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MINISTRY OF AGRICULTURE

Ethiopian ATI
Agricultural Transformation Institute
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# Digital Agriculture Roadmap 2032

# FOREWORD

Statement from Minister of Agriculture

Ethiopia is entering a transformative era in agriculture, aiming to revolutionize a sector vital to our economy and essential for our people. In 2022, we successfully began this transformation with the development of the Digital Agriculture Extension and Advisory Services (DAEAS) roadmap. The Digital Agriculture Roadmap (DAR) aims to accelerate our transformation efforts by expanding them beyond advisory to cover the entire agriculture value chain.

The Digital Agriculture Roadmap (DAR) provides clear recommendations on which digital use cases should be prioritized and the necessary initiatives in the enabling environment to ensure these use cases are impactful. The roadmap has prioritized 12 use cases and initiatives that are most feasible in the current context and are also projected to achieve the most impact on farmers and pastoralists.

Our goal is straightforward: to equip every Ethiopian farmer and pastoralist with the digital tools and resources to succeed. This includes, but is not limited to, developing strong digital infrastructure, enhancing digital literacy, and improving access to quality inputs and financial services. These steps will help our farmers and pastoralists become more productive and resilient as well as ready to face challenges like climate change and global market shocks.

This effort is a team endeavor, involving various stakeholders including government agencies, international partners, and local communities. I am grateful to everyone who has contributed to this roadmap. A special thanks to the members of the Technical Committee and Steering Committee for their input and support as well as the Bill and Melinda Gates Foundation that provided the financial resources necessary to develop the roadmap.

I urge all stakeholders—government bodies, private sector organizations, donors, and farmers—to invest, coordinate, and collaborate in digitalizing Ethiopia’s agriculture sector. Together, we will make our farms more productive, our markets more accessible, and our food systems more resilient.

This roadmap is not just a plan, but a call to action to help create a digitally empowered future for Ethiopian agriculture. Let's tackle this challenge together with commitment and cooperation.

His Excellency Dr. Girma Amente
Minister of Agriculture
Federal Democratic Republic of Ethiopia

# CONTENTS

# TABLE OF FIGURES

# 1 Preface

## 1.1 GLOSSARY OF ACRONYMS

| Acronym | Name |
|---|---|
| **ATI** | Agricultural Transformation Institute |
| **MoA** | Ministry of Agriculture |
| **AGRA** | Alliance for Green Revolution in Africa |
| **EIAR** | Ethiopian Institute of Agricultural Research |
| **IFAD** | International Fund for Agricultural Development |
| **BMGF** | Bill & Melinda Gates Foundation |
| **DAR** | Digital Agriculture Roadmap |
| **CABI** | Centre for Agriculture and Bioscience International |
| **DAEAS** | Digital Agricultural Extension and Advisory Services |
| **AI** | Agricultural Intelligence |
| **aLIVE** | A Livestock Information System Roadmap for Ethiopia |
| **API** | Application Programming Interface |
| **AICCRA** | Accelerating Impacts of CGIAR Climate Research for Africa |
| **Clim-ARM** | Climate Analytics into Agricultural Risk Management |
| **DAIH** | Digital Agriculture and Innovation Hubs |
| **ECX** | Ethiopian Commodity Exchange |
| **EDACAP** | Ethiopian Digital AgroClimate Advisory Platform |
| **EthioSIS** | Ethiopian Soil Information System |
| **GNI** | Gross National Income |
| **IBM** | International Business Machines |
| **IVR** | Interactive Voice Response |
| **MinT** | Ministry of Innovation and Technology |
| **ML** | Machine Learning |
| **NMIS** | National Market Information System |

| | |
|---|---|
| **SSA** | Sub-Saharan Africa |
| **EWA** | Early Warning Systems |
| **SSHI** | Supporting Soil Health Intervention |
| **ICT** | Information Communication Technology |
| **GoE** | Government of Ethiopia |
| **INSA** | Information Network Security Administration |
| **CIAT** | International Center for Tropical Agriculture |
| **CGIAR** | Consortium of International Agricultural Research Centers |
| **MoE** | Ministry of Education |
| **CoW** | Collision of the Willing |
| **PDPP** | Personal Data Protection Policy |
| **ECA** | Ethiopian Communications Authority |
| **ODI** | Open Data Institute |
| **FAO** | Food and Agriculture Organization |
| **ATVETs** | Agricultural Technical and Vocational Education Training |
| **NRLAIS** | National Rural Land Administration Information System |
| **EDITS** | Ethiopian Digital Inputs Tracking System |
| **NSIS** | National Soil Information System |
| **NMA** | National Meteorology Agency |
| **LMICS** | Low and Middle-Income Countries |
| **GSMA** | Global System for Mobile Communication Association |

