

Community digital accessibility for enhancing farmers' access to knowledge

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Abstract

Purpose – This paper aims to show how community digital accessibility – as a social innovation emerging from institutional arrangements – enhances farmers' access to agricultural knowledge.

Design/methodology/approach – Using a qualitative approach based on a case study highlighting social innovation around community digital devices, data was collected through semi-structured interviews. The data collected were analyzed using discourse analysis.

Findings – The results indicate that community digital accessibility, supported by the community's choice of managers and the mobilization of farmers to maintain the equipment for these digital devices, promotes close and tailored support for farmers in accessing digital services and agricultural knowledge. These collective dynamics have enabled the sustained functioning of digital devices, facilitating continuous access to digital services and agricultural knowledge.

Practical implications – These results suggest that agricultural policies should rely on local collective dynamics to facilitate farmers' adoption of digital technologies and improve their efficiency in agriculture.

Originality/value – This research emphasizes a transdisciplinary approach that links social, institutional, cognitive and technological dimensions to generate knowledge supporting agricultural transformation.

Keywords Community digital accessibility, Social innovation, Appropriation, Knowledge, Benin

Paper type Research paper

1. Introduction

Given the contemporary challenges facing agriculture – food security, climate change and resource degradation – farmers' knowledge is recognized as a valuable resource. It offers significant potential for improving the sustainability and resilience of agriculture ([Šūmane et al., 2018](#)). Indeed, knowledge encompasses experience, attitudes, values, skills and information that enable people to act in an organized, logical and productive manner ([Gardeazabal et al., 2023](#)). It enables farmers to adopt new sustainable practices ([Liao et al., 2022](#)). Referring to this power to instill novelty to adapt to the radical changes taking place in agriculture, [Kilis et al. \(2022\)](#) argue that knowledge is necessary for innovation. Consequently, the lack of knowledge is problematic. For example, farmers' limited knowledge hinders their adaptation to climate change ([Agboola et al., 2024](#)). With the introduction of digital technologies in agriculture, referred to as “digital agriculture” ([El Bilali et al., 2020](#); [Degila et al., 2023](#)) and considered the fourth agricultural revolution ([Barrett and Rose, 2022](#)), access to knowledge has been radically impacted ([Klerkx, 2021](#)). Information and communication technologies specifically provide more effective and efficient means of accessing knowledge ([Kountios et al., 2023](#)). They allow reaching a wider



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target audience in a relatively short time. Social networks, for example, are a means by which knowledge is transmitted between individuals (Engås *et al.*, 2023). In addition to their effect on physical access to knowledge, digital technologies impact cognitive processes and influence information absorption and learning (Vedechkina and Borgonovi, 2021). However, digital inequalities involving unequal access to agricultural knowledge can be observed among farmers, raising social issues.

In Africa, only 38% of the population uses the internet according to International Telecommunication Union (ITU, 2024), with rural communities being the most limited (Engås *et al.*, 2023). Gouthon *et al.* (2024) have shown that in Benin, there are inequalities between farmers in terms of motivation, material access, digital skills and use. In addition, in some rural areas, farmers face constraints in terms of connectivity (Kos and Kloppenburg, 2019) and electricity, limiting their use of digital technology. Because digital technologies are means for knowledge transfer, digital inequalities also lead to asymmetries in access to resources, services, information and knowledge (Golder *et al.*, 2010), with potentially negative effects on food security (Zscheischler *et al.*, 2022). This issue of unequal access to knowledge, due to digital inequalities between farmers, reveals a disconnect between what is ultimately optimal for farmers and what is materially available to them, reflecting a digital divide that goes beyond the simple question of infrastructure. It reveals a gradual social exclusion of certain farmers from the agricultural innovation process, which compromises their equitable participation in collective rural development dynamics. Thus, differentiated access to digital technologies is becoming a major social issue, affecting social justice and equity in agricultural areas. It is in this context that Ebrahimi *et al.* (2021) question the ability of digital agriculture to be inclusive, highlighting the limits of its social sustainability. In response to this social issue, community digital accessibility, which is a set of collective dynamics that contribute to local rural communities' access to digital tools and services, appears to be a relevant solution, as it promotes in principle, the inclusion of the most marginalized farmers and reduces inequalities in access to knowledge. It allows rethinking the ways in which knowledge is accessed, not only through technical means, but also through institutional arrangements adapted to local contexts. Social innovation can rely on institutional arrangements, and when these are robust, they bring tangible benefits to the community (Lukesch *et al.*, 2020).

