

AF SA

ALLIANCE FOR FOOD SOVEREIGNTY IN AFRICA



Digitalisation and agroecological markets in Africa

Foreword

The digitalization of African agriculture is a battleground for supporters of the conventional or Green Revolution agenda and Agroecology. Supporters of the Green Revolution regard digitization as one of the technological or technical solutions to Africa's agricultural difficulties. It is part of their effort to boost efficiency and productivity. The African social movement has no fundamental issue with technology, but views it through the lens of political economy. The Movement sees Africa's troubles as a deliberate and concerted exploitation of the continent's life. They see digitalization as assisting and easing the utilization of the continent's genetic and other information. They inquire, "Who owns the technology?" Who owns the data extracted by digital technologies? What are the implications of the power imbalance caused by digitalization, given that these technology and support mechanisms are provided by existing strong groups? Nobody can blame the Movement for becoming suspicious and worried about these technologies, given that their adoption is buried in a slew of covert bilateral and multinational agreements. The continent's ever-impressed African elites with Western civilization and technology are supporting this digital robbery of its freedom and data. The Africa social movement, on the other hand, understands the significance of these technology. It understands its power in luring the next generation to agriculture, in removing the bloodthirsty middlemen from agricultural markets, and in facilitating the production and consumption of healthy food.

Digitalisation is a fact of life that will continue to pervade the most important elements of our lives. The food system is no different. In recent years, there has been a significant explosion of tech incubators and start-up accelerator programs aimed primarily at the food system across the continent.

AFSA members recognized markets as one of the roads to agroecology on the final day of the third biennial food systems conference 2020.

AFSA commissioned this study on the function of digital marketing in increasing access to agroecologically produced food in Africa based on the foregoing.

The publication urges African governments to adopt a "digital food markets strategy to protect and strengthen the functioning of territorial markets and generate a political mandate for trade and innovation departments while being aware of the hazards of data mining and digital enslavement."

Enjoy your reading!



Million BELAY (PhD)
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Executive Summary

In Africa, digital technologies are already present in most aspects of the food chain. They co-exist with traditional financial and communication technologies that were prevalent before the advent of ICTs. Established mobile apps such as WhatsApp and social media platforms like Facebook are widely used as peer-to-peer networks for sharing information or exchanging goods. Mobile and web solutions abound for payments, price discovery, online marketplaces, advisory services, and learning. While logistics and the movement of physical goods remains a key challenge particularly in the 'first mile', some start-ups are tackling this by attempting to streamline ordering, aggregation, and delivery scheduling. There is cautious optimism for the applications of advanced technologies like blockchain for traceability and cost transparency, but real-world applications are rare or in very early stages.

Ongoing digitisation represents well-known risks to the agroecology movement. Ideas that start with a noble vision at inception morph into profitable young companies that get bought out by bigger fish, and in so doing serve as harbingers of consolidation. Social contact and cohesion throughout the food chain is lost as digital technologies disrupt normal patterns of buying and selling and face-to-face interaction. The digital divide, which already discriminates against women and those in rural

settings, is further entrenched as the benefits of digital technologies naturally accrue to those who have access, or to people similar to those who are building the technology.

Yet while these outcomes might seem inevitable, they are not foregone conclusions. After recent, rapid growth in the number of new applications, the digital landscape is still fragmented with many similar offerings in different places working out who to target, what to offer, and how to achieve financial sustainability. Many digital startups have struggled to figure out a profitable business model. Most solutions remain reliant on donor funding or ongoing fundraising from early-stage investors. Difficulties in developing sustainable business models have been driven in part by the significant financial investments required to build digital literacy and to familiarise users with new technological offerings. With few regulatory guidelines specific to digitisation in food markets, those who find creative solutions to pressing challenges, adapt already-familiar technologies, and figure out sustainable business models while doing so are likely to set the tone for how digitisation plays out.

In this light, there is an urgent need to understand how digital technologies might be adopted to support agroecological markets, and the agroecology movement more broadly. Without ignoring the

risks, this report focuses on the opportunities for achieving this, keeping in mind key outcomes that align with principles of agroecology. Based on a desktop scan of real-world applications already present in the food value chain, and insights from interviews, this report identifies opportunities for digitisation in support of agroecology, namely:

- Enabling new ways of building territorial networks of communication, exchange, and collaboration.
- Strengthening existing territorial markets, and re-territorialising markets dominated by consolidated global retail, by improving consumer convenience and access to product variety.
- Offering new opportunities for AE farmers to tell the story of their food and build relationships and trust with their consumers.
- The promise of increased transparency, including price transparency; who profits and by how much; what consumers want; how food is produced; the real cost of food (true cost accounting); and real-time quality checks.
- The potential for accurate order tracking and 'pooling' of produce from multiple farmers helping to reduce the administrative burden of sourcing from multiple smallholder farmers.
- Bypassing big retail via new digital sales and distribution channels.
- Connecting consumers and farmers in novel ways such as crowdfunding and payback services that share the risk and reward of agricultural activities.
- Influencing the thought space for youth who are exploring digital applications by telling strong, positive stories in support of agroecology.
- Harnessing data free platforms to provide services while cutting out data costs for the end user.
- Creatively boot-strapping existing services and focusing on in-person effort to solve digital challenges on the ground without the need for big investments.
- The range of mobile money solutions that allow access to the digital payment arena for the unbanked.
- Networking the majority into a unified force via

platform technologies that facilitate learning and market transactions, negating the trend towards vertical integration of supply chains.

Taking current trends, potential opportunities, and risks into account, this report makes the following recommendations:

1. Celebrate the ingenuity of local problem solvers by running an annual competition that seeks out the best promising digital solutions based on existing digital platforms such as SMS's, WhatsApp, and Facebook MarketPlace.
2. Work on solutions for public procurement for institutions such as schools, colleges, and hospitals, helping to make public procurement from local small-holders easy for state institutions.
3. Actively involve women by funding digital incubation programmes for and by women as well as investing into digital literacy and programming skills for young women from farming families.
4. Work towards a data-free future by lobbying national governments and the global funding community to collaborate with mobile network operators to provide zero-rated, data-free solutions to African farmers and value chain actors.
5. Explore the idea of an agroecology super-app which offers users a simple one-stop solution to a range of digital needs. While this might seem somewhat outlandish from our current perspective, and contrary to the recommendation to make use of simple existing technologies, bundled apps are likely to play a more significant role as time passes.
6. Agroecology funders need to step in as active shareholders to help to shape company culture and ethos in food-tech startups.
7. Call for a 'digital food markets strategy' to be adopted in member countries that preserves and strengthens the functioning of territorial markets and creates a political mandate for departments of trade and innovation.
8. Develop territorial policy positions on what a positive digital pathway might look like for food markets.

Glossary of terms

Artificial intelligence (AI): Computer systems able to perform tasks normally requiring human intelligence, such as visual perception, pattern recognition, decision-making

Big data: Extremely large data sets from multiple sources that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions

Blockchain: A system of recording information in a digital ledger that is duplicated and distributed across a network of computer systems

Data analytics: Systematic computational analysis of data or statistics used for the discovery, interpretation, and communication of meaningful patterns in data

Digitalisation: To transition from analogue or physical processes to digital processes, with related shifts in business models, working practices, or social norms (sometimes referred to as digital transformation)

Drone: A flying robot that can be remotely controlled or fly autonomously using software-controlled flight plans in its embedded systems

Food value chain: The flow of food products from farm to fork with its related processes and services which include market information, advertising and sales, payments, logistics and transport, certification, and traceability (used interchangeably with food chain)

Internet of Things (IoT): Physical objects with sensors, processing ability, and other technologies that exchange data over the Internet, such as radio frequency identification (RFID)

Mobile app: A computer programme or software application designed to run on a mobile device which has access to a cellular system

Platform: A web or mobile application that provides a space for users to connect, share, or transact across the internet

SMS: Short message service. A component of most mobile device systems that can send text and other media such as images or voice recordings

Social media: Websites and applications that enable users to create and share content or to participate in social networking

Territorial markets: Highly diverse markets through which most of the food consumed in the world passes, which may operate at a local, cross-border or regional level, in rural, peri-urban, or urban settings

Background, objectives, and methodology

Digitalisation is a reality that will continue to permeate the most vital aspects of human life. The food system is no exception. Recent years have seen a rapid proliferation of tech incubators and start-up accelerator programs across the continent that specifically target the food system. During the final day of the 3rd Biennial Food Systems Conference 2020, AFSA members identified markets as an alternative pathway to pursue agroecology. Among others, future

research efforts need to explore the reasons behind the lack of recognition for African markets, how to improve value addition and food traceability, as well as investigate systems for certifying the quality of products available in territorial markets. Premised on the above, AFSA commissioned this study on the role of Digital Marketing to increase access to agroecologically produced food in Africa for better health and quality of life.

Specific objectives

1. To examine the current state of play in digital marketing for agriculture in Africa including emerging technologies, approaches, and actors.
2. To explore the role of digital marketing in the agroecological marketplace across Africa including opportunities and risks for agroecological entrepreneurs.
3. To generate concrete proposals, approaches, and recommendations of the use of digital marketing to enhance the transition to agroecology.



Methodology

The study employed a three-pronged qualitative approach.



Prong one:

was a scan of grey and white literature

to map out 1) key global trends in digital marketing in the food sector and 2) an overview of emerging digital marketing strategies and technologies in the African food sector.



Prong two: was to complete five in-depth country perspectives covering South Africa, Kenya, Zimbabwe, Burkina Faso, and

Senegal. Input was provided by the following representatives: South Africa – Matthew Purkis; Kenya – Raymond Jumah; Burkina Faso – Edouard Sango; Senegal – Aboubacar Sidy Sonko; Zimbabwe – Tawanda Hove.



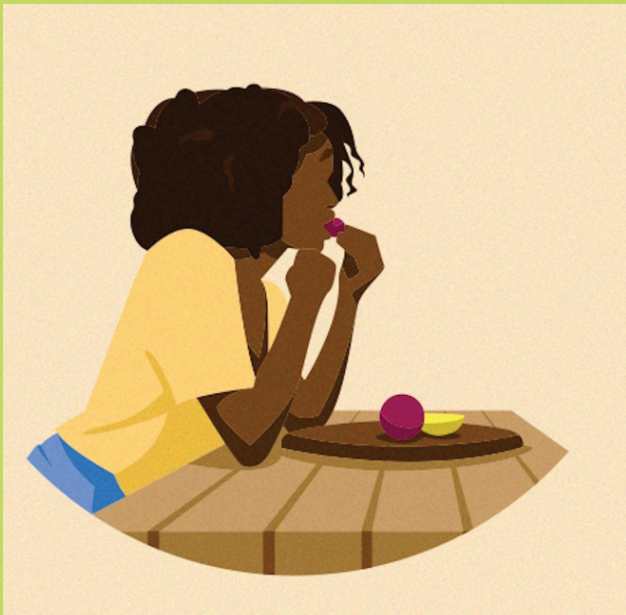
Prong three:

engaged key AFSA informants in a focus session. The

aim was to gain input and feedback on emerging opportunities and explore their visions for how digital agroecological markets could connect to their work in future.



We acknowledge upfront that this report has not escaped the skewed gender representation that exists in the technology space. The main authors and in-country representatives for the country case studies in this report are all male, based purely on who responded to the call for input within the short timeframes of this study. We recommend that AFSA takes concrete steps to gain input from female authors and collaborators as this report is socialised and this topic is taken forward into future research.



Introduction

There is a tendency across the current literature to position digitalisation as a recent and game changing force. Generally, what is implied by 'digitalisation' discussions today refers specifically to the recent and rather late mainstreaming of internet access across Africa and the rapidly increasing ownership of mobile phones in most of the world. While this is certainly a profound transformation, this framing is problematic as it obscures many of the most problematic elements of the current food market system.