## 1.2 KEY DEFINITIONS

| Term | Definition |
|---|---|
| **Digital agriculture** | The use of technologies and integrated digital systems to enable farmers and stakeholders within the agricultural value chain |
| **Digital Farmer Services (DFS) Framework** | The framework developed by the Bill and Melinda Gates Foundation that categorizes actions and initiatives into elements of the solution areas & use cases, the digital stack, and the enabling environment |
| **Use case** | A tangible activity with a clear beneficial result for the end user that can be facilitated or improved using digital tools, and ultimately supports the farmer or pastoralist. Examples of a use case include tracking and tracing of inputs and access to finance. |
| **Digital stack** | Architecture that integrates user interfaces, data processing, analytics, and infrastructure to power digital solutions. The digital stack also includes crucial data sets that digital use cases require for successful implementation |
| **Enabling environment** | Pre-requisites for digital agricultural transformation, that promote innovation and ensure sustainable growth within the agricultural sector. The Enabling Environment includes areas such as government policy, physical infrastructure, and digital infrastructure |
| **Enabling initiatives** | Recommended digital stack and enabling environment interventions that support the implementation and operation of digital agriculture use cases. Examples include creating a farmer profile and digital literacy training for farmers and DAs. |
| **Solution area** | A high-level grouping of digital agriculture use cases by the section of the value chain the specific use cases target |
| **Initiative area** | A high-level categorization of initiatives in the digital stack and enabling environment, based on the specific aspects of the supporting stack they target |
| **Ag Datahub** | An API enabled repository containing over 570 Ethiopian agriculture and soil agronomy related data sets, with tools for interoperability and consent (e.g., anonymization) in development |
| **GSMA index** | An index that accesses the performance of different countries against four key enablers[1] of mobile internet connectivity |
| **Interactive Voice Response** | An automated telephone system technology that enables callers to receive or provide information, or make requests using voice or menu inputs, without speaking to a live agent |
| **Digital Public Infrastructure** | A digital network that enables countries to deliver economic opportunities and social services safely and efficiently to all residents |
| **Interoperable** | The ability of different software products or systems to readily connect and exchange information seamlessly |

[1] These 4 key enablers are infrastructure, affordability, consumer readiness and content

| Term | Definition |
|---|---|
| **DAEAS roadmap** | The Digital Agriculture Extension and Advisory Services Roadmap (2022) A comprehensive 10-year strategy aimed to provide high-quality, customized, and cost-efficient data and advisory information through a solutions pipeline supported by a digital stack, and enabling environment |
| **Smallholder farmer** | Small scale farmers, pastoralists, forest keepers, fishers who manage areas ranging between one and ten hectares |
| **Open source** | Software whose original source code is freely and publicly available and can be modified by anyone |

## 1.3 ACKNOWLEDGEMENT

This Digital Agriculture Roadmap has been developed through a collaborative effort between the Ministry of Agriculture (MoA) and the Agricultural Transformation Institute (ATI) with inputs and reviews by stakeholders from across the Ethiopian agriculture ecosystem, including development partners, private sector companies and NGOs. We express our profound gratitude to the institutions and partners whose invaluable contributions have been pivotal in the development of Ethiopia's Digital Agriculture Roadmap (DAR). In particular, we are grateful to the Steering and Technical Committees[2] that supported MoA and ATI to develop DAR.

We also acknowledge partners and collaborators who attended the National and Partner convenings[3]. Their inputs played a crucial role in shaping the comprehensive and sustainable approach that this roadmap embodies.

Special thanks to Bill & Melinda Gates Foundation (BMGF) whose financial and strategic support has enabled the development of the roadmap.

[2] Full list of members of the Steering and Technical Committees available in the appendix, section 8.1

[3] Full list of stakeholders that were engaged throughout the development process of the Digital Agriculture Roadmap (DAR) can be found in appendix section 8.1

## 1.4 PURPOSE AND SCOPE OF THIS DOCUMENT

The Ministry of Agriculture (MoA) and the Agricultural Transformation Institute (ATI) have been working together to digitalize agriculture in Ethiopia, in order to increase production and change the livelihoods of farmers. In 2022, together they launched the Digital Agricultural Extension and Advisory Services (DAEAS) roadmap to digitalize the primarily in-person extension services provided in Ethiopia by ~50,000-60,000 government development agents. Following successful development and launch of the DAEAS roadmap, MoA recognized the need to expand the digitalization ambition for the agriculture sector beyond extension and advisory services to incorporate the entire agriculture value chain. The Digital Agriculture Roadmap (DAR) is thus a holistic framework that guides the development of digital agriculture solutions in a systematic and gradual way to enable targeted and phased resourcing towards priority use cases and initiatives.

This document lays out Ethiopia's Digital Agriculture Roadmap (DAR). It is structured in four main sections:

1. **Approach and objectives:** Provides an overview of the methodology used to develop the DAR and outlines the overarching objectives and target state for the roadmap.
2. **Context and ecosystem assessment:** Outlines the importance of the agriculture sector in Ethiopia and introduces digital agriculture in the country. The section also summarizes the results of the digital ecosystem assessment, an analysis used to establish the point of departure for the DAR.
3. **DAR recommendations:** Details the framework used to develop DAR recommendations and details out the digital use cases and digital stack and enabling environment initiatives that are included in the roadmap. The recommendations are also categorized into those prioritised for Phase 1 "Build the Digital Foundation" (2025-2029) and Phase 2 "Diversify and scale the ecosystem" (2030-2032).[4]
4. **DAR implementation plan:** Describes the governance structure for DAR moving forward and how progress on the roadmap will be monitored.

[4] For more details on phasing, see Section 5: **Error! Reference source not found.**

# 2

# Executive Summary

Ethiopia is on the path to becoming a digital economy, and the agriculture sector has been identified by the Digital Ethiopia 2025 strategy as a strategic pathway for prosperity. This digital strategy has led to visible reforms in several other sectors (e.g., telecom, health), and is now being applied to agriculture.

