TECHNICAL REPORT

Scaling Agtech Innovation Bundles Across African Markets

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April 2026

Acknowledgements

This work was undertaken as part of the CGIAR Scaling for Impact (S4I) Program. We would like to thank all funders who supported this research through their contributions to the CGIAR Trust Fund (www.cgiar.org/funders).

We extend our sincere appreciation to our partners, stakeholders, and collaborators whose expertise, insights, and commitment have contributed significantly to shaping this work. Their contributions have been instrumental in advancing CGIAR's ambition to scale proven innovations across food, land, and water systems, fostering impact that is inclusive, sustainable, and transformative.

We also recognise the continued support and collaboration of national and regional partners, whose engagement ensures that the solutions developed are responsive to local needs, strengthen innovation systems, and contribute to building more resilient agrifood systems.

About the CGIAR Scaling for Impact (S4I) programme

Scaling for Impact (S4I) is a CGIAR programme (2025–2030) that tests, refines, and scales innovations in food, land, and water systems. It works to align those innovations with stakeholder needs to achieve a transformative impact.

Website: https://www.cgiar.org/cgiar-research-porfolio-2025-2030/scaling-for-impact/

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Citation

Omondi, Joshua, Christi TK, Mahlatse Nkosi, and Josey Kamanda. 2026. *Scaling Agtech Innovation Bundles Across African Markets.* International Water Management Institute (IWMI).

Front and back cover photo: Mahlatse Nkosi/IWMI

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Acronyms and Abbreviations

AFAAS - African Forum for Agricultural Advisory Services
ASEco - Adaptive Scaling Ecosystem
CGAP - Consultative Group to Assist the Poorest
CSR - Corporate Social Responsibility
DFI - Development Finance Institution
EAGC - East African Grain Council
ESOs - Entrepreneur Support Organizations
FAO - Food and Agriculture Organisation
FSSS - Foundation for Sustainable Smallholder Solutions
GDP - Gross Domestic Product
IFAD - International Fund for Agricultural Development
IWMI - International Water Management Institute
JICA - Japan International Cooperation Agency
KCIC - Kenya Climate Innovation Centre
NAFIR - National Agricultural Finance Implementation Roadmap
NAIP - National Agricultural Intelligence Platform
NGO - Non-governmental Organisation
R&D - Research and Development
S4I - Scaling for Impact
USD - United States Dollar
VIA - Virtual Irrigation Academy
WDI - World Development Indicators
ZARI - Zambia Agriculture Research Institute

Executive Summary

This report examines the landscape of agtech innovation, which includes digitally-enabled ventures active across the agricultural value chain, across five key African markets (Ethiopia, Kenya, Malawi, Nigeria and Zambia). It aims to address persistent challenges such as food insecurity, climate vulnerability, and resource gaps in agriculture. In response to these issues, a growing ecosystem of over 600 agtech companies has emerged, collectively raising more than USD 1.5 billion over the last five years.

This study focuses on three priority areas: access to water, soil health and waste management. It then examines the innovations developed to tackle them. The study uses an adapted Adaptive Scaling Ecosystem (ASEco) framework to assess how market maturity influences the strategies for bundling products and services. The core objective is to identify which scaling pathways are viable and to provide actionable recommendations for the design, financing, and sustainable growth of agrifood solutions in the focus countries.

In addition, the report is meant to serve as a decision support tool within the enabling environment ecosystem. It is meant to provide an evidence base guiding (1) the prioritization of innovation bundles aligned with country-level needs, (2) inform future country policy dialogues and private-public collaboration and (3) inform the deployment of technical assistance and financing instruments that are complementary to the identified innovations/innovation bundles as a means to accelerate inclusive and market-driven scaling efforts.

Key Findings

Countries are at different stages: Kenya leads with acceleration-stage ecosystems. Ethiopia, despite having the relatively largest agricultural economy (34.9% of GDP), is in niche stage due to limited commercial capital. Nigeria shows early momentum, but companies lack scale-up capital. Malawi and Zambia have very small ecosystems, with very few companies disclosing their funding information.

Circular solutions are early across the board: Even in Kenya, innovations like biodigesters and biochar are still in early stages. These solutions need 5-10 years to become proven business models that are financially sustainable and scalable without being permanently reliant on subsidies.

Lessons from case studies

Through the case studies, the main lessons obtained were: partnerships are critical for expansion, bundling services strengthens business viability, and system-level constraints limit scale. Successful companies work through existing networks such as cooperatives and government extension services and combine services to increase value to the customer. However, limited access to appropriate funding, regulatory frictions and weak links between ecosystem actors continue to constrain adoption.

Insights from support organisations also highlighted that effective scaling depends on partnerships across the different actors, including donors, government, training providers, farmer organisations, financial institutions, and the private sector.

Introduction

Context and Background

Agriculture remains one of the most critical sectors in Africa, contributing significantly to GDP, providing widespread employment, and meeting growing food demand both locally and globally. Yet, according to the FAO estimates, food insecurity affects approximately 20% of the continent's population (WorldBank, 2023). Agricultural productivity therefore remains structurally under-optimised, exacerbated by rising exposure to climate shocks, macroeconomic volatility, global supply-chain disruptions, and persistent infrastructure gaps across food,land and water systems.

In response to these challenges, a rapidly expanding agtech innovation ecosystem has emerged across the continent. This ecosystem comprises startups developing solutions across the agricultural value chain, as well as investors and entrepreneurship support organisations (ESOs) that provide capital and venture building support. AgBase estimates that more than 600 agtech companies have collectively raised over USD 1.5 billion in disclosed funding over the past five years. These solutions span the entire agrifood value chain, from on-farm technologies to off-farm services, seeking to address long-standing inefficiencies related to water access, soil degradation, post-harvest losses, and market integration. Despite this momentum, the ability and trajectory for agtech innovations to scale sustainably and inclusively remains fragmented, shaped by differences in market maturity, policy environments, institutional capacity, and access to finance.

This report contributes to CGIAR's Scaling for Impact (S4I) enabling environment lab in efforts to provide an applied, evidence-based understanding of how agtech innovations are positioned and developed to scale within and across diverse African markets by understanding regulatory openness and constraints. Resultantly, it generates actionable insights into the policy landscape, market, and institutional conditions that shape the adoption and scaling of innovation bundles informed by pathways to scale in agrifood systems. The analysis is designed to inform both mid-term program delivery and long-term system level interventions that target reduced transaction costs, derisking investment, and strengthening inclusive market participation through an applied Adaptive Scaling Ecosystem (ASEco) framework and innovator case studies.

This study focuses on the agtech innovation ecosystem across five key markets based on the S4I country prioritisation methodology (Ethiopia, Kenya, Malawi, Nigeria, and Zambia), and examines three interrelated challenge areas that consistently constrain agrifood system performance which are of interest to the International Water Management Institute (IWMI):

- **Access to water:** According to the World Bank, about 6% farmland in Sub-Saharan Africa is irrigated, leaving the majority of farmers to depend on rain-fed agriculture (WorldBank, 2025a) .
- **Soil health and yield productivity:** Africa holds approximately 60% of the world's arable land, much of which is underutilised, leading to declining soil fertility and stagnant yields (Khumalo, 2025).
- **Waste management:** Responsible and sustainable waste management remains a significant resource gap across the continent, calling for greater circular processes.

Across these challenge areas, diverse innovations are emerging, from independent technologies to integrated service models. However, the companies mapped against these solution areas differ in terms of

technological sophistication, business models and the financing required to scale. While some companies have reached commercialisation in specific markets, others remain in pilot or early-growth phases, constrained by enabling environment bottlenecks such as regulatory uncertainty, fragmented value chains, limited access to finance, and weak institutional coordination. These constraints have given rise to distinct scaling pathways, some characterised by specialisation in single innovations, and others by the bundling of multiple technologies, products, and services to address interconnected risks and market failures.

Using the Adaptive Scaling Ecosystem (ASEco) lens developed by (Minh and Schmitter, 2025), this report examines how market maturity influences innovation bundling strategies across water, soil and circularity interventions. It identifies and explores which pathways enable viable scaling to offer actionable recommendations for the design, financing, and sustainable growth of agrifood solutions in the focus countries. The findings are meant to inform the Accelerating Agribusiness for Impact package by guiding its implementation design for applied diagnostic, targeted enabling environment technical assistance, and policy and market interventions that strengthen value chain integration, curating a conducive and supportive enabling environment while catalyzing private investment.

Methods and Data

The analysis in the study leverages a mixed-methods approach combining proprietary market data from the AgBase platform, desk review of the enabling environment, and stakeholder engagements:

1. **Quantitative data mapping:** Investment and company data were sourced from Briter Intelligence and AgBase, covering deal flows, product bundles, investors, and founder demographics. Data collection covered five countries: Ethiopia, Kenya, Malawi, Nigeria, and Zambia, focusing on companies active in irrigation, soil and water management and circular nutrient solutions.
2. **Qualitative data:** We conducted ten key informant interviews (KIIs) with founders, investors and ecosystem enablers who have experience working at the intersection of irrigation, soil and water management and circular economy. These interviews provided more context on the innovation bundling and scaling journeys, and insights from these engagements informed several of the key learnings in this report.
3. **Market data:** Desk research on key macroeconomic indicators in Agriculture (GDP contribution, agricultural workforce) to help contextualise the innovation data. All macroeconomic data were obtained from the World Bank's World Development Indicators (WDI) database.

The Adaptive Scaling Ecosystem (ASEco) Framework

To assess how innovation bundles are evolving and scaling across different country contexts, this report applies an adapted version of the ASEco framework. The framework is used explicitly to analyse the financing, ecosystem stakeholders, and enabling conditions that shape scaling outcomes.