Digitalisation is nothing new. The supermarkets and swift, globalised supply chains that underpin the current industrial food system are an expression of a process of value chain digitalisation which began in the 1980's. Without digital inventory, ordering, and accounting systems the complex inventories and economies of scale achieved by supermarket giants such as Walmart, Shoprite and Alibaba would not have been possible. Nor would their competitive advantage over local markets, informal traders and mom & pop stores have been so profound.

This is a 40-year head start which has propelled the global food system to previously unimaginable levels of consolidation, centralisation, and automation. We

sit with a deeply embedded and highly advanced level of digital infrastructure in food markets today, and while the majority of this is proprietary technology which remains invisible to the public, it exerts a powerful global influence.

It is important to appreciate this head start, so we do not assume that the agroecology movement is at a fair starting line in the race to see who can leverage digital technology most effectively as we strive to promote agroecological transitions by enabling territorial markets. What AFSA and its partners face is a David and Goliath situation, in which the agroecology movement needs to weigh up the potential for the creative application of a suite of simple technologies in its defence against a highly digitised giant.

Thankfully, amidst the current frenzy of techno-optimism in which smartphone apps appear as the solution for all the world's problems, a small but growing number of critical voices are emerging. While techno-scepticism is essential in providing a balanced view, there remain very few positive visions put forth by the agroecology movement for the digitalisation of African food systems. This report attempts to fill this gap, specifically looking at the arena of markets which have tended to be ignored as most research has focussed on on-farm processes. Drawing on AFSA's emerging research into territorial markets, this work takes stock of the current state of play and offers a solutions-oriented analysis of digitalisation of food markets in Africa. It identifies several specific technologies and systemic opportunities and motivates for an ambitious and creative response.

The report is set out as follows. In the first section we provide an overview or 'state of play': how digital technologies are shaping the food value chain today, globally as well as in Africa. Next, we present 5 country case studies from authors in each country. The report then identifies emerging implications for African food markets and actors within them, drawing on grey and white literature and insights from interviews with local representatives in several African countries. Then, we discuss the opportunities offered by digitalisation, using two lenses: first, their potential for strengthening territorial markets; and second, how they might support the broader cause of agroecology. We then expand on the significant risks posed by the current wave of digitalisation and its potential to support further entrenchment of the status quo. Finally, we outline a set of recommendations to take forward, including the need for further exploration of some of the topics uncovered by this study.

State of play

While digitalisation in the food system is not new, rapid adoption of mobile smartphones and the rise of big data underpins a new wave of digital applications in food markets all over the world. Not surprisingly, a step-up in remote interaction during the COVID-19 pandemic has accelerated this trend and has had a marked influence on the way food is sourced, moved, and consumed. We view this from a global perspective before bringing our focus to Africa.

Digitalisation in the global food chain

Globally, the current wave of digitalisation is perhaps most obvious in the rise of online e-commerce. Almost any large retailer now has an online store, traditional retailers are expanding their digital capabilities (for example, [Walmart's acquisition](#) of Flipkart) and e-commerce retailers are moving into food (with [Amazon's acquisition](#) of Whole Foods perhaps the most well-known example). The meal-kit delivery market is now flooded with brands including Hello Fresh, Blue Apron, Marley & Spoon, Home Chef, Every Plate, Sun Basket, Freshly and hundreds of other web-based and mobile-based platforms. Some of these are owned by brick-and-mortar retailers, giving them a share of the online delivery market – for example, Home Chef was [bought by Kroger in 2018](#). Globally this market is worth \$20 billion and is expected to [triple in size by 2030](#). The online market is supported by now-standard online card payment systems and mobile payment such as Apple Pay or Google Pay, along with a host of smaller, local operators.

As has happened with hospitality (Airbnb) or transport (Uber), technology firms are disrupting the food system, creating new offerings that rival established incumbents. Pinduoduo in China is an [online marketplace](#) that links 12 million farmers to 850 million mostly urban consumers, bypassing conventional supply chains. The

platform has a dizzying array of add-on services that include an e-commerce business institute to help farmers understand the online environment. Popular e-commerce websites Facebook Marketplace, Etsy, and Amazon provide [ready-made markets](#) for food producers looking to sell directly to customers.

New entrants in the e-grocery segment are attracting major investment from private equity and venture capital, demonstrating a growing belief in the potential for disruption of the global food chain. Gorillas and Flink are two competing start-ups in Europe who work directly with local farmers to source and deliver groceries by e-bike. These are not minor players: Gorillas was [valued at over \\$1 billion](#) in early 2021 based on a capital raise; Flink was valued at [\\$2.7 billion later that year](#). Established technology-driven brands like DoorDash, Uber Eats, and Deliveroo have created an efficient last-mile infrastructure and have seen a surge in popularity during the pandemic.

Digital technologies are increasingly integrated within existing agricultural supply chains. Large R&D budgets allow large industry leaders to create or acquire advanced digital technologies. Farm management platforms like AGRIVI offer a suite of products including farmer advisory, supply chain management, and traceability software using Internet of Things (IoT). As does John Deere's powerful digital ecosystem.

... technology firms are disrupting the food system, creating new offerings that rival established incumbents.

AGRIVI's customers are in over 100 countries and [include multinational conglomerates](#) such as Nestle. Proagrica offers advanced (and expensive) data analytics to make agriculture [supply chains more efficient and transparent](#). Agricultural giants such as Cargill – which already straddle multiple aspects of the food supply chain – also have their own in-house [digital transformation programmes](#) that leverage available technologies to drive efficiency gains.

On the near horizon, there is much excitement about applications for advanced technologies like blockchain and artificial intelligence (AI), but real-world applications are rare or in very early stages. Traceability using blockchain technologies is being piloted in higher-value supply chains in advanced countries (FAO, 2021). Ripe, AgriChain, AgriDigital, and AgriLedger are four companies [piloting blockchain technologies](#) for traceability. While others such as SCiO are emerging with hand-held [molecular sensors](#) that scan fruits and vegetables for sugar content, calorie count, or freshness.

Digital technologies aim to break down the barriers between farmers and customers, creating transparency in the food chain on all sides.

Digitalisation in Africa's food chain



In Africa, almost every aspect of the food chain is now being targeted in some way by digital technologies, whether these are long-established

platforms or new mobile applications. According to Dalberg & CTA (2019) most registered solutions are advisory and information services (68%) followed by financial access (17%) market linkage (8%) and supply chain management and logistics (7%).

Mobile payments services like M-Pesa or Ecocash allow those without bank accounts to transact digitally. Start-ups like Kamtar in Côte d'Ivoire, and established logistics operations like MaxAB in Egypt, use sophisticated data analytics to connect fleets of drivers with customers. Online marketplaces like Khula! And YeboFresh in South Africa, direct wholesalers like ifarm360 in Kenya, or direct farm to consumer services like Fresh in a Box in Zimbabwe, are all competing with physical retail stores.

Digital technologies aim to break down the barriers between farmers and customers, creating transparency in the food chain on all sides. Knowledge sharing platforms like eMKambo combine multiple channels including Voice Over Internet Protocol (VOIP), WhatsApp, and radio among others. Kurima Mari mobile app and M-Farm's text messaging service provide farmers with selling tips and market information. Crowdfunding platforms like Livestock Wealth in South Africa or Farmcrowdy in Nigeria create a direct financial link between customers and their products. Established mobile apps such as WhatsApp and social media platforms

Over half of all registered food system solutions are based in East African countries, and two thirds of all registered farmers using digital solutions. Within this, Kenya is the leading country in terms of both innovations and users...

like Facebook are already widely used as peer-to-peer networks for sharing information, learning, or exchanging goods. Without creating a single minute of its own video content, YouTube has emerged as a powerful platform for learning which augments existing extension support; some farming videos have attracted millions of views from all over the world. On the other hand, some services rely on simpler technologies: mNutrition uses standard SMS text messages to provide child feeding and dietary advice to women with young children. The choice of digital solutions is determined by factors like costs of data and compatibility with existing communication channels, tools, and cultures. For example, most farmers, traders, and consumers associate voice with authenticity of information and knowledge.

However, many digital startups in the African food sector have struggled to figure out a sustainable business model. Most solutions still rely on donor funding and are not yet financially viable, and it remains a somewhat fragmented market, with similar offerings repeating themselves in many locations. Regional differences in the food chain are part of the reason for this. Context is proving to be critical, and transferability between countries remains limited. In response, bundling (offering more than one service in an app such as advice, weather forecasts and price updates) is starting to become widespread – as much as 50% of all digital solutions, and climbing (Dalberg & CTA, 2019). This trend is likely to continue as profit-oriented startups work out how to turn users into viable revenue streams, through improved usability and interactivity, and by tapping into specific user needs.

Perhaps predictably, digital innovation is concentrated in a few key regions, and often funded by the usual suspects. Over half of all registered food system solutions are based in East African countries, and two thirds of all registered farmers using digital solutions. Within this, Kenya is the

leading country in terms of both innovations and users (Dalberg & CTA, 2019). Notably, ‘big tech’ firms (Microsoft, Google, IBM, Bosch, and Alibaba) and ‘big agri’ (Bayer, Syngenta, Yara, and UPL) as well as agricultural processing, trading, and logistics (Cargill, ADM) are starting to make inroads through acquisitions, partnerships with local firms, developing new products aimed at the African market, or initiating pilot programmes (Dalberg & CTA, 2019). ‘Big food’ (PepsiCo, Shoprite) have also launched programmes targeted at funding agricultural and [value chain innovations](#).

As investment and activity forges ahead, regulators are focused on creating enabling environments for e-commerce and related activities (e.g. implementing acts to regulate electronic services and transactions). However, most regulators have not been able to temper the cost of data associated with digital solutions. They have also been found wanting with respect to making sure digital solutions meet public interests. Markets used by smallholders and the informal economies they thrive in are often invisible to policymakers. Digital markets are no exception (CSM, 2016). While many African countries now have well-developed [digital strategies](#), few have a standalone strategy that is specific to digitalisation in the food system. In many countries, the responsibility for building agricultural data infrastructure remains unclear (Dalberg & CTA, 2019). Enforcement remains problematic, and breaches of intellectual property rights are common in some countries. For example, the share of unlicensed software in Africa is 50 percent higher than the global rate, with Libya and Zimbabwe both hovering around the 90% mark (Malabo Montpellier Panel, 2019).

All of this leaves the playing field quite open. Those who find creative solutions to these challenges and figure out sustainable business models while doing so are likely to set the tone for how digitisation plays out in Africa’s food markets in the future.

Country case studies

Burkina Faso, Zimbabwe, South Africa, Kenya, Senegal

BURKINA FASO

Key stats



22 million
total population



6 million monthly
active internet users
(27% of the population)



26 million mobile
subscriptions
(mobile penetration
rate of 118%)



2 million monthly
active users on
social media (9% of
the population)

The use of digital technology is growing rapidly in Burkina Faso. The culture of buying online or via electronic devices is becoming part of the habits of Burkinabè, especially for city dwellers. Mobile and social networks are increasingly popular. COVID-19 has re-shuffled the cards in the e-commerce space, as agripreneurs seized the opportunities offered by digital technology to distribute food during periods of confinement, quarantine, and market closure, and to generate income.

Alongside the expansion of mobile telephony, radio and television, **Market Information Systems (MIS)**, both online and via telephone, are increasingly taking root in Burkina Faso. State, NGOs, and national and international private structures have set up market information systems to provide information and sales opportunities for local products (cereals, livestock, fruit, vegetables, etc.). This is improving overall price and market transparency. As in many other regions, digital tools are integrated with existing logistics. **Tôtô Riibo** is an order and delivery service that delivers home-cooked meals to company employees in

Ouagadougou, employing the services of female street food vendors. Mobile money is the dominant form of payment, facilitated by a plethora of offerings.