Institutional arrangements are a manifestation of multi-stakeholder partnerships and collective action, and are of major importance in digital agriculture (Ingram *et al.*, 2022). Seen as the institutionalization of knowledge-sharing platforms (Moumouni and Labarthe, 2012), they are a means of engaging farming communities in the co-construction of digital solutions, which is a way of diagnosing potential factors of inequality in access to knowledge upstream and providing appropriate responses (Paget *et al.*, 2022). Institutional arrangements empower farmers and make them more accountable by influencing their ability to appropriate digital technologies (Newton *et al.*, 2020). They are fully in line with a logic of social innovation, promoting the emergence of collective solutions built by and for the actors concerned. They enable to move beyond purely techno-centric approaches by integrating social dimension into the dynamics of agricultural transformation. Therefore, in this paper, community digital accessibility is viewed as social innovation emerging from institutional arrangements.

The main objective of this research is to show how community digital accessibility, supported by institutional arrangements, improves farmers' access to knowledge. This research highlights a strong mobilization of transdisciplinarity, where social issues (such as social innovation) are intricately intertwined with institutional (institutional arrangements), cognitive (knowledge) and technological (digital agriculture) dimensions to produce

knowledge relevant to the transformation of the agricultural sector. By exploring these interactions, the study aims to produce actionable knowledge to guide policies and practices toward a more equitable and sustainable digital agriculture.

2. Theoretical and analytical framework

Digital accessibility is a concept that has gained renewed interest in recent years (Sanderson *et al.*, 2022; Chemnad and Othman, 2024; Bong and Chen, 2024). It involves ensuring that everyone has access to digital products and services (WAI Initiative, 2022). It refers to practices that allow individuals to access digital systems and services. On this basis, we define community digital accessibility as the establishment of collective actions that enable members of a community – particularly in disadvantaged areas – to access and use digital technologies equitably. It relies on shared resources, locally adapted facilities and the active participation of users, with the aim of fostering inclusion, learning and digital autonomy. It requires community engagement and as such, carries a social responsibility (Chemnad and Othman, 2024). This engagement addresses the social need for digital inclusion among farmers, who are often left behind, thereby positioning community digital accessibility as a form of social innovation.

Indeed, social innovation refers to collective actions and social relationships aimed at solving social problems that often impact marginalized groups (Galego *et al.*, 2022). This topic has been extensively investigated in recent years (Fauzi *et al.*, 2025; Sottini *et al.*, 2025; Dionisio *et al.*, 2024). Social innovation involves ethical considerations. Its primary aim is not to generate profit but to pursue social and humanitarian objectives (Ims and Zsolnai, 2014). However, social innovation can be hindered by systemic barriers rooted in colonial legacies, which constrain the actions of groups formerly subjected to colonization and currently involved in social innovation projects (Kalema, 2019). These barriers include the dominance of Western discourses and practices, which may favor imported innovation methods while devaluing local knowledge and context-specific solutions during social innovation processes. They also encompass inequalities in access to resources, knowledge and technologies, resulting from a colonial heritage that privileged certain groups, thereby limiting the participation of disadvantaged groups in social innovation processes. Consequently, the author argues that it is necessary to deconstruct power dynamics linked to coloniality to foster inclusive social innovation processes. Adopting this critical perspective is essential, as noncritical approaches tend to reinforce power asymmetries associated with coloniality by failing to address inequalities among actors engaged in the process. Social innovation is based on two pillars: institutional innovation and locally rooted innovation in the economic sense (Moulaert and Nussbaumer, 2005). It therefore has an institutional dimension, which is highlighted in this paper. From this perspective, social innovation cannot be separated from the institutional arrangements that frame and facilitate collective dynamics at the local level. These arrangements structure actors' behavior and influence their capacity for collective innovation. Accordingly, examining the concept of institutions more closely is worthwhile.

Institutions are “regulatory, normative and cultural-cognitive elements that, when combined with activities and resources, bring stability and meaning to social life” (Scott, 2008, p. 56). This definition links institutions to social life, making this conception of the institution more relevant to this paper. The concept has been the subject of scientific research, with changing schools of thought over time. The work of March and Olsen (1984) as well as Hassenforder and Barone (2019) historically distinguishes three schools of thought on the question of institutions: old institutionalism, behaviorism and neo-institutionalism. In the view of old institutionalists, institutions have a formal character with a legal basis. These

