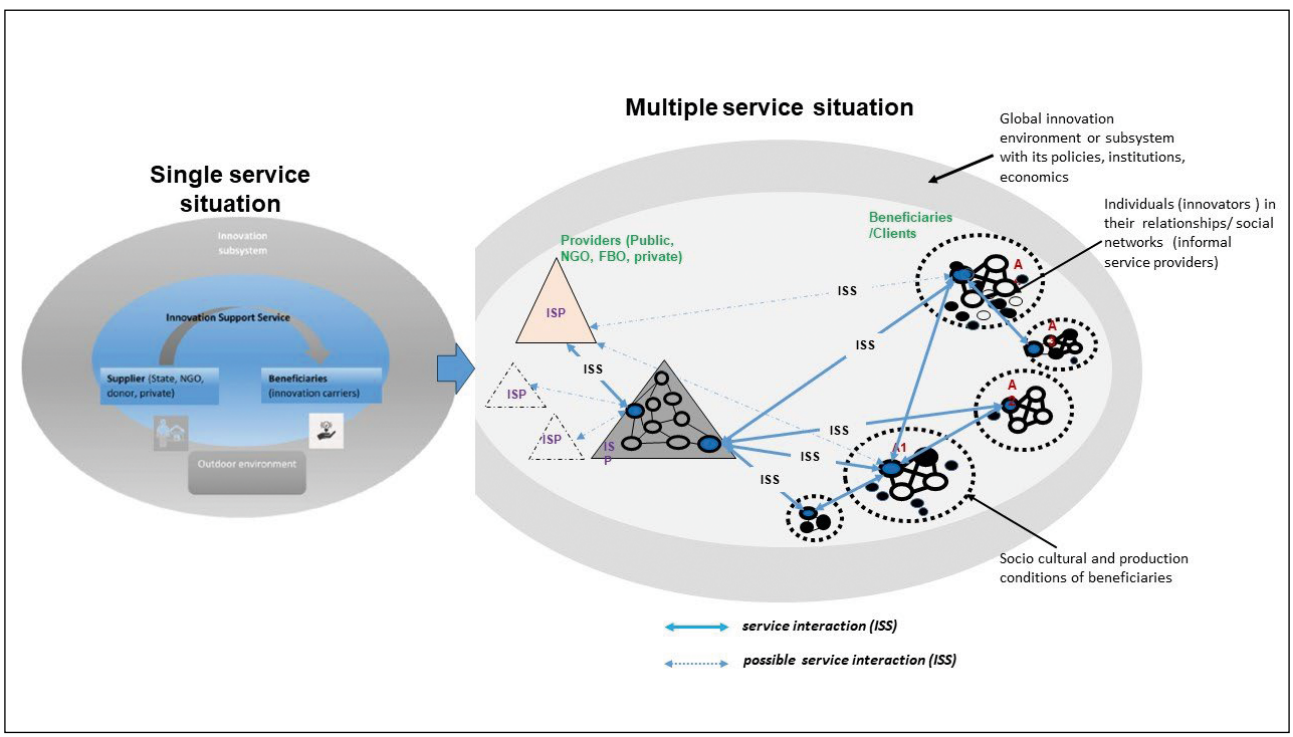

FIGURE 1 A framework for the service situation

and the trainers' approaches still take precedence (Ison and Russell, 2000; Koutsouris and Zarokosta, 2020; Landini and Conti, 2023).

The entire ISS activity is embedded within a broader environment which is shaped by e.g., policies, institutions, and economic conditions (Figure 1). The figure places one service provider at the centre of the interactions, but in practice, there are varied service providers with characteristically different types of interactions and ISS. With this framework, we assume that causes of success or failure in a successful service provision may occur at any point in the overall service frame i.e., be it at the agent, organisational, inter-organisational or broad environment levels.

2.2 *Typology of innovation support services*

To explore networking activities from a relative perspective, and to assess the importance of networking services in relative terms, we utilize a generic typology of service functions. This typology was initially derived from the literature by Mathé et al. (2016) and further refined through fieldwork in Europe (Faure et al., 2019; Ndah et al., 2018) and Africa (Toillier and Kola, 2018; Agrinatura and FAO, 2019) (Table 1).

2.3 *Typology of innovation support service providers*

For capturing innovation support service providers, we used an adapted typology initially proposed within EU-related studies (Faure et al., 2019; Ndah et al., 2018) and adjusted based on field experiences across case studies in Africa. This typology categorises service providers into several distinct groups based on their structure and purpose, including private organizations like consultancy firms and cooperatives; national public organizations such as government ministries and research institutions; and international public organizations that promote innovation abroad. Additionally, non-governmental organizations (NGOs) focused on social or environmental causes; farmer-based organizations, including professional associations; hybrid organizations, which are temporary collaborations like project consortia; and informal service providers, including family, friends, and local community members offering informal support.