However, the cost of digital tools remains a general challenge. Digital entrepreneurs often prefer to advertise themselves on social networks because they do not have sufficient funds to hire a professional; typically, they might ask acquaintances on social media platforms to share their post on their news feed or story. Another challenge is irregular and costly Information and Communications Technology (ICT) infrastructure that is insufficient in the face of rapidly growing demand. Obsolete telecommunications infrastructures cause low quality supply and high service prices for services.

In terms of agroecology, the main difficulty in Burkina Faso is finding customers willing to pay higher prices. Organic vegetables are easily confused with ordinary vegetables. To address this, local certification systems have been set up to differentiate themselves, like the **BioSPG label**. Initiatives like **Lôgôba Agriculture** aim

to help organic producers to reach a wider market that is more aware of the added value of organic products. Networks of female farmers who are part of the **La Saisonnière** association and use agroecological practices have created WhatsApp groups to communicate about the availability of vegetables to current or potential customers.

Another challenge is that agroecology is more prevalent in urban and peri-urban areas, where farmers struggle to access production space and water, and face high costs of equipment and inputs for organic farming. Online markets are not a solution for this.

Table 1: Level of digitalisation across the food value chain in Burkina Faso

Aspect of the food value chain	Level of digitalisation today (1-10)	Initiatives and impacts
Payment systems transactions along the whole food value chain.	8	Orange Money, Moov Money, Wave , Sank , Coris Money
Logistics (middlemen, transport, cold chain)	6	Poz'Otaf , Tôtô Riibo , BonBiz Food , Okalm , Conekto
Sales (market discovery, buyer/seller matching, online marketplaces)	6	Zinbiss Yaar , Le Terroir , Ouaga Yaar , Agribusiness Shop , LÔGÔBA Agriculture
Price transparency & market information	4	Garbal
Advertising	1	
Agroecology value-adding/ differentiation (eg. Certification and traceability)	2	BioSPG label
Learning & extension support for marketing	1	

Notable actors in the digital space and their relative influence:

- ☑ Yam Pukri is an ICT incumbent and a pioneer in the provision of ICT services for agriculture.
- ☑ Orange BF and Moov Burkina are the main mobile phone service and mobile payment solution providers.
- ☑ There is an established regulatory presence for oversight of digital exchange which includes the Regulatory Authority for Electronic Communications and Posts, the National Agency for the Promotion of ICT, the Central Cybercrime Unit, and the Ministry of Digital Transition, Postal Services and Electronic Communications.
- ☑ The National Council for Organic Agriculture is a hub for agroecology practitioners and provider of BioSPG certification for agroecological products; however, it has limited influence.

Examples of digitalisation in the food chain:

- ☑ **Ouagayaar** is a platform developed by the Ouagadougou City Council as a response to the slowdown of economic activities during the COVID-19 crisis. Funded by the UNDP and the Republic of Japan, the portal is designed to promote local initiatives, while reducing physical contact within the markets. It is a showcase for the local, social and solidarity economy. As such, it is an opportunity for agroecological actors. Indeed, the Ouagadougou City Council has been strongly promoting healthy and local consumption since 2019 through the “Eat well, eat healthy” campaign. In the name of this principle, the platform (managed by the City Council) will be open to the deposit of agroecological products. However, the platform needs to be boosted because transactions are still very limited or non-existent.
- ☑ **Lôgôba Agriculture** integrates a downloadable application (in addition to having a web platform) and places much more emphasis on the distribution of agro-food and agricultural products in addition to their promotion. Indeed, the production and especially the processing of agricultural products is strongly encouraged by the government. Several actors, most of them women, are putting excellent quality agri-food products on the market, but these products and their virtues are little known by potential consumers. Lôgôba proposes a solution to this problem. It also represents a favourable environment for increasing the market for

agroecology. The platform is already proving its worth as it has enabled agripreneurs to access a large customer portfolio and buyers via the platform claim to have been satisfied with the quality of the products and service. However, to be dynamic, the designers have realised that a hybrid model is needed between the old marketing methods (physical presence only) and the new methods using new communication technologies.

- ❑ **La Saisonnière** is an association under Burkinabe law that brings together a large network of women farmers in agroecology. Faced with competition from vegetables produced using chemical products, the association decided to fine-tune its marketing strategy by focusing on a specific type of market. For this purpose, the women have created **WhatsApp** groups in which they include their customers (current or potential) and communicate regularly about the availability of vegetables. Those who want to order can pay electronically via mobile money or cash services or have the products delivered. It is a transposition of the traditional proximity market to the digital environment. The particularity is that it does not require a great mastery of technology and is inexpensive, given that the women who have developed it have limited income.

ZIMBABWE

Key stats



15 million
total population



5 million monthly
active internet
users (33% of the
population)



14.8 million mobile
subscriptions (mobile
penetration rate of
98%)



1.3 million monthly
active users on social
media (9% of the
population)

- ❑ WhatsApp users in Zimbabwe account for [44% of the people using the internet](#)

- ❑ 3 Mobile network providers (Econet, Net One and Telecel) with only one (Econet) enjoying a monopoly of the mobile network space

- ❑ POTRAZ – the regulator lacks capacity and power to generate fluid evidence that is necessary for coming up with informed regulatory measures

Digital marketing in Zimbabwe is a mixed bag – some things are working well, in other areas there are key problems still to be solved. The most mature area for using digital tools is payments. A cash crisis and the difficulty getting hold of US dollars has contributed to a high level of mobile money usage, predominantly using **Ecocash**, a subsidiary of Econet. Today, cashing out is less common than it used to be as people have gained trust in the system. However, the cost of digital payments is higher than cash: every mobile transaction now attracts a 2% tax.

While several new initiatives are competing in buyer/seller matching space, the market remains fragmented, and they have not yet reached significant scale. Many startups are backed by NGOs; they may have a great concept, but their reach is small, less than 1% of all commerce. NGOs do not always have a 'growth' mindset, so their offerings tend to remain small. For-profit startups like **FreshInABox**, on the other hand, are driven by the need to solve market problems, such as offering a first-mile transport service to farmers when they saw the need for this, or growing their own produce using greenhouses when they realised there were tomato shortages.

Established platforms are also commonly used to solve local challenges, such as eMKambo which works with more than 20 territorial markets across the country. To the extent they deal with agroecological commodities, these markets are part and parcel of agroecology. Small groups of farmers use **WhatsApp** to coordinate supply and demand between them, organise deliveries, and flag locations using landmarks so that transporters can plan efficient routes. For instance, eMKambo has more than 20 commodity specific WhatsApp groups, not to mention several other WhatsApp groups at community, district, and national levels. Buyers speak to farmers unions and ask to be added to their WhatsApp groups. The **Facebook** group ZimbabweSmallScaleFarmers has two hundred thousand members

and is used to discuss and exchange information and sometimes to post excess produce, which might be picked up by large retail buyers. It is unclear how effective this system is at exchanging produce, especially where buyers and sellers don't have a pre-existing relationship. Facebook is more popular with young farmers and traders, but most older value chain actors prefer SMS, voice calls, radio, word of mouth and WhatsApp.

While digital platforms often help to build trust and relationships between farmers and traders, this is not always the case. One challenge for online commerce in Zimbabwe is trust between certain market participants. Fraud is common – that is, transacting online carries the risk of being conned outright, or receiving goods that are not the promised quality. To combat this, groups remain small and have built-in vetting processes so that only legitimate sellers can participate. This limits the uptake of digital channels for buying and selling produce and it means digital transactions have not reached the scale they might have.

Table 2: Level of digitalisation across the food value chain in Zimbabwe

Aspect of the food value chain	Level of digitalisation today (1-10)	Initiatives and impacts
Payment systems transactions along the whole food value chain.	9	EcoCash, One Money, TextaCash.
Logistics (middlemen, transport, cold chain)	5	WhatsApp Producer Groups, WhatsApp truckers, Voice Calls, DanChurch aid app for backloads
Sales (market discovery, buyer/seller matching, online marketplaces)	7	Classified pages, Producer WhatsApp groups with private sector buyers invited onto the group, FreshInABox
Price transparency & market information	2	EcoFarmer (Econet subsidiary), Bundling produce means farmers can't see the cost of a specific item they supplied eMKambo bundle of services links farmers with markets, transporters, traders, consumers, buyers, and policy makers.
Advertising	6	Facebook, Kurima Mari Marketplace, iFarm, Recipe cooking apps, eMKambo
Agroecology value-adding/differentiation (eg. Certification and traceability)	1	eMKambo
Learning & extension support for marketing	6	Facebook groups

Notable actors in the digital space and their relative influence:

- ☑ Non-government organisations (**NGOs**), for example the United Nations Development Programme (UNDP), are doing a lot to stimulate innovation: hackathons, innovation camps, and financing good ideas.
- ☑ Accelerators and innovation hubs such as **Stimulus Hub** help to bring ideas to fruition. However, they haven't gotten the support they deserve in Zimbabwe.
- ☑ The parastatal marketing watchdog, **Agri Marketing Authority**, is mandated with the overall regulation of the production, marketing, and processing of agricultural products in Zimbabwe. It has a digital market bulletin circulating prices. But they are a somewhat negative influence overall as they want to charge fees for doing so.
- ☑ The new government **Minister of Agriculture** is supportive of digitalisation generally – currently working on setting up a tele centre.
- ☑ The ministry of ICTs has been setting up rural information centres.

Examples of digitalisation in the food chain:

- ☑ **FreshInABox** is a mobile app that allows customers to order produce directly from farmers at prices comparable to going to Mbare market, but without the hassle of travel, or dealing with pickpockets or touts in a busy marketplace. Customers can buy a mixed box of produce and receive it the same day. FreshInABox can achieve low prices because they deal directly with farmers. They have their own fleet of pickup trucks for collection and use motorbikes for delivery.
- ☑ **eMKambo** is a web-based platform comprising a bundle of services such as VOIP, virtual call centre, short message service, radio and several WhatsApp groups all consolidated on one platform. It has been working with more than 20 territorial markets since 2010.
- ☑ **Kurima Mari** provides farmers with information on crops, livestock, nutrition, financial services (for agriculture business), selling tips and market information. The app is available in three different languages, English, Shona, and Ndebele. Most of its functions can be used offline, apart from videos and podcasts, allowing for use in areas without coverage and reducing data costs. It purchases market information from eMKambo.
- ☑ **AgriShare** is a platform connecting farmers with equipment and other inputs to those who need to hire equipment. In a sense, the Uber of trucks for transport and delivery. People have expanded its use cases, using it to list labour or other inputs. However, in Zimbabwe the platform has not taken off to the same extent as in Uganda due to transaction limits placed on mobile payments by the regulator. This has an impact on high value transactions like truck rentals.
- ☑ **EcoFarmer** offers farmers, government, contracting companies, NGOs, Farmer Unions etc. a wide range of digital solutions across the agriculture value chain. Launched in 2013 as a weather indexed insurance and micro insurance product with an SMS based advisory service has evolved to offering diversified services including logistics, warehousing, cold chain, and others.

SOUTH AFRICA

Key stats



60 million
total population



41 million monthly
active internet
users (68% of the
population)



108 million mobile
subscriptions
(mobile penetration
rate of 180%)



28 million monthly
active users on
social media (47% of
the population)

39,5 million monthly active WhatsApp users
(96% of all internet users)

South Africa has a relatively mature digital market, but also an established physical infrastructure with well-worn consumer buying patterns. While COVID-19 saw an expansion of online food sales, in South Africa this was somewhat short-lived. **Checkers Sixty60, Pick n Pay ASAP and Woolworths Dash** enjoyed a bump in sales during the pandemic, but many consumers have now gone back to old habits. South Africans show some preference to go physically shopping at brick-and-mortar retailers.