include, for example, established formal laws. This school of thought has been criticized sociologically, which later gave rise to behaviorism, which emerged in the USA in 1930 and experienced a significant resurgence of interest between 1960 and 1970. Behaviorists claim to be highly objective and factual, but this has not spared them from criticism. They are accused of maintaining a hyper-factual stance, marginalizing context, meaning and history (Rhodes, 2011). In response to these new criticisms, a third school of thought related to the question of institutions – neo-institutionalism – emerged in the USA in 1970. Neo-institutionalists do not view institutions as external to society, as the old institutionalists did. For these contemporary institutionalists, institutions are presented as levers for collective action by providing rules for cooperation between actors. At the same time, they constrain collective action by limiting choices and influencing the attitudes and behaviors of actors. Institutions help define identities. Based on the logic of appropriation defended by March and Olsen (1984), individuals adopt the behaviors that seem most appropriate to them according to the institution to which they refer. From this theory, we understand conversely that institutions are put in place to make individuals adopt the behaviors deemed most appropriate for them. Thus, by structuring the behaviors and interactions of actors, institutions determine the frameworks for cooperation and rules of conduct. However, to respond to specific and contextual challenges, these institutions can translate into institutional arrangements, which are flexible and adapted configurations that allow actors to collaborate more effectively.

Institutional arrangements have been poorly defined in the literature (Hassenforder and Barone, 2019). However, they are likened to rules, norms and practices that are consensually established and adopted by actors belonging to the same ecosystem (Baron *et al.*, 2018). They refer to a set of rules or agreements governing the activities of a specific group of people pursuing a certain objective. An agreement between farmers, for example, to jointly purchase inputs is an example of an institutional arrangement (Eaton *et al.*, 2008). They can therefore exist in a formalized form, as conceived by the old institutionalists, but also in an informal form. In agriculture, institutional arrangements are generally associated with rules co-established by actors for the collective management of the environment and natural resources. Today, with the introduction of digital technologies in agriculture, new forms of institutional arrangements are emerging. Hinings *et al.* (2018) identify three new types of local institutional arrangements for digital transformation: digital organizational forms, digital organizational infrastructures and “digital institutional building blocks.” The first forms constitute a set of practices governing a digital organization. Digital infrastructures are digital hardware devices that coordinate the interactions of actors in an ecosystem. The latter, on the other hand, are digital technology modules that are set up and ready for use. Thus, institutional arrangements are evolving with the introduction of digital technologies, requiring a more specific approach to analyze their dynamics. To understand these developments, it is crucial to consider the key elements that structure these arrangements and enable them to be analyzed in depth.

First, it is clear that any situation involving action involves actors occupying specific roles. Institutional arrangements inevitably involve actors whose respective roles (Ostrom, 1990) converge on collective actions. Sager and Gofen (2022) emphasize the importance of the role played by actors in defining and implementing institutional arrangements. Similarly, Hassenforder and Barone (2019) in their work on water governance, consider actors and their roles to be central elements in the analysis of institutional arrangements. The structural approach to the analysis of institutional arrangements (McGinnis, 2011; Ostrom, 2005) also attaches great importance to this. Second, these actors generally introduce facilities that are beneficial to the collective, giving shape to these arrangements in the form of formal or

informal rules, the former being the prerogative of state actors (Williamson, 2009), the latter weaving the fabric of social structures (Dau *et al.*, 2022). These rules or institutions can also take the form of a simple consensus between actors. Third, institutional arrangements are based on a logic of action that constitutes a set of socially shared rules of thought and behavior (Dequech, 2013). This explains the motivation behind the actions of actors involved in institutional arrangements. This motivation is potentially linked to personal or collective interests or to compliance with social norms. The question of the logic of action is perceived in different ways. Olson (1965) believes that in the absence of external mechanisms, individuals will not spontaneously act for the collective good even if they would all benefit from it, while Ostrom (1990) believes that communities can effectively self-organize to manage common resources by defining their own rules, norms or monitoring mechanisms. Fourth, divergent rationales for action are likely to weaken institutional arrangements whose implementation requires resources such as time, knowledge, labor and natural resources. Fifth, beyond these elements that structure institutional arrangements, the sustainability and stability of the arrangement itself is also an important point. They highlight the institutional arrangement's ability to adapt to change and maintain cooperation over the long term. Ostrom (1990) identifies principles such as monitoring, graduated sanctions, conflict resolution mechanisms and recognition of organizational rights as essential to ensuring the stability and resilience of institutions for managing common resources. Sixth, the purpose of an institutional arrangement is to produce impacts or outcomes that are, in principle, beneficial to the community as a whole. The effectiveness of an arrangement depends on the nature of the impacts it has. Hassenforder and Barone (2019) also define the outcomes of institutional arrangements as a crucial point of analysis. In light of these key points, we propose the following analytical framework (Table 1) to understand the institutional arrangements highlighted in this paper.