TABLE 1 Adapted typology of ISS

Adapted typology of ISS	Brief description
1. Knowledge awareness creation and exchange	Activities and tools contributing to knowledge dissemination (Research results dissemination, farmers' awareness raising) and exchange (demonstration fields, fairs, workshops, conferences, various Media and contents)
2. Advisory, consultancy and backstopping.	Advisory, consultancy and backstopping activities aimed at solving problems and construction of solutions to actors' demand
3. Networking, facilitation, and intermediation	Services to organize networks; improve relationships between actors, to align services, all activities aimed at strengthening collaborative and collective action
4. Capacity building on technical issues, crop, and animal production	Activities linked to classical training targeted at advancing farmers' technical knowledge on aspects of animal and crop production including operating technical machines, and other technical devices within the farm context
5. Capacity building on functional issues, group formation and management	Services comprise the provision of training geared towards collective actions and group formation. Experiential/participatory learning processes, training on group leadership and facilitation all fall into this category
6. Demand articulation.	Services targeted to help actors express clear needs to research, service providers, and other actors in the market
7. Improving access to resources.	Services enhancing the acquisition of resources for the innovation process (access to inputs facilities and equipment and funding).
8. Institutional support for scaling up	institutional support (incubators, experimental infrastructures, etc.), support for the design and enforcement of norms, rules, funding mechanisms, taxes, and subsidies

Adapted from Faure et al., 2019; Labarthe and Laurent, 2013; Mathé et al., 2016; Ndah et al., 2018; Toilier et al., 2018; and complemented with field experience.

2.4 *Forms of networking as service activities for innovations*

2.4.1 Networking as events and facilitated activities

After consolidating networking activities into a single overarching function called 'Network facilitation and brokerage' (Mathé 2006, Ndah 2018, Faure 2019) (see Table 1), the authors further postulate that specific forms of networking may include service activities designed to enhance collaborative and collective action. These activities encompass organising innovation fairs, facilitating round table discussions, maintaining interaction platforms, managing social media sites, and serving as mediators (Table 1).

2.4.2 Networking as bridging, linking and bonding activities

In their work, Gellynck and Kühne (2010) explored the concept of networking, distinguishing between vertical and horizontal forms of networking. According to Gellynck and Kühne (2010), vertical networking signifies the collaboration of partners at disparate stages of the same value chain, encompassing all upstream and downstream flows of products, services, finances, and information. These findings are consistent with the concepts of bridging and linking social capital, as described by Cofré-Bravo et al. (2019). The aforementioned authors refer to these concepts as the "links between separate dense networks for collaboration and coordination, characterised by larger and looser networks with weaker ties, and as norms of respect and networks of trusting relationships between people interacting across formal or institutionalised power gradients in society". The role of bridging and linking in networking activities is further consistent with the concept of "open networking" proposed by Coleman et al. (2001). Horizontal networking, in contrast, refers to the collaborative efforts of firms that are primarily competitors within the same sector, or stage of the value chain or industry. Such collaborations may take the form of strategic alliances or joint ventures with the objective of facilitating information exchange to benefit fostering social benefits, and developing informal relationships. Pittaway et al. (2004b) state that such networking facilitates the safeguarding of property rights when complete or contingent contracts are not possible, while Robertson et al. (2011) suggest that horizontal networking acts as a key vehicle for obtaining access to external knowledge. This perspective is consistent with the findings of Cofré-Bravo et al. (2019) and Klerkx and Proctor (2013), who discuss bonding social capital as trusting and cooperative relationships between network members, characterised by thick trust, dense multiple networks, generally informal collaboration, and long-term reciprocity. The aforementioned bonding ties correspond to strong ties between homogeneous groups and intra-community networks (e.g., peers, neighbours, friends, and family). This corresponds to the concept of closed networking elaborated by Coleman et al. (2001).

2.4.2.1 *Implications of the above theoretical underpinning for this contribution*

Considering the examples of networking activities (Mathé 2006, Ndah 2018, Faure 2019) and the outlined forms of networking (Cofré-Bravo et al., 2019; Gellynck and Kühne 2010; Klerkx and Proctor 2013), we argue that networking activity involves all forms of collaboration, cooperation, and interactions. This reflects the interaction and co-creation processes that prevail during the "service situation" process (Figure 1), irrespective of the type of ISS that emerges as an outcome of such interaction. Thus, it can be concluded that each service and service situation inherently involves networking activities, which can be either visible (as forefront dominant activities) or invisible (as second-level implicit activities), all serving as catalysts for enhancing innovation processes. The important role of bridging, linking, or bonding as networking activities in the success of innovations necessitates a close examination and enhancement to promoting innovation processes.