The framework is used here as a practical organising and diagnostic lens. It links innovation bundles to the system-level challenges they are designed to address, and to the types of funding, ecosystem stakeholders, and enabling conditions required to support different scaling pathways. This allows the analysis to move beyond describing where bundles sit today, towards identifying what needs to change for them to progress.

ASEco distinguishes four scaling functions: Niche, Reach, Accelerate, and Transform. In this report, these functions are not treated as linear stages of innovation maturity. Instead, they are used to describe how financing is structured, which stakeholders are involved, and what conditions are in place to support scaling at different points. In this analysis, AgBase and Briter Intelligence data, as well as secondary market data, are mapped onto this adapted ASEco framework to assess how innovation bundles are evolving across the five focus markets. The scaling function is identified using proxies across four main areas:

- Innovation ecosystem: this includes the number of funded ventures within a bundle
- Funding landscape: includes typical ticket sizes, dominant funding instruments
- Support ecosystem: includes funder profiles and the presence and role of key ecosystem stakeholders.
- Market context: includes agricultural and economic conditions of each market, policy environment

These indicators are broken down and summarised in Table 1, which shows how financing patterns, stakeholder involvement, and ecosystem support differ across the four ASEco functions.

Table 1. ASEco framework

ASEco function	What this looks like in practice	Number of funded ventures	Typical funding size	Dominant funding instruments	Key Stakeholders (Funders and ecosystem)	Market Context
Niche	Ventures testing core solutions and early bundles through pilots and small-scale deployments to learn what works in real contexts	High number of ventures but limited capital deployed	Very small (USD 1000 - 100000)	Grants, Awards and Prizes, In-Kind Assistance	**Funders:** Donors, foundations, research programmes, accelerators **Ecosystem:** Research orgs, NGOs, pilot partners	**Conditions:** 30%+ ag GDP/employment, <1% irrigated, <60 connectivity **Policy:** Strong donor coordination, government prioritisation emerging, constrained by state controls, financial barriers, infrastructure gaps
Reach	Ventures expanding adoption in a core market by strengthening delivery, bundling services, and demonstrating	Moderate number of ventures	Small to medium (USD 10000 - 500000)	Early-stage equity, grants	**Funders:** Impact investors, early-stage VCs, philanthropic capital **Ecosystem:** ESOs, distributors, extension networks	**Conditions:** 20-35% ag GDP, 0.3-1% irrigated, 60-100 connectivity **Policy:** Government ag prioritisation, digital systems emerging, constrained by limited capital access, infrastructure deficits,

	early commercial traction					and institutional capacity gaps
Accelerate	Ventures with proven demand using larger tickets to reduce risk, improve affordability, and scale more rapidly across users or regions	Moderate number of ventures, but increasing capital concentration	Medium to large (USD 500000 - 5 million)	Equity, Debt	**Funders:** DFIs, development banks, corporates **Ecosystem:** Corporates, sector platforms, infrastructure actors	**Conditions:** 15-25% ag GDP, 1%+ irrigated, 100+ connectivity, digital functional **Policy:** Digital systems widespread, commercial focus, structured markets, limited by governance complexity, policy fragmentation, and financing constraints
Transform	Ventures embedded into markets, public programmes, or sector systems, so solutions become durable and system-level	High capital concentration, with few ventures receiving large funding	Large (USD 5 million+)	Debt and late-stage equity	**Funders:** Commercial banks, governments, large corporates **Ecosystem:** Regulators, public procurement bodies	**Conditions:** <20% ag GDP, 120+ connectivity, multi-sector systems **Policy:** Digital frameworks operationalised, procurement pathways clear, commercial banks active, PPPs embedded, minimal institutional barriers

This adapted use of ASEco allows bundles and countries to be assessed relative to one another, making it possible to see where different bundles sit across markets and what financing, ecosystem interventions, or enabling conditions are needed to support their progression.

Through this approach, the analysis focuses on:

- Which types of funding are supporting or constraining progression between scaling functions;
- Which ecosystem stakeholders are present, missing, or misaligned at different points, and
- Which enabling conditions, such as policy frameworks, public programmes, distribution infrastructure, or procurement pathways, are required for innovation bundles to advance.

However, the framework should not be seen as rigid. Stakeholder consultation, including with Delta40, offered important nuances. Not all companies need to reach the Transform stage to create lasting value. Many can achieve success through focused, profitable operations. Furthermore, the progression is often non-linear, with the speed of iteration being a more significant factor than sequential stage progression. Examples of companies that have been able to do this successfully include SunFi, which successfully embedded itself into Nigeria's financial system through partnerships with Sterling Bank and Renmoney to enable them to scale beyond their balance sheet constraints.

Using ASEco in this way makes it possible to understand how innovation bundles sit relative to one another across countries, and what financing, ecosystem interventions, or enabling conditions are needed to move them forward. This lens is only useful if it is grounded in a clear understanding of the innovation bundles themselves and how they are evolving across markets. The next section, therefore, focuses on defining these bundles, identifying what they have in common, and describing how they are taking shape across different contexts.

Introducing the Innovation Bundles

Innovation bundles refer to a suite of complementary products and services designed to work together to address specific challenges. The expectation is that these bundles will enhance the relevance of different solutions and thereby increase the chances of achieving impact at scale. Table 2 outlines the innovation bundles by specifying the problem addressed, products covered, solution and expected interaction with the ASEco framework.

Table 2. Innovation bundles and key enabling factors

Bundle	Problem addressed	Products	Solution	Dependencies	Expected interaction with ASEco
Irrigation technologies	Unreliable water availability Inefficient irrigation practices	Drip/sprinkler systems, pumps, solar-powered irrigation, sensors, and mobile advisory	Improve water access, distribution efficiency, and timing; stabilise production; optimise water use	Energy access, finance, technical support, and enabling water policies	**Niche**: Pilots in high water-stress areas **Reach**: Expansion via partnerships and service providers **Accelerate**: Financing, policy support, market linkages **Transform**: Integration into water governance and farm practices
Soil and water management	Soil degradation Low nutrient retention Poor water-holding capacity	Soil testing and pest detection, conservation agriculture, digital advisory services, precision agriculture, water harvesting, erosion control	Enhance soil structure, nutrient availability, and water retention; improve yield stability	Farmer training, integration with cropping systems, local material availability, agronomic advisory	**Niche**: Demonstration plots, farmer experimentation **Reach**: Extension networks, farmer groups, farmer cooperatives, lead farmer initiatives **Accelerate**: Policy incentives, capacity building, technical support **Transform**: Embed sustainable practices in regional/national farming systems and policies
Circular water and nutrient management	Inefficient nutrient use Pollution Unsustainable water practices	Waste to energy, waste to nutrient solutions, biofuels, organic and food waste, biogas and fertiliser systems, water recycling and treatment technology, aquaponics and fertigation systems, nutrient recycling	Recover and recycle nutrients and water; reduce input dependency; improve system-wide efficiency and environmental outcomes	Infrastructure for collection/processing, regulatory support, community/farmer buy-in, market linkages	**Niche**: Small-scale pilot sites **Reach**: Farmer cooperatives, input suppliers, demonstration sites **Accelerate**: Infrastructure investment, enabling regulations, market incentives **Transform**: Circular practices become standard, reducing environmental impacts and costs

The Landscape for Innovation Bundles

Exploring the Data

In order to assess the maturity and scalability of each of the different models in an Adaptive Scaling Ecosystem, the following sections break down the landscape into several dimensions that inform the maturity and readiness of the different bundles to scale. The six key dimensions and their indicators, used as proxies to assess the scale and maturity of the bundles, are detailed in Table 3.

Table 3 . Data

Dimension	Indicators (Proxies for Scale)
Market and bundle scaling analysis	Assessment and analysis of the bundles using the ASEco framework
Case studies	Real-life scaling journeys
Market Context	Agriculture sector size (% GDP, employment), overall economy size (GDP), mobile and internet adoption rates, enabling environment (supportive and limiting policies)
Innovation Landscape	Number of startups/solutions in the bundle space, range/diversity of technologies
Funding Landscape	Funding by country, bundle, funding instrument (grants, equity, debt, etc.)
Support Ecosystem	Look at the funders, accelerators and incubators, research institutions, government agencies, NGOs, etc.

Real-life Innovation Bundles: Case Studies

Mapping the innovation bundles and enabling a support environment is one thing; evaluating how they navigate real-world markets is another. To bridge this gap, this section combines case studies with quantitative and qualitative data across the five focus countries. Insights from the interviews reveal the strategic decisions, market adaptations and enabling conditions that companies have to contend with in their scaling journeys.

Each case study examines the products that the company offers, the scaling strategies they used and the factors that either worked or did not work for them.

Case study 1: Mechro

Countries: Malawi

Funding Raised: $157K

Bundle: Irrigation Technologies, Soil and Water Management

Description: Mechro makes precision farming tools affordable for smallholder farmers. Their products include soil health solutions, irrigation, grain storage and cold chain monitoring.

Scaling pathway: Partnerships and product diversification

The company's scaling strategy has been largely based on adapting its products to respond to immediate farmer pain points. They followed the farmer's journey from soil health to storage and eventually market access. This enabled them to have a stack of complementary innovations that helped them reach out to more farmers rather than innovating in isolation.

Partnerships have also played a key role for Mechro. The partnership with Virtual Irrigation Academy (VIA) helped them validate their soil testing kits and also helped build credibility with other institutions. They have also partnered with the Department of Irrigation within the Ministry of Agriculture, which has played a major role in expanding their reach.

Factors that enable scale	Factors that limit growth
• Supportive regulatory environment • Partnerships with VIA and the Ministry of Agriculture helped them reach more farmers.	• Lengthy certification processes for the hardware they use. • Limited government procurement pathways. • Farmer financing gaps.