The Ministry of Agriculture (MoA) in partnership with the Agricultural Transformation Institute (ATI) has developed the Digital Agriculture Roadmap (DAR) 2025-2032, aligned with the strategic objectives and timeline of the MoA ten-year strategy. The roadmap was developed in a highly collaborative manner with a diverse set of stakeholders, engaged through convenings and one-on-one interviews, and is aligned with the government's policies, strategies, and regulatory frameworks. The DAR has also been aligned to the DAEAS roadmap by incorporating DAEAS actions and ensuring recommendations support extension and advisory use cases.

A robust ecosystem assessment was undertaken to identify Ethiopia's progress in digital agriculture activities as well as the biggest gaps. Example areas that have been identified as in need of strengthening are digital infrastructure, including the cost and accessibility of smartphones and data, and human capital, including digital and financial literacy for farmers and pastoralists. Ethiopian and international best practices were also leveraged to inspire and support roadmap development.

The vision for the DAR is to build inclusive, affordable, sustainable and interoperable digital solutions, supported by a coordinated and aligned ecosystem, that transform the lives of farmers and pastoralists. The roadmap is organized in three areas – Solution Areas and Use Cases, the Digital Stack, and the Enabling Environment:

**Solution Areas and Use Cases:** Specific applications or sets of practices designed to address identified challenges within the agricultural value chain by leveraging digital tools.

**Digital Stack:** The necessary digital elements to support the product development and the use of farmer and pastoralist use cases (software infrastructure, data and analytics).

**Enabling Environment:** The environment required to enable and facilitate the digitalization of the agriculture sector -government and policy, digital and physical infrastructure, agricultural markets, human capital, and innovation and technology.

The solution areas and use cases area consists of prioritized actions to address the key challenges within Ethiopia. These priorities include creating national intelligence for better decision-making, enhancing market linkages, providing universal access to financial services, and leveraging technology for real-time supply chain solutions. By focusing on these targeted solutions, the DAR aims to empower Ethiopian farmers and pastoralists, fostering a digitally advanced, resilient, and prosperous agricultural sector. The DAR proposes 22 use cases to overcome the current challenges and deliver the roadmap vision, with 6 use cases identified as priority for Phase 1.

The digital stack and enabling environment areas consist of prioritized initiatives to support successful delivery of the 22 use cases. The data stack initiatives focus on providing interoperable, obtainable data sets for improved insights, reliable farmer profile data to enable use cases, and improved analytics. The enabling environment priorities include robust and inclusive data policy and guidelines to drive insights, data sharing and decision making, innovative device and connectivity solutions, a well-resourced and

empowered population to build and adopt use cases and an enabled private sector that allows for development of priority innovative tools. The DAR proposes 32 initiatives to enable the use cases, with 6 initiatives identified as priority for Phase 1. The DAR also includes an implementation plan, including procure and distribute inputs and data stack with APIs business case deep-dives, proposed governance structure, and reporting routine to ensure successful implementation. The governance structure and reporting routine include a high-level Steering Committee for strategic oversight, a Technical Committee for expert guidance, and operational units within the Ministry of Agriculture and the Agricultural Transformation Institute for day-to-day management. Regular stakeholder engagement and a robust monitoring and evaluation framework with a dedicated Project Management Office ensure accountability and adaptability, fostering a collaborative environment for the successful digital transformation of Ethiopia's agricultural sector The roadmap looks in detail at the first phase use cases and initiatives to be implemented during the period 2025-2029. The second phase 2030-2032 is to be further detailed after a mid-term evaluation.

# 3

# DAR's Approach and Target State

## 3.1 APPROACH FOR DAR

The Ethiopian Digital Agriculture Roadmap (DAR) was developed January to June 2024 and followed a highly iterative and strategic approach centered on stakeholder engagement and alignment with existing policies and government priorities. Key stakeholders, including government agencies, industry experts, and donor organizations, were identified and invited to participate in a series of workshops and convenings organized to gather input and ensure a broad range of perspectives were considered and included in DAR.

A Steering Committee, chaired by His Excellency, Dr. Girma Amente and comprising of the State Ministers of Agriculture in Ethiopia and select institutional funders led the strategic direction for the development of the roadmap[5].

A Technical Committee, chaired by Anteneh Legesse, director of ICT at MoA, was established and comprised of experts from various sectors, to provide specialized insights into the technical requirements and potential barriers of identified digital use cases. The Technical Committee met regularly throughout the development of the roadmap to provide feedback and played a crucial role in shaping the roadmap's practical development.

Stakeholders not included in the Steering or Technical Committees were consulted individually and collectively throughout the development process to ensure their feedback was incorporated into the roadmap, including at the National and Partner Convenings. This iterative process helped refine the goals, strategy and initiatives of the roadmap, making it more robust and comprehensive. A full list of stakeholders consulted for the development of DAR can be found in Appendix section 8.1

Moreover, throughout the process, the roadmap's objectives were aligned with Ethiopia's national and agricultural policies and priorities to ensure consistency and support from government entities. A summary of key policies and documents consulted in the creation of DAR can be found below in Table 1 and a full list of policies and reports leveraged for DAR can be found in appendix section 8.2.