Over the past three years, solutions trying to solve the 'market access' gap have hit the market. However, by far the most important challenge to solve is the aggregation model: how do we get physical produce from A to B? The real innovations here might lie in leveraging technologies that are already being used, like WhatsApp, to link into more sophisticated platforms, rather than trying to introduce new front-end channels. **Khula!** focuses on farming to businesses such as hotel chains and has set up a logistics arm to support this. The latest iteration of the **Good Food Network** focuses on getting farmers connected to consumers but is still working on the logistical challenges of direct purchasing.

Large corporations are stepping into this space too. **Trade Club** is Standard Bank platform that facilitates buyers and aggregators and helps give stable market access. Connected Farmer is Vodacom's offering that aims to connect farmers to information, inputs, credit, and buyers. The real challenge remains the aggregation and logistics that gets produce from farmers to buyers. Tech-savvy consumers might want to use an app to buy directly, but this places a heavy burden on farmers who need to work out the logistics and are generally less tech literate.

In advertising, those with strong brands and concise, clear offers are more likely to gain traction. 'Flyers' that summarise this information can be easily shared through multiple channels. **WhatsApp** groups are a popular choice for promoting products. **Facebook Marketplace** allows farmers to do targeted marketing. Many farms sell products directly through their own website and may even handle logistics. For example, **Babylonstoren**, an organic produce farm near Cape Town, offers next-day deliveries.

In general, price transparency is poor in South Africa; not all farmers have access to the real cost price of produce. Retailers have little incentive to reveal their sales margins. Searching a retailers' listed prices on their websites may give some indication. Traceability using blockchain is in its infancy. **Food Print** is a QR code-enabled tracing system that aims to make the supply chain for food clear, but it is still in the development stage. A key hurdle is the price of blockchain software and who ultimately pays for it – customers, retailers, or farmers? – and what value they receive from the system in return. Establishing trust is another challenge. Here, **Participatory Guarantee Systems (PGS)**, which certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks, and knowledge exchange, may play a supporting role.

Table 3: Level of digitalisation across the food value chain in South Africa

Aspect of the food value chain	Level of digitalisation today (1-10)	Initiatives and impacts
Payment systems transactions along the whole food value chain.	3-4	Payfast, PayPal, Snapscan, Yoco, Paystack
Logistics (middlemen, transport, cold chain)	2	Umlimi organic sector app, Khula!, Good Food Network, Connected Farmer (Vodacom), Trade Club (Standard Bank)
Sales (market discovery, buyer/seller matching, online marketplaces)	3	Good Food Network , Food Hub Clubs Online shops (small and large retailers for eg. Farm Table in GP), Facebook Marketplace
Price transparency & market information	3	Google search local online shops
Advertising	5	Facebook Marketplace, WhatsApp Groups, Online Websites
Agroecology value-adding/differentiation (eg. Certification and traceability)	3	Food Print blockchain solution Links to GAP certification
Learning & extension support for marketing	2	YeboFarmer Next Farmer

Notable actors in the digital space and their relative influence:

- ❑ Technology incubators and accelerators. A range of technology incubators and start-up accelerators are in operation in South Africa. There is a growing interest among these in supporting agricultural and food value chains. [Founders Factory's Ag-Tech](#) programme is an example of this. The logic and framing applied by these organisations is playing a profound role in shaping the future of digital innovation in South Africa.
- ❑ University graduates from commercial agricultural families in South Africa are using their combined knowledge of agricultural value chains with university degrees in fields such as electrical engineering and entrepreneurship to start new digital companies.
- ❑ Large retailers such as **Checkers** are investing into expanding their home delivery systems. Global tech companies such as Uber are also moving into the food market in a big way through their home delivery services.

Examples of digitalisation in the food chain:

- ❑ Street vendors accepting payments via mobile wallets
- ❑ One App – Spaza Shop bundles all the services Spaza shops offer such as airtime and prepaid electricity sales with a stock-take and inventory system, reaching 8,000 Spaza shops and turning over USD6 million
- ❑ AVC Sustainable agricultural value chain big into 4IR using GIS (Production planning)
- ❑ Proof of Impact, linking block-chain with corporate environmental social responsibility spending and international funders (Linking grassroots work on digitalisation to funders)

KENYA

Key stats



54 million
total population



22 million monthly
active internet
users (40% of the
population)



59 million mobile
subscriptions (mobile
penetration rate of
109%)



11 million monthly
active users on social
media (20% of the
population)

21,5 million monthly
active WhatsApp
users ([97% of all
internet users](#))

In the past, most foodstuffs in Kenya were handled, marketed, and distributed by parastatal bodies like Kenya Meat Commission, the Horticultural Cooperative Union, Kenya Creameries Cooperative, and Maize Produce and Marketing Board. However, food shortages, poor quality, and high prices for consumers have been persistent problems. Established modern retail markets, or supermarkets, struggle with perceived low safety standards in daily operations, high costs and slow delivery services. Price transparency can be an issue; some supermarkets' online "guide prices" cannot be relied upon. In the meantime, since 2014, Kenya has built extensive infrastructure for internet connectivity, and internet penetration and mobile usage is extensive.

All of this has opened space for new services. In recent years digital market offerings are competing by attempting to address. Some consumers have moved away from sit-downs, food trucks and even speciality locations. Online stores like **Twiga Foods** are an example of one potential future for food markets.

Yet Twiga is just the tip of the iceberg. The growing popularity of fast food, coupled with the growing trends for convenience and value for money, have opened digital opportunities in the Kenyan food market. A registry at Nairobi County shows that over 50 licensed food markets are serving over 20,000 residents every month through digital apps. Web portals like **Chandarana Foodplus** are an extension of physical retailers that have started offering online ordering. Traders in urban centres like Nairobi have riders for delivery to their digital app customers. Mobile apps like **Grocerypik** help to aggregate orders. However, **Twiga Foods** remains one of the few market aggregators currently achieving some level of scale and profitability.

Digital tools that support price transparency in Kenya are relatively mature. As an example, **KAMIS** was developed by the Ministry of Agriculture, Livestock, Fisheries and Co-operatives to provide members and stakeholders with improved early warning marketing and trade information, aiming to facilitate efficient and competitive transactions in food trade between surplus and deficit regions.

There is some evidence that digital tools support female entrepreneurs, improving both access to opportunities and safety. A growing trend in the Kenyan urban cities is the door-to-door delivery of vegetables, fruits, and cereals by young female vendors. This group typically uses social media (**Facebook** pages), and apps to source groceries and aggregate orders, and **Google Maps** through location pins to locate clients for delivery. Another group is female grocery traders – a majority of whom live in informal settlements – often sell into the night, and deposit their sales money on mobile phones for security purposes. Traders accept payment via **Mpesa**, **Paybill** and **Lipa na Mpesa** because they are quick and convenient.

A registry at Nairobi County shows that over 50 licensed food markets are serving over 20,000 residents every month through digital apps.

Table 4: Level of digitalisation across the food value chain in Kenya

Aspect of the food value chain	Level of digitalisation today (1-10)	Initiatives and impacts
Payment systems transactions along the whole food value chain.	8	E-payments (PayPal), cards (Visa) and mobile money (M-Pesa), The Lipa na Mpesa Buy Goods (Till Number).
Logistics (middlemen, transport, cold chain)	5	Twiga Foods , Sendy , Glovo , Uber Eats, Jumia Google Maps for locating clients
Sales (market discovery, buyer/seller matching, online marketplaces)	4	Grocerypik , Chandarana Foodplus Eateries have also introduced loyalty programs where customers earn redeemable points
Price transparency & market information	3	KAMIS Google Play Apps that compare food prices
Advertising	4	YouTube pages with sizable followings get such advertisements posted on their pages
Agroecology value-adding/ differentiation (eg. Certification and traceability)	5	Mkulima Facebook pages
Learning & extension support for marketing	4	iShamba , USSD codes, Animation and short how-to shareable videos, WhatsApp groups

Notable actors in the digital space and their relative influence:

- ☑ State Department of Agriculture
Communications Authority of Kenya
- ☑ Input suppliers, NGOs, Telcos, and IT companies: Data collection and interpretation, Development of mobile applications and web portals
- ☑ Consumers of agricultural produce, aggregators distributors and users of apps: Contribute to the development/improvement of digital tools for efficiency – Apps are made to suit their needs

Examples of digitalisation in the food chain:

- ☑ **Kenya Organic Agriculture Network** unites over 2,000 producers, traders, and like-minded individuals keen on promoting organic agriculture in Kenya. Other than their online portal, the group also operates on a WhatsApp group.
- ☑ **Lipa na Mpesa** is a cashless payment service that allows customers to make payments for goods and services securely and conveniently.
- ☑ **Mkulima** is a digital platform developed in Kenya where food producers can market their produce and sellers get buyers.

SENEGAL

Key stats



17 million
total population



7.8 million monthly
active internet
users (46% of the
population)



17.5 million mobile
subscriptions (mobile
penetration rate of
103%)



4 million monthly
active users on
social media (23% of
the population)

Over the past 10 years there has been a gradual acceptance of digital services. Mobile penetration is now over 100%. In rural areas, many people now use smartphones, although many prefer simpler SMS or Voice as this is what they have become used to. New platforms often still need to offer these channels for customers who prefer them.

The extent of internet and mobile use today – even in small villages – has expanded the number of potential customers and has led to a number of start-ups entering the space. **MyAgro**, **Afrikamart**, and **Bayseddo** are targeting different aspects of the food value chain. Courier services such as **Yobante Express** handle deliveries and use digital tools to track products and monitor delivery.

mLouma is one of the longest-standing online services in Senegal, and an example of a maturing offering that has bundled multiple services. It is a digital platform designed for farmer organisations, who can use it to inform members about storage availability so that they can better manage bringing crops to the warehouse or inform them of availability of inputs. In addition, farmers, banks, importers, transporters, buyers, can all log into this platform and use it to connect with each other for financing, logistics, transport, or purchasing.

The difficult work often lies in explaining the benefits and impacts of digital tools, and helping new users adopt technologies. Digital marketing is difficult because the target is not tech-savvy people but farmers who are often not comfortable with digital services. Significant time and energy must be spent on this.

There is still a tendency to use cash over mobile payments, although this is changing as people become more

trusting of technologies. Many online services are already integrated with card or mobile payments, but customers still use cash in many cases, whether due to a lack of confidence, or simple habit.

A key challenge for digital services in Senegal is developing tools and content in local languages. Many people do not speak French (the country's official language) but speak a language local to their region. This means that many existing information platforms such as YouTube are not accessible, particularly for those in rural areas.

Table 5: Level of digitalisation across the food value chain in Senegal

Aspect of the food value chain	Level of digitalisation today (1-10)	Initiatives and impacts
Payment systems transactions along the whole food value chain.	6	Paydunia, Intech Group, Intouch, Wave , Orange Money, MyAgro
Logistics (middlemen, transport, cold chain)	7	Yobante , Express , paps , Tiak Tiak , Kamtar
Sales (market discovery, buyer/seller matching, online marketplaces)	6	mLouma (LoumaMbay), Sooretul, Afrikamart , Bayseddo
Price transparency & market information	5	mLouma (supports information sharing between members of farmer organisations), ARM (public agency)
Advertising	1	
Agroecology value-adding/differentiation (eg. Certification and traceability)	1	
Learning & extension support for marketing	5	mLouma (Louma du Savoir knowledge market)

Notable actors in the digital space and their relative influence:

- ❑ Senegalese Institute of Agricultural Research (ISRA) is a public institute of science and technology whose mission is to undertake and develop research in plant, animal, forest, and fish production and to put in place decision-making support tools with a view to contributing to growth in agricultural production and its sustainability, including the production of appropriate technologies and knowledge.
- ❑ The Syngenta Foundation for Sustainable Agriculture (SFSA) promotes access to mechanisation for rice farmers through their Center for Mechanized Services (CEMA)
- ❑ The Programme d'Accélération de la Cadence de l'Agriculture Sénégalaise (PRACAS) is a state-funded programme to build a competitive and diversified agricultural market and to be able to trade internationally.
- ❑ The Kosmos Innovation Center runs the Senegal Start-Up Accelerator with the aim to launch five new businesses with the potential to transform the agricultural industry in Senegal.