Case study 2: Rhea Africa

Countries: Kenya

Funding Raised: $250K

Bundle: Soil and Water Management

Description: Rhea has a soil health intelligence platform for smallholder farmers, which uses AI to provide real-time recommendations to farmers. They focus on data quality, continuous calibration, and precision agronomy by layering soil testing, real-time recommendations, farmer support, and MRV systems to deliver accurate, location-specific insights that improve productivity and sustainability.

Scaling pathway: Partnerships and product diversification

Rhea started with soil testing hardware and later integrated AI and machine learning models that offered real-time recommendations at scale. With this, they have been able to create a farmer support tool and a continuously updating agronomic knowledge base.

Partnerships have also helped Rhea scale. Their work with the East African Grain Council (EAGC) as the council's soil health partners have helped them reach more farmers.

Factors that enable scale	Factors that limit growth
• Proprietary technology (AI/ML models) • Partnerships with EAGC	• Data protection regulations • Data scarcity • Technology costs

Case study 3: AgroCares

Countries: Kenya, Nigeria, Uganda

Funding Raised: Undisclosed

Bundle: Soil and Water Management

Description: AgroCares offers real-time diagnostics for soil, feed, and crop health using proprietary sensors, in-house applications and databases. They provide a comprehensive diagnostic bundle by integrating soil, feed, and leaf analysis with handheld and lab-based sensor technologies, delivering laboratory-grade insights and deep data analytics to facilitate faster decision-making and increased productivity for farmers.

Scaling pathway: Geographic expansion, partnerships and product diversification

AgroCares core offering is soil-related diagnostics and advisory services. The primary driver for scale has been soil testing. Over time, they have been able to add complementary services such as leaf tissue testing to create an integrated solution.

Partnerships have been key to their scaling approach. AgroCares works with different organisations drawn from the private sector, public sector and academic institutions. In Kenya, they have worked with Safaricom through DigiFarm to help smallholder farmers with soil testing services. They have also partnered with Bukura Agricultural College to reach more farmers with their technology. Across Africa, partnerships with local governments and the World Bank have been key for their growth. Through these collaborations, they have been able to leverage local expertise, build credibility and focus on their core competence in soil diagnostics.

Different regulatory environments have also been a major factor in their scaling journey. In the EU, for instance,the Soil Monitoring Law(European Union, 2025) has supported AgroCares operations by driving demand for harmonised soil data and creating a more favourable enabling environment for the adoption and scaling of private-sector soil testing and monitoring solutions. In other markets like India, they faced restrictions on exporting soil samples for further testing. This required that they leverage their local partnerships. High technology costs have also limited the adoption of their technology among smallholder farmers.

Factors that enable scale	Factors that limit growth
• Horizontal product diversification • Partnerships with private, academic and public institutions • Supportive regulations like the soil monitoring law in the EU • Technology differentiation	• Market-specific regulatory barries e.g the Indian restriction on exporting soil samples • High technology costs, which limit adoption • Limited farmer financing

Case study 4: Sistema.bio

Countries: Ethiopia, Ghana, Kenya, Malawi, Nigeria, Morocco, Senegal, Uganda, and Zimbabwe

Funding Raised: $56M

Bundle: Circular Water and Nutrient Management

Description: Sistema.bio provides smallholder farmers with biodigester systems that convert organic and livestock waste into clean biogas and organic fertiliser. Their integrated systems, including digesters, appliances, training and financing, reduce energy costs, manage waste sustainably and improve soil productivity.

Scaling pathway: Geographic expansion, partnerships and product diversification

Scaling out has been a key part of their strategy. Sistema.bio started operations in Kenya in 2017 and now operates across all 47 counties within the country. Over the past three years, they have expanded to Ethiopia, Malawi and Morocco. Partnerships with local distributors and other full-service partners have been key to their success. Development partners and government agencies have also been a major factor in their scaling efforts. For example, in Ethiopia, the government's push to have more biodigester installations made it easier for them to start operations because of aligned incentives.

Their bundle is heavily service-integrated. Apart from hardware, they provide installation, training, ongoing maintenance support, and financing solutions (grants, Corporate Social Responsibility (CSR) partnerships, carbon finance) to overcome the high upfront cost barrier.

Partnerships with local distributors handle last-mile delivery, while relationships with development partners and government agencies (especially in Ethiopia, where government biodigester targets aligned with their expansion) provide policy support and subsidy access.

The regulatory environment has presented both challenges and opportunities. For example, as each government has its own laws when it comes to Article 6 has created complex approval processes for them. Article 6 sets the rules for voluntary international cooperation on climate action, allowing countries and companies to trade or credit emissions reductions (UNFCCC, 2015). Part of it includes approaches for cooperating (Article 6.2) and a crediting mechanism for generating carbon credits (Article 6.4).

Factors that enable scale	Factors that limit growth
• Aligned government incentives • Partnerships with local distributors • Carbon financing innovation • Product diversification	• Limited farmer purchasing power • Subsidy dependency • Regulatory complexities (e.g Article 6) • High costs of the biodigesters limit adoption

Case study 5: Lersha

Countries: Ethiopia, Kenya, Uganda

Funding Raised: $2.9M

Bundle: Soil and Water Management

Description: Lersha supports smallholder farmers through a bundled model that integrates climate smart advisory with Inclusive finance and market. Lersha reduces credit risk for partner financial institutions, while partnerships with large off-takers help secure output markets and support reliable loan repayment.

Scaling pathway: Horizontal product diversification, vertical integration and partnerships

Lersha's phygital approach combines a digital platform with a last-mile agent network and a call centre to support continuous farmer engagement. Access to finance is bundled with agronomy support, market and other complementary services, improving productivity and farmer incomes while managing risk and supporting repayment. This integrated model also creates service-based employment across field operations and advisory delivery.

Access to finance remains one of the major constraints facing smallholder farmers in Ethiopia, many of whom lack collateral, formal credit histories, and required documentation such as landholding certificates or national identification. Lersha works with commercial banks and insurance providers, using its agent-led model to help make smallholder farmers more bankable through digital profiling, structured engagement, and digital credit scoring. The financing facilitated through this model takes the form of productive loans, delivered primarily in kind.

Government-led initiatives such as the recently launched National Agricultural Finance Implementation Roadmap (NAFIR) signal a growing policy focus on expanding agricultural finance in Ethiopia. As implementation unfolds, this direction is expected to create an enabling environment that aligns with Lersha's model and supports its future growth.

Lersha is focused on deepening and scaling its operations within Ethiopia, where it currently operates across 9 regions and serves a growing base of more than 320,000 farmers through a network of over 3,600 agents. Building on early market engagement and partnerships, the company is prioritising scale-up activities in Kenya and Uganda, alongside expansion into other East and Southern African markets, including Rwanda, Tanzania, Zambia, and Malawi. Lersha's is working towards reaching 1 Million active farmers by 2030, leveraging its integrated digital and agent-enabled service model and facilitating cumulative agricultural financing of approximately USD 1 Billion.

Factors that enable scale	Factors that limit growth
• Digital product diversification across the value chain • Partnerships with banks, agrodealers, offtakers e.t.c • Policy alignment with the government • Phygital model	• Long list of requirement for KYC and loan processing • High cost of doing business that led to partnership dependencies • Geographic adaptation needs

Case study 6: Emerging Cooking Solutions

Countries: Zambia

Funding Raised: $4.6M

Bundle: Circular Water and Nutrient Management

Description: Emerging Cooking Solutions manufactures and distributes biomass cookstoves and locally produced biofuels to help households switch from charcoal and firewood to more sustainable cooking options.

Scaling pathway: Product diversification, carbon finance-enabled growth

Emerging Cooking Solutions spent four years (2013 - 2017) developing reliable pellet stove technology while simultaneously testing different ways to make the stoves affordable. They initially tried selling directly to wealthier households and offering long payment plans (2 - 3 years), but eventually adopted a perpetual lease model where customers never own the stove but receive ongoing service and support.

The company changed its strategy to target households currently using charcoal because this is where they could have the greatest impact. Their business model generates revenue from pellet fuel sales. That way, customers have to continuously buy pellets to use the stoves, creating a steady income that funds the company's operations and growth. The stoves include IoT technology that tracks usage and allows the company to provide proactive customer support.

Factors that enable scale	Factors that limit growth
• VAT exemption for stoves • Article 6.2 regulatory clarity • Recurring pellet fuel revenue	• Shifting policies around taxation • PAYG model failures • 4+ years of developing hardware

Market Context

The underlying agricultural and economic conditions of each market shape the relevance of innovation bundles and their ability to reach users at scale. Factors like agricultural dependence, productivity, input use, infrastructure, and digital readiness determine the need, barriers each innovation must address, and the type of solutions/bundles that will scale in each particular market.

Table 4 below depicts key agricultural and economic indicators across the five markets. Ethiopia and Malawi are highly agriculture-dependent markets, with 62% of the population employed in agriculture and agriculture contributing over 32% to GDP. Zambia, on the other hand, shows a structural productivity gap, where agriculture employs over half the population but contributes less than 2% to GDP. Though agriculture still employs roughly one-third of the workforce in both countries, Kenya and Nigeria are comparatively more diversified economies.