Based on the above conceptual grounding, this contribution examines several aspects of networking service activities from a dynamic perspective (i.e., the timing and providers of networking activities throughout an innovation chronology) and a relative perspective (i.e., interplay of networking service activities with other Innovation Support Services (ISS). These perspectives provide a comprehensive understanding of the multifaceted role of networking in supporting and driving innovation.

3 Methodology

3.1 *Studied innovation cases*

The targeted innovation for this study was selected through a participatory interactive process characterised by a series of bilateral talks and discussions between the practitioners, research teams and case owners using a predefined selection grid. This grid revealed the novelty

(newness) of the innovation, the main issue driving the innovation process, the scale of the innovation, the phases of the innovation process, the main obstacles to the success of the innovation and the potential of the innovations to impact on sustainable agriculture and agri-food system. For this contribution, we limit to six cases within which conditions for a service's performance could be clearly stated, and where the need for networking service activities became evident and was successfully fulfilled. Besides, we purposely target cases that fall within the stable (subsistence) and organic farming subsystems (Mathé et al., 2023; Ndah et al., 2020) across the 03 countries (Madagascar, Burkina Faso, and Cameroon) (Table 2).

3.2 *Data collection and analysis*

Data was collected through a mixed-method approach grounded in participatory, multi-stakeholder, and systemic activities. Especially specific tools for data collection included group and individual interviews, as well as a literature review. These resulted in detailed innovation chronologies and learning histories (narratives) for the six cases (Table 2) – all capturing the diversity and dynamics of service situations and influencing environmental factors along the different phases of innovation processes.

We implemented an ex-post data analysis process that began with the selection and prioritization of key service situations through participatory workshops involving the country research teams. Following this, we conducted a detailed characterization of the prioritized service situations using the MS-Excel-based innovation support service matrix (Ndah et al., 2020). This matrix not only identified the actors and their service activities across various cases and phases of the innovation processes but also provided insights into how service needs were articulated, how services were delivered, and which policies and socio-economic norms facilitated or hindered these processes. The extracted data were systematically organized and transformed into MS-pivot tables to enable cross-relational data analysis. This process culminated in the visualization of targeted results in the form of tables and graphs.

4 Findings

4.1 *General overview*

112 service situations across 06 innovation cases have been identified and analysed (Table 3). With findings from these situations, the frequency and ranking of networking innovation support services were analysed to

TABLE 2 Studied innovation case studies

Country	Title of innovation	Main problem/concern	Innovation subsystem (Mathé et al., 2023; Ndah et al., 2020)
Madagascar (MG)	Potatoes Postharvest storage	How to solve the problem of potatoes' post-harvest losses and hunger gap periods	Stable crop production subsystem
	Organic pink berries production (farmers' cooperative)	introducing pink berry cultivation into producers' production systems, new production techniques (hole setting, fertilisation, pruning, etc.) and packaging	Organic farming subsystem
Burkina Faso (BF)	Organic cotton farming	How to guarantee the certification of economic, social, and environmental standards in the production, exportation, and distribution of textile products	Organic farming subsystem
	System of rice-fish cultivation	How to optimise water resource use and reduce synthetic products	Stable crop production subsystem
Cameroon (CM)	Case of 24-hour cassava retting	How to improve the rapid processing of cassava roots to avoid physiological deterioration after harvest	Stable crop production subsystem
	Participatory guarantee system	How to improve the marketing of organic products	Organic farming subsystem

TABLE 3 Overview of identified service situations across innovation cases.

Innovation cases	Advisory, consultancy, and backstopping	Demand articulation	Improving access to resources	Institutional support for scaling up	Networking, facilitation, and intermediation	Capacity building on functional issues	Capacity building on technical issues	Knowledge awareness creation and exchange	Grand total
24-hour cassava retting (CAM)	0	0	0	0	0	11	1	0	**12**
Participatory guaranteed system (CAM)	0	1	5	0	1	0	4	3	**14**
Rice-fish farming (BF)	1	0	4	0	2	2	9	1	**19**
Global Organic Textile Standard (BF)	1	0	0	0	5	0	3	2	**11**
Organic pink berries production (MG)	0	0	10	1	2	2	5	3	**23**
Potatoes seed storage (MG)	13	0	8	3	4	3	1	1	**33**
Grand Total	**15**	**1**	**27**	**4**	**14**	**18**	**23**	**10**	**112**

CAM: Cameroon; BF: Burkina Faso; MG: Madagascar

understand their multifaceted role in supporting and driving innovation. Specifically, we analysed how networking services, in combination with other Innovation Support Services (ISS), interact to enhance different types of innovation. We also investigated networking as an often unseen and unintentional activity, recognising its significant but typically unacknowledged contributions to innovation. Additionally, we assessed the importance and impact of networking throughout various phases of the innovation process, providing insights into its role at different stages. Lastly, we examined the diversity of networking forms across different types and phases of innovation, highlighting how these forms vary and adapt. These perspectives collectively offer a detailed and nuanced understanding of how networking services facilitate and bolster the innovation process, particularly in the agro-food sector.

4.1.1 Service activities across innovation cases

From a ranking of service activities (high to low) in terms of occurrence across the cases, the following order was observed:

1) improving access to resources (27);
2) capacity building on technical issues (e.g., training on crop, and animal production (23),
3) capacity building on functional issues (e.g., group formation and management) (18),
4) activity for Advisory, consultancy, and backstopping (15) and
5) networking, facilitation, and intermediation activities (14).

Service activities related to facilitating farmers' demand articulation (01) and institutional support for scaling up (4) were observed to be limited or missing. Results further show a strong variation in the observed number of services across innovation cases, ranging from 11 for the potato conservation case (MG) to 33 for the global organic textile case (BF).

At the country level, Madagascar cases have been observed to attract the most service situations for both organic and subsistence farming-related cases (33 and 25). However, there is no major difference in the absolute number of service activities observed for Burkina Faso (11, 19) and Cameroon (14, 12) cases (Table 3). Furthermore, an observation was made that certain cases, such as the potato case (BF), elicited all seven service activities, while others, including the 24-cassava rating (CM), attracted only two out of seven service activities.

4.1.2 Networking as an invisible and unintentional activity across cases

The results indicate that, in addition to the 24-cassava ratting case (CAM), networking service situations with corresponding activities have been observed across five out of six innovation cases. However, these activities have been identified as invisible and unintentional, with lower intensity compared to other service activities.

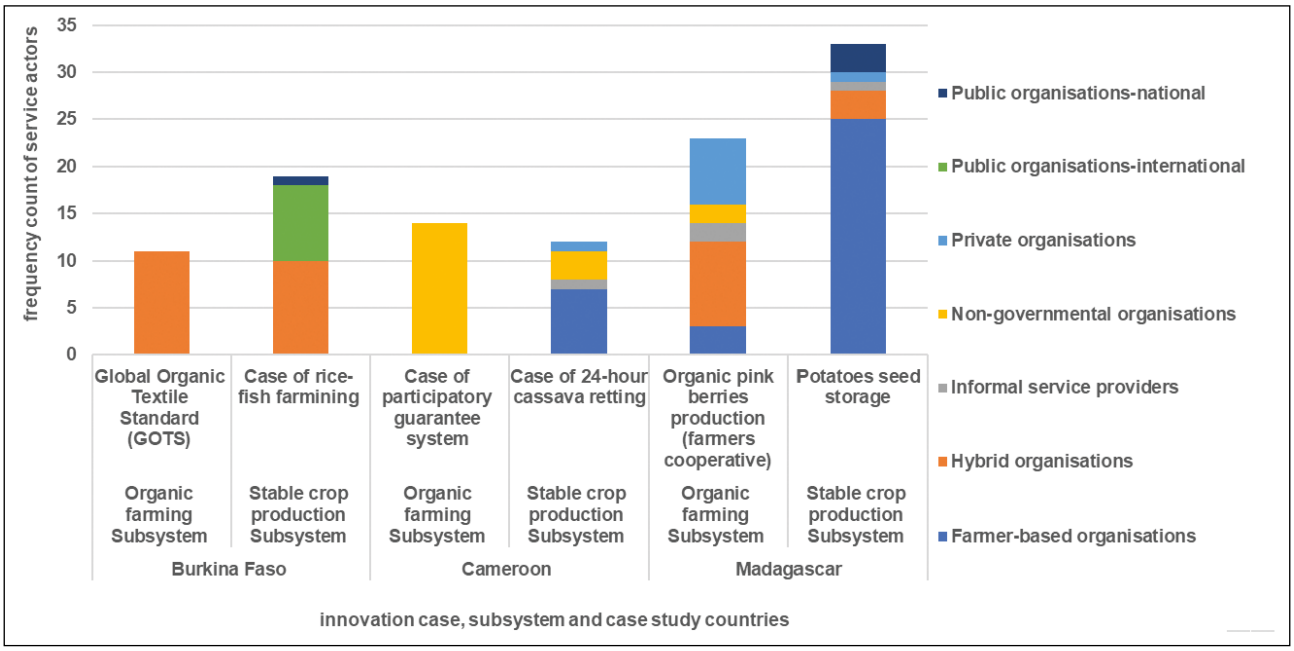

FIGURE 2 Networking service activities across cases within subsystems of innovations

Again, while no emerging cross-cutting pattern is noticed in the distribution of observed networking activities, the Organic textiles case (BF) and potatoes case (MG) appear to have attracted slightly more networking activities compared with other cases (Figure 2).

