Small-scale farmers at the heart of global food systems

Increasing the sustainability and traceability of global food supply chains

GLOBAL RESILIENCE PARTNERSHIP

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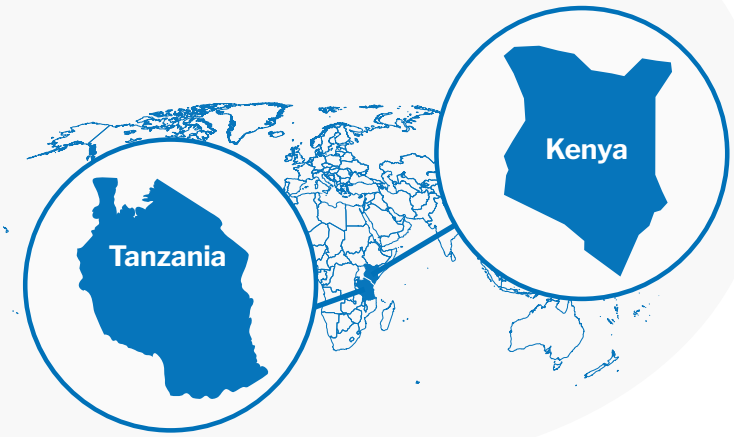
Through digital platforms that foster sustainability, transparency, and traceability, Zowasel sets out to build resilience for farmers, food systems, and supply chains. Building on their experience in Nigeria, the initiative's pilot phase in Kenya and Tanzania focuses on promoting regenerative agriculture, deploying its digital platform, and creating a system to help farmers access the carbon credit market.

Implementing organisation: Zowasel
Project name: Zowasel Carbon and Biodiversity Program
Location: Kenya and Tanzania
Stage: Pilot
Food system focus: Small-scale farmers and global commodity markets
Goal: Build farmer, food systems, and supply chain resilience by providing sustainable, digitally powered solutions and platforms that promote sustainability, transparency and traceability
Key words: Small-scale farmers, sorghum, regenerative agriculture, carbon credit, digital marketplace



GLOBAL RESILIENCE PARTNERSHIP

In Kenya and Tanzania, the agricultural sector is essential to the economy and to individual livelihoods. Kenya's agricultural sector contributed more than 20% of the country's Gross Domestic Product (GDP) in 2022, employing between40% and 70% of the population in rural areas[1]. The sector is divided into four main subsectors: crops, livestock, fisheries, and forestry, with crops contributing to over 70% of the agricultural GDP[1]. Similarly, in Tanzania, with a population of 60 million, the agricultural sector accounts for 25% of GDP. Kenya and Tanzania's agricultural output is largely dependent on small-scale farming. In Kenya, small-scale farmers produce 65% of the marketed agricultural output. In Tanzania, small-scale farmers cultivate 85-90% of the available land[2]. . employ various sales strategies, including direct sales from their homes and local markets, or they rely on intermediaries who distribute their products to regional traders[1,3]. These strategies are similar in Kenya. Agricultural cooperatives play a significant role in both countries, with Kenya having over 14,000 agricultural cooperatives[1]. Kenya and Tanzania face similar challenges, including reliance on rain-fed agriculture in arid and semi-arid regions and limited market access for small-scale farmers[2,4]. In both countries, most people eat a cereal-based diet, including maize and sorghum as staple crops, which are essential to food security, particularly in rural areas[5,6]. Sorghum stands out among the country's staple crops as critical because it is drought-resilient and thus important for food security[5].

Globally, sorghum has significant value and is used in food, alcoholic beverages, and animal feed[5,7]. Because it is drought-resistant, it is a common crop in semiarid regions such as Sub-Saharan Africa and South Asia[6]. In Tanzania, it is the third most cultivated cereal, an essential source of livelihood and food security, especially in drier years[5,8,9]. It is grown in semi-arid regions such as Tabora, Singida, Mara, and Shinyanga, and predominantly used for direct consumption (90.4%)[10]. To ensure good yields, farmers in Tanzania receive support from the government on farming methods and seed types to improve harvests and profits[11].

However, it is frequent that grain quality does not meet market standards, and this challenge affects many farmers[11]. Even though sorghum is a key crop in Tanzania, small-scale farmers face challenges in commercialising their produce due to limited market access and quality concerns.

In Kenya, the dynamics are similar. Sorghum is the third most popular cereal, and it is grown in the country's arid to semi-arid zones such as Siaya, Migori, and Homabay[4]. Sorghum production is predominantly done by small-scale farmers for subsistence, often intercropped with beans and maize[12]. The weak connections between farmers, local processors, and markets are a challenge in expanding sorghum's market reach, which limits the creation of new sorghum products[4]. Another challenge is limited access to information on improved growing practices and pricing information. Agricultural extension officers have the mandate to link farmers to information, technology, and markets. However, this support is very limited in practice with a ratio is 1:1500 officers to farmers[1,13].

In light of the challenges and opportunities of sorghum in Kenya and Tanzania, Zowasel saw an opportunity to digitise its supply chain in order to connect farmers with buyers and improve traceability. Zowasel pinpoints the need for digitalisation to bridge small-scale farmers and local and international buyers. In sub-Saharan Africa, digital tools in agriculture, including digital extension services, farm management, financial services and marketing platforms, show promise for small-scale farmers[14]. These tools can improve access to information, expand market opportunities, and enhance income and livelihoods[14]. Simultaneously, large corporate buyers are increasingly integrating sustainability into their business practices, which includes a better understanding of where their produce comes from, who is farming them, and under what conditions[15].

In Tanzania and Kenya, a limited number of platforms connect buyers to farmers or provide access to real-time information on the growing environment of agricultural products. There are several challenges to digitalisation, including inadequate digital infrastructure in sub-Saharan Africa, limited digital literacy skills among small-scale farmers, and the high cost of digital devices[14]. Sustainability concerns and regulations, particularly those related to supply chain transparency, drive the need for improved traceability. For industries focused on sorghum and cocoa, there has been a stronger push for regulations to protect both farmers and ecosystems. Producers and farmers are faced with growing pressure from corporate Environmental, Social, and Governance (ESG) commitments and global climate policies, such as the European Union Deforestation Regulation (EUDR)[16], which requires robust data to ensure that produce sourced is farmed under ethical and sustainable conditions, with fair compensation to farmers. Members of the EU must follow these regulations or face fines, market bans and confiscation of goods[16]. In response to regulations like the EUDR, Zowasel developed their digital platform to serve not just as a marketplace for farmers and producers but also as a resource for tracing commodities and as an educational hub for farmers, cooperatives, and extension officers.

About the Zowasel Carbon and Biodiversity Program

Zowasel aims to build farmer, food system, and supply chain resilience by providing sustainable, digitally powered solutions and platforms that promote sustainability, transparency, and traceability. The initiative has been in operation for over a decade, with a primary focus on Nigeria. It has recently expanded into Kenya and Tanzania, focusing on small-scale farmers who produce sorghum in rural areas.

Zowasel's digital platform serves as a marketplace connecting farmers with buyers. Farmers can showcase their produce on the platform, providing them with direct access to buyers who can select and purchase what they want. As most buyers require large quantities of produce Zowsel works with cooperatives that gather produce from many farmers and put it onto the platform together. Cooperatives and farmers can access commodity prices on the platform, which helps them set profitable rates. The platform offers direct and secure payments, allowing farmers to receive compensation within 48 hours if all quality parameters are met. It also prioritises traceability and transparency, allowing users to track the origins of commodities, farming practices, and supply chain conditions. Zowasel utilises a Digital Measurement, Reporting, and Verification (D-MRV) system for monitoring and analytics, enabling companies to report and maintain sustainability standards. Artificial Intelligence (AI) is used for on-ground quality assessments, providing buyers with information on produce quality. They also offer access to an AI-powered carbon credit evaluation scoring system that enables farmers to earn carbon credits. Through partnerships, Zowasel facilitates access to credit, insurance, seeds, and fertiliser. Users can also find insights into market trends, demand forecasting, and climate conditions to inform their decision-making.

More recently, Zowasel came to realise that farmers and cooperatives face technical challenges accessing the platform and all the services it provides. This led to the introduction of the Crop Centres. These Crop Centres are physical spaces where people can access the Zowasel platform. They feature digital structures that enable farmers and cooperatives to utilise the digital marketplace, credit scoring, digital advisory services, agricultural inputs, and rent farming machinery. The Crop Centre also includes a Farmers Call Centre that provides farmers access to advisory services for agriculture, finance, insurance, nutrition, hygiene, and climate-smart information through Unstructured Supplementary Service Data (USSD), Interactive Voice Response (IVR), Short Message Service (SMS), WhatsApp, Telegram, and AI channels. Farmers can also receive information on weather, alternative financing, and market access through voice and text in various languages such as Hausa, Yoruba, Pidgin, Swahili, and English.

How does the Carbon and Biodiversity Program contribute to transformative change?

The initiative has contributed to several dimensions recognised as enabling transformative potential. However, while their current actions address all of the framework's dimensions, this is manifested to varying degrees as their work focuses more on some dimensions than others. Importantly, the five dimensions of transformative potential we use in this analysis are not static, and actions that fall within one dimension can support others and even be prerequisites for them. This is reflected in how various factors can drive transformations[17–21]. Through the Zowasel Carbon and Biodiversity Program, Zowasel focuses on challenging existing power structures and norms while fostering and building the relationships and collaborations needed to support this work. The following sections will explore how the initiative operates within its context and how its activities might contribute to (or not) the five dimensions of transformative potential.

Fig 1 Framework: Seeds transformative potential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SURVEY

Navigating a context that can enable or constrain the initiative's action

1. Aligns with local and broader contexts

Zowasel's work strongly aligns with global trends and policies on sustainability and transparency. Global food systems are highly interconnected, with food passing through several actors and travelling long distances before reaching the plate. This has raised issues of transparency of how food is produced, transported and commercialised. As a result, there is an increasing number of initiatives, voluntary schemes, and policies aimed at increasing transparency and traceability. These measures are implemented by individual companies, multinational corporations, and through global trade agreements. We also observe new regulations regarding sustainability and climate change, as food production systems have significant potential to mitigate environmental and climatic pressures. For many companies, this means finding ways to comply with new reporting requirements that demand detailed data. The regulations are forcing larger global companies, often distanced from farmers, to engage more directly with them to meet sustainability compliance. Zowasel has strategically aligned itself with these trends and policies. Their digital service enables companies to source produce and provide knowledge about how and by whom it is produced.

Farmers are also experiencing higher reporting requirements and must use digital tools to sell in regional and global markets, with little to no support provided to them. Zowasel's platform is aimed at farmer cooperatives. They equip the cooperatives with the necessary technology and resources to connect to the platform. Farmers can sell at the platform through cooperatives and Zowasel then facilitates deals with global corporations. As farmers are the ones who ultimately face increased reporting demands, utilising the farming cooperatives with which they are already engaged with is a way to align and provide a solution that fits their daily operations and local contexts. Some cooperatives that cannot meet requirements, such as high quantity demands, can use the platform to register and collaborate with others to fulfil those needs. Another global trend that Zowasel is aligning with and exploring is the use of carbon credits. Their platform and the farming data they collect are suitable for generating carbon credits. This presents an opportunity, as carbon credits are sought after by companies, governments, and farmers (for whom it can be a good additional source of income). Zowasel's efforts to help farming cooperatives sell in global markets and to provide the necessary data for reporting are encouraging farmers to adopt more sustainable farming practices. Another factor essential to attracting big corporations is that Zowasel's technology is compatible with the systems companies use. Zowasel's platform is designed to integrate easily with existing systems, making it possible for companies' to use their own ERP or SAP solutions.

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"This is the era of EUDR, you can't ship a commodity without traceability. So we enable the cooperative to use the technology to manage their operations, and once selling the commodity, we ship the commodity and the data to the buyers, and the buyers pay for both services." **Zowasel**

Enabling transformation is not only about aligning with broader global trends but also with local contexts. In this case, it involves aligning with farmers and cooperatives that produce the products Zowasel sells in global markets. Digital adoption has been strong in Kenya and Tanzania, making it easy for Zowasel to introduce its platform. To ensure that farmers can use the platform, they equip the farming cooperatives with equipment and knowledge to facilitate this. When needed, they have taken additional steps to assist farmers in connecting by employing extension officers to support farming cooperatives and establishing Crop Centres

in more isolated areas without cooperatives, enabling farmers to still access the platform. Crop Centres ensure that more farmers can access training, inputs, and the resources they need.

2. Is enabled by resources and support

Zowasel is enabled by strong partnerships, investments from global corporations and businesses, and their own revenue. Among others, they have partnered with large-scale companies specialising in the beverage market, chocolate and cocoa products, and banks. These external investments have allowed them to keep expanding and developing their platform, opening new Crop Centres, and expanding their operations from Nigeria to Tanzania and Kenya. Zowasel is not only supported by external resources but also provides its own resources to farming communities through their platform. The platform supports carbon credit schemes, monitoring of trends, financial solutions, and farmer training and education. They have assisted in creating farming cooperative structures where they are lacking, and have established Crop Centres that allow farmers to access the resources and support they need to connect with and utilise their platform.

Through an additional mobile application, they provide training for extension officers on how to educate farmers, gather and report information in a way that complies with regulations and policies, monitor carbon stocks, ensure traceability, and determine crop prices. These trainings aim to enhance extension officers' capacity to contribute to more sustainable and profitable farming in their areas. Zowasel has also employed extension officers to help local farming cooperatives further digitise their documents, spreadsheets, and data so these can be uploaded to their platform. Training programs have been digitalised to reduce training costs for more farmers and extension officers. Buyers can also upload material and courses to this platform if they assess that the available options are not comprehensive enough or do not align with their needs regarding sustainable farming practices. Thus, the application also serves as a means for Zowasel to ensure they meet their customers' expectations concerning the farmers' agricultural practices, which represents a top-down approach to enhancing sustainable farming practices.

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"So we developed what we call the Crop Centre. So the Crop Centre model enabled us to go to a community like I am now. We see [meet] farmers who are cooperative. We license this technology all to them for free. They don't need to pay to get access to the technology... [cooperatives can] use it to get market access, to get advisory services." **Zowasel**

Actions employed by the initiative

3. Builds and fosters relationships and collaborations

Zowasel relies on strong peer-to-peer, cross-scale, and cross-sector relationships and collaborations. Their key relationships are with cooperatives that engage and support farmers in joining the platform, extension officers who provide knowledge transfer to farmers, and large corporations that purchase produce from the platform. Their collaborations with global corporations enhance the initiative's credibility, creating ripple effects that increase interest in the platform and its offerings. The scale at which Zowasel operates enables the initiative to expand to other countries based on commodity demand. Focusing on prior relationships with these companies, Zowasel has leveraged existing trust to secure high-level buy-in and to pitch their ideas directly to corporate leadership and strengthen long-term engagement. As mentioned above, with increasing numbers of corporate buyers having to meet national, international, or their own sustainability targets, traceability and sustainability are becoming a high priority. The initiative supports these requirements by helping farmers transition from conventional farming to regenerative agriculture, which aligns closely with corporate demands. The transition is supported through collaboration with both cooperatives and extension officers, who themselves often want to increase their skills in regenerative methods. The initiative provides this support through their Crop Centres.

The farming cooperatives and the agricultural extension officers form local operational partnerships for the initiative. Farming cooperatives collect produce from farmers, manage relationships with farmers and farmer groups, coordinate and distribute resources, and assist farmers in adapting to new agricultural practices and trends. These cooperatives do not work in isolation; they are part of a larger network of relationships that the initiative must navigate. The initiative must also engage with various authorities that serve as gatekeepers, either granting or withholding access to farmers. These include local governments, traditional authorities, and intermediaries. In order to work with farmers in any capacity, they must first introduce their concept to these individuals. Among these, cooperatives are the preferred contact points because they function as custodians for farmers. They recruit farmers, oversee training programs,

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“So they [cooperatives] play a key role because they are the ones who aggregate commodity assets on behalf of farmers. They are the ones who normally will do all the training, manage the training, manage the inputs, distribution, all of those qualities.” **Zowasel**

aggregate and distribute their produce, and manage the inputs on which farmers rely. By working directly with cooperatives and large corporations, rather than intermediaries, Zowasel aims to support farmers securing fairer prices for their commodities.

Overall, there is trust in how the platform works and in Zowasel, while they greatly rely on the cooperatives and their processes to ensure smooth business operations. Within this process, agricultural extension officers play a crucial and evolving role. As the significance of agricultural practices evolves, extension officers are tasked with ensuring that farmers meet buyers' needs and demands, ultimately guiding them on what they can successfully sell.

4. Enables changes in power structures and norms

Intermediaries, also referred to as “middlemen”, play a significant role in supporting farmers' connection to traders and markets. However, their influence on farmers in Tanzania and Kenya has been mixed. Narratives differ, and intermediaries have been described as either supporting farmers in getting a fair price for their products or taking advantage of farmers by taking a substantial

portion of the profits. Often, intermediaries charge high service fees for collecting, transporting, and selling farmers' produce, which ultimately reduces farmers' profits and income. Zowasel aims to shift this power dynamic by working with cooperatives. When cooperatives aggregate farmers' produce, it enhances their bargaining power, allowing them to secure better prices. Through pooling resources and collaboration, cooperatives help farmers reduce costs and enhance their market value. This aligns well with the Zowasels platform, which strengthens the process by allowing farmers to sell larger quantities of produce to buyers simultaneously, thereby appealing to buyers seeking efficiency and transparency. Zowasel may not only help farmers increase the value of their produce but also alter power dynamics and market norms by reducing intermediaries' role and fostering a more equitable market environment.

The initiative also navigates other power structures, including gatekeepers controlling access to farmers. Gatekeepers include individuals, organisations, non-state actors, or government authorities. As the initiative operates across multiple countries, it must engage with local, regional, and national institutions within each country's government structure and adapt to each country's specific policies. In many cases, local government approval is non-negotiable, as they are closest to communities and regulate farmer groups. Certain traditional institutions in the region also require permission before entering the communities. In some areas, local customs require that outside organisations obtain consent from traditional leaders, including kings and princes, who must be consulted before approaching farmers. Navigating these power structures and norms at several levels of governance has involved thoughtful negotiation with different authorities and respect for established power dynamics.

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"Some of the benefits it [the platform] provides, it eliminates all middlemen... it [the platform] enables farmers to earn more for their crops because they pay for a lot of services to middlemen who buy and sell to the big buyers." **Zowasel**

5. Supports learning and systems understanding

Stricter sustainability regulations have led corporate buyers to become increasingly interested. Zowasel saw the growing interest in transparency and tracing of agricultural products as an opportunity to create a space where farmers and buyers alike could access information. Through their digital platform, farmers can monitor the prices of different produce to adjust their own accordingly. Based on the information gathered by Zowasel, farmers can track their carbon footprint and, in the near future, potentially earn carbon credits from their work as an additional source of income. Buyers can bypass intermediaries by purchasing directly from cooperatives, where they get information on the farming methods used and can determine if they align with their demands and regulatory obligations. Data available includes information on farmers, their produce, prices, types of farming used, and how these practices have evolved over time.

Zowasel engages in capacity building of farmers, cooperatives, and extension officers. Training farmers has been expensive because they are often situated in rural areas, requiring trainers to travel considerable distances to reach them. To reduce costs, they use digital learning programs that can be accessed through their platform from anywhere in farmers' own preferred language. The training programs cover a range of topics, including regenerative agriculture, finance, and insurance. Zowasel has specifically created the training programs to align with the standard demands of buyers. This alignment ensures that learning is directly relevant and gives farmers a greater chance of selling their produce. Crop Centres emerged from the realisation that many

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“So we have to digitise all the learning modules... why is this important because we normally take quality education from buyers and now train farmers on how to meet those quality qualifications. So unlike others, we train farmers on agriculture, we train on meeting the buyers' quality requirements. So the buyers produce commodities in a certain manner, and we train the farmers on that. So we have to develop this Crop Centre to provide relevant, accurate information around agriculture, whether it's finance, whether it's insurance, whether it's education, whether it's hygiene, whether it's climate smart...” **Zowasel**

cooperatives struggle to access digital platforms, either due to a lack of technology to support them or difficulties understanding and using them.

Instead of waiting for an in-person training course, farmers and cooperatives can take action when it suits them by utilising the online learning courses available through the Crop Centres. This saves costs and time for everyone involved, making Zowasel’s work accessible to more people and allowing them to continue learning and sell their produce on the marketplace. At Crop Centres, farmers can access information on agriculture, finance, insurance, and nutrition, all of which are equipped with updated information. The Crop Centre creates a common space for cooperatives, their members, and extension officers, offering opportunities to develop their skills close to home or at their work sites.

Transformative potential of the initiative...

1. Aligns with local and broader contexts

Aligning with broader policy and social trends

- Responding to growing global transparency demands (e.g., regulatory frameworks such as EUDR) by creating a space for companies to track the origins of produce, the conditions of farmers, and to store and collect data through digital tools.
- The Zowasel platform reduces technical barriers for large corporations by having its software integrate with existing corporate ERP/ SAP systems
- Creates an enabling environment for farmers and cooperatives to benefit from carbon markets by providing data collection and storage infrastructure suitable for carbon credit generation.

Aligning with the local context

- Supporting agricultural cooperatives: by working with established cooperatives in the region, providing cooperatives with a platform and support, supporting farmers to meet reporting and quantity demands as a group
- Working to support farmers' access to markets and increase profitability
- Creating Crop Centres in more isolated areas to provide training, agricultural inputs, and connections to farmers through a physical platform

2. Is enabled by resources and support

External resources and support

- Strategic partnership and investment
    - Partnerships with large corporations create credibility for the initiative
    - Investment received from large corporations for platform development and broadening the initiative to other regions

Internal resources and support

- Ownership of the platform
- Revenue from the initiative)
- Continuous development of the platform to remain relevant, which is done by the Zowasel team
- Online training resources that allow for educating more farmers with fewer resources

Resources and support provided by the initiative

- Creation of the Zowasel platform, which includes:
    - Free licensing to the platform for cooperatives for both market access, advisory services, tools for traceability, crop pricing information, and carbon tracking.
    - Training and capacity-building opportunities for cooperatives and farmers, with constantly updated online courses and training materials for farmers on sustainable practices
    - Training for extension officers on how to train farmers, monitoring carbon stocks, and how to be compliant with traceability and regulatory requirements
- Creation of Crop Centres:
    - Physical spaces in isolated areas where farmers can access the platform, inputs, technology, and training.

Transformative potential of the initiative...

3. Builds and fosters relationships and collaborations

Peer-to-peer relationships and collaborations

- Agricultural cooperatives and the Crop Centres
    - Recruit farmers
    - Collect produce from farmers, manage inputs, and oversee transactions
    - Provide training to farmers and help them adopt to new practices which align with market demands
    - Are the first point of contact between the initiative and farmers
- Extension Officers
    - Work in parallel with the cooperative to train farmers
    - Work on capacity building with farmers on traceability, carbon tracking, and using the platform

Cross-scale collaborations

- Get permission from the local government, traditional leaders, and other intermediaries
- Work across multiple countries with cooperatives and extension officers from that region

Cross-sector:

- Train partners: Syngenta Foundation and Solidarity

Corporations/producers: Diageo, Bari
NGOs and research institutions
Collaborating with other Start-ups

4. Enables change in power structures & norms

Shifting power dynamics in agricultural markets

Get fairer profits for farmers through the facilitation of access to markets and by emanating intermediaries
Use cooperatives that need to do reporting and updating of farmers' data onto the platform, instead of working with intermediaries, aids in transparency and traceability

Navigating existing power structures

- Engage with various gatekeepers for permission to work with farmers
- Understand and operate with multiple differing regulatory and institutional landscapes based on different countries they work with

Transformative potential of the initiative...