3. Methods and materials

3.1 Case study presentation

For this study, we adopted a case study approach. This method enables an in-depth analysis of a specific case – whether it be an individual, a group, an entity or an event – to understand its characteristics, mechanisms and implications, with the aim of generalizing the results obtained (Gustafsson, 2017). It focuses on what Flyvbjerg (2011) describes as a “unique unit” thus allowing the researcher to concentrate on a specific phenomenon. The case study is generally associated with a deep understanding of complex phenomena (Heale and Twycross, 2018). By choosing this method, our goal is to provide an in-depth knowledge base that is also generalizable (Gustafsson, 2017) regarding the phenomenon under investigation. For this purpose, we selected the Digikiosks – digital kiosks providing community-based digital services – installed in villages under the DigiCLA project (AGriCef, a digital solution for more effective and efficient agroecological management of the fall armyworm [FAW] in northern Benin) as our case study. The choice of Digikiosks, established under the DigiCLA project, as a case study is first explained by their exemplary character in terms of social innovation: beyond their technological dimension, these digital devices have given rise to new institutional arrangements driven by rural communities. This process illustrates how the introduction of a digital tool can become a genuine form of social innovation, fostering community appropriation and shared governance. Second, the thematic relevance of the Digikiosks lies in their role in the agroecological management of the FAW, a major agricultural challenge in Benin. Finally, their analytical value rests in their potential to generate transferable insights into the interplay between digital and social innovation, as well as into the conditions for their appropriation by rural communities. The DigiCLA project was

Table 1. Elements of institutional arrangement analysis

Variables	Questions
Actors and roles	• Who are the participants? • What roles do they play?
Informal rules	• Is the distribution of roles formal, implicit, rotating? • Is there a clear consensus on the rules? • Are they written, oral or implicit? • Who makes decisions? Who implements them?
Logic of action	• How are decisions made? (vote, consensus, village chief ...) • Are actions motivated by collective or individual interest? • Do people act “because it’s customary” or because they expect a direct benefit?
Resources mobilized	• Is there a social norm supporting the action? • What resources were mobilized? • Is the cost collective or individual? • How were contributions distributed?
Sustainability and stability of the arrangement	• Was there coordination or conflict? • Is the arrangement temporary or long-lasting? • Has it been renewed or replicated elsewhere? • Is there monitoring, an ability to adapt or repair? • What are the threats or weaknesses?
Perceived impact / outcomes of the arrangement	• Are there mechanisms for sanction, reward or correction? • Is the outcome considered positive? • Were there any side effects? • Did it strengthen collective will or lead to disengagement?

Source(s): Authors’ own work

implemented from 2022 to 2024 by a consortium composed of the academic NGO Eclodio, the private company TIC AgroBusiness (TIC ABC) and the Research Laboratory on Innovation for Agricultural Development (LRIDA) at the University of Parakou in Benin, which served as the lead organization. The objective of the project was to achieve inclusive and sustainable improvement in maize productivity and household income through the use of digital tools tailored to FAW management. The project promoted three (03) types of digital technologies to provide farmers with access to agricultural knowledge necessary for agroecological pest control: the “AGriCef-Mais” mobile application, a voice messaging system and Digikiosks. The latter are kiosks installed in villages that offer local communities digital services such as agricultural video screenings, phone battery charging, public e-services, money transfers and internet data purchases. To ensure the optimal operation of the Digikiosks, rural communities and project stakeholders jointly developed social innovation that we refer to as community digital accessibility supported by (i) community choice of Digikiosks managers and (ii) community mobilization for the maintenance of Digikiosks equipment – making them genuine community-based digital infrastructures.

Indeed, once the Digikiosks were installed, project stakeholders, in line with a community management approach, asked farmers to select their own manager from within the

community. In each village where a Digikiosk was installed, the farmers held discussions among themselves and, based on consensus and informal arrangements, selected a manager. This management model reflects the project stakeholders' intention to facilitate local ownership of the kiosks by farming communities. Likewise, in some of the intervention villages, to ensure that the kiosks remained functional and enabled farmers to effectively access agricultural knowledge, the farmers organized themselves to build more durable enclosures around the kiosks and to replace faulty batteries. These efforts allowed managers to continue screening agricultural videos and offering other digital services. These two institutional arrangements, which are the focus of this study, contribute to community digital accessibility, understood as a form of social innovation.

3.2 Interviewed participants

Participant selection followed a purposive sampling logic, guided by their role and direct involvement in the institutional arrangements supporting social innovation. Three categories of actors were interviewed: (i) members of the consortium (researchers, NGO and a private company) involved in the design and management of the DigiCLA project; (ii) Digikiosk managers, chosen by the communities and responsible for the daily operation of the infrastructures; and (iii) farmers, either direct beneficiaries or indirectly involved, who were mobilized through focus groups to capture the diversity of experiences and perceptions. This combination of actors aimed to ensure functional representativeness, thereby guaranteeing a variety of perspectives on the phenomenon under study. Moreover, engaging these three categories offered an opportunity for triangulation by cross-checking institutional, operational and community viewpoints, which strengthened the validity and reliability of the data collected. Thus, actors from the consortium organizations – three (3) from LRIDA, two (2) from TIC ABC and three (3) from the NGO Eclosio – were interviewed. The project includes six Digikiosk managers, one per village. Regarding the farmers, a focus group with an average of 12 participants was organized in each village. A total of 87 participants were interviewed. Table 2 details the interviewed participants.

3.3 Data collection

Through semi-structured interviews conducted using an interview guide, we gathered information about the social innovation and the institutional arrangements that compose it. This method also allowed us to obtain details about the different actors involved in this social

Table 2. Interviewed participants

Actors	Participants	Number
LRIDA	Director of LRIDA/coordinator of the DigiCLA project	01
	Researcher affiliated with LRIDA, in charge of plant protection	01
	Researcher affiliated with LRIDA, in charge of sustainable land management	01
TIC ABC	Company director	01
	Assistant to the company director	01
NGO Eclosio	NGO coordinator	01
	Monitoring and evaluation officer	01
	Facilitators	02
Local community	Digikiosks managers	06
	Farmers	72
TOTAL		87

Source(s): Authors' own work

innovation and their respective roles, their action logics, meaning the motivations, interests and perceptions underlying their engagement. The various resources mobilized by the actors were also documented, whether human, cognitive, financial or others. Furthermore, the semi-structured interviews enabled the collection of data related to the sustainability and stability of the institutional arrangements. Attention was given to the mechanisms put in place by the actors to ensure the monitoring of actions, enforcement of rules (through sanction or regulation systems) and to guarantee the long-term sustainability of the innovation. These aspects are essential to understanding the extent to which the institutional arrangements can be maintained, adapted, or transformed in response to local dynamics.

3.4 Data analysis

The data collected through semi-structured interviews were analyzed using a qualitative approach. Each piece of information was carefully transcribed, coded and organized according to emerging categories related to the research objectives. Discourse analysis was used to interpret the information, allowing us to examine how the roles and interactions of different actors translated into collective actions that shaped the governance and functioning of the Digikiosks, as well as farmers' access to agricultural knowledge. The interpretation relied on a dual logic: (i) intra-case, by examining each village separately to highlight local specificities; and (ii) inter-case, by comparing the six villages to identify regularities and common mechanisms. This cross-analysis ensured the robustness of the results and prevented a partial or one-sided interpretation. These analytical methods also helped explain the actors' logic of action and connect it with the social values of the agricultural communities. In addition, they highlighted the various resources mobilized by the actors to establish the institutional arrangements, with particular attention to their sustainability and stability. The use of these methods led us to incorporate *verbatim* excerpts as illustrations of the findings. Finally, these methods allowed us to understand the impacts of the institutional arrangements by analyzing discourse related to observed changes, particularly in access to digital services and knowledge.

4. Results

4.1 Actors and roles in community digital accessibility for access to knowledge

To promote community digital accessibility, two types of actors are involved: external actors and the farming community. The former group includes research institution, farmers' support organization, and a private company that form the consortium implementing the project which introduced the community digital devices (Digikiosks). In contrast, among the engaged community actors, we mainly find the farmers themselves and those we call "social innovation mediators," who are the designated managers responsible for running the Digikiosks.

Therefore, the external actors include LRIDA, the NGO Eclodio and the private company TIC ABC. Together, these actors initially played the role of architects of a digital common by initiating the installation of Digikiosks within local communities, which are now seen as shared resources by farmers. Their community appropriation led to the institutional arrangements studied in this paper. Thus, as facilitators of community action, this consortium contributed to the emergence of a community dynamic around the Digikiosks. Following this initiating role, these actors later adopted the role of facilitators of collective governance by defining the foundations for collective management of the Digikiosks, enabling farmers to better organize around the common good for sustainable access to agricultural knowledge. Indeed, after the installation of the Digikiosks, these actors encouraged the farming communities to select, internally and based on predefined criteria, the managers of these

kiosks. The aim of this inclusive approach being to foster community ownership of the kiosks for sustainable use and thus enduring access to agricultural knowledge. The appointed managers therefore become central actors in the provision of digital services and access to agricultural knowledge.

These social innovation mediators – Digikiosk managers – fostered collective dynamics around the kiosks by acting as intermediaries between these digital infrastructures and the digital services benefiting the farming communities. Beyond personal and technical objectives, their actions also aimed at social transformation: improving access to knowledge, empowering farmers and promoting the shared management of a common digital resource. The community-based anchoring of these social innovation mediators creates close proximity with farmers, allowing them to adapt modalities of access to digital services and, by extension, to agricultural knowledge. For example, they organize agricultural video projections according to farmers' availability, facilitate their access to the use of other digital technologies and thus to access agricultural knowledge. They thus strengthened the sustainability of digital infrastructures within local communities.