[5] Full list of Steering and Technical Committee members available in the appendix 8.1

**Table 1: Select key policies and documents consulted for development of DAR**

| Policy or Document | Year | Issuing institution/ entity | Relevance for DAR |
|---|---|---|---|
| Personal Data Protection Policy (PDPP) | 2024 | MinT | National, cross sectoral policy that governs how individual's data should be stored, used and shared. This will be crucial for the management of farmer profiles and sharing information across digital platforms for agricultural purposes |
| Towards Digital Agriculture in Ethiopia: an overview of the status, challenges, enablers and prospects | 2023 | CIAT, CGIAR, Acatech, MoA | Comprehensive assessment of Ethiopian digital agriculture, with recommendations to be used for DAR ecosystem assessment and prioritization |
| National Digital Skills Country Action Plan | 2021 | MinT and MoE | Human capacity and capability recommendations, including for digital literacy, to be used for DAR human capacity initiatives |
| National Digital Payments Strategy | 2021 | National Bank of Ethiopia | Digital payments recommendations, to be used for DAR financial services use cases and digital transaction initiatives |
| National Agriculture Strategy | 2021 | MoA | National strategic objectives, to which DAR will both contribute and align |
| National Financial Inclusion Strategy | 2021 | National Bank of Ethiopia | Financial services recommendations, to be used for DAR financial services use cases and digital transaction initiatives |
| Digital Ethiopia 2025 | 2020 | GoE | Overall strategic direction for digital strategy and policy, including a focus on digitalizing the agriculture sector as a pathway to prosperity, to which DAR aligns |
| Ministry of Agriculture Ten-Year Plan | 2020 | MoA | MoA strategic objectives, to which DAR will both contribute and align |
| Ethiopia Country Strategic Plan | 2020 | GoE | Aligns with the UN Sustainable Development Cooperation Framework, aiming at economic growth and national development, which includes the agricultural sector, to which DAR will align |