5. Supports learning & systems understanding

Building awareness

- Build a broader understanding of the process followed from the farmer to the consumer
- The platform allows farmers and buyers to access information on farming methods, prices, carbon footprint, and how pricing has changed over time
- Support buyers in aligning their purchases with sustainability standards

Training and capacity building

- Provide access to courses on regenerative agriculture, finance, insurance, nutrition, and climate-smart practices
- Courses are aligned with corporate buyers' regulatory requirements
- Programs accessible in local languages

Provides spaces for learning

- The Crop Center provides a physical space where farmers, cooperatives and extension officers can come and access the platform and all its learning resources
- Centers are a place for continuous learning which can be done alone

Pathways forward

Research on local-scale initiatives and their contribution to wider transformations indicates that local initiatives rarely drive systemic change on their own[22]. Instead, broader transformations require partnerships and collaborations among individuals and initiatives working towards shared goals[22–24]. Beyond local initiatives, there is a need for relationships and collaborations with wider actors and networks across scales and sectors that help generate resources, exchange knowledge, and strengthen adaptive capacity toward broader systemic transformations[20,24–26]. Zowasels' work aligns with these insights in how they are creating a digital space that connects diverse actors who might not otherwise come into contact, thereby revealing opportunities that might otherwise remain inaccessible. Zowasel connects typically isolated actors in the food system, including small-scale farmers, agricultural cooperatives, extension officers, and large corporate buyers, facilitating direct market access, allowing for traceability, promoting fair pricing, and enabling structured payments. This work also supports continuous learning and adaptation by using digital tools for training that are regularly updated. In this way, Zowasel enhances competence and capacity development across its users, which can lead to increased individual and collective agency[23,32].

Nevertheless, some challenges may limit Zowasel's transformative potential. As the Zowasel platform becomes a central point for cooperatives and farmers to access markets, there is a risk that increased dependence on the platform will reduce farmers' autonomy. While the initiative and its platform reduce middlemen and intermediaries, they risk becoming a high-level intermediary themselves. With this in mind, a pathway forward as Zowasel continues to expand, can be to increase their focus on empowering cooperatives and farmers' own agency by strengthening their negotiation skills, internal governance mechanisms, and leadership, so that they remain empowered and self-reliant. As Zowasel has already demonstrated its capacity to 'scale out' through its expansion from Nigeria into both Kenya and Tanzania, keeping these aspects in its design is important. Research highlights three dimensions of scaling, which include scaling out, scaling up, and scaling deep, and their potential effects on transformative change[27]. Scaling out refers to impacting a greater number of people and/or geographies by replicating the initiative elsewhere. Scaling up involves the initiative reaching a level at which it starts to impact policy and institutional structures. Lastly, scaling deep concerns the initiative's involvement in shifting values, mindsets and power dynamics[27].

Zowasel's ability to scale out is primarily due to their ability to clearly address corporate buyer needs for traceability and transparency while also aligning with cooperatives and farmers' needs to comply with market standards. The accessibility of mobile phones at the cooperative level, as well as the relatively low barriers to using digital tools (such as low costs), have further enabled their replication.

The initiative demonstrates their capacity to scale out, but they have not yet demonstrated significant ability to scale up or deep. There are potential pathways the initiative could take in this regard. For changing mindsets and values, trust is central to the process. Strengthening trust through stronger relationships with both companies and farmers could be achieved by demonstrating how the initiative has significantly facilitated companies' access to transparent and traceable farming products, increased farmers' incomes, reduced uncertainty, and/or strengthened farmers' bargaining power. With increased communication, they could potentially shift the understanding of traceability and transparency from a compliance requirement to something that provides benefits to all along the supply chain. Research on transformative learning and reflection shows how changing mindsets and values require specifically curated spaces where people can come together to reflect on assumptions, worldviews, and power structures and norms[28]. The Crop Centre could be an ideal starting point for a physical space for these dialogues, bringing farmers, cooperatives, and, ideally, corporate representatives together. Another aspect could be expanding the training programs to focus on a systemic understanding of food systems and the roles different actors within them hold, to better equip individuals to understand their position and agency within them.

For scaling up, Zowasel could strengthen their cross-sector partnerships with research institutions, NGOs, and local governments. Fostering institutional collaborations could potentially help embed the platform and its corresponding practices into broader regional agricultural strategies. The initiative could build a thorough evidence base on the impacts of traceability (potentially similar outputs to those used for farmers) to further increase credibility and legitimacy in policy discussions. Additionally, they could aim to identify and form relationships with other local-level initiatives to engage in knowledge and resource exchange and policy advocacy, further contributing to system-level transformation since networks of local initiatives and collaborators have been shown to support and enable transformations towards sustainability and equity[29–31]. Research suggests that a combination of all three scaling types is important for large-scale systemic change[27].

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