Examples of digitalisation in the food chain:

- ❑ **MyAgro** allows farmers to use their mobile phones to purchase seeds and fertiliser in small increments. Farmers buy myAgro cards and layaway from US\$1 to \$50 to purchase seed and fertiliser for the planting season. When farmers buy myAgro cards, the card codes and amounts are sent by text message to myAgro's database, and the individual farmers' accounts are credited by myAgro. myAgro then delivers purchased high-quality seed and fertiliser in bulk at planting time directly to farmers and provides training on best farming practices
- ❑ **Afrikamart** is a fresh produce distribution platform that also offers marketing and support services. It brings together producers, retailers, hotels, restaurants, and supermarkets. As of 2021, the startup delivered 8000 kilograms per day from 600 farmers.
- ❑ **mLouma** provides services to nearly 70 farmer organisations with members totalling almost 60,000 farmers. It hosts 10 banks and 5 input suppliers. The platform also includes a knowledge market that can be used to share methods and techniques.
- ❑ **Bayseddo** is a crowdfunding platform that connects farmers who have land and who need financing to individuals who want to invest in agriculture. The startup takes 25 percent of the margin from any project run through its platform.

Horizon scan and emerging implications



We cannot predict how digitalisation will play out in all scenarios, but we can observe and highlight several deep, strong undercurrents in African nations that will need significant energy to shift course.

Digitalisation will continue to move at the speed of access. While smartphone penetration is a step forward, many users still face significant barriers (Metelerkamp & Durr, 2021). These include:

- ❑ Old mobile phones being incompatible with recent operating system updates.
- ❑ Low-cost mobile phones with limited storage space and processing power.
- ❑ Data costs associated with operating system upgrades, downloading, and running new apps.
- ❑ Data bundles that provide affordable access exclusively to key social media apps such as WhatsApp and Facebook.
- ❑ Difficulties in learning to use new apps, particularly for older users.
- ❑ Lack of electricity leading to high costs for recharging batteries.

These enabling conditions for technology will be the main bottleneck for digitalisation, and how it plays out equitably – or not. There is already a marked difference in digital maturity among African nations because of ‘ecosystem effects’ (technological capabilities, supporting policy) and it is not automatic that digital technologies will spread uniformly throughout the continent as a result, or among users in urban, peri-urban, or rural regions (Dalberg & CTA, 2019).

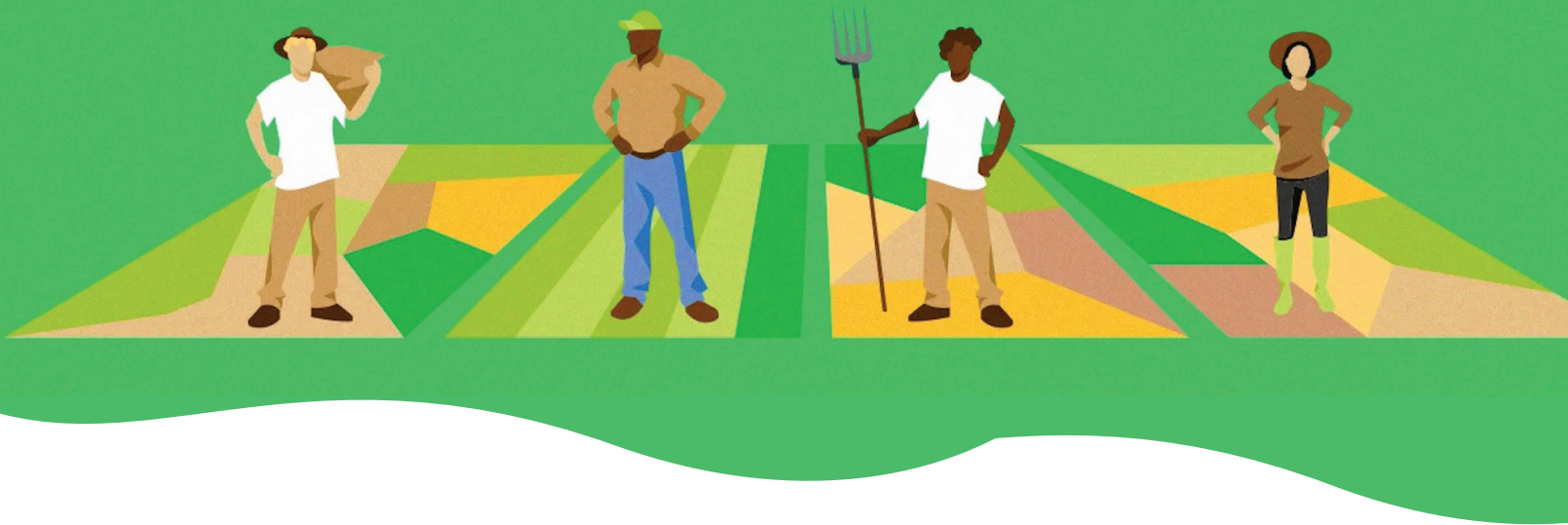
Traditional extension services will be augmented by digital, and not always official, sources. Farmers are already increasingly accessing information through digital channels. *“Compared to 10 years ago when we started, we’re now starting to see the results – farmers starting to use digital tools in their practices”* (Sonko, 2022). In a 2020 study into knowledge sources that supported pioneering organic farmers in South Africa, YouTube came up as more important than all South Africa’s agricultural universities combined (Metelerkamp, Bigg & Drimie 2020). As much of the content uploaded onto YouTube is from other farmers, it presents a working example of a platform web application supporting peer to peer learning on a massive scale. The volume of agriculturally related content on YouTube is staggering and the main challenge, particularly for users with lower levels of tech literacy, is finding the right content amidst a vast array of options, and in their home languages.

For some time, familiarity will be preferred over advanced features. Solutions that find creative ways to leverage familiar apps and technologies (such as WhatsApp) are seeing faster rates of adoption than those that rely on learning new interfaces, even if these have more powerful applications. Comparatively cheap data bundles which enable access to only WhatsApp and Facebook may be another reason these have remained the digital solutions of choice across the informal economy. *“I use different platforms for marketing; if you are less able to pay for data costs maybe you buy a WhatsApp data bundle and use this exclusively”* (Majiza, 2022). Traditional technologies should not be overlooked either; delivering information via mobile apps might not work if farmers rely on morning radio broadcasts or television. For now, microentrepreneurs with local knowledge, existing relationships, and specific focus have an inherent advantage over multinational corporations.

The gender gap will persist. Very few digital products are designed specifically for use by female farmers, traders, or processors (World Bank, 2017). Women continue to be less likely to use mobile services, especially those in rural areas (GSMA, 2021); the gender gap in Sub-Saharan Africa is 34% (Malabo Montpellier Panel, 2019). Given 40–50% of smallholder farmers are women (Dalberg & CTA, 2019), and mobile continues to be the way most people access the internet, without targeted intervention this ‘digital divide’ will be entrenched as digital technologies are further embedded in processes and services.

‘Super apps’ that bundle together multiple use cases are likely to be the winners in the longer term. Many solutions in Africa are fragmented from each other, still rely on donor funding, and do not yet have financially viable business models – even successful apps like Kurima Mari with over 200,000 users. Farmers are typically unable or unwilling to pay for advisory services alone. As a result, we can expect further bundling of services and use cases (Dalberg & CTA, 2019, FAO, 2021). But even so-called ‘super apps’ need to retain a regional focus. Farmers need to know specific, local information, such as the prevailing market price for maize and agroecologically-produced commodities at the closest market. This requires significant, ongoing resources, and limits the incentive to ‘plug and play’ the same solution in new locations. While not specific to agriculture, apps such as Moya in South Africa are an example of the power of linking advanced super apps into data-free ecosystems which the agroecology sector should be paying close attention to.

To be successful, those who build digital solutions will need to invest in social infrastructure, not just technology. Generally, in low-tech environments, each new user needs to be woven into the process personally. Developers cannot expect things to just ‘go viral’ digitally. A lot of work in-person needs to be done when attempting to develop digital solutions and this is expensive and difficult. *“Marketing digital tools is difficult; our target is farmers, not tech people. We spend a lot of time explaining the potential applications... this is not easy work”* (Sonko, 2022). Those entering the digitalisation field need to plan for equal if not greater investment into the social processes and relationships behind the digital solution. This might include for example running digital literacy clinics with user groups, supporting digital extension workers, or equipping community agents to act as intermediaries between smallholders and smartphone app developers.



Opportunities offered by digitalisation

“There is an enduring misleading assumption that most smallholder farmer challenges are production-oriented... [but] farmers’ needs have shifted from production to distribution, logistics, post-harvest and markets” (AFSA, 2021b).

Those who refer to the potential for digital transformation in agriculture in Africa are often referring to advanced technologies like precision agriculture, drone surveillance, remote monitoring, smart irrigation, and digital advisory services. These technologies promise to help farmers boost productivity, reduce costs, and improve resource efficiency. They play into well-worn narratives of traditional African smallholder farmers being unable to cope with the scale of production required by today’s growing populations unless they adopt packages of Green Revolution technologies.

Yet many studies closer to the ground, including AFSA’s own work on territorial markets (AFSA, 2021), highlight a different problem: organising and coordinating food supply chains to link millions of farmers with tens of millions of consumers in democratic ways. That is, effective functioning of the food market, from farm to fork, supporting the equitable and efficient distribution of food from production to consumption. Food markets include physical infrastructure, but extends to the systems, information flows, and processes that allow highly complex, networked markets to function. Here, digital technologies might play an even more critical role, certainly from the perspective of agroecology.

We must be upfront that while digital technologies

make certain functions plausible, such as supporting immensely complex networks of exchange, or improving transparency and traceability, the adoption of ever more sophisticated technologies (and the patterns of ownership and control that typically accompany this adoption) carries serious risk that could outweigh any of the opportunities we describe below. These risks are set out in more detail in the next chapter.

However, failing to engage with digitisation poses a greater risk: we need to understand the implications of digital technologies and how they might be adopted in a way that supports a decentralised food system. As one interviewee for this study observed,

“If we, as a network, don’t tackle the digital question head-on, we’re going to lose this opportunity to be a sovereign, producer-centred network of people, practitioners, and NGOs” (Purkis, 2022)

To this end we first discuss the potential for digital technologies to improve the functioning of territorial markets, and then turn to the opportunities for agroecology more specifically.

Digitalisation and territorial markets

For the purpose of this study, we adopt AFSA's working definition of territorial markets as those which

"...meet preferences of the majority of farmers, traders and consumers. More than location, they represent these people's shared identity and values built through trust and relationships. They are also defined by diversity of commodities and inclusive participation. Collectively, these markets are organic in ways that characterise indigenous commerce whose key principles include low barriers to entry, open knowledge sharing and generational transfer of business practices" (AFSA, 2021a).

Territorial markets have inherent characteristics and strengths that support a diversity of smallholder farmers, methods, seeds, and practices. While they do not necessarily result in broad adoption of agroecological practices, the presence of healthy, functioning territorial markets is a recognised condition for agroecology to flourish.

Drawing on AFSA's 2020 conference materials (AFSA, 2020) and the territorial markets study (AFSA, 2021a), we summarise the key challenges faced by territorial markets as follows:

- The 'many-to-many' challenge: coordinating selling and supply logistics between farmers and consumers
- High levels of food losses and waste along the food chain
- Poor market facilities (cooling, warehouses, etc.) causing inefficiency and bottlenecks
- Lack of standards or monitoring leading to food safety issues
- Limited bargaining power for farmers due to lack of transparency on prices
- Volatile prices (over- or under-supply, post-harvest losses, bargaining power between vendors and consumers)
- Poor access to finance for enterprises involved



Understanding the current challenges gives us a point of departure for our analysis of digital technologies and where they might be brought to bear to strengthen the functioning of territorial markets.