Regarding innovation subsystems, there appears to be a slightly higher presence of networking service activities for the stable food crop innovations compared with the Organic innovation subsystem cases in Madagascar. This observation is opposite in the case of Burkina Faso with networking activities slightly present for Organic subsystem cases compared to stable food subsystem cases. The above observation for Madagascar and Burkina Faso is completely different for the case of Cameroon with networking service activities observed to be either very low (e.g., case of participatory guaranteed system) or completely missing (e.g., case of 24-hour cassava retting) across the studies innovation cases (Figure 3).

4.1.3 Service providers across innovation cases and corresponding subsystems

An overview of service actors across the three case study countries reveals very unequal participation of public organisations in service provision. For instance, only the rice-fish farming innovation (BF) has obtained services from both, national and international public organisations, while in the potato seed conservation case (MG), there was a small number of national public service providers involved. For the other three of the remaining five cases, we notice a certain pluralism of providers but very little crosscutting commonalities. For instance, in one Madagascar and one Cameroonian case, Farmer-based organisations (FBOs) are observed as the dominant service providers, and in three we see a significant representation of hybrid organisations. For the cases of Cameroon, NGOs are observed as the dominant service provider type, while projects (hybrid organisations) are revealed as the dominant service provider organisation for Burkina Faso (Figure 3).

When viewed from a subsystem perspective, the staple food crop subsystem has attracted more Service providers compared to the Organic food system (e.g., Madagascar and Burkina Faso). Specifically, for Organic subsystem cases, mainly projects are observed to be active for the case in Burkina Faso, while for the case of Cameroon mainly NGOs are observed to be involved (Figure 2).

4.1.4 Place of networking activities with other services across phases of innovation

Across the six innovation cases, the majority of service situations and corresponding activities were observed during the development (59 situations) and dissemination (30 situations) phases, respectively (Table 4). Networking activities, in particular, followed this pattern, predominantly occurring during the development phase and subsequently in the dissemination phase, while the initiation phase was entirely devoid of networking activities (Table 4). In Madagascar, specific

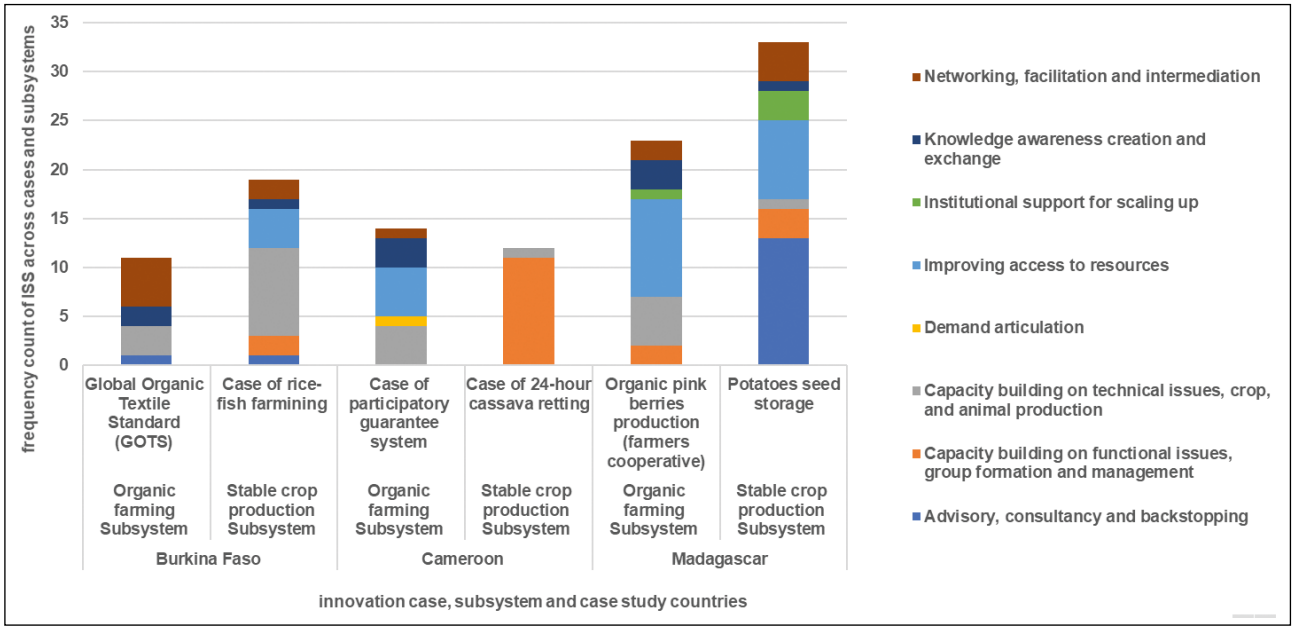

FIGURE 3 Service providers across cases and corresponding subsystems

TABLE 4 Place of networking activities with other ISS across innovation phases

Phases of innovations	The position of networking activities admits diverse ISS								Grand Total
	Advisory consultancy and backstopping	Capacity building on functional issues, group formation and management	Capacity building on technical issues, crop, and animal production	Demand articulation	Improving access to resources	Institutional support for scaling up	Knowledge awareness creation and exchange	Networking, facilitation, and intermediation	
Initiation	4	4	5	0	3	2	5	0	23
Development	8	11	12	1	17	1	3	6	59
Dissemination	3	3	6	0	7	1	2	8	30
Grand Total	15	18	23	1	27	4	10	14	112

examples of networking activities included the facilitation of farmer group formation (e.g., the formation of young farmers' groups), mobilizing a network of farmers to provide close support to field technicians and extension workers, and organizing exchange visits to connect emerging farmers with others in the same region. In Burkina Faso, examples included the organization of cooperation and collaboration between water and forest agents and technicians from the agriculture ministry, particularly within the context of integrated rice-fish farming, as well as the formation of farmer groups. Additionally, in the case of organic cotton production, linking producers and suppliers to meet international standards represented another key networking activity.

Besides networking activities, services related to 1) improving access to resources, 2) Capacity building

activities, and 3) advisory, and consultancy, are seen to have featured as main services across all three phases of studied innovations (Table 4).

Specific activities related to the situation of facilitating access to resources included: marketing support and market access, seed supply and distribution, especially for potatoes post-harvest case (Madagascar). For capacity building service functions, especially linked with technical training, specific activities included: training for seed production and potato storage (for potatoes post-harvest storage case), training for general animal husbandry, animal health, farm management, chicken feed fabrication and chicken vaccination process (for chicken Vaccination (Table 2).

4.2 *Diversity of networking forms for innovations*

Results show that specific networking features could be traced across all studied innovation processes and phases in varied dynamics, diversity, and forms (this is in contrast to Table 4). Sometimes, in combination or conjunction with other services offered. For instance, in the cases of MG, specific dedicated services related to networking like organizing fairs, a workshop for sharing experiences and knowledge, and other services which include some part of networking activities as second-level services (e.g., linkages through input provision, technical training gathering actors from several networks, etc. ...) have all been distinguished. Other examples, included traces of networking service activities i) at the level of farmers' groups, where farmers get connected and collaborate on specific and general aspects linked with enhancing their innovative activities, ii) at the level of acquiring inputs and selling their products (enhancing access to resources), where farmers and input supply dealers get connected for input supplies as well as with middlemen and market linkages for the supply of outputs, iii) at the level of joint learning workshops (knowledge awareness and exchange), where farmers get familiar, learn and exchange with each other.

More so, during exchange visits to different case study regions and sites, networking processes between farmers with different levels of exposure to the innovations are further realised. Besides, activities within and around development projects through which support organisations use to accompany and support innovation processes, further enhance farmers' and support actors' networking activities.

While using the concept of bridging, linking and bonding networking (as elaborated in section 2.4.), we further differentiated the dynamics and diversity of these two forms of networking across the studied cases and phases of innovations as shown below:

4.2.1 Bridging or linking networking across innovation cases and subsystems

The results indicate that across the six innovation cases, there is no significant difference between the observed unintentional bonding activities and bridging or linking networking activities. However, in specific cases like potato storage (MG) and organic pink berry production (MG), bonding activities are more prevalent than bridging activities (Table 5).

TABLE 5 Bridging and bonding networking activities across innovation cases and subsystems

Innovation cases and subsystems	Bonding (horizontal) service activities	Bridging (vertical) service activities	Grand Total
Organic farming Subsystem	**32**	**16**	**48**
Case of the participatory guarantee system (*CAM*)	9	5	14
Global Organic Textile Standard (*GOTS*) (*BF*)	8	3	11
Organic pink berries production (*farmers' cooperative*) (*MG*)	15	8	23
Stable crop production Subsystem	**25**	**39**	**64**
Case of 24-hour cassava retting (*CAM*)	0	12	12
Case of rice-fish farming (*BF*)	6	13	19
Potatoes seed storage (*MG*)	19	14	33
Grand Total	**57**	**55**	**112**

Notes: CM – Cameroon; BF – Burkina Faso; MG – Madagascar. Bonding (horizontal) networking involves all forms of collaboration across homogenous networks, belonging to similar value chain stages or industries. Bridging and linking (vertical) networking: involves all forms of collaboration across heterogeneous networks, across different stages of the value chain

At the subsystem level, a notable distinction emerges: the organic farming subsystem demonstrates a significantly higher presence of bonding activities compared to bridging, whereas the staple food crop production subsystem exhibits a stronger emphasis on bridging activities (Table 5).