Finally, farming communities are at the heart of the community engagement around the Digikiosks, assuming a dual role as collective actors and active beneficiaries of these community digital devices. They ensure collective management of the Digikiosks through actions such as appointing managers and maintaining kiosk equipment. They demonstrate self-organization capacity and show community commitment to sustaining the digital services offered by the Digikiosks and thereby access to agricultural knowledge. Moreover, these farmers are users of the digital services provided by the Digikiosks. They more easily recharge mobile phone batteries, carry out money transfers, receive assistance in using the digital technologies deployed by the project and access agricultural knowledge broadcast through agricultural video projections, which allows them to improve their farming practices.

4.2 *Community digital accessibility for access to agricultural knowledge*

4.2.1 *Community choice of managers for community digital devices.* For community digital access, the farmers, after the installation of these digital devices – Digikiosks – consensually appointed one of their own to be the manager. This choice reflects participatory governance adapted to the local context and constitutes an institutional arrangement, emerging from a consensual process that formalizes the Digikiosk manager. The legitimacy of the manager thus derives from social recognition rather than an official mandate, illustrating the group's capacity to organize governance through social mechanisms.

Several actors played key roles in the community choice of Digikiosk managers. External actors to the community proposed a typical profile for this manager, emphasizing the need for them to belong to the community and to be chosen by consensus among farmers. These actors thus initiated and supported the collective governance of these kiosks. In contrast, the farmers, drew on sources of social legitimacy such as social credibility, social reputation and perceived cognitive ability, to jointly choose their manager. For example, in Kotopounga, one of the villages where a Digikiosk is installed, farmers explained their choice of manager as follows:

We chose this manager because he studied more than we did. He went to university. Therefore, he understands digital issues better than the rest of us. Besides, we have no complaints about him in this village.

The appointed manager was thus granted the role of “community entrepreneur” because he acts primarily in the community's interest, facilitating farmers' appropriation of digital

innovations for sustainable access to agricultural knowledge. The selection of Digikiosk managers by farming communities was made by oral consensus among farmers, based on social values rather than formally established rules, thereby granting legitimacy to the manager rather than legality. However, this community choice of Digikiosk managers is somewhat influenced by external actors. Farmers did not choose a manager solely out of social norm; rather, this approach was suggested to them from outside, thus leaving room for possible shortcomings in the management of the digital devices. Thus, although presented as a community approach to collective management of the Digikiosks, this modality – promoted by actors external to the community – practically results in a personalization of power. It grants a single individual a decision-making monopoly that runs counter to principles of equity and collective participation, sometimes hindering farmers' access to agricultural knowledge. In one village where a kiosk is installed, for example, farmers ironically noted that the scheduling of video projection sessions strongly depends on the "manager's mood." Such remarks raise significant questions regarding the durability of this institutional arrangement and the results or impacts it produces, especially in terms of farmers' access to agricultural knowledge.

The choice of Digikiosk managers proved to be a one-time action, not extending into a continuous dynamic. Moreover, the manager was entrusted with loosely defined powers, with unclear limits, which could expose the management of the Digikiosk to risks of drift toward exclusive control. Although there are no formal or specific mechanisms established for the Digikiosks, existing general community mechanisms are also applicable to their operation. Thus, the manager knows that the whole village watches him and that the quality of his service depends on the interest granted to the Digikiosk, the esteem or admiration he will receive and the recognition he will be shown within his village.

Immediately, significant results have emerged. The choice of managers for these kiosks by the farming communities themselves created a social proximity between them and the farmers, facilitating regular, flexible and less intimidating access to digital services and agricultural knowledge. This proximity strengthened trust between the managers and the users, making interactions smoother and better adapted to local needs. It also promoted better appropriation of digital content, as farmers felt freer to ask questions and request help. This relationship of trust stimulated Digikiosks attendance and contributed to wider dissemination of agricultural knowledge, notably through video projection sessions or individual consultations. In some cases, these managers went beyond their role as kiosk managers to, at times, act as "agricultural advisors" by further explaining to farmers, during agricultural video projections, the agricultural technologies presented, enabling easier appropriation by the farmers.

4.2.2 Community mobilization for the maintenance of digital device equipment. Community engagement was not limited to the governance of the Digikiosks for accessing digital services and agricultural knowledge. Collective efforts to maintain the Digikiosk equipment have also been documented. For instance, in some areas, farmers built a stronger enclosure around the Digikiosk, while in another village, the farming community replaced a defective battery with a more durable one. These initiatives reflect the local initiative of farmers to maintain the Digikiosks and constitute an institutional arrangement, as they embody consensus among diverse community members, around shared actions.

In contrast to the previously presented arrangement, external actors, notably those responsible for project implementation supporting the farmers, are absent from this collective initiative. It is therefore an exclusively local initiative, also reflecting the collective responsibility assumed by the farmers for sustainable access to agricultural knowledge. This engagement illustrates an upward innovation process, where users become co-actors.

Collectively, they generated ideas and consensually mobilized the necessary resources for their realization. These various roles have no formal basis and rely on a logic of mutual aid, a sense of responsibility and a shared perception of the usefulness of these common digital devices, as illustrated by the words of this farmer:

The Digikiosk helps us a lot. Before, for example, to get units to recharge, we had to leave our village to go to the commune's town center. Today, with the Digikiosk, we have this service nearby, plus video screenings that allow us to learn more about methods to fight against FAW.

This community mobilization thus illustrates social capital not forged by external forces for managing digital common goods in rural areas. To achieve this, farmers solicited financial and material resources, mobilized in an unsystematic and improvised manner among themselves, reflecting their adaptability and flexibility in supporting the Digikiosks and maintaining continuous access to agricultural knowledge. This reactive form of mobilization also reflects the existence of social engagement capital in which farmers articulate available resources to support continuous access to information technologies and agricultural knowledge. At the same time, this spontaneous and improvised character, seen as an automatic behavior of farming communities, raises doubts about its durability and stability.

Similarly to the previous institutional arrangement mentioned, community mobilization around Digikiosks equipment (building enclosures for the Digikiosk, battery replacement) is sporadic and lacks monitoring mechanisms or provisions to facilitate replication when needed. These weaknesses reflect a low institutionalization of maintenance rules for these digital common goods, not making local communities proactive in preserving and operating the Digikiosks. This collective mobilization of farmers to rehabilitate equipment has positive effects, despite limitations on its reproducibility. Such mobilization has allowed Digikiosks to continue operating, providing digital services and disseminating agricultural knowledge. In some areas where such arrangements have not emerged, agricultural video screenings and battery recharging have been interrupted and the Digikiosks themselves damaged.

4.3 Critical analysis of community engagement around digital common goods

Community engagement has manifested through the choice of managers for digital common goods and collective mobilization for maintaining the equipment of these devices. Cross-analysis of the two cases of community engagement with Digikiosks, shows that farming communities can initiate dynamics around digital common goods for better access to digital services and agricultural knowledge. This dynamic can also be stimulated by external actors, as in the case of the community choice of Digikiosk managers. However, although the manager is chosen by informal consensus among farmers, the fact that this community governance was initiated by external actors, may weaken its rooting in endogenous social norms, creating fragilities in the sustainability of these digital devices. For example, although this community choice arises from a consensus among farmers in the community, power is entrusted to a single individual, exposing the governance of these community digital devices to individualistic drift.

Moreover, in both cases, farming communities' engagement represents social innovation, as it relies on local, collective initiatives aimed at fulfilling a key need: access to digital services and agricultural knowledge. This engagement enabled community governance, fostering regular, close and flexible support in farmers' access to digital services and agricultural knowledge. This community engagement is motivated by social norms, solidarity dynamics collective and personal interests. To some extent, social capital proved to be a driver of innovation. However, the materialization of farming communities' engagement – such as choosing managers and mobilizing around device maintenance – are

one-time actions lacking robust and continuous institutional framing. These weaknesses render community management of these digital devices in a fragile state and limit the temporal scope of digital services and access to agricultural knowledge. These observations invite reconsidering agricultural digitalization not only as a technical challenge but also as a complex socio-technical process, where cultural factors, social networks and forms of social innovativeness play a crucial role in the success or failure of community digital devices.

5. Discussion

This paper aimed to show how social innovations, taking the form of institutional arrangements around community digital devices, promote access to digital services and agricultural knowledge. This study first reveals the emergence of institutional arrangements around digital technologies in rural areas, which had been relatively less underexplored. Traditionally, institutional arrangements in rural or agricultural contexts are associated with the collective management of the environment (Moreno-Plata, 2021), natural resources (Barrett *et al.*, 2005) such as land (Azadi *et al.*, 2022) and water (Khalid and Iqbal, 2020; Fox, 2019). Because digital technologies are perceived as technological innovations in rural areas, particularly in developing countries, institutional arrangements and social innovations driven by local actors should be regarded as original creations. Therefore, this study makes an original contribution to existing theoretical knowledge by shifting the analysis of institutional arrangements toward the digital field in agriculture, a domain still underexplored in the scientific literature. The need for knowledge in this field and the relevance of the question had already led researchers to identify institutional arrangements in digital agriculture as priority issues for future research (Ingram *et al.*, 2022). The exploration of this research field in the present work allowed the unveiling of new forms of organization of farming communities, social innovations materialized by institutional arrangements involving various actors. Hinings *et al.* (2018) had previously highlighted that digital technologies give rise to new forms of institutional arrangements.