Table 6: Potential application of digital technologies to existing territorial markets challenges

Territorial markets challenge	How digital technologies could play a role	Real-world examples
Many-to-many coordination challenge	Peer-to-peer exchanges via purpose-built online marketplaces or through digital platforms such as WhatsApp or Facebook E-commerce and logistics services that bypass 'brick & mortar' retailers Tracking and aggregation of goods from multiple producers Bundling purchases from multiple consumers Connecting farmers with cost-effective logistics and transport options	ifarm 360, Market Wagon, AgroSpaces, Local Harvest, TaniHub Gorillas, Flink, Twiga Foods, MaxAB Green Fingers Mobile, Khulal Pinduoduo AgriShare, Kamtar, eMKambo
Food losses and waste along the food chain	Tracking surplus food and matching with vetted beneficiaries Tracking demand and supply over time, improving forecasting, and reducing waste Expanding physical market access through online ordering and delivery	SA Harvest eProd Solutions YeboFresh, Zomato
Inefficiencies due to poor market facilities (cooling, warehouses)	Systems for booking and monitoring stock levels in warehouses and cold storage	mLouma
Lack of standards or monitoring leading to food safety issues	Formation of controlled groups containing vetted producers Rapid, transparent-to-all feedback to farmers on quality and freshness of produce	WhatsApp SCiO
Lack of price transparency resulting in limited bargaining power for farmers	Mobile applications, voice or SMS services that provide local market information Transparency through the supply chain on who sold what and what price	Kurima Mari, FarmDrive, M-Farm AgriLedger, Abelobi, FarmNeed, eMKambo
Volatile prices due to over/under supply, post-harvest losses	Digital warehouse receipt systems that allow storage and timing of sale when market prices are attractive	ACE
Poor access to finance	Crowdfunding platforms that create up-front financing for farmers and risk sharing Cashless, mobile payments for the unbanked	Livestock Wealth, Bayseddo, Farmcrowdy Ecocash, M-Pesa

Opportunities for agroecology

The functioning of territorial markets is one 'lens' through which to view the potential for digital technologies. A second lens through which we can identify potential applications is to think about specific opportunities for supporting agroecology. Here, we draw on both AFSA's own research as well as recent work on agroecological markets conducted by the Seed and Knowledge Initiative (SKI) to ground our process in a set of outcomes that align with principles of agroecology (Metelerkamp, Drimie & Davies, forthcoming).

Six outcomes we are keeping in mind when considering opportunities

- Outcome 1:** Celebrates local traditions, indigenous foods, and African cultures
- Outcome 2:** Enables the mainstreaming of agroecological farming practices through stimulating demand for, and facilitating access to, agroecologically grown food.
- Outcome 3:** Safeguards family farmers and local enterprises from displacement by the global industrial food system, retaining control at a local level while ensuring opportunities and profits are fairly shared by all who contribute.
- Outcome 4:** Promotes food that is nutrient dense and free from harmful residues, offering diets that are healthy and balanced, while limiting excessive consumption and wastage.
- Outcome 5:** Builds a caring food system through a deepening of social tissue and relationships between actors and with the environment.
- Outcome 6:** Favours territorial markets as the optimal condition for local incomes and relationships, promoting small markets and informal traders over large supermarkets and globalised trade.

We have grouped examples of digital technologies into 12 themes. Each theme highlights an opportunity for agroecology based on real-world applications of digital technologies to the food value chain. Many examples are from African nations, and others are from abroad. Some examples are well-established, and their benefits are clear; others are still in early stages but show promise. These are not exhaustive lists, nor does every example fit neatly into a category. However, they all represent tangible, real-world efforts by very smart people using digital tools to address an aspect of the food chain today. Our aim is not to provide 'solutions', but to start an important and urgent conversation about what a positive outcome for agroecology might look like as digital technologies continue to be embedded in food markets.

1. Boot-strap existing services. One of the most promising opportunities for supporting digitisation in the short to medium term is the creative repurposing of existing widely used applications such as WhatsApp.

When faced with the challenge of consumers losing faith in buying through existing WhatsApp and Facebook groups because of scammers and product misrepresentation by unscrupulous sellers, Zimbabwean farmers unions developed a simple solution that put their customers' minds at rest. They started a controlled WhatsApp group in which all sellers listing products on the platform had to pay a small once-off subscription fee to list on the group. Other members of the group would then conduct an in-person verification visit to the new farmer's farm to ascertain that they were indeed a legitimate seller and to communicate the standards and expectations of the WhatsApp group.

While this is a specific example which is not representative of the entire Zimbabwean digital landscape, it shows that creativity and a bit of in-person effort can go a long way in solving digital challenges on the ground without the need for big investments or new digital solutions. As with agroecological farming, there is often a lot that can be done with the basic resources one has at hand.



WhatsApp: Working with what's already there

Low-income users buy WhatsApp bundles as the lowest cost way of connecting to the digital economy work and life. Informal traders and **street vendors** form WhatsApp groups as a means of supporting each other, notifying each other of threats and opportunities.

WhatsApp groups of up to 250 members form, in which farmers list products with photos and prices. Buyers and sellers can connect directly at a very local level. This has multiple useful aspects:

- ☑ **Aggregation.** Institutional buyers from hotels and supermarkets start asking to be added to local farmers WhatsApp groups as the most effective way to stay abreast of what's available without having to contact each farmer one by one.
- ☑ **Trust.** Creative farmer groups tackle trust and scamming issues by creating members only 'certified farmer only' WhatsApp groups. 'Reply privately' function allows farmers and customers to connect and engage on specific details without overloading the main group.
- ☑ **Supply/demand matching.** Having a quick easy way to broadcast information about discounts for crops close to spoiling helps move stock before it goes to waste.

Farmers and middlemen stay in touch about collection and deliveries and transact using mobile money. Farmers order trucks, share locations via WhatsApp, and pay **transporters** using mobile money they received in advance from their **consumers** in urban areas.

Rural farmers and urban customers begin transacting without ever meeting each other. Farmers share photos of the products available and receive payment using mobile money before sending their produce via local **taxis** to urban areas. **Restaurants** and **food vendors** receive orders from local customers and in turn call bicycle or scooter **delivery riders** on WhatsApp. They share a location pin to guide the rider to the client.

Rural farmers use **urban markets** (urban contacts and farmers in other areas) to get price updates and strengthen their bargaining position when selling to traders and middlemen. **Extension workers** stay in touch with farmers via WhatsApp and farmers use photos and video calls to communicate practical issues to support agents off site.

In addition to groups, WhatsApp Business is widely used for marketing purposes, giving farmers a 'formal' online presence without the cost or maintenance requirements of a website. Status updates are easy to update and push out to a contact list of potential customers, for example at planting or harvesting time. Farmers can set up a browsable product catalogue that describes their produce and prices. For those who use multiple platforms, the business WhatsApp phone number can be integrated with Facebook or Instagram pages, so that users can easily send a message enquiring about products. The service is currently free in most African countries and purchasing WhatsApp bundles is a common way to bring down data costs.

2. 'Divided we fall but together we thrive' - build or rebuild territorial networks. Digital technologies provide far-reaching tools for extending territorial networks of communication, exchange, and collaboration. They can enable decentralised, networked rather than linear/vertical systems of collaboration and trade; they can improve transparency and awareness of the flow of goods through the system; they can support solidarity networks and peer-peer collaboration which transcends existing value systems and financial logics; and they can help build local alliances.

***Sayurbox** (Indonesia) was founded with the social mission of providing market access to local farmers by using digital technologies to streamline the agricultural supply chain. It sells 5,000 items from 10,000 farmers to around 1 million customers.*

***AgroSpaces** (Cameroon) aims to connect smallholder farmers with customers directly, cutting out the middleman. They do this through text message alerts of latest market prices (AgroAlerts) connecting farmers and consumers online (AgroMarket). They take a 10% commission on trades through their platform.*

***TradeDepot** (Nigeria) is a logistics start-up that distributes products including food, and handles shipping, pricing, and customer service. It is aiming to expand its reach among small African retailers, aiming to address fragmented logistics and supply chains. It has expanded into Ghana and South Africa.*

***Big Barn** (United Kingdom) is the country's most well used online market for direct purchasing from food producers. They have a directory of over 8,800 outlets. The store positions itself as the 'Amazon' of food, but with a mission to connect people with local food suppliers. Big Barn handles orders, payment, and delivery.*

***Avaaj Otalo** (India) is a service for farmers to access relevant and timely agricultural information over the phone. By dialling a phone number and navigating through simple audio prompts, farmers can record, browse, and respond to agricultural questions and answers, including pricing information for produce at local markets.*

***ifarm360** (Kenya) is a wholesale market service connecting fresh produce farmers to buyers through storage and distribution hub enabled by WhatsApp or web store. It has over 300 farmers on its platform.*

3. Strengthen localisation. Agroecological food movements can't and don't want to compete in the global commodities system. But digitalisation offers the chance to bring many of the things consumers love about the global food system to the very local level. Easy payment systems, simple, convenient shopping experiences, and a variety of products through improved collation of locally and regionally available products. *"Markets can be unpleasant especially for the middle and upper class.... There are touts, pickpockets... but the prices are just super low. What these [digital startups] have done, you can order a box, an assortment of vegetables, delivered to your doorstep, for the same price"* (Hove, 2022). This is an opportunity both for strengthening local and territorial markets where they remain the norm, and for re-territorialising markets dominated by consolidated global retail systems. These services include both raw ingredients to business clients and individual consumers, as well as platforms designed for vendors and local restaurants to sell cooked meals directly.

Fresh In A Box (Zimbabwe) is an order and delivery portal that connects farmers to urban consumers in and around Harare. The website and mobile app are backed up by a small logistics team that does collections from rural smallholders and then distributes to customers using a network of motorbike delivery agents. Payments are processed using mobile money or card payments.

Order Kasi (South Africa) Kasi meal delivery service that offers food from restaurants based in townships, providing township restaurants access to reach a larger market through the platform as they cater to customers located outside township areas. Customers can order from the mobile app or through WhatsApp

Market Wagon (United States) is an online farmers market that manages local supply and delivery. Farmers and artisans can list and sell their products online. Customers can choose from individual products or pre-selected 'bundles' and can order and pay online. A division of Market Wagon called FarmDelivery contracts a network of drivers who handle local deliveries through instructions delivered to their mobile phone.

Local Harvest (United States) connects local farmers with consumers using an online platform. It also maintains a map of local farmers markets and helps customers know where to buy produce close to them.

The National Confederation of Agriculture (CNA) (Brazil) launched a portal to bring together rural producers from all over the country, e-commerce applications, end users, retail chains, and logistics companies. The portal has nearly 300 registered producers and more than 100 buyers from various regions of the country registered.

4. Re-story the food system and build relationships with consumers.

Ironically digital platforms have the power to help make food personal again and connect consumers to the people and ecosystems that produced their food in ways that were not possible before. As the world becomes increasingly urban and disconnected from the landscape and cultures that produce their food, digital platforms offer new opportunities for AE farmers to tell the story of their food and build relationships and trust with their consumers.

WhatsApp, Instagram, and Facebook are used by organic farms and farmers markets globally to promote their products and build a relationship with customers through re-telling the story of where food comes from, differentiating it from factory farmed food and communicating the variety of values associated with sustainably and ethically produced food. Importantly, these social media platforms also allow consumers to speak directly with farmers and other vendors, asking them questions, leaving reviews, and sharing them with others.

Abelobi (South Africa) is a social enterprise that supports sustainable small-scale fisheries. Using technology, Abelobi enables fishing communities to activate Community-Supported Fisheries (CSF) that promote fair market access, transparent supply chains, and broader food security. It also enables consumers to connect with the story behind their fish; using a QR code system to check it against WWF's Sustainable Fisheries lists, bringing up the bio of the fisher person who caught it and where it came from. *[expand on this]*

While these positive opportunities are real, they very much need to be considered in equal measure against the cultural and personal exchanges that are lost when people stop meeting face to face in physical marketplaces.

5. Increase transparency. While information can be overwhelming, when structured correctly digitalisation offers the promise of increased transparency, including price transparency; who profits and by how much; what consumers want; how food is produced; the real cost of food (true cost accounting); and real-time quality checks.

Agriledger (United Kingdom) is a social enterprise using digital ledger technology (blockchain) to improve traceability between farm and fork. The idea is that farmers drop their produce at collection points where each item is counted and registered (digitally) in the farmer's name. Each item gets a QR code sticker that links to all relevant information, including the name of the farmer, the price paid to the farmer, when and where the item was shipped, and at what price the consumer pays for it. Anyone with access to the ledger (farmer, retailer, consumer who scans the QR code when buying the item in store) has access to all this information.

Kurima Mari (Zimbabwe) provides farmers with information on crops, livestock, nutrition, financial services (for agriculture business), selling tips and market information. The app is available in three different languages, English, Shona, and Ndebele. Most of its functions can be used offline, apart from videos and podcasts, allowing for use in areas without coverage and reducing data costs.

eMKambo (Zimbabwe) is a web-based platform comprising a bundle of services such as VOIP, virtual call centre, short message service, radio and several WhatsApp groups all consolidated on one platform.

SCiO (Global) is a handheld device that uses infrared spectroscopy to measure levels of sugar, fat content, and protein content in various foods. The user scans fruit or vegetables with the device, which links to a mobile app that indicates quality and freshness. The Changhong H2 smartphone, manufactured in China, was the first to incorporate the technology directly in a mobile phone.

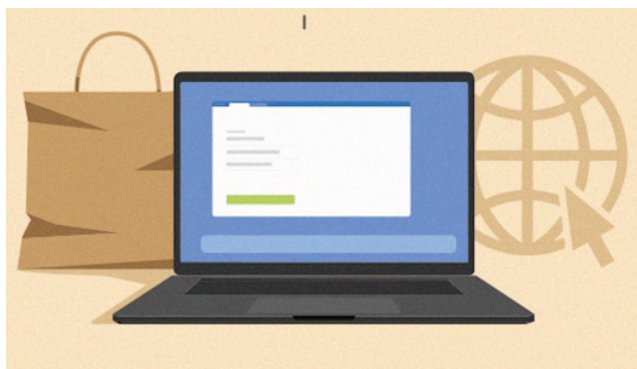
☑ Mobile data collection tools like **Open Data Kit** and **KoboCollect** enable early warnings on volumes of commodities ready for the market and prices in different locations. Some national statistical agencies and agricultural extension services already use some of these tools.



6. Solve logistics challenges. There remains significant scope for investment, innovation, and development in first mile logistics as well as the need for aggregation points. “Platforms that facilitate market access is one thing but being able to get the produce from the farmers into the platform and then distributed is where the magic lies. If we can solve the aggregation model using digitization and collective data ownership, we will be in a completely different space” (Purkis 2022). While they will not solve the physical movement of inventory problem – which requires physical infrastructure – digital technologies offer potential for accurate order tracking and ‘pooling’ of produce from multiple farmers without losing track of ownership or payment information, helping to reduce the administrative burden of sourcing from multiple smallholder farmers. The use of farmer location data and production calendars also open scope to reverse engineer logistics systems to better suit the needs of farmers at local and regional levels.

AgriShare (Uganda, Zimbabwe) Africa’s Uber for agricultural equipment. This includes the rental of delivery vehicles for farmers, enabling individual farmers or groups more agency and bargaining power in the first mile. This has been taking off in Uganda. Payments made using Mpesa and other mobile money platforms. Simple regulatory barriers around mobile money payment in other countries such as Zimbabwe have stifled Agrishare’s growth.

Green Fingers Mobile (South Africa) is a mobile-first Software-as-a-Service (SaaS) technology platform, to manage and finance large groups of smallholder farmers. Established in 2016, the company piloted a mobile technology platform with Nandos to streamline their purchasing from a network of smallholder farmers. The technology cuts the high administrative costs of sourcing from multiple smallholder farmers by digitising purchasing and reporting so that larger food companies can easily buy their crops.



7. Leap-frog big retail: As Airbnb did for the hotel industry or Uber for transport, digital technologies have shown potential to disrupt the status quo. New digital sales and distribution channels could bypass big retail but must be carefully incubated with protective measures to avoid falling into the hands of multinationals who are already dominant players.

Pinduoduo (China) originally started out in 2015 as a direct sales model (purchasing fresh produce directly from suppliers and selling on to consumers) and transitioned to an online marketplace in 2017. The platform allows bundling of purchases by multiple consumers who then get lower prices. This has fuelled its rapid growth, as customers are encouraged to invite their friends onto the platform to get better deals. Pinduoduo relies on sophisticated analytics to track and optimise the movements of goods between 12 million farmers and 850 million consumers using multiple 3rd party logistics companies.

Gorillas and **Flink** (Germany) are e-groceries that offer organic items like fresh herbs, fruits, bread, essentials, and home supplies. Delivery riders use e-bike and are hired by the company on a full-time basis. They can deliver fresh food at speed through maintaining a network of warehouses in low-cost city locations, known as 'dark stores'. They compete on price with physical retailers, who typically have stores in premium locations.

New digital sales and distribution channels... must be carefully incubated with protective measures to avoid falling into the hands of multinationals who are already dominant players.

8. Share risk and reward. Digitally enabled innovations such as crowdfunding and payback services that accurately track and monitor flows of finance allow consumers and farmers to be linked in novel ways, sharing in the risk and reward of agricultural activities, and building strong networked connections.

Farmcrowdy (Nigeria) & **Livestock Wealth** (South Africa) crowdsources funds from individuals and corporates, via its online platform, with a promise of a share in the returns from farming activities. Farmcrowdy has a network of over 300,000 farmers and cultivated across 70000 hectares of farmland. [Add stat about Livestock Wealth?]

Community Supported Agriculture (CSA) is a financial mechanism (United States) that allows farmers to sell 'shares' in their produce to the public, who in return receive a box of vegetables, fruits, or other produce on a regular basis through the farming season. Farmers get early cash flow and can focus on marketing their produce during the quiet times of year rather than in the middle of harvest. Consumers can pick up produce at their local farmers market or arrange delivery for a fee.

TaniHub Group (Indonesia) is an agritech startup with the goal is to help farmers earn more for their crops through streamlining the food chain. TaniHub connects farmers with food, hotel, restaurant, and catering businesspeople. A key innovation is that farmers can loan money through TaniFund, a financial services arm. Farmers effectively pay back their loans as their products are sold through TaniHub. There are more than 45,000 farmers and 350,000 buyers on the platform.

9. Build youth engagement in the agroecology movement. More than 70% of registered users of digital agriculture solutions are young people (Dalberg & CTA, 2019), and they represent over a third of all internet users in Africa (FAO, 2018). Agriculture will continue to be a key source of employment for this group, which will be larger than anywhere else in the world by 2050 (FAO, 2018). As digital technologies will continue to be integrated within agricultural practices, there is an opportunity to tell strong, positive stories about a digital future that supports the cause of agroecology and influence the thought space for youth who are exploring digital applications.

10. Get in early on the data free revolution. Data free platforms such as www.datafr.ee are rapidly growing and are showing the potential of cutting out data costs for the end user. While not truly data free, these systems do offer a wide suite of reverse charge options that effectively make data free for selected user groups even if they have no credit on their SIM cards. This opens a huge opportunity for supporting inclusivity for low-income users in Africa. Currently only available across a small number of countries in Africa at present, the potential impact of offering free access to selected digital services is an emerging digital innovation which is likely to transform the digital economy in coming years.

***Data Free** (Australia, South Africa) uses the 'reverse billing' model adapted from the telecommunication industry, which enables them to deliver content from websites, apps, and dedicated IP addresses to users at no mobile data cost, even with no airtime or data balance*

***Moya** (South Africa) is a free messenger service that allows users to send unlimited text messages for no data cost even when the user doesn't have any talk-time or data balance.*

11. Simplifying payments with digital money. Mobile money solutions are opening a range of new possibilities for digital market innovations that simplify online payments and allow access to the digital payment arena for the unbanked. Ubiquitous across much of East Africa and growing elsewhere, mobile money has also become popular among informal traders and women for whom the hassle of safety concerns associated with carrying cash has been addressed. Mobile money that makes payments simple in person, over longer distances, and for online trades is a critical enabler of many of the opportunities mentioned in this list, and there are no doubt many other applications.

***M-Pesa** (Kenya) is a mobile banking service. It relies on a network of authorised agents who manage withdrawals and deposits. Customers can withdraw cash or spend it at authorised M-Pesa merchants. The financial track record that is developed over time enables credit scores and lending.*

***EcoCash** (Zimbabwe) is a mobile payment service that allows users to send money, buy airtime, pay for goods and services, among other transactions.*

***SnapScan** (South Africa) is a smartphone app that enables contactless mobile payments using a camera and QR code. It is used in stores or as a payment option for bills or invoices, linked to a customer's debit or credit card.*

***PayFast** (South Africa) is an online payment gateway for individuals, businesses, and charities to accept payments online. They process payments with up to 8 different payment methods and allow you to split up a single customer payment to a range of different accounts, which is handy when wanting to simplify profit sharing between producers.*

12. Network the majority into a unified force via platform technologies. Platform-based applications provide a space for users to connect with each other, providing a clear value proposition to both demand side and supply side. Their essence is simple: solving a problem of scarcity, by opening a way for people to connect with each other in ways that were not possible before. Platforms typically help to sell products (Ebay, Alibaba) or services (Freelancer, Taskrabbit, Uber, Airbnb) or to generate content (Facebook, Twitter, YouTube, Wikipedia). Platforms are of course never neutral, and many valid concerns exist around the subtle ways that power and perception can be shaped using the algorithms behind many of the world's most powerful platforms such as Facebook. There is also

... the potential impact of offering free access to selected digital services is an emerging digital innovation which is likely to transform the digital economy in coming years.

a growing concern over the decolonisation of these platforms—whose voices are privileged, where do profits accumulate, and can this runaway train be slowed down to produce a more inclusive and representative internet? However, given the many-to-many nature of agricultural production and consumption, there may be a central role for platforms to facilitate learning and market transactions and negate the trend towards vertical integration of supply chains by big players we have seen in the developed world.

Yebo Farmer (South Africa) is an online platform that helps connect agricultural advisors and business coaches with farmers. It is a platform-based model in the purest sense in that it has two groups of users. Those listing their training and coaching services and those searching for training and mentorship services. Yebo Farmer provides no content or facilities beyond a simple

to use platform that makes searching easy, supports effective engagements and facilitates payment. This model enables an alternative to a conventional agricultural extension service, through which the state could provide credit to farmers to hire agricultural experts of their choice as and when they needed them.

YouTube has emerged as a platform for learning, but while it (and other similar platform-based models) is a very relevant and powerful tool for farmers in the USA and Europe, farmers in many African contexts struggle to find the kind of content that is relevant to them, in languages they are familiar with. This suggests an opening for content development in local languages, as well as support for searching, filtering, and selecting appropriate and helpful content.

There is also a growing concern over the decolonisation of these platforms—whose voices are privileged, where do profits accumulate, and can this runaway train be slowed down to produce a more inclusive and representative internet?

Risks of digitalisation

The aim of this study is to uncover opportunities enabled for agroecology by the application of digital technologies, and this remains its focus. However, increasing digitisation presents very real risks for food markets in Africa and elsewhere.