Table 4. Agricultural economic indicators

Metric	Ethiopia	Kenya	Malawi	Nigeria	Zambia
Ag. Market Size (% of GDP)	34.9%	21.3%	32.4%	20.4%	1.8%
Employment in Ag. (% of Total)	62%	32%	62%	34%	55%
Arable Land (% of Land Area)	14.5%	11.4%	42.4%	40.5%	5.1%
Fertiliser Use (kg per hectare of arable land)	45.3 kg	50.5 kg	87.4 kg	4.2 kg	77.3 kg
Irrigated Land (% of total ag land)	0.5%	1%	*0.6%	*0.3%	N/A
Mobile Connectivity (Subs/100 people)	57	121	61	98	102

Note: Recency of data varies by metric. Ag Market size is as of 2024, Employment in Ag is as of 2023. Arable land is as of 2023, Fertiliser use is as of 2023, Mobile Connectivity is as of 2023, except Ethiopia, which is as of 2022
Data marked with * are older than 5 years.
Source: World Bank

Across all five markets, low input use and weak infrastructure constrain productivity and limit the reach of yield-enhancing technologies. While irrigated land remains below 1% in nearly all countries, use of fertilisers ranges from just 4.2 kg per hectare in Nigeria to 87.4 kg in Malawi (WorldBank, 2025b). These conditions limit yields and increase exposure to climate risks. This suggests a need for innovations that improve water efficiency, soil productivity, and input effectiveness, often requiring accelerating mechanisms such as subsidies, public programmes, or blended finance to overcome affordability barriers.

Digital readiness is another factor that differentiates scaling environments. Kenya, with high mobile penetration (121 subscriptions per 100 people), supports reach-driven scaling through digitally mediated

advisory and financing solutions. Ethiopia and Malawi, with significantly lower connectivity, have to rely on agent-led, bundled, or institutionally anchored models, as it's hard for data-driven platforms to scale.

The market indicators offer distinct signals for scaling the three innovation bundles:

- **Irrigation technologies:** They are most needed in markets with extremely low irrigation coverage and growing climate risk, but their ability to scale depends on public programmes, infrastructure finance, and institutional partnerships to a great extent in most of these markets.
- **Soil and water management:** These solutions fit particularly in agriculture-dependent economies like Ethiopia, Malawi, and Nigeria, where improving soil health and input efficiency is needed for yield gains, as the major constraints are low productivity and inefficient input use.
- **Circular water and nutrient management:** Even though these solutions often require complementary financing or institutional support to scale beyond the household level, as they focus on affordability-based adoption among users, markets with low purchasing power, fragmented demand, and waste availability are where these solutions are best fit.

Market conditions are what determine when and where most innovations are needed, but how they scale is determined by the ecosystem and enabling environment in these markets, which is created by policy frameworks, financing mechanisms, and institutional partnerships. All these factors determine whether a solution moves beyond the pilot phase and creates system-level adoption.

Enabling environment

Funders play a key role in scaling solutions, but their participation depends on a conducive environment. Similarly, innovators rely on favourable policies and an interactive network of stakeholders to establish operations and scale their services beyond an individual product. This section looks at the policy frameworks, partnerships and other external factors that may act as catalysts or inhibitors to scaling.

Enabling factors

- **Digitalisation and connectivity:** widespread use of e-voucher/digital input systems in Zambia and Kenya, unified digital frameworks in Zambia and expansion of internet access in Ethiopia (FAO, 2025; MoA and ATI, 2025).
- **Government policy:** strong government push for climate-resilient agriculture for Ethiopia, import substitution policies in Nigeria and national visions prioritising commercial focus in Malawi (GoM, 2021; IFPRI, 2022).
- **Structured markets:** guaranteed market linkages in Malawi, targeted credit for youth/SMEs in the case of Nigeria, and a mature venture capital ecosystem in Kenya.
- **Collaborative ecosystems:** strong central alignment of donors/partners in Ethiopia and public-private ecosystem partnerships as noted in Kenya.

Limiting factors

- **Policy and institutional structures:** state control over markets/data which is the case in Ethiopia, devolution challenges in Kenya (UNCTAD, 2025), and a focus on one crop like maize in Zambia.
- **Economic and financial barriers:** Forex shortages in Ethiopia, high interest rates limiting SME/smallholder access to capital for both Zambia and Kenya, and budgetary constraints from massive subsidy programs in Malawi.

- **Infrastructure and logistics challenges:** connectivity gaps in rural areas persist in Ethiopia, poor roads and limited cold storage causing high post-harvest losses and low mechanisation are continued causes for concern in Nigeria.
- **Security and climate vulnerabilities:** in Nigeria insecurity and conflict are a major concern as they disrupt supply chains, and in Zambia dependence on hydropower has made the country vulnerable to energy supply fluctuations while additionally raising further concerns with respect to droughts (ACAPS, 2025).
- **Market depth:** Malawi faces limited private sector depth leading to market instability as production increases.
- Unfavourable unit economics make it hard for companies to scale despite raising funding.

Additional examples of enabling and limiting factors by country can be found in Annex A.

The Innovation Landscape

Across the five selected markets, 160+ companies operating across the three innovation bundles have been mapped. Of these, 104 have disclosed funding information. These companies represent approximately one-third of the total agrifood landscape across the five countries, providing a substantial sample of innovation activity in the region's agrifood sector. Figure 1 below depicts a map of innovators who have been able to successfully scale within the countries of interest.

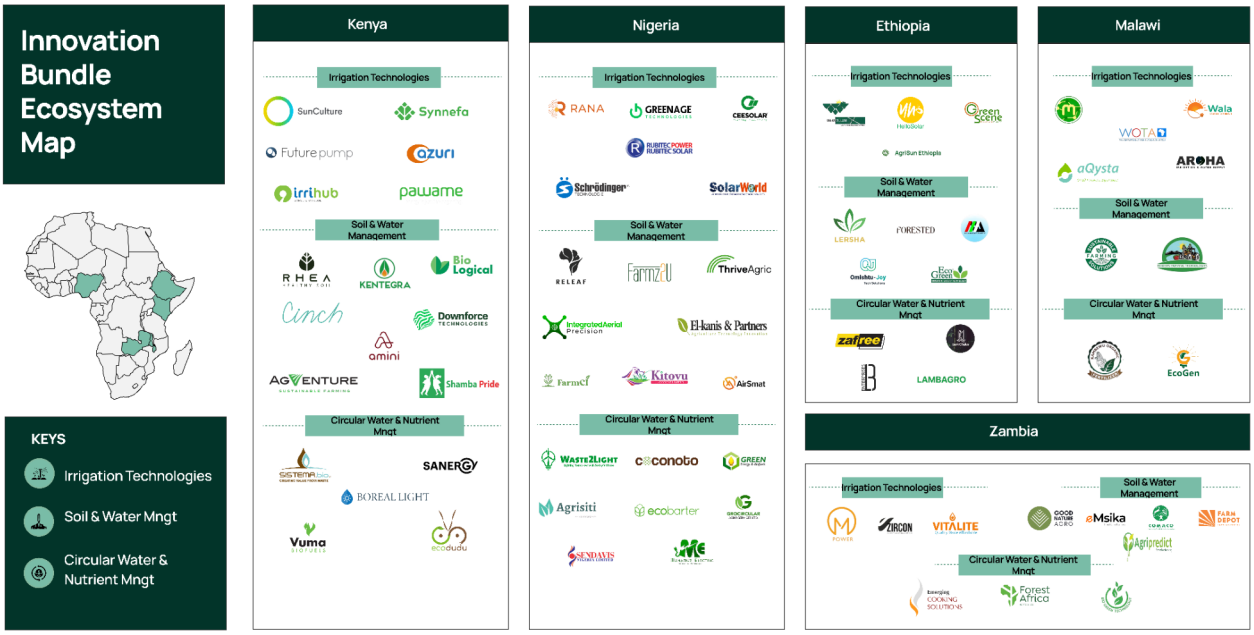

Figure 1. Innovation ecosystem map
Source: Briter, AgBase (2025)

Note: This map presents innovators. It is not an exhaustive list but aims to highlight major players.

Geographical distribution

Kenya has the most active innovation ecosystem, accounting for over 50% of identified companies. It also has the highest number of startups across each of the bundles. However, it is the most unevenly distributed. The majority of startups in the country are concentrated around soil and water management and circular water companies. Irrigation technologies only account for 13% of the total number of startups.

In smaller markets, innovation activity is more evenly spread across bundles with the exception of Malawi. Despite the fact that Malawi is a relatively small market, with only 14 identified startups, 9 of those are irrigation technologies.

Overall, the soil and water management bundle has the highest representation with 63 startups. Irrigation technologies have the lowest representation, having only 41 startups, representing 25% of total startups. The geographical distribution and breakdown of companies across bundles are shown in ***Figure 2***.

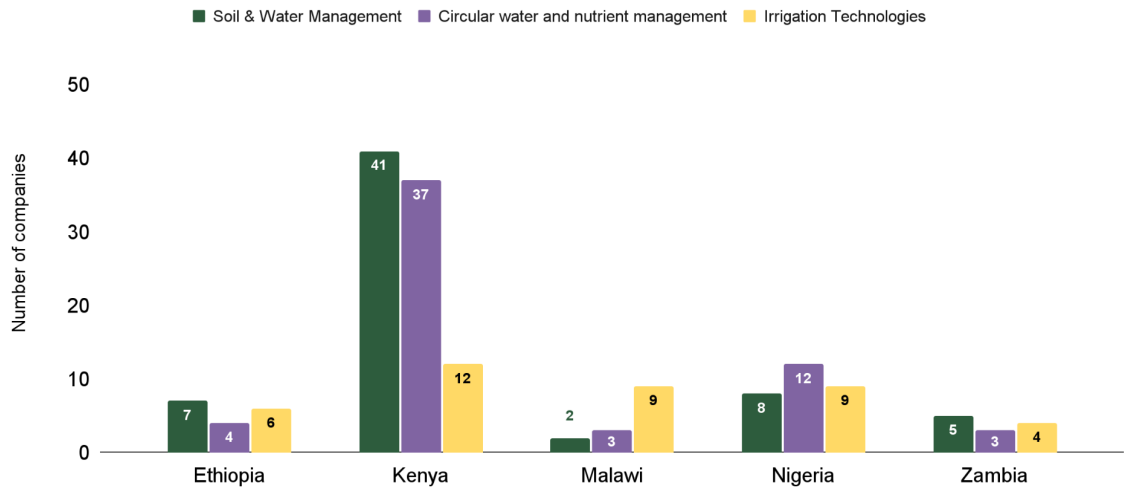

Figure 2. Number of companies by country and bundle.
Source: Briter, AgBase (2025)

Expansion activity by country

Beyond the distribution of startups within the countries, the data also shows that some startups are operating in more than one country. For those expanding beyond their borders, the expansion is mostly focused on neighbouring countries, a pattern consistent with the broader data. Only Kenya and Nigeria have companies which have scaled out beyond their regions. Despite this, their main focus remains within their respective regions. The expansion activity of companies beyond their initial borders is depicted in Figure 3.

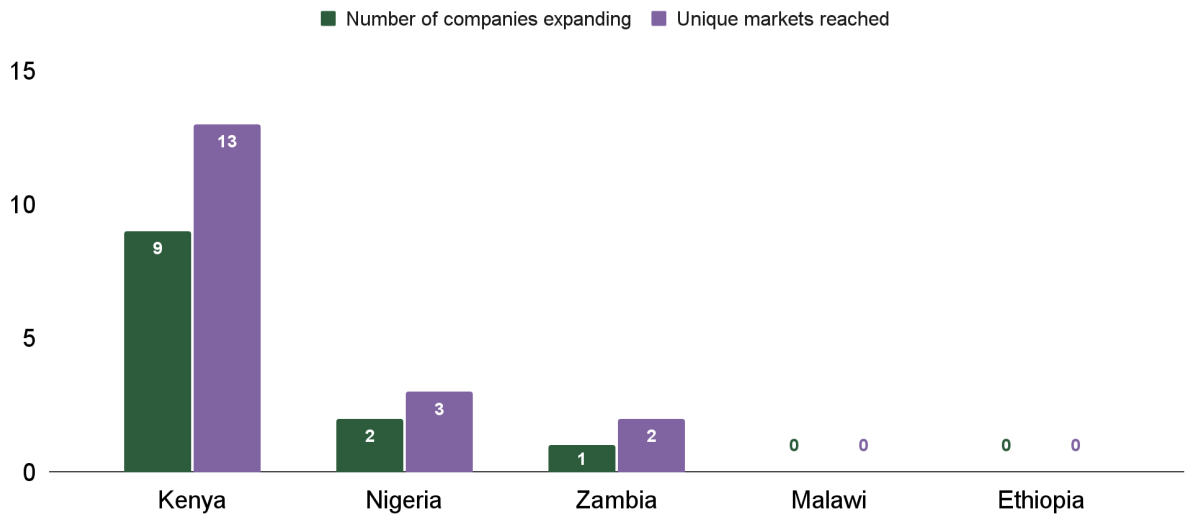

Figure 3. Expansion activity by country.
Source: Briter, AgBase (2025)

Product integration across bundles

An additional observed trend from the data is the integration of multiple products within individual companies. The soil and water management category has the highest integration rate, with 71% of its companies integrating several products. Irrigation Technologies follows closely at 63%, while Circular water and nutrient management has the lowest rate at 52%.

Within the respective categories, the most frequently bundled products are:

- **Soil and Water Management**: soil testing and advisory services.
- **Irrigation Technologies**: solar energy and irrigation pumps.
- **Circular Water and Nutrient Management**: biofuels, gas and cooking equipment.

There is also a strong indication of vertical integration, particularly in irrigation technologies and soil and water management, where products and services are combined to deliver more end-to-end solutions for users. In contrast, integration in circular water and nutrient management is less consistent and appears to vary according to the underlying business models. However, the funding landscape for these solutions tells a slightly different story. Figure 4 details the product integration rate within each innovation bundle.

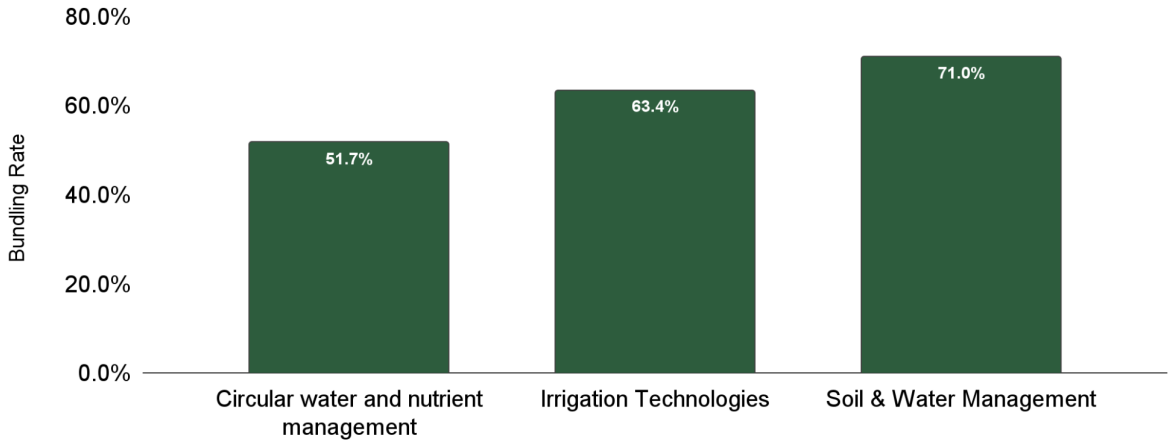

Figure 4. Product integration rate by bundle.
Source: Briter, AgBase (2025)

Funding Landscape

The funding data used in the analysis covered all publicly disclosed deals from 2015 through to 2025. While the three innovation bundles explored have become increasingly prominent features of the agrifood landscape, they contribute to a small fraction of the total funding landscape across all five countries.

Across Ethiopia, Kenya, Malawi, Nigeria, and Zambia, 104 startups within these bundles have publicly disclosed funding deals, representing 65% of all identified companies in this space. Combined, these companies have raised over USD372 million across 188 disclosed deals. To contextualise this within the broader agriculture funding landscape, these three bundles account for 29% of total agrifood funding volume, 49% of all deals and 42% of funded startups across the five countries. The analysis shows where funding is concentrated, how capital is deployed across markets and bundles, and where financing gaps persist.

Country-level funding

Similar to the distribution of the mapped companies, the funding activities are highly concentrated towards Kenya, with startups raising a total of USD269 million across 129 deals, accounting for over 70% of total funding raised. Showing Kenya's relatively mature innovation ecosystem, stronger investor presence, and more established public/private delivery channels. Nigeria follows at a distant second with a total of USD72 million in funding from 49 deals, indicating active deal flow but lower average ticket sizes. In the cases of Zambia, Ethiopia and Malawi, they collectively represent less than 10% of total funding activity, showing the funding gap in less mature markets. Figure 5 shows the distribution of total funding raised and the number of deals by country.

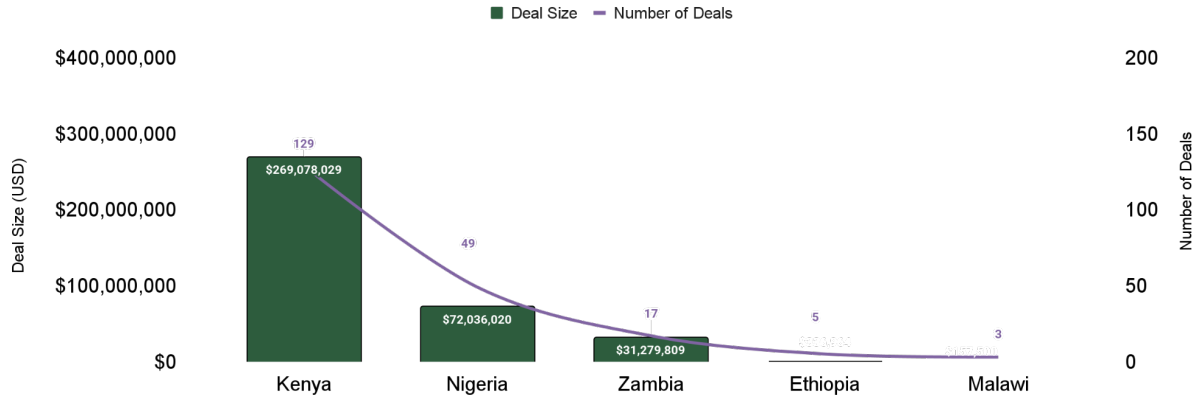

Figure 5. Funding volume and number of deals by country.
Source: Briter, AgBase (2025)

Bundle-wise, funding distribution varies significantly by market. Kenya has a more balanced funding landscape across all the bundles. However, in terms of funding raised, irrigation technologies dominate, accounting for over 90% of total funding across the five countries. This concentration is a result of two companies, SunCulture and Azuri, which together raised a total of USD120 million.

Nigeria's funding pattern leans more towards soil and water management, with this bundle accounting for 26 out of the total 49 deals recorded in the country and 94% of total funding recorded in the country.

Zambia shows a more modest presence across all the bundles, where Ethiopia and Malawi show highly concentrated patterns, with Ethiopia active only in irrigation and soil and water and Malawi exclusively in irrigation technologies. The distribution and share of deals by country and bundle are shown in Figure 6.

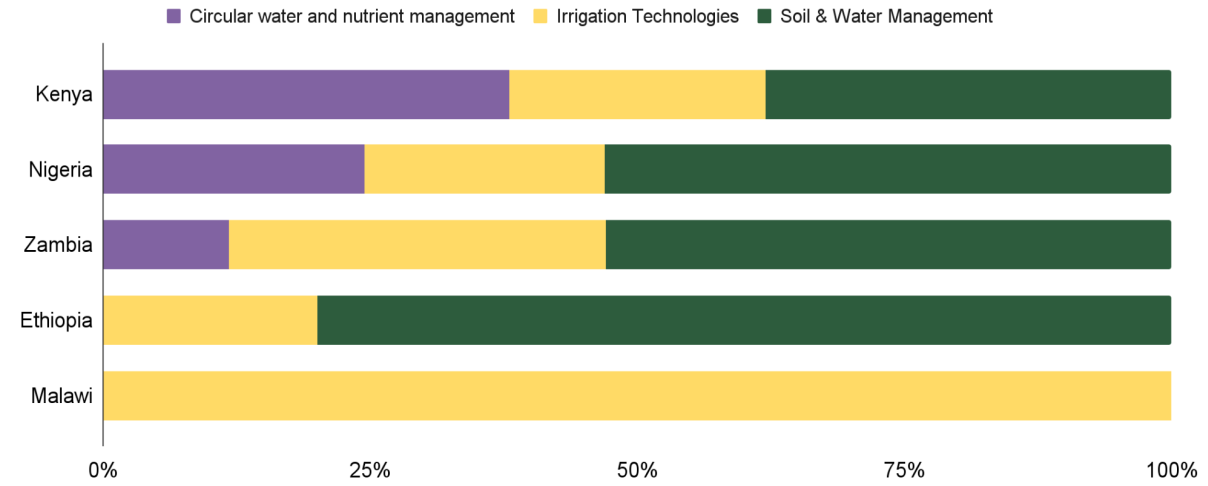

Figure 6. Share of deals by country and bundle.
Source: Briter, AgBase (2025)

Funding by bundle

Out of the three bundles, soil and water management and irrigation technologies emerge as the most active bundles. They account for over 75% of funding raised, with startups in irrigation technologies raising a total of USD146 million across 52 deals and soil and water management startups raising USD136 million across 88 deals. In the case of circular water and nutrient management startups, despite a comparable number of transactions, they only raised USD90 million across 63 deals. Figure 7 compares the funding volume and number of deals across the three innovation bundles.

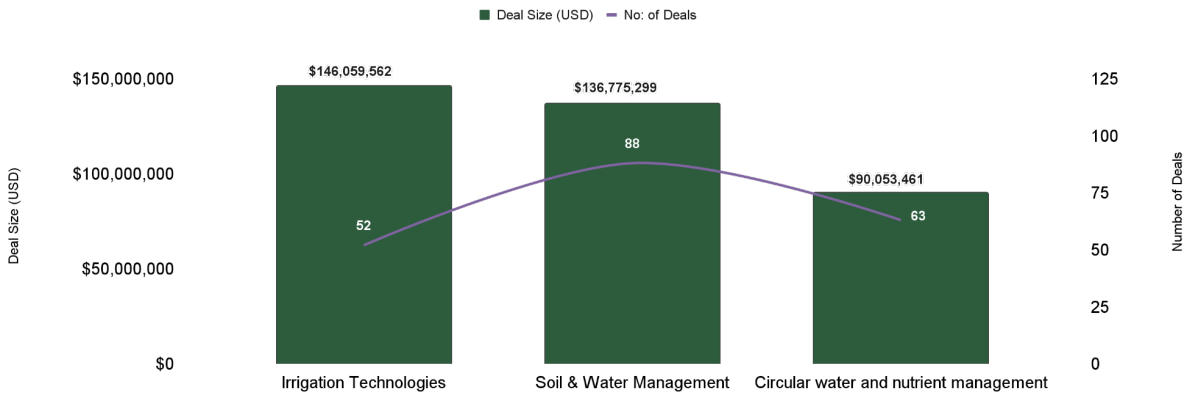

Figure 7. Funding volume and deals by category.
Source: Briter, AgBase (2025)

Ticket size distribution across bundles

Soil and Water Management comprises the highest number of deals across the bundles, with the largest number of small ticket sizes. In contrast, irrigation technologies deals are more concentrated in the medium to large ticket sizes. Circular water and nutrient management is more balanced across the ticket sizes, but

slightly higher for the smaller ticket sizes. The overall distribution of deals based on ticket size for each bundle is detailed in Figure 8.

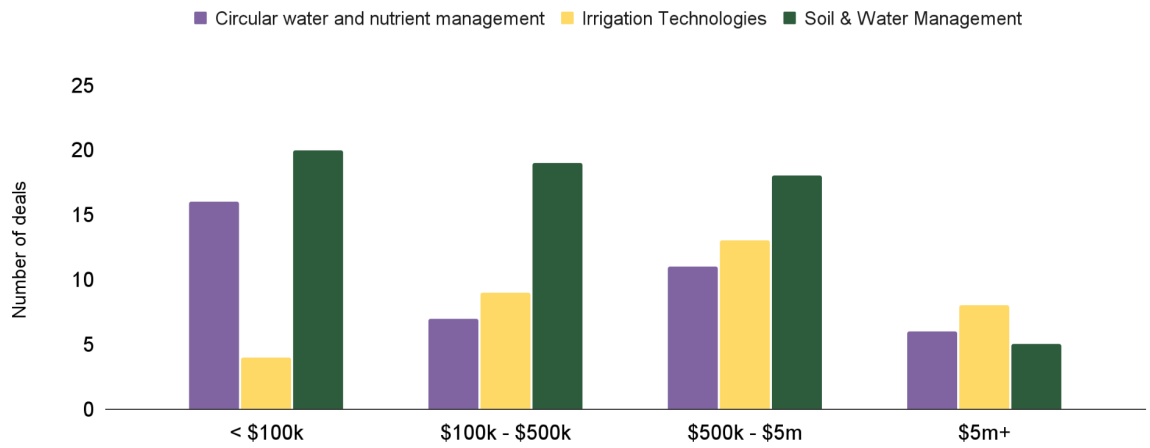

Figure 8. Number of deals by ticket size and bundle.
Source: Briter, AgBase (2025)

Funding archetypes by bundle

These funding patterns reflect the unique capital requirements of each innovation bundle. Irrigation technologies attract the majority of debt financing, accounting for 17% of deals, the highest among all the bundles, with soil and water and circular water and nutrient management all having less than 10% of deals being debt financing. This is because irrigation is typically asset-heavy, and the infrastructure required, such as pumps, can serve as collateral for the debt. This pattern can be seen from the top-funded startups within the irrigation bundle, like SunCulture and Azuri Technologies, where debt financing accounts for more than half of their total deals.

However, despite this capital availability and strong innovation ecosystems in countries like Kenya, affordability barriers constrain the scaling of irrigation technologies. Our engagement with CGAP highlighted this gap: *"Kenya's low irrigation adoption is an affordability problem. Banks don't offer irrigation-specific loans, so farmers use standard products with monthly repayments that don't match harvest cycles. Financing must align with when farmers earn income and be priced appropriately for smallholders. The problem is multi-pronged, rooted in the shortage of affordable irrigation solutions that are adequately tailored to specific agricultural value chains, water needs, and the varied agro- ecological contexts in which farmers operate." (Elizabeth Kariuki, CGAP Representative)*

This bundle is also capital-intensive in the sense that debt deals in irrigation technologies have larger ticket sizes (USD8 million median) compared to USD750 000 (median) for equity deals.

Further, grants account for 31% of irrigation technologies deals, the highest share across all the bundles. However, these grants mostly support smaller players, with the median ticket size being USD107 000. This points to an ecosystem where the established players leverage debt for scaling while early-stage innovators rely on grants for growth.

Soil and water management, which mostly consists of Research and Development (R&D), science-driven solutions rely on both equity and grants. Grants represent 25% of soil and water deals, with a median ticket size of USD113 000, while equity deals have a median of USD1.1 million. Awards and prizes account for 18% of deals, but with a smaller median ticket size of USD25 000. This significant presence of small-ticket awards reveals an ecosystem with a large pipeline of early-stage innovations that have yet to secure the substantial capital needed for scaling.

Circular water and nutrient management has the most diversified capital mix with equity representing 37%, awards 22% and grants 19%. This points to the varied business models within this bundle. Awards and prizes have a median of USD13 000, and grant sizes have a median of USD26 000, the lowest across all bundles. Equity deals have a higher median of USD3.5 million, driven by a few established players like Sistema.bio. This huge variation in the ticket sizes across different funding instruments shows an ecosystem where a small number of proven circular economy models attract the majority of funding, while the majority, which are at an early stage, depend on grants, awards and prizes to scale.

Capital concentrates mostly around a small number of scalable platforms. Across all bundles, asset-heavy and commercially established models attract debt and larger tickets, while R&D intensive and circular models depend on equity, awards, and grants. Notably, the availability of funding depends highly on the surrounding support ecosystem, and the types of stakeholders offering support at different stages of growth and for different financing needs. Figure 9 illustrates the number of deals across the three bundles by funding instruments.

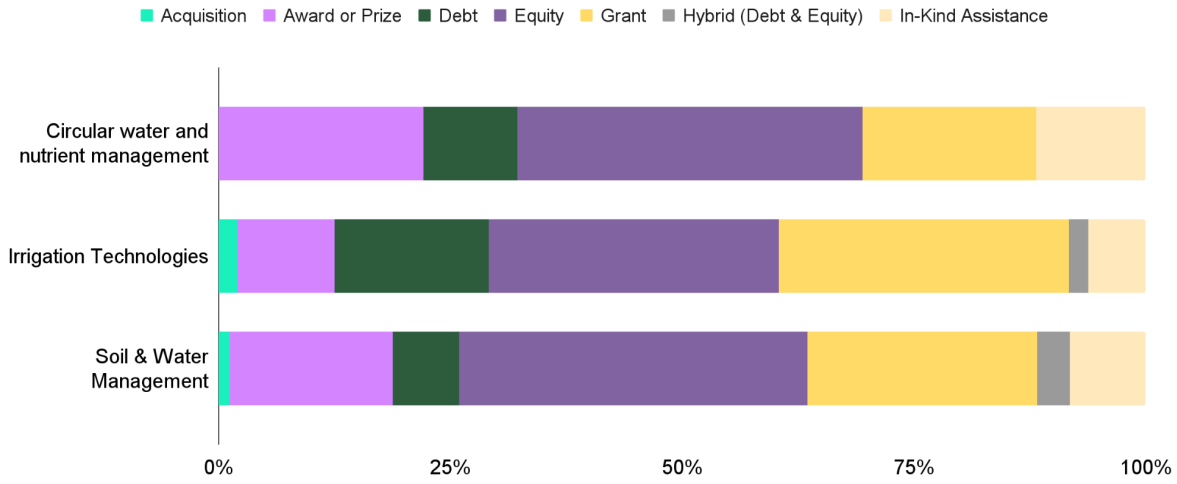

Figure 9. Number of deals by funding instrument and bundle.
Source: Briter, AgBase (2025)

Support Ecosystem

Innovation ecosystems extend beyond the companies themselves. It is also defined by the actors enabling the acceleration of solutions and risking for scale, as well as adoption, delivery, and expansion across markets. Within the Adaptive Scaling Ecosystem (ASEco), these factors are core to the Accelerate function, where proper conditions for solutions to grow beyond the early stages are created, and structural constraints are addressed. The availability of support infrastructure, including investors, accelerators, government agencies and development organisations, plays a crucial role in the health of the ecosystem and the likelihood of success. To assess the full ecosystem landscape, this study maps both innovators and the underlying support organisations.

The analysis identified 200+ support organisations across the five markets, including venture capital firms, impact investment firms, accelerators and incubators, development finance institutions, government agencies, agricultural research institutions and NGOs focused on agrifood systems. These actors contribute to the risk-sharing, coordination, and policy alignment functions that tie to the ASEco Accelerate phase. The distribution of these organisations varies by market, with Kenya and Nigeria showing higher numbers of impact investors and venture capital firms. ***Figure 10*** below maps some of the support ecosystem, including funders, accelerators, non-governmental organisations (NGOs), research institutions and government agencies.

Figure 10: Support ecosystem map.
Source: Briter, AgBase (2025)

Note: This map presents stakeholders. It is not an exhaustive list but aims to highlight major players.

The support ecosystem map shows how agrifood innovation is supported by a wider system of capital, institutions, and intermediaries. It also gives a glimpse of how these solutions are financed, validated, and integrated into markets and public systems.

Impact investors are the most active funder group supporting the ecosystem. About a third of all investments have been under the lens of impact investing. Their risk tolerance, alignment with impact, climate and productivity improvement make them ideal for early and mid-stage agrifood innovations. FINCA Ventures is one of the most active impact investors, having invested in startups from Kenya, Zambia and Nigeria. As a representative from FINCA Ventures noted***, "****Scaling solutions around soil and water management is tough because of the high upfront costs of the technology for farmers."* They also emphasised the importance of a good enabling environment to enable the sector to scale to achieve impact.

Venture capital firms account for around 10% of deals. Representing a smaller share of the funders, they focus on markets and solutions with clearer growth signals and stronger commercial traction. Accelerators and incubators account for another 10% of the deals; they help companies progress toward investable scale, playing a complementary role by providing early-stage capital, technical support, and making them market-ready.

Government Agencies like Nigeria's River Basin Authorities, Malawi's Green Belt Authority, Kenya's National Irrigation Authority, and Ethiopia's Agricultural Transformation Institute act as key enablers by shaping the policies, regulations, and infrastructural environment within which the innovations operate and grow. These institutions set the stage for where and how these solutions can be deployed, particularly in which sector and region, focusing on the impact and actual needs of the ecosystem.

Research institutes play a crucial role as developers and validators of new technologies. They also act as a bridge between academic research and industry-wide application, which helps accelerate the transfer of innovations from the lab to viable businesses.

Accelerators play a key role beyond just funding. They offer the necessary incubation and early-stage investment needed to transform these validated technologies into commercially viable, investable businesses. They are more active in the soil and water management category and circular water and nutrient management. Some of the most active accelerators in the space include Kenya Climate Innovation Centre (KCIC), Standard Chartered Women in Technology Incubator and NINJA Accelerator by JICA.

These active stakeholder groups are those who shape this ecosystem, not just by providing the capital but also by influencing the pathways through which innovations are scaled, validated and tailored to different regions. The support ecosystem is also shaped by the surrounding conditions that determine the demand for different solutions, and the enabling policy environment to transition through stages of growth.

Market and Bundle Scaling Analysis

Building on the observed scaling mechanisms and data, the following section applies the same framework at the bundle level to examine where scaling is working, where it is getting stuck, and what conditions are required to unlock further impact of the bundles across the focus countries, with bundle-specific findings detailed in Tables 5-7.

Irrigation

Table 5. Linking Irrigation Technologies to ASEco

Indicator	Ethiopia	Kenya	Malawi	Nigeria	Zambia
Number of irrigation companies	6	12	9	9	4
Typical ticket size	Undisclosed	Median: $2M	Median: $78K	Median: $110K	Median: $1.6M
Dominant funding instruments	Award/prize - 17% Undisclosed - 83%	Equity - 28% Debt - 22% Grant - 28% Award/prize - 9%	Grants - 20% In-kind assistance - 10%	Equity - 33% Grants - 25% In-kind assistance - 17%	Equity - 25% Grants - 13% Debt - 13% Hybrid(debt + equity) - 13%
Dominant funder types	Donors, government-linked funders	Impact investors, DFIs, some corporates	Donors, NGOs	Impact investors, donors	Donors, Corporate, NGOs
Key ESOs / stakeholders	Government agencies, cooperatives	Private distributors, DFIs, accelerators	NGOs, ministries, development partners	NGOs, value-chain actors	Government agencies, research organisations
Market Context	**Conditions:** 34.9% ag GDP, 0.5% irrigated, 57 connectivity **Policy:** Government prioritises irrigation, strong donor alignment, constrained by state control, forex shortages, and connectivity gaps	**Conditions:** 21.3% ag GDP, 1% irrigated, 121 connectivity **Policy:** Digital systems widespread, mature VC/PPPs, commercial focus, limited by high interest rates	**Conditions:** 32.4% ag GDP, 0.6% irrigated, 61 connectivity **Policy:** Development partner presence, policy support, constrained by limited private sector, connectivity gaps, and budgetary constraints	**Conditions:** 20.4% ag GDP, 0.3% irrigated, 98 connectivity **Policy:** Import substitution policies, digital emerging, constrained by poor infrastructure, insecurity, and limited capital access	**Conditions:** 1.8% ag GDP, N/A irrigated, 102 connectivity **Policy:** Digital systems widespread, unified frameworks, constrained by single-crop focus, high interest rates, energy vulnerability
ASEco function	Niche	Acceleration	Niche	Reach	Reach

Soil and Water Management

Table 6. Linking Soil and Water Management to ASEco

Indicator	Kenya	Ethiopia	Nigeria	Malawi	Zambia
Number of companies	41	7	8	2	5
Typical ticket size	Median: $318K	Median: $113K	Median: $150K	Undisclosed	Median: $1.8M
Dominant funding instruments	Equity - 35% Grants - 19% Awards/prize - 11%	Grants - 44% Others - 56%	Equity - 37% Grants -19% Awards/prize - 25%	N/A	Equity - 55% Debt - 18% Award/prizes - 9%
Dominant funder types	Impact investors, VCs, DFIs, some corporates	Donors, government-linked funders	Impact investors, VCs, angels	N/A	Impact Investors, DFI
Key ESOs / stakeholders	Government agencies, research institutes, accelerators, and development partners	Government agencies, research institutes, development partners	NGOs, development partners, government agencies	Government agencies, development partners, research institutes	Government agencies, research institutes, and development partners
Market Context	**Conditions:** 21.3% ag GDP, 50.5 kg fertiliser/ha, 121 connectivity **Policy:** Digital platforms active (DigiFarm), soil health associations emerging, structured markets, constrained by fragmented data regulations, and high input costs	**Conditions:** 34.9% ag GDP, 45.3 kg fertiliser/ha, 57 connectivity **Policy:** The government prioritises soil health, research institutions are active, constrained by state control, low connectivity, and limited commercial capital	**Conditions:** 20.4% ag GDP, 4.2 kg fertiliser/ha (lowest), 98 connectivity **Policy:** Critical soil management needs, competition-driven innovation, constrained by poor infrastructure, limited mechanisation, and weak extension	**Conditions:** 32.4% ag GDP, 87.4 kg fertiliser/ha (highest), 61 connectivity **Policy:** High input use needs optimisation, development partner focus, constrained by a minimal private sector, and very limited commercial activity	**Conditions:** 1.8% ag GDP, 77.3 kg fertiliser/ha, 102 connectivity **Policy:** High fertiliser use indicates an optimisation opportunity, constrained by a single-crop focus (maize), project-driven approach, and limited venture density
ASEco function	Acceleration	Niche	Reach	Niche	Reach

Circular Water and Nutrient Management

Table 7. Linking Circular Water and Nutrient Management to ASEco

Indicator	Kenya	Ethiopia	Nigeria	Malawi	Zambia
Number of companies	37	4	12	3	3
Typical ticket size	Median: $520K	Undisclosed	Median: $25K	Undisclosed	Median: $2.3M
Dominant funding instruments	Equity - 31% Grants - 13% Awards and prizes - 11% In-kind assistance - 11%	N/A	Awards and Prizes -43% Grants - 21% Equity - 14%	N/A	Equity - 25% Debt - 25%
Dominant funder types	Impact investors, VCs, Accelerators	N/A	Impact investors, Government-linked funders	N/A	Impact Investors, DFI
Key ESOs / stakeholders	Government agencies, research institutes, and development partners	Government agencies, development partners	NGOs, development partners, government agencies	Research institutes, development partners	Research institutes, development partners
Market Context	**Conditions:** 21.3% ag GDP, 1% irrigated, 121 connectivity **Policy:** Digital systems widespread, environmental priorities emerging, circular frameworks developing, constrained by regulatory uncertainty, and limited organic markets	**Conditions:** 34.9% ag GDP, 0.5% irrigated, 57 connectivity **Policy:** Government biodigester targets, strong donor alignment, constrained by minimal infrastructure, state control, and connectivity gaps	**Conditions:** 20.4% ag GDP, 0.3% irrigated, 98 connectivity **Policy:** Competition-driven innovation, government interest emerging, constrained by poor waste infrastructure, limited capital access, and nascent regulatory frameworks	**Conditions:** 32.4% ag GDP, 0.6% irrigated, 61 connectivity **Policy:** Development partner presence, environmental priorities low, constrained by a minimal private sector, limited awareness, and infrastructure gaps	**Conditions:** 1.8% ag GDP, N/A irrigated, 102 connectivity **Policy:** Article 6.2 operationalised (carbon finance), energy vulnerability creates opportunity, constrained by single-sector focus, limited market depth
ASEco function	Reach	Niche	Niche	Niche	Niche

Key Findings from the Framework and Recommendations

Applying the ASEco framework to funding data across the five countries, as seen in Table 8, helped reveal patterns within each bundle and across the countries. Through that, it is possible to assess where each country sits across the four scaling functions. That way, it is also easier to identify where the gaps and opportunities lie.

Table 8. Ecosystem Assessment

Country	Irrigation Technologies	Soil and Water Management	Circular Water and Nutrient Management	Market context	Key Strengths	Key Constraints
Kenya	Accelerate	Accelerate	Reach	Commercially viable: strong ag economy with high connectivity enables digital distribution; small irrigation penetration presents untapped opportunities	Strong private sector, DFIs active, commercial distributors, depth of ventures	Circular solutions are still thin, with affordability and farmer finance gaps
Ethiopia	Niche	Niche	Niche	Largest agricultural economy with minimal irrigation and digital infrastructure, creating demand. But it is strained by limited commercial capital.	Clear policy direction, public programmes, soil and irrigation prioritised	Limited commercial capital, heavy donor and public reliance
Nigeria	Reach	Reach	Niche	Big market with soil management needs (lowest input efficiency)	Large addressable market, growing angel and VC interest, active NGOs	Small ticket sizes, grant and prize dominance, weak follow-on capital,
Malawi	Niche	Niche	Niche	High ag dependency with strong development partner presence, but digital and commercial gaps hinder scaling of innovations	Strong development partner presence, policy support for agriculture	Minimal private sector participation, very limited commercial capital
Zambia	Reach	Reach	Niche	Ag is mostly subsistence, with good infrastructure, but there is concentration in the innovation ecosystem, with very few players attracting the majority of commercial capital	Larger ticket sizes in irrigation, some equity presence	Low venture density, scaling driven by projects rather than firms

Findings

The ASEco assessment shows that scaling these innovations depends on how market conditions, ecosystem readiness and available funding interact. Stakeholder engagements also highlighted recommendations to enable this progression. Interviews with actors, including Delta40, CGAP and AHL Venture Partners, highlighted some of the things that need to be addressed:

- Build partnerships across all the different actors: donors, government and private sector.
- Provide stage-appropriate capital: catalytic funding for early stage, blended finance for growth, patient capital for scale
- Address infrastructure gaps that alter unit economics
- Prioritise policy stability over perfection

Table 9 presents the country-specific findings and recommendations, showing how innovation bundles in each context can progress from one stage to the next.

Table 9. Findings and recommendations

Country	Key Strengths	Key Challenges	Funding Landscape	Ecosystem	Enabling Conditions	Recommendations
Kenya	Mature commercial infrastructure, Strong private sector& DFIs, Good connectivity	Affordability gaps, Underdeveloped circular solutions	Commercial & blended finance available for irrigation/soil, Circular relies on grants, Gap is affordability, not early-stage capital	Private companies, DFIs& extension services are present and aligned. Needs better public-private coordination	Government programmes exist, but are not connected to tested innovations. Regulatory frameworks for circular underdeveloped	Embed proven innovations (e.g., SunCulture) into government procurement, Mobilise blended finance, and validate circular business models
Ethiopia	Largest agricultural economy (34.9% GDP, 62% employment), strong government support	Limited commercial capital, State control, Minimal infrastructure (0.5% irrigated,57 mobile subs/100 people)	Public funding& development finance dominate, Commercial capital is scarce, the gap is converting policy into investable opportunities	Government & research institutions are active; the limited private sector and agent networks are underdeveloped	Strong policy frameworks (NAFIR) lack operational partnerships & first-loss guarantees, and low connectivity needs offline support	Operationalise NAFIR through partnerships, build evidence via pilots, Support agent-led bundled models, and early-stage piloting for circular

Nigeria	Large market, Growing investor interest, Extensive NGO networks & agro-dealer channels	Small funding sizes, Fertiliser use lowest (4.2 kg/ha), 43% funding from awards/prizes	Missing middle: follow-on capital USD 100K–300K, Bottleneck where innovations stall after initial recognition	NGO networks (AFAAS, FSSS)& agro-dealers not connected to innovation pipelines, Accelerators are insufficient	Agro-dealer distribution exists, No pathway connecting competition winners to commercial investors	Bridge early-stage awards to commercial investment via accelerators, Bundle soil diagnostics with agro-dealer distribution, and mobilise blended finance
Malawi	Strong development partner presence	Minimal private sector, Very thin ecosystems, Low connectivity (61 mobile subs/100 people)	Almost no commercial or early-stage private capital. Need is foundational: seed capital & incubation	A small number of startups, the private sector, accelerators & local investors are largely absent	Development partner schemes (IFAD, World Bank) are not structured as commercial hubs. Low connectivity needs offline models	Strengthen last-mile delivery & farmer capacity, Build evidence via pilots, Support agent-led bundled models
Zambia	ESOs, NGOs & cooperatives present, Policy support (Article 6.2 carbon finance), ZARI research potential	Capital concentrated in a few companies, Low company density (4–5 per bundle), 50%+ in agriculture, but only 2% GDP	Investment concentrated in a few companies; Not enough ventures to absorb available capital	ESOs, NGOs & cooperatives are not well connected to innovation scaling	Policy support exists but needs public programmes, subsidies & mixed financing	Leverage partnerships for farmer training networks, Strengthen last-mile delivery, Offer subsidies & mixed financing

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Appendices

Appendix A

The following annex provides complementary information to support the findings in the main report.

Table A.1. Enabling and limiting factors

Country	Enabling Factors	Limiting Factors
Ethiopia	• Government push for climate-resilient agriculture. • The opening of the telecom sector significantly expands internet access for digital tools. • Strong central alignment of donors and private partners under the Agricultural Transformation Institute (ATI). *(Source: Government of Ethiopia, IMF)*	• Forex shortages make it difficult for the private sector to import essential machinery, spare parts, and specialised fertilisers needed to modernise the sector. • State control over the market and data infrastructure crowds out private sector growth. • Connectivity gaps as internet penetration in rural areas is low, limiting the reach of digital agriculture tools.
Malawi	• Structured market linkages: Guaranteed alliances (AGCOM) connecting farmers to buyers before planting. • Subsidy Reform: Shifting from blanket handouts to targeted support for productive farmers. • Commercial Focus: National vision (Malawi 2063) prioritising wealth creation over subsistence. *(Source: UNDP, World Bank)*	• Limited Private Sector Depth: A small market of commercial off-takers leads to market crashes when production rises. • Budgetary Constraints: The Affordable Inputs Programme (AIP) consumes the majority of the Ministry's budget, limiting funds for other growth areas.
Zambia	• Digitised input distribution: E-voucher systems and electronic registers (4.3 million+ farmers), reducing corruption. • Unified digital frameworks: standardisation of digital tools prevents fragmentation. *(Source: FAO)*	• Maize-focused agriculture, which may be prone to vulnerabilities like pests and price shocks, discourages diversification. • Hydropower Dependence: Droughts cripple energy supply, rendering irrigation systems unusable. • High Interest Rates: limits SME access to affordable capital for expansion.

Nigeria	• Import substitution: policies (NATIP) creating massive demand for local production to replace food imports. • Centralised data: The National Agricultural Intelligence Platform (NAIP) acts as a digital backbone • Youth funding: targeted credit facilities for youth and SMEs to bypass traditional bank hurdles. *(Source: FAO, CGIAR)*	• Insecurity: conflict in the Northern and Middle Belt regions disrupts supply chains and investment. • Infrastructure gaps: poor roads and limited cold storage cause high post-harvest losses. • Low mechanisation: low tractor density keeps farms dependent on manual labour, limiting scalability.
Kenya	• Digital Input Systems: transparent, data-driven E-voucher subsidies replacing manual distribution. • Public-Private Ecosystem: opening government registries to startups via the *One Million Farmer Platform*. • Venture Capitalist Ecosystem: mature fintech/agritech landscape attracting significant venture capital. *(Source: World Bank, UNCTAD)*	• High interest rates: the prohibitive cost of loans limits smallholder access to inputs despite fintech growth. • Devolution challenges: inconsistent alignment between national and county governments leads to fragmented policy implementation.

Appendix B. Contributors

We extend our sincere gratitude to all the stakeholders who were interviewed for this report and who have provided their consent to be cited as key informants.

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