4.2.2 Bridging or linking networking across phases of innovation

For networking across different phases of innovations, results show that while the initiation phase has attracted slightly more bridging and linking (vertical) forms of networking over bonding networking though with low differences per case, the Dissemination phase has attracted more Bonding (horizontal) form of networking over bridging (19 Vs 11). There appears to be no major difference in both forms of networking for the development phase, with results revealing high importance for both (29 vs 30) (Table 6).

5 Discussion

5.1 *Diversity of innovation support services for innovation*

The results highlight several key innovation support services offered across the six cases studied, including facilitating access to resources, capacity building on both technical and functional issues, and providing advisory, consultancy, and backstopping services (Table 3). These findings align with other studies that emphasise the critical importance of resource acquisition (particularly financial) and technical knowledge in driving innovation, especially in the global South (Audouin et al., 2021; Kilelu et al., 2014b; Ndah et al., 2021). Additionally, some services, such as facilitating farmers' demand articulation, are limited, while others, like institutional support for scaling up, are absent. The lack of institutional support for niche innovations is particularly surprising, given the expressed need for such services by

TABLE 6 Forms of networking and phases of innovations

Phases innovation processes	Forms of networking		
	Bonding (horizontal) networking	Bridging (vertical) networking	Grand Total
Initiation	**9**	**14**	**23**
– Case of 24-hour cassava retting (CM)	0	1	1
– Case of participatory guaranteed system (CM)	5	3	8
– Case of rice-fish farming (BF)	0	4	4
– Global Organic Textile Standard (GOTS) (BF)	1	0	1
– Organic pink berries production (MG)	1	2	3
– Potatoes seed storage (MG)	2	4	6
Development	**29**	**30**	**59**
– Case of 24-hour cassava retting (CM)	0	10	10
– Case of participatory guaranteed system (CM)	3	2	5
– Case of rice-fish farming (BF)	6	6	12
– Global Organic Textile Standard (GOTS) (BF)	2	3	5
– Organic pink berries production (MG)	12	3	15
– Potatoes seed storage (MG)	6	6	12
Dissemination	**19**	**11**	**30**
– Case of 24-hour cassava retting (CM)	0	1	1
– Case of participatory guaranteed system (CM)	1	0	1
– Case of rice-fish farming (BF)	0	3	3
– Global Organic Textile Standard (GOTS) (BF)	5	0	5
– Organic pink berries production (MG)	2	3	5
– Potatoes seed storage (MG)	11	4	15
Grand Total	57	55	112

Notes: CM – Cameroon; BF – Burkina Faso; MG – Madagascar

both support actors and beneficiaries expressed during group discussions (pers. com) and by other scholars (Aggestam and Weiss, 2011; Kaufmann and Tödtling, 2002). This gap suggests a need for increased lobbying and dialogue with authorities to advocate for policies that better support innovation processes in agro-food systems, as emphasized by (Aggestam and Weiss, 2011). They argue that rural development policies should be multi-layered, consider all sectors interacting in the landscape, and stimulate connectivity at and between the appropriate levels.

5.2 *Pluralism of service providers for innovation*

Regarding service providers, the findings indicate unequal participation and less visible engagement of public organizations across the cases and subsystems studied (Figure 3). In Madagascar, farmer-based organisations (FBOs) play a significant role, while in Cameroon, NGOs are more involved, followed by project interventions in Burkina Faso.

Although these findings may be influenced by the case selection process, which focused on a few multi-actor and project-linked cases, they nonetheless highlight the need to strengthen the engagement of the public sector in supporting and accompanying innovation processes across the focused case countries and the global south as a whole.

5.3 *Networking service activities and innovation*

5.3.1 Unseen and unintentional – but catalysts for innovation processes

While networking facilitation and intermediation services are generally present across innovation cases, the above results show that they occur as unintentional by-products of other primary service activities, with purposefully designed networking efforts being less evident (Figure 2). This phenomenon may stem from the implicit collaborative and co-creative processes within service situations (Figure 1), which, although primarily focused on addressing beneficiaries' immediate service needs, tend to result in unintended bonding and bridging connections, as observed by Cofré-Bravo et al., (2019). This highlights the need for service providers to intentionally incorporate and plan networking activities as a deliberate outcome of service situations, leveraging their catalytic effects to advance innovation processes.

5.3.2 Bridging and Bonding Networking Service Activities for Innovations

Results have shown that there is no significant difference between the observed bonding service activities and bridging or linking networking activities across the studied innovation cases (Table 5). Nonetheless, with regards to corresponding innovation subsystems (i.e., stable subsistence versus organic innovation subsystem), bonding networking activities are seen to have a higher occurrence within the organic subsystem cases, while bridging and linking networking on the other hand has featured more in the case of stable (subsistence) subsystem (Table 6). One plausible explanation for this observation is the intensive knowledge required to comprehend the principles and requirements for organic farming, in addition to the challenging market entry point.