The most acute risk, perhaps, is that if we lose the opportunity to look each other in the eye and shake each other's hands as we share and trade food, we risk losing the care, trust and implicit food cultures which underpin the ethos of agroecology. In this sense, digitisation risks cutting loose what we hold most dear, the personal ties people have to one another, the markets they shop at and the ecosystems that support them. This could trigger a loss of livelihoods, social cohesion, and trust. If digital channels become the preferred way to interact between buyers and sellers of produce, what happens to Africa's physical markets? If access between farmers and consumers is improved, what happens to the livelihoods of the people who operate in between, such as aggregators, transporters, and market agents? There will continue to be a need for services such as logistics, transport, and matching sellers to buyers, but there might be a 'squeeze' on incomes in the middle if farmers are able to determine market prices and find buyers independently. More concerning is the loss of social contact throughout the food chain if digital technologies disrupt normal patterns of buying and selling, such as a shift away from physical markets to online platforms, and the resulting erosion of physical contact, face-to-face transactions, and trust based on dealing with who you know.

The second of these risks is that digitisation paves the way for big food and big tech to use their existing technological advantage to extend their control

over African markets. Almost without exception, digital start-ups entering incubation and funding programmes are expected to demonstrate plausible pathways to financial profitability to be funded. As the startup grows and funding needs increase so too does the pressure to focus on the financials. Early-stage investors often look to exit (sell their shares at a profit) within 3-5 years and they are expecting founders to demonstrate plans for this. Who funds tech startups in early phases really matters. In reality, governments and NGOs don't buy out emerging companies. Bigger companies buy emerging companies. In this way, ideas which start with a noble vision at inception morph into profitable young companies that get bought out by bigger fish, and in so doing serve as harbingers of consolidation. What starts as a noble market level solution for traders, becomes an established provincial trading platform, becomes a national company then gets bought out by a multinational. The challenge for public policy is to create the regulatory environment for digital technologies without it becoming a breeding ground for monopolies that crowd out smallholders.

Linking to this is the reality of the digital divide and the risk of deepening it. The gap between those with mobile and internet access and those without is well documented, none more severe than that between men and women, with the gender gap for the use of mobile internet hovering at 34 percent in Sub-Saharan Africa. As new applications for digital technologies are built, the benefits will naturally accrue to those who

have access, further entrenching the divide unless it is quickly addressed. For instance, while WhatsApp has enjoyed widespread adoption, software and hardware is still externally controlled such that users are forced to download new versions each time there is an upgrade. That is a cost felt most acutely by farmers and market actors in remote parts of Africa. The digital divide also describes the gap between supermarkets and agricultural giants who already hold big technological advantages, and smaller players in the food system.

Data privacy and the power of big data are issues that affect all technology sectors and food is no exception. Advanced data analytics relies on the availability and quality of underlying data such as registries, data sets, soil mapping, and other primary data, which in many African countries does not exist in easily consumable formats. As private firms develop solutions, this underlying infrastructure will be built 'on the fly', with concerning implications for data privacy and ownership concentrated in the hands of a few large technology firms.

Scamming and cybercrime also pose new financial

risks to consumers and vendors alike. Insights from interviews conducted suggest scamming and fraud are substantial barriers to the rise in online trade. They also indicated that significant differences existed in the digital cultures across the region: *"In Kenya you can trust an Mpesa payment even if you've never met the person, but in Zim there are scammers"* (Hove, 2022). The risk is that expansion of digital services in some countries may come with a related expansion of opportunities for scamming and other kinds of cyber fraud, eroding trust between market participants in peer-to-peer networks, and opening the door to large, 3rd party institutions who can promise security.

Lastly, as Hellen Shikanda (2022) observes from the Kenyan perspective, the proliferation of trendy online food ordering apps is contributing to the rise of obesity in urban areas. "There is an array of food apps that people use because they are easily accessible, but they are not good for their health". Food ordered via online apps may open opportunities for smaller players to enter the market and compete with global fast-food chains, but this doesn't mean the food is healthier, particularly as people cook less and order more.

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Recommendations



Celebrate the bootstrappers

This research process suggests that there are a number of potentially powerful solutions that have been developed using existing digital technologies. These include toll free numbers and a range of WhatsApp innovations. Celebrate the genius of these simple problem solvers who are using existing systems and help to spread these ideas.

Start by running an annual competition that seeks out the best promising application of existing technologies. For example, The Best WhatsApp-based solution, The Most Watched Agroecology YouTuber, and the Most Active Facebook Group.



Work on solutions for public procurement

Public procurement for institutions such as schools, colleges and hospitals could play a role in supporting agroecology transitions. However, red tape and procurement preferences that favour bulk orders from larger farms are a barrier. There is an opportunity to develop digital solutions that make public procurement from local small-holders easy for state institutions by:

Simplifying red-tape and other administrative barriers in public procurement by, for example, automating and streamlining tendering notices and procurement procedures.

Developing systems for use by the public sector that aggregate and track orders for public institutions.



Actively involve women

There are major gender gaps in the digital space, both in terms of access and who digital interventions are designed for. This suggests the need to:

Fund digital incubation programmes for and by women: finding ways to support and enable female software developers to work with female farmers and traders to develop digital agroecology solutions focussed on women.

Invest into digital literacy and programming skills for young women from farming families.



Work towards a data-free future

National governments and the global funding community need to join hands with mobile network operators and the agroecology movement to provide zero-rated, data-free solutions to African farmers and value chain actors. There are a growing number of solutions that address the issue of data and airtime costs. However, to date very few of these seem to have been applied to agroecological technology solutions.



Explore the idea of an agroecology super-app

There is a lot said in the grey literature about the rise of ‘super-apps’ which offer users within a particular field (such as food retail) a simple one-stop solution to a range of digital needs. These bundle a range of services and/or offerings into a single app or system, saving users the need to switch and change between different apps and service providers. It’s often just simpler for the user. While this might seem somewhat outlandish from our current perspective, and contrary to the recommendation to make use of simple existing technologies, bundled apps are likely to play a more significant role as time passes. In some cases, it is already happening. Kurima Mari, for example, offers weather forecasts, farming advice, local recipes, pricing information and a range of other services all under the banner of a single app. Kurima Mari has over 200,000 users in Zimbabwe. As contrary as it may feel, it could be worth investing some time and resources to explore this line of thought a little more. Drawing on Kurima Mari’s experience could be a good place to start.



Become active shareholders

There is no point complaining about the fact that digital solutions all end up selling out to big business; agroecology funders need to come in as active shareholders who help to shape company culture and ethos. By doing this they can protect promising start-ups from the pressure to maximise profitability, which ultimately leads to impact dilution or buyouts by incumbents.

Consider an AE investment facility that makes early-stage investments into promising start-ups to maintain a vote in their development as they grow.

Consider matching investment funds for start-ups that show promise for supporting agroecology to bring a balance of financial and impact objectives. This needs to take the form of a longer-term facility or endowment fund for agroecological ag-tech innovation that private sector investors trust as a bankable contribution to a start-ups revenue stream rather than a high-risk ‘donor dependency’.

Motivate for integrating investments in pro-agroecology startups into public expenditure to remain pro-poor and pro-farmer. For example, via the Department of Agriculture extension budget or through agencies like SEDA in South Africa.



Motivate policy makers

A lack of a clear policy direction for the inclusion of digital technologies in food markets means that the digital agenda will be heavily influenced and perhaps dominated by first-movers who find ways to solve problems for farmers, aggregators, vendors, and consumers. These forces will not necessarily support the cause of agroecology or the functioning of territorial markets in support of smallholder farmers.

Call for a ‘digital food markets strategy’ to be adopted in member countries that preserves and strengthens the functioning of territorial markets and creates a political mandate for departments of trade and innovation.

Develop a policy position on what a positive digital pathway might look like for food markets.

Conclusion

The question is no longer whether food markets should be digitised or not. Digitisation has been underway in our food market system for the past four decades. This has had a profound effect on the structure of today's food system. In Africa, the level and nature of digitisation in food markets differs significantly from country to country. However, in one form or another digitisation was present in the food marketing systems of all countries we studied. In all instances, access to digital technologies and the digitalisation of food value chains was on the increase.

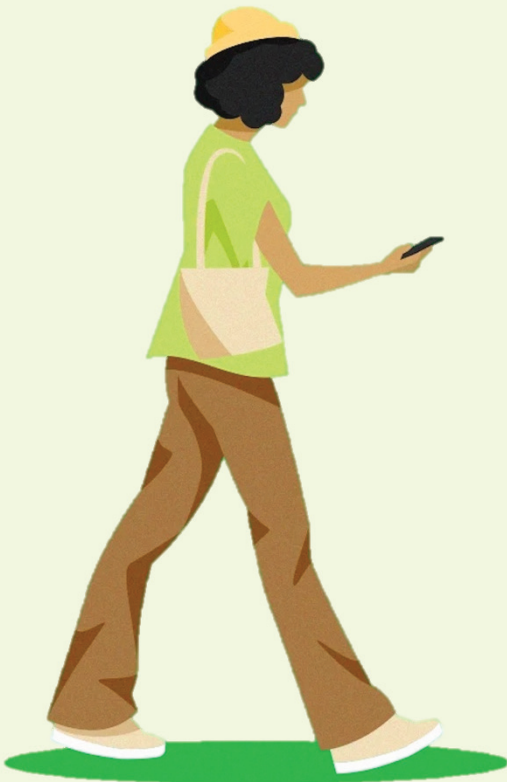
Therefore, while digitalisation poses risks to the goal of an agroecological transition, failing to develop a proactive response, or simply resisting digitisation as a blanket reaction, poses far greater risks. It is imperative that the agroecology movement in Africa rises to the occasion and begins to assert its collective voice in the formulation of positive digitalisation pathways for food markets across the continent. This implies the need for forward-focussed work in practice, policy and finance while also fostering active debate on the ethics of digitisation.

Against this backdrop, the findings from this scanning report suggest promising strategic opportunities for the agroecology movement as well as some practical entry points for engagement.

We also noted several emerging considerations which we believe need to be accounted for. These included the need to consider equal investments into the human elements of digital solutions, to support the building of more women-led technology solutions, and to actively pursue new ways of providing data access to data-poor users.

That Africa's future will be increasingly digital is far less in doubt than whether it will be increasingly agroecological. However, digitisation presents a profound opportunity to leap-frog the centralised models of industrial food production and distribution that have proliferated across much of the world, providing the possibilities for decentralised many-many forms of commerce and exchange which offer simplicity, convenience, and variety, without ceding control to large food traders, processing factories and super-markets. In the context of an increasingly urban future, digital technologies also offer new ways of building networks of relationship and exchange between farmers, fisher-folk, traders, and consumers that are localised, personalised, and decentralised. These modes of operation are well suited to the informal nature of Africa's food value chains.

Furthermore, the retrofitting and repurposing of free and widely used social media and communication applications, such as WhatsApp, mean that with a little creativity even relatively low-tech, low-income actors can begin to put the power of digital technologies to work in supporting their food-based cultures and livelihoods. Indeed, they are already.



..the need to consider equal investments into the human elements of digital solutions, to support the building of more women-led technology solutions, and to actively pursue new ways of providing data access to data-poor users.

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List of studied countries

Burkina Faso
Cameroon
Côte d'Ivoire
Egypt
Ethiopia
Ghana
Kenya
Malawi
Mali
Nigeria
Senegal
South Africa
Tanzania
Uganda
Zambia
Zimbabwe

Links to source materials

Digitalisation across the food value chain, emerging technologies, examples of digital applications
<https://docs.google.com/spreadsheets/d/1xFkVIFbvXeakGUPD263fNlmsi9j8DG2tpgOfk3M0eas/edit#gid=0>

External reports and publications referenced
<https://drive.google.com/drive/folders/1V5f2uL3hUH9FfRzxJ4o0v8XCUZuVYaoB>

AFSA reports and publications referenced
https://drive.google.com/drive/folders/1FJepnuPcgXnx84Ns_IHZexuc44020xxt



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