In this study, we considered the full range of community institutional arrangements around digital devices – community digital accessibility – as a form of social innovation, enabling farmers’ access to agricultural knowledge. From this perspective, social innovation confirms all the positive effects commonly attributed to it, notably its potential to provide farmers with useful information (United Nations, 2021), to transform agriculture (Da Silva *et al.*, 2024; Firmansyah *et al.*, 2024) and to address social and environmental issues (Krittayaruangroj *et al.*, 2023; Pikkemaat *et al.*, 2019). It is also seen as a promising alternative for food security (Al-Obadi *et al.*, 2022) and economic development (Singh *et al.*, 2020). However, social innovation does not emerge easily (do Adro and Fernandes, 2020), especially when it is digital-centered and driven by rural communities characterized by strong cultural values, which tend to maintain existing practices (Fahmi and Arifianto, 2022). Furthermore, in developing countries, limited access of rural populations – particularly farmers – to digital technologies (Gouthon *et al.*, 2024) hinders their effective participation in social innovation dynamics. While access to digital equipment is ensured, social structures often continue to obstruct actors’ genuine involvement in these processes (Qureshi *et al.*, 2018). Given the considerable influence of social structure, Qureshi *et al.* (2021) urge researchers working on digital social innovation to prioritize social issues over technological complexity, what they call a “social-first approach.” Thus, community digital accessibility, seen as a potentially transformative social innovation, does not always follow a linear trajectory. Moreover, several researchers emphasize that socially innovative initiatives carry strong potential for inclusive governance as well as social and political transformations

(Galego *et al.*, 2022). One of the facets of social innovation highlighted in this paper is polycentric governance.

This research highlighted digital devices installed in villages for primarily agricultural purposes, whose governance involves both external institutional actors and the farming communities themselves. This diversity of actors simultaneously involved in the governance of community digital devices highlights a multi-actor and inclusive management system, thereby raising the question of polycentric governance, as conceptualized by Ostrom (2010). Indeed, polycentricity is a self-organized governance system composed of multiple actors, decision-making bodies and the relationships that connect them (Kim, 2020), allowing better adaptation to farmers' contexts, giving more power to local populations (Pahl-Wostl, 2009). Consequently, polycentric governance is widely promoted, though not without drawbacks (Koopmans *et al.*, 2018). Moleka (2024) mentions power imbalances and uneven participation, limited institutional capacity and resource, accountability and transparency concerns, coordination challenges and fragmentation (Peter, 2021). This governance is indeed associated with positive impacts on access to knowledge, but the participation on which it is based comes with conflicts and complex issues related to resource management and autonomy of action (Pradel-Miquel, 2015). Moreover, a contradictory aspect exists in the relationship between social innovation and governance. Indeed, governors can use social innovation as a façade to give the impression of openness while maintaining centralized power logics or neutralizing potentially transformative collective dynamics (Galego *et al.*, 2022). Overall, community digital accessibility, considered as a social innovation, facilitates farmers' access to knowledge and supports inclusive governance dynamics. However, it also reveals limitations related to social inequalities, power relations and institutional constraints. Thus, its transformative potential remains dependent on the actors' ability to overcome these structural barriers.

6. Conclusion and implications

This study aimed to show how institutional arrangements fostering community digital accessibility – considered a form of social innovation – enhance farmers' access to knowledge. Several theoretical insights emerge from the findings. First, various types of actors are involved. In the present case, we identified both external actors, who initiated the collective dynamic and the farming communities themselves, who carried it forward. Specifically, the selection of managers and the collective mobilization to maintain the equipment of community digital devices both contribute to enhancing digital accessibility. The former enabled farmers to benefit from close and context-specific support, while the latter helped reinforce the sustainability of the devices by ensuring their functionality. These combined effects facilitated farmers' access to digital services and, subsequently, to agricultural knowledge.

These results invite policymakers to rethink the institutional anchoring of social innovations in rural areas by integrating flexible yet robust regulatory mechanisms capable of supporting sustainable agricultural transformation. On the other hand, the findings also call on researchers to model the process of integrating such devices. In other contexts, promoting community digital accessibility requires several conditions: recognizing social structures and the self-organizing capacity of local communities, ensuring institutional flexibility to adapt to local contexts and establishing inclusive, polycentric governance systems that encourage community participation and the local adaptation of digital devices. Community digital accessibility facilitates knowledge access while promoting social justice by including marginalized smallholder farmers, ensuring equity in knowledge dissemination

and supporting sustainability through the active involvement of local communities in device governance.

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