This calls for bonding collaboration and connections far beyond the local context though within the homogenous organic subsystem. On the other hand, staple or peasant innovation subsystems to a certain extent are strongly rooted in indigenous knowledge practices – hence the need for a rather external bridging and linking connections across heterogenous networks of service providers, and other external stakeholders involved in the support and promotion of farmer-driven and bottom-up innovation processes. These observations are consistent with the findings of Cofré-Bravo et al., (2019) who likened both forms of bonding, bridging and linking connections as "ambidexterity". This suggests that vertical networks, on the one hand (based on linking and bridging social capital), are employed to explore and access new knowledge and resources. Conversely, horizontal networks, characterised by bonding social capital, are employed for the effective implementation and utilisation of novel technologies and practices. Furthermore, Cofré-Bravo et al. (2019) emphasized that farmers utilize a diverse array of social capital within their support networks, exhibiting distinct configurations influenced by personal motivations, innovation objectives, and resource endowments.

Moreover, the above results have revealed that while initiation phases of studied innovations have slightly attracted bridging (vertical) forms of networking, the dissemination phases have attracted bonding (horizontal) networking activities, with no major variation observed for the development phase where both networking forms are seen as strongly visible. While such findings suggest the strategic importance of bridging networking at the initiation stage of innovations, both networking forms are needed at the development phase which doubles as the peak activity stage in the innovation process. On the other hand, bonding networking at the dissemination phase, suggests its strategic importance for innovation outreach and scaling – especially as a basis for institutionalisation and embedding.

5.3.3 Preliminary conclusion on networking service activities for innovation

In sum, these results have shown that different forms of networking must be defined for each phase of the innovation in combination with the targeted services and purpose to be achieved. At the same time, results call for awareness and recognition of the second-level invisible networking activities which are implicitly generated through the collaboration and co-creation processes involved during each service situation. These observations confirm the observations of Faure et al. (2019), Ndah et al. (2017), and Proietti et al (2023) who stated that different forms of networking among innovative stakeholders are required at different phases of the innovation processes to overcome specific problems.

6 Conclusion and Recommendations

In the context of sustainability-oriented innovations in agriculture and the agri-food sector, networking service activities play a pivotal role in facilitating the adoption and diffusion of innovations, as well as enhancing the exchange of knowledge and information among stakeholders. While a substantial body of research on networking for innovation exists across various disciplines, much of it has primarily focused on management and business topics. This study makes use of novel concepts such as 'service situation' and 'Innovation Support Services (ISS)' and builds upon existing literature to examine the role of networking service activities in fostering innovation. It adopts a dynamic perspective, analysing the providers of networking activities along the innovation process, as well as a relational perspective, exploring the interplay between networking activities and other ISS throughout the innovation process. The research focuses on the agri-food sector in the global South, drawing on case studies from Cameroon, Madagascar, and Burkina Faso.

Results of the study indicate that networking activities were not prioritised as key services, but instead, the focus was on resource access and capacity-building services across all six innovation cases.

Moreso, support actors and beneficiaries of services are observed to attach more importance to these services over other soft skills-related service activities such as institutional support for niche innovations and demand articulation services. Especially, the latter is either minimal or completely missing in the typology of services offered by most support actors in the studied innovation cases.

Based on these findings, we recommend a close consideration of other service functions beyond the observed technical training and enhancing access to input services which presently dominate the portfolio of services offered by support actors while accompanying and supporting innovations in the global south. Especially, there is a need for a rethink on how to integrate networking services, institutional support for niche innovations services, as well as advisory, consultancy and backstopping service functions which appear to be completely neglected despite their potential positive influence on the success of innovations.

Our results indicate that networking service activities while varying in intensity and nature of networking activities, are consistently present across all studied innovation processes and phases. These activities manifest in diverse forms and dynamics, sometimes in conjunction with other services. We conclude that networking services play a significant, though often subtle, role in the success of innovations by providing flexible support. Based on these findings, we recommend categorising networking activities into two distinct types: managed (intentional) and informal (unintentional) activities. This distinction would offer several benefits:

a) it would enable researchers to adopt a more targeted normative or diagnostic approach when studying and analysing different forms of networking across the innovation process, and
b) it would help ISS providers better understand and manage the impact of these services, thus enhancing the "ambidexterity" required to balance both types of networking activities.

Recognising the importance of both managed and informal networking activities suggests the need for vocational training or skills development aimed at improving the effectiveness of both types of networking efforts. In sum, we recommend that different forms of networking must be intentionally defined for each phase of the innovation in combination with the targeted services and intended purpose to be achieved. Both service providers and beneficiaries should consciously recognise and incorporate these recommendations to enhance the operationalisation and impact monitoring of networking services, thereby improving innovation processes.

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Declaration of Interest statement

We declare that this is an original empirical research work with no conflict of interest to declare.

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