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What sort of digitalization do family farmers need?

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Digitalizing the agricultural sector in West Africa is a promising opportunity for stakeholders in the agricultural and technology sectors, an opportunity that relies on agricultural producers' voluntary mass appropriation of connected phone tools. Mobile phones and app use could foster independent producer networks, improve value chain structuring and boost the sector's economic value. Agricultural producers are now being targeted by a growing number of providers of "digital services", in the form of apps developed by tech and agritech start-ups. However, apps developed specifically for agricultural producers have met with mixed success. What lessons can be drawn from this mixed bag of results, and what will it take for digitalization to truly serve producers and facilitate the transition to socially, economically and environmentally sustainable practices?

WHAT'S AT STAKE

A PROMISE OF TRANSITION THAT REQUIRES SUBSTANTIAL INVESTMENT

In a context of technological change, digitalization is seen as a major lever for modernizing farming in Africa (Dooyum Uyeh et al., 2023). National strategies are encouraging its adoption to structure value chains, optimize production and marketing, guarantee traceability and foster producers' social, economic and financial inclusion. Some future scenarios even imagine farms run by drones or using "digital twins" (Ncube et al., 2018).

A range of investments have been made to support this transition, often funded by soft loans from international financial institutions. For example, the World Bank invested 2.3 billion dollars in sub-Saharan Africa between 2015 and 2019 to develop road and digital infrastructures in rural areas (World Bank, 2019). Bilateral cooperation agencies have also implemented numerous digitalization projects, designing agricultural apps to be developed via local start-ups, with an economic model in which producers fund the tool. However, these initiatives have not necessarily lasted (Kieti et al., 2022), as shown by a survey of developers and by farmers' limited use of agricultural apps.

UNDERSTANDING ADOPTION TO HELP RETHINK MODELS

The literature highlights two main empirical obstacles to producers' adoption of agricultural apps: a lack of capacity on the part of farmers and a design process not based on co-design (McCampbell et al., 2021; Steinke et al., 2024). Our research shows that while relevant, those two factors do not fully explain the failure of many phone apps.

KEY MESSAGES

► Invest in digital technology in rural areas (access to phone tools, free training, charging points, attractive pricing, etc), recognizing that producers prefer mobile phones and simple tools.

► Accept that producers' willingness to pay hinges on network access rather than on specific farming apps.

► Develop digital solutions anchored in existing use patterns, with no need for any particular business model, to encourage long-term adoption at a lower cost.

► Steer digitalization projects towards apps on a value chain scale, to facilitate their structuring, with easy-to-use interfaces for producers.

► Invest in digital technology for its impacts on market organization, agroecological transition or producer wellbeing, rather than for its short-term economic and financial returns.

NEW INSIGHTS

We studied digitalization processes in West Africa, particularly public policy and the adoption of digital technology by agricultural producers, and measured the digital divides that existed or were exacerbated by such technology. Our research focused on three contrasting value chains and three countries – market gardening in Benin, cocoa in Ivory Coast and dairy in Senegal. On a policy scale, we studied the conditions in which the range of digital services on offer to farmers was built, and initiatives aimed at fostering "digital service innovation ecosystems". We also looked into access, capacity and use of digital technology in each value chain. We tested digital developments, notably by co-designing simple digital agricultural advice tools on agroecology – applying the DigiCLA project to control maize fall armyworm – and co-building social media chat groups and decision support tools for participatory guarantee schemes.

Our analysis revealed trends shared by all the value chains, such as the central importance of mobile phones (20% smartphones, 60% simple phones and 20% of producers not equipped) and the greater success of simple solutions based on farmers' usual digital habits: calls, mobile money and instant messaging. Specificities also emerged for different value chains: low digital tool use in the cocoa value chain, which is already well structured, contrasting with more variable use in the market gardening sector in which producers generally tend to organize themselves around simple solutions.

Public policy and digitalization models: big ambitions being put to test by reality

Digitalizing the agricultural sector has become a priority for countries in West Africa since the late 2010s. The rush to digitalize has arisen from the success of mobile phones and the mass adoption of mobile money. Public policy on digitalization (extending connectivity in rural areas, supporting digital services aimed at farmers, etc) is accompanying road building as a way of opening up isolated rural areas.