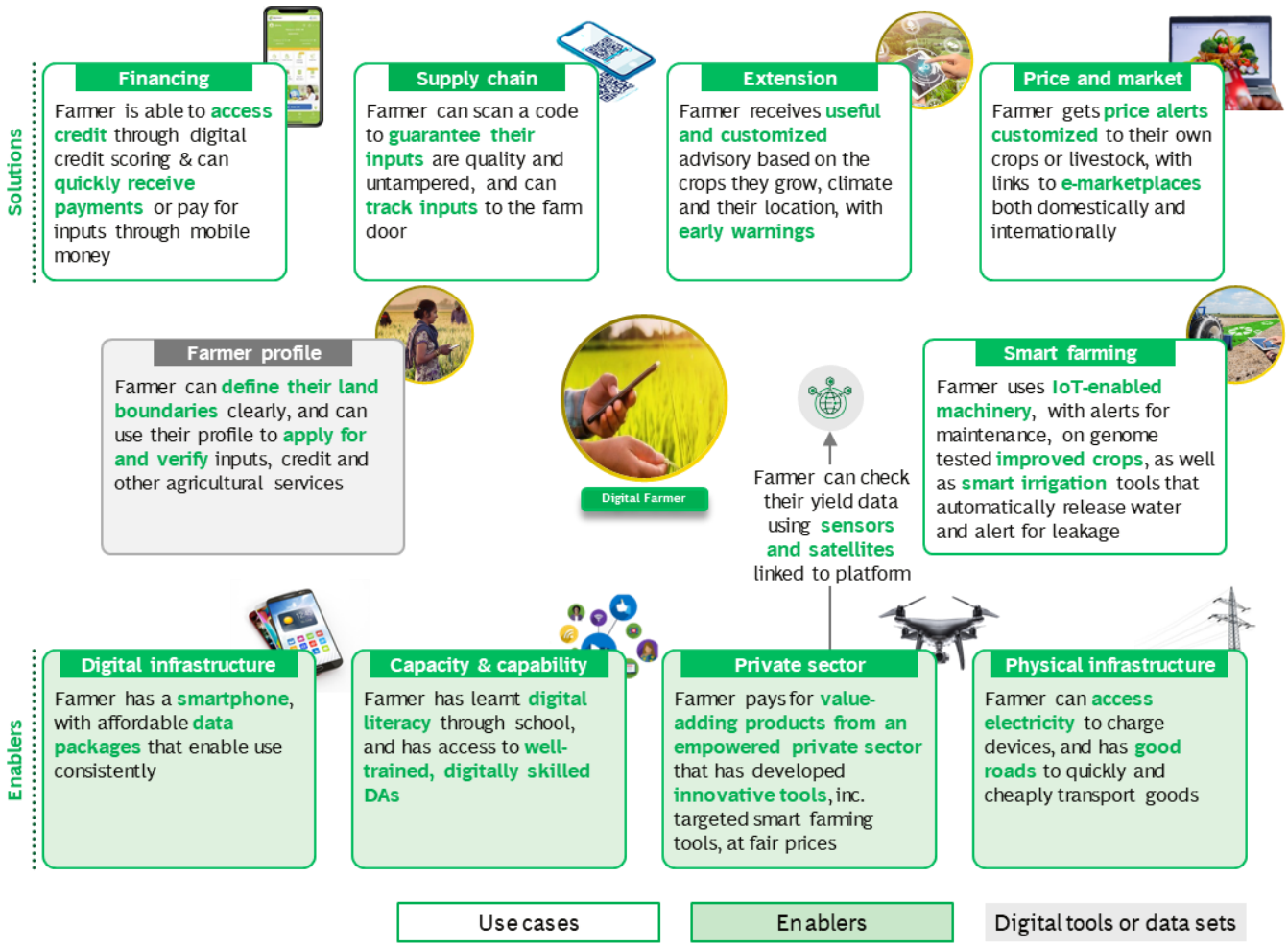
## 3.2 DAR TARGET STATE

Agriculture plays a pivotal role in Ethiopia's economy, contributing significantly to GDP, employment, and food security. However, challenges such as climate variability, resource scarcity, and traditional farming practices have hampered productivity and sustainability. The DAR addresses these challenges by making recommendations to integrate digital technologies that improve efficiency, productivity, and decision-making, ultimately leading to enhanced agricultural output and improved farmers' livelihoods. It aims to bridge the gap between traditional practices and modern technology, fostering a more robust agricultural ecosystem.

To achieve this aim, recommendations will be designed with impact for the farmer or pastoralist at the center. The end target state for DAR will integrate digital solutions throughout Ethiopia's agricultural sector, transforming the sector by creating digitally empowered farmers and pastoralists. To achieve the target state envisioned in Figure 1, the roadmap's recommendations are structured across three layers:

- **Solution areas and use cases:** The solution areas are where digital agriculture products and services (use cases) are applied by or to the end user. This layer contains digital agriculture use cases across six distinct solution areas that cover the entire value chain: Agricultural intelligence, supply chain management, financial services, smart farming, pricing and market services, and extension & advisory services. Within each of these solution areas, high priority use cases have been identified and phased throughout the roadmap.
- **Digital Stack:** The digital stack consists of the necessary digital elements to support the product development and the utilization of use cases. These elements are categorized into four areas: The user facing layer, the integration layer, the analytics layer, and data and content. In each of these areas, high priority initiatives have been identified and phased.
- **Enabling Environment:** This layer is the environment required to enable and facilitate the digitalization of the agriculture sector, and includes six enabling areas: Government and policy, digital infrastructure, physical infrastructure, agricultural markets, human capital, and innovation and technology. In each of these areas, high priority initiatives have been identified and phased.

**Figure 1: DAR Target State**



# 4

# Ethiopia Context and Ecosystem assessment

## 4.1 IMPORTANCE OF AGRICULTURE IN ETHIOPIA

Ethiopia is a low-income country in East Africa with a population of 107 million[6]. The country has ambitions to reach lower middle-income status by 2025, which would require an 11% increase in GNI per capita from $1020 to over $1135 by 2025.[7] The agriculture sector plays a significant role in Ethiopia's economy and has been identified as one of the sectors to enable this transition. Agriculture contributes ~35% to Ethiopia's GDP, employs 70% of the population and is responsible for ~75% of the country's exports. Smallholder farmers dominate the production landscape with land size holdings smaller than 2 hectares and produce 95% of the country's agricultural products. These smallholder farms are managed without significant access to modern farming technology or methods, limiting productivity and efficiency[8].

The government has implemented policies aimed at enhancing agricultural productivity and sustainability such as the Agricultural Development Led Industrialization policy (1994), Industrial Development Strategy (2022) and the Growth and Transformation Plan I and II (2010-2020). Since 2010, implementation of GTP I and II have had a positive impact on the sector, including increasing the use of organic and inorganic fertilizer by ~20 percentage points and increasing production to result in a 1.4% decrease in food imports by 2020[9]. Government-led plans to improve agricultural productivity have included actions to strengthen cluster farming, increase R&D, enhance irrigation practices, and expand commercial farms. Collectively, these actions undertaken by the government have improved the adoption of farming technologies and strengthened food systems in the country.[10]

However, despite these improvements, agriculture productivity in Ethiopia still has room to grow and the sector has many opportunities for strengthening. Challenges or roadblocks to future growth in the sector include fragmented land holding, underdeveloped infrastructure, fragmented data sets, and limited integration of data into decision making. Reliance on in-person extension methods also presents a challenge as these methods are constrained by time lapse in data collection and use, as well as challenges in reaching farmers who are widely dispersed and often located in remote areas. Digitalization of the agricultural sector offers significant potential to address some of these challenges and enable faster and more sustainable agriculture transformation.

[6] Ethiopian Statistical Service 2023
[7] World Bank, 2022 (latest data), does not adjust LMIC target for inflation
[8] FAO 2020
[9] 10 years of the Ethiopian Agricultural Transformation Agency 2020
[10] Joffre OM, Poortvliet PM and Klerkx L; Agricultural systems 2019

## 4.2 INTRODUCTION TO DIGITAL AGRICULTURE IN ETHIOPIA

The government of Ethiopia is actively pursuing digital agriculture as part of its broader strategy to transform its agricultural sector. The government has set ambitious goals under the Digital Ethiopia 2025 strategy, which aims to integrate digital technologies across various sectors, with agriculture identified as a priority sector for digitalization. The strategy focuses on fostering inclusive growth through digitalization, improvements in education, economic development, and infrastructure.