However, such initiatives are often inspired by the platform economy and the digital economy, based on other economic zones, without taking full account of local realities. Despite substantial funding from several technical and financial partners, aimed at building a "digital service offer" devoted to agriculture – market or digital advice platforms –, projects have run up against obstacles to anchorage and adoption. Our surveys and experiments have shown that funded apps developed by national or regional start-ups are often under-used due to their unsuitability for producers' uses or requirements, or because of a failed economic model. Moreover, apps often cannot be adapted to actual uses and producers may see them as restrictive, if not obsolete, and therefore choose not to use them.

Infrastructures, access, uses: persistent digital divides and continuity between daily life and agriculture

Our surveys showed that telecoms networks were widely available, with growing access to phone networks and internet and exchange kiosks. Network accessibility and quality were generally seen to be good. Solar power makes it possible to charge and thus use mobile phones, the only digital tool that producers use.

Analysing access, capacity and use revealed structural inequalities very similar to those seen universally: men, young people, and people with the most education and wealth had greater access, capacity and use. These divides add up, resulting in cumulative exclusion dynamics.

Mobile phones are used in many areas of daily life – phone calls, money transfers via mobile money or social networks – and for leisure pursuits – radio, video, etc. In farming, use varies from one value chain to another but fits in with day-to-day use. In Senegal, livestock farmers use phones to organize transhumance and sell livestock using photos and videos. Market gardeners in Benin check prices, trade and share knowledge or promote their products via instant messaging groups. In Ivory Coast, however, the cocoa value chain, which is more vertical and regulated, offers fewer opportunities. These differences stem from the characteristics of the different value chains: product perishability, harvesting times, producer mobility, market structure, etc.

Balancing simplicity and rigidity: what sort of apps for what uses?

Our experiments showed that when it comes to farmers, simple solutions that fit in with daily habits are the most successful. Setting up instant messaging groups with clear rules, which are still active several years later, has helped to build mutual aid and advice systems among market gardeners in Benin. However, more complex tools have met with obstacles to their adoption. The AgriCEF-Maïs app, which requires a stable internet connection and specific skills, is a good example. The same goes for certification support apps within participatory guarantee systems, which require regular maintenance. The future therefore lies in developing solutions that correspond to the digital technology habits and material and economic contexts of future users. Repeated trial phases are required to stabilize app use.

More advanced systems on the scale of other parts of value chains can also prove successful, however, as shown by the Laiterie du Berger dairy, which has set up an information system to manage milk collection. The system, which is both time-consuming and costly, is a geographical database that allows collectors to manage their rounds. There is a smartphone app to allow collectors to access farmers' accounts by scanning a QR code that farmers keep. The farmer's account is then credited, allowing them to buy inputs and receive money on their mobile money account at the end of the month.

RECOMMENDATIONS

Public policy on digitalizing agricultural value chains largely centres on entrepreneurial initiatives. While app development is often funded by international aid, the dominant economic model relies on farmers' willingness to pay. This is its biggest weakness. Our results show that in fact, farmers are not actually willing to pay.

Digital technology is a powerful, appropriate lever for including producers in broader information, organization and financial systems. Keenness and ability to use that technology depends on access to a phone, whether simple or smart. However, there is still very little willingness to pay for specialist apps. Mobile packages and withdrawal fees are already a burden for many producers, and expecting them to pay extra is both unrealistic and likely to exacerbate inequalities.

Furthermore, designing paid apps for producers has several structural limitations. Making them evolutive and tailoring them to requirements means high development and maintenance costs, which are often underestimated. Capacity building is often required for farmers to use tools, which means ongoing training costs that are likely to hamper scaling up. Extra data costs for producers also hinder app adoption. Lastly, the fact that apps rapidly become obsolescent and require regular updating and adjustment is also an obstacle.

Our experiments showed that more open, informal apps such as chat groups on instant messaging platforms are more suited to producers' current habits. Such tools offer considerable freedom of organization, dialogue and information sharing, with no need for capacity building, and reduce the risk of exclusion, at least for smartphone owners.

As a result, an approach that reconciles digitalization, agricultural value chain structuring and inclusion is called for. Rather than expecting digital solutions to be profitable immediately, they could be seen as strategic infrastructures. Solutions like those we describe, which are imperfect but fit in with producers' habits and are truly relevant, could have significant socioeconomic impacts. Their impact should not be measured in terms of direct profits, but of broader societal objectives, such as their contribution to sustainable production, better market access and better living conditions for producers.

BRIEF RECOMMENDATIONS

► Maintain efforts to roll out digital infrastructures.

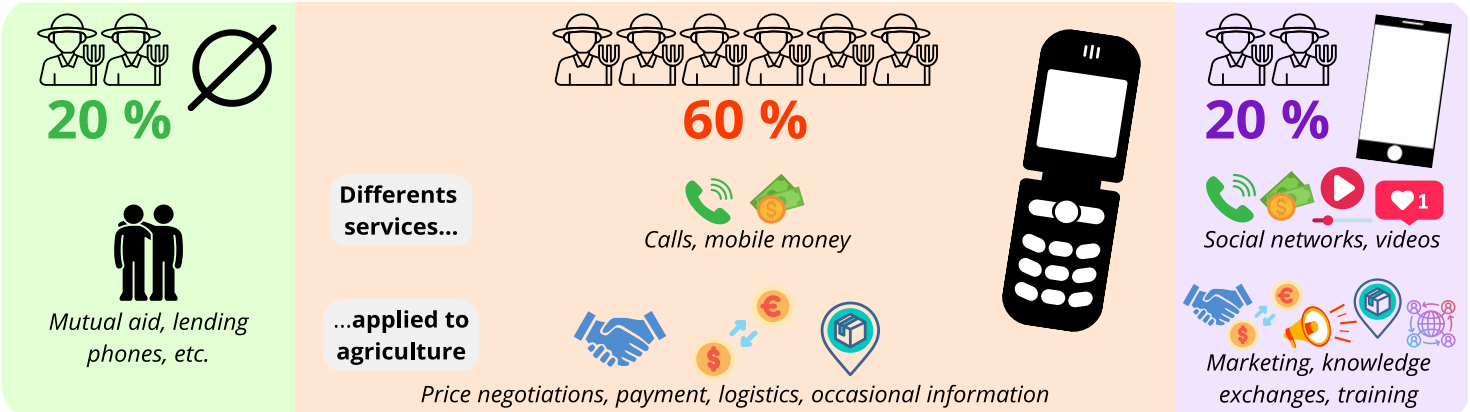
► Prioritize the simple digital tools producers already use: rely on existing generic apps in common use rather than on specific developments that are costly in terms of training and maintenance.

► Develop bespoke solutions for specific needs: more sophisticated digital tools may be useful for certain groups of players in view of their requirements and financial capacity, such as agricultural advice services and agricultural firms, or on other scales such as value chains. Such solutions could have a simple interface intended for producers if necessary.

► Allow a long phase of repeated trials of the design, functions, app path, etc, to ensure that the tool fits producers' requirements and how they use it.

► View digitalization as a social lever rather than a growth model for immediate profit. Smart farming services for producers would benefit from the authorities seeing them not as a short-term, profit-making scheme, but as a tool to serve broad social objectives, such as building digital networks for players, structuring value chains, improving producer well-being and achieving agroecological transition.

Figure 1. Phone use in West Africa: family farms are not all equally connected



CONCLUSION

Extending smart farming in West Africa essentially relies on phone use. Simple interfaces, tailored to producers' habits, could foster inclusion rather than exacerbating inequality. Expecting farmers to pay for high-tech tools is not the solution, as shown by converging results from various surveys. There are alternatives, particularly for individuals, but also on a value chain scale, with the development of different, versatile tools for different users that have potential for transformation, notably for tracing and managing financial and information flows.

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Projects and partnerships

The **Fracture Numérique (digital divide) project** set out to characterize the uses and non-uses of digital technology in the agricultural sector in three African countries. Its work is funded by the French Ministry of Europe and Foreign Affairs.
https://www.fracture-numerique.org/ (in French)

The **ACOTAF project** is helping to strengthen agricultural advisory services to support agroecological transitions in family farming systems in sub-Saharan Africa. It is also funded by the French Ministry of Europe and Foreign Affairs.

The **Compairs project** aims to understand peer-led certification pathways in agriculture better. Participatory guarantee systems (PGS) often rely on instant messaging groups. Its research is funded by ADEME and Agropolis Fondation.

The **DigiCLA project** is using digital technology to control the fall armyworm, a very common maize crop pest in Benin. It is funded by AGriDI, the International Centre of Insect Physiology and Ecology (ICIPE) in Kenya, and the European Union.

References and other links

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