The government is also undertaking significant efforts within the enabling environment that will support digital agriculture initiatives in the country. For example, efforts are underway to improve education by enhancing educational systems[11] through integration of digital tools and resources to improve access and quality of education. Infrastructure improvement efforts center on developing robust digital infrastructure to support connectivity across the country[12] and expand internet access. These efforts to improve digital infrastructure and education will strengthen the digital ecosystem and enabling environment in the country and support and accelerate the digitalization of the agriculture sector

In 2022, the Ministry of Agriculture (MoA) in partnership with Agricultural Transformation Institute (ATI) developed and launched the Digital Agriculture Extension and Advisory Services (DAEAS) Roadmap. The objective of DAEAS was to enhance the efficiency, quality, and impact of advisory services to farmers in Ethiopia through digital transformation of the extension and advisory processes within the country. DAEAS was broadly successful at aligning the ecosystem on digitalization priorities in agriculture and was able to catalyze funding for several of the roadmap's priority initiatives such as farmer profiles and digital kiosks, both of which are currently in the process of being implemented[13].

Early implementation of DAEAS highlighted the need for a comprehensive roadmap to guide broader digital transformation in agriculture beyond extension and advisory services. Implementing additional digital solutions throughout the value chain has the potential to significantly improve productivity and livelihoods for farmers and pastoralists. For example, digital solutions and interventions in areas such as supply chain management and digital financial solutions can increase farmers access to quality inputs (e.g., fertilizer) and the financing required to purchase these inputs. However, to make this possible, significant improvements are needed in the digital stack and enabling environment such as quality, up-to-date data on individual farmer land holdings, production, and yield. Digitalization of the entire value chain will also help farmers become more productive and resilient to the effects of climate change and help provide a pathway to better-paying markets to increase their income.

It is thus imperative that Ethiopia addresses digital agriculture challenges and prioritizes strategic areas that can foster a more integrated, efficient, and responsive agricultural ecosystem, significantly

[11] This includes initiatives such as the Digital Skills Country Action Plan targeting 800,000 students from 50 public universities with and aim of creating state of the art facilities and systems to enable online learning

[12] MNO efforts have enabled 85% of the population be covered by 3G (above the SSA average of 84%)

[13] The Farmer Profile pilot launched in 2024 and will aim to collate and clean 1.25m profiles in the next two years; the Digital Kiosk pilot is at the stage of location selection, content/service mapping, and kiosk procurement

enhancing the sector's impact on the nation's economy and food security.

## 4.3 ECOSYSTEM ASSESSMENT SUMMARY

The DAR was developed to provide a holistic framework to guide the strategy and crowd-in investments into the digital agriculture ecosystem. Thus, a thorough assessment of the ecosystem and an in-depth understanding of the country's digital strengths and areas for strengthening was important to establish a point of departure for the DAR. A strong understanding of the ecosystem ensured that recommendations identified and prioritized as part of the roadmap were both high impact and implementable within the Ethiopian context.

To assess the ecosystem, the framework illustrated in Figure 2: DAR Digital Agriculture Ecosystem Assessment Framework was leveraged[14]. The framework is structured over three layers as shown in section 0 describing the target state for DAR – Solution Areas and Use Cases, the Digital Stack, and the Enabling Environment. Each section of the framework is further divided into sub-sections, and it was at this level that the ecosystem assessment was conducted. Descriptions for each sub-section in the framework can be found in the appendix 8.5.

[14] The ecosystem assessment framework was developed by the Digital Farmer Services (DFS) team at the Bill and Melinda Gates Foundation (BMGF)

**Figure 2: DAR Digital Agriculture Ecosystem Assessment Framework**

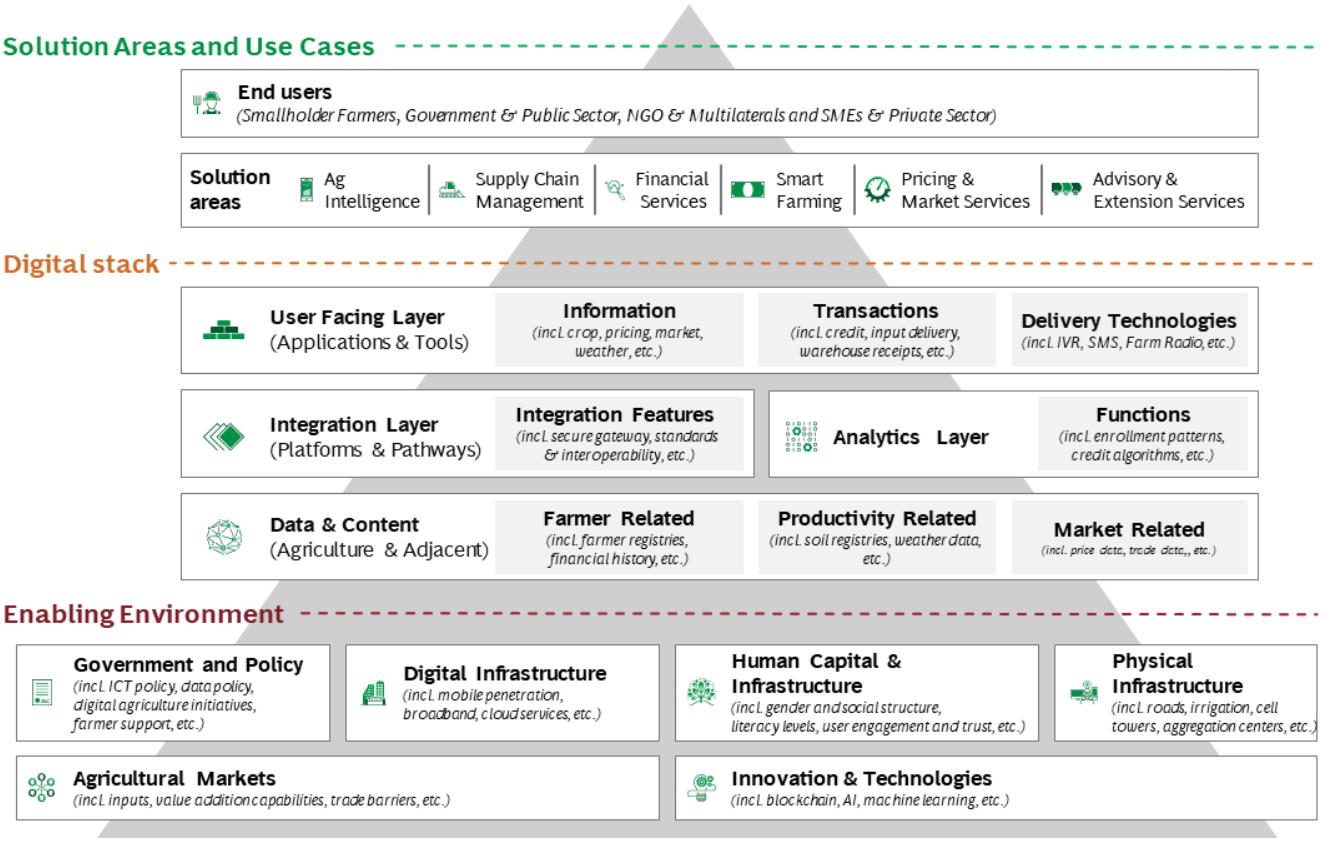
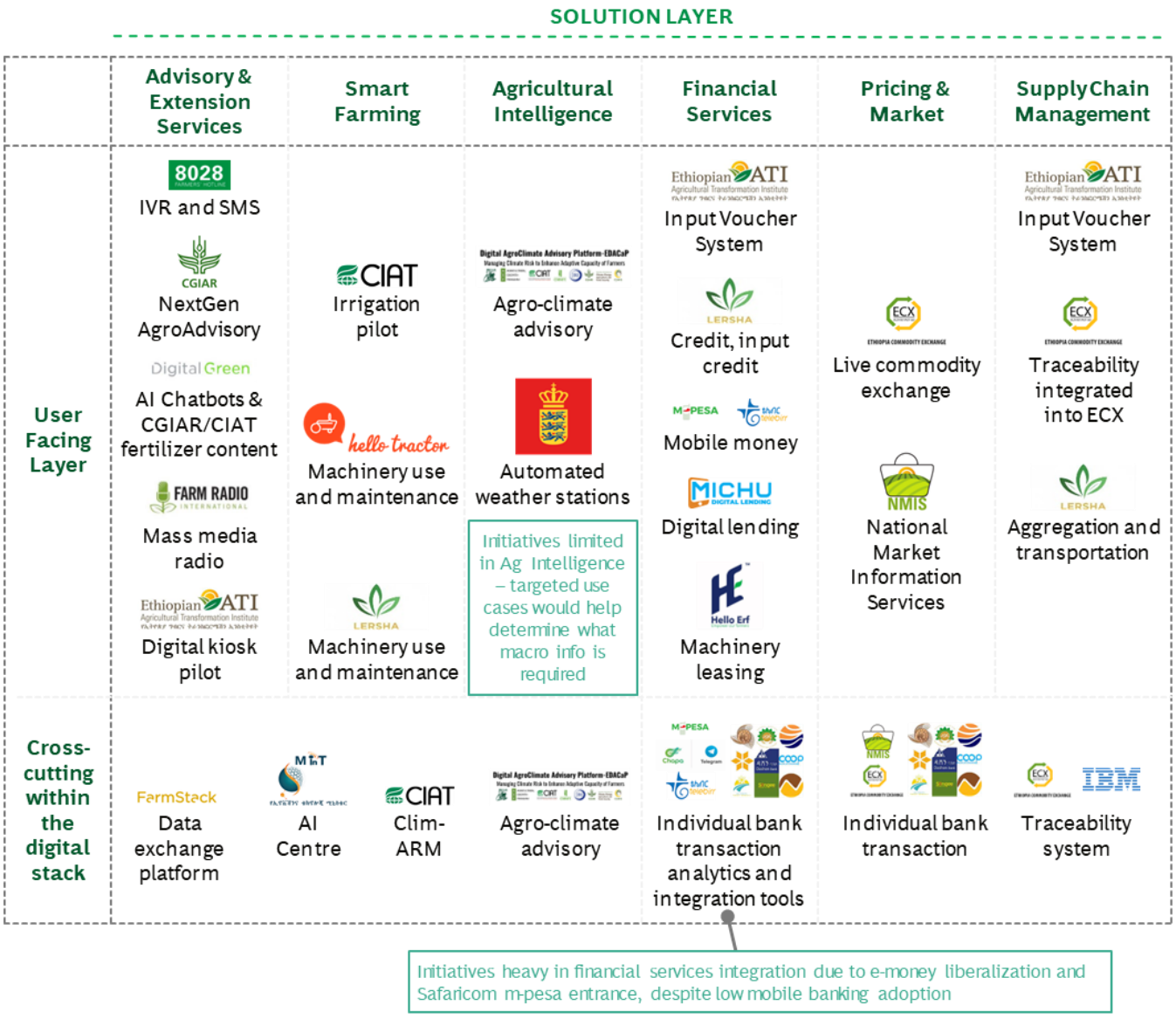


**Figure 3: Ethiopian Initiatives across 6 solution areas (non-exhaustive)**




The results of the ecosystem assessment show that while Ethiopia's digital agriculture ecosystem is still relatively nascent with many areas to strengthen, there are areas of progress to highlight. Particularly, the country shows good progress in physical infrastructure, stakeholder participation, and the breadth of data in the ecosystem. Physical infrastructure is well-developed and on par with Sub-Saharan African peers with 85% 3G network coverage and satellite access[15], which together have laid a solid foundation for connectivity. Additionally, there is strong engagement in the ecosystem from development partners and a growing private

[15] GSMA The State of Mobile Internet Connectivity Report 2023

sector driving initiatives across various digital agriculture solution areas including finance, extension, and supply chain management (see Figure 3 below). There is also a wealth of agricultural data in Ethiopia, and in recent years, progress has been made towards developing open standards and increasing interoperability for this data. Initiatives in this space include the National Data Exchange Directive, aLIVE Roadmap, Coalition of the Willing and the Supporting Soil Health Initiative, the National Framework for Climate Services, Digital Green's FarmStack protocol, and the GIZ-funded Natural Resource Management System data lake.[16]

However, challenges in the ecosystem persist, particularly in the utilization and cost of digital infrastructure. The cost of digital data usage remains high, with charges amounting to 5% of the GNI per capita for higher usage baskets, and smartphone costs equating to ~100% of the GNI per capita[17]. These expenses prevent broader access to digital tools, especially amongst rural Ethiopians and smallholder farmers. Furthermore, while the Ethiopia digital ecosystem benefits from innovative pilots and stakeholder collaboration with regards to data aggregation (e.g., Coalition of the Willing), it suffers from significant gaps in analytic capabilities as decision-makers often operate without access to integrated, real-time, accurate data. Moreover, there is room to strengthen digital capabilities across the country as national adult literacy stands at 52%[18] and the country ranks low in terms of digital skills (119 out of 134 countries).[19]

Data governance and standardization are additional areas requiring strengthening. Despite new data policies, such as those for e-transactions, the recently ratified Personal Data Protection Policy (PDPP) and bottom-up initiatives such as Coalition of the Willing and aLIVE, there remains a need for standardization and better governance of data across the sector. Data governance challenges include numerous data silos, and reluctance to share data, coupled with legal and technological barriers to sharing, and the absence of robust policies and oversight mechanisms. The lack of structured data management hinders the potential to develop high impact and comprehensive digital agriculture solutions that rely on an enhanced digital stack and data governance framework. Addressing these data challenges is pivotal for enhancing agricultural productivity and sustainability in Ethiopia.

A high-level summary of the results of the assessment can be found below in Table 2. Each sub-section of the ecosystem was assessed to be at one of three different maturity levels: 1) Nascent, 2) Exists but needs strengthening/ not at scale, 3) Relatively strong / at scale. All sub-sections within Ethiopia were assessed to be either 'nascent' or 'exists but needs strengthening/ not at scale'.

Additionally, more details on the ecosystem assessment including recent improvements, areas to strengthen, and select ongoing initiatives for each sub-section of the framework are outlined in section 5 of this document.

[16] A full list of existing initiatives within the ecosystem can be found in section 0 in the appendix
[17] GSMA Mobile Connectivity Report 2023
[18] World Bank Development Indicators 2017
[19] Digital Skills Gap Index Wiley Report (2021)

**Table 2: High Level Results of Ethiopia Digital Agriculture Ecosystem Assessment**

| | Solution / Initiative area | Maturity | High Level Status Summary[20] |
|---|---|---|---|
| Solution Areas and Use Cases | Agricultural Intelligence | Exists, Needs strengthening / Not at Scale | Weather and soil (SSHI)[21] decision-making is functional, but these are the only use cases and have room to be strengthened |
| | Supply Chain | Exists, Needs strengthening / Not at Scale | Private sector led by Lersha is moving into aggregation, but no input tracing is still a challenged |
| | Financial Services | Exists, Needs strengthening / Not at Scale | Mobile money & banking better is operational, but rural population remain underserved |
| | Smart Farming | Nascent | Limited activity, however, there are emerging irrigation solutions such as the Water Ways project by CIAT[22] |
| | Pricing & Market services | Exists, Needs strengthening / Not at Scale | ECX[23] and NMIS[24] are generally strong but limited in scope |
| | Extension & Advisory | Exists, Needs strengthening / Not at Scale | Low-tech delivery channels are strong (e.g., IVR)[25], but better integration with data is needed e.g., weather |
| Digital Stack | User Facing Layer | Exists, Needs strengthening / Not at Scale | Strong low-tech tools e.g., IVR 8028, improving market info & 30k tablets going to DAs, but high-tech tools e.g., Digital Green AI chatbot only in pilot stage |
| | Integration Layer | Exists, Needs strengthening / Not at Scale | Emerging solutions such as FarmStack provide strong middleware potential but need integration with further use cases; Limited presence of ag-specific mobile wallets solutions due to lack of mobile infrastructure and financial sector engagement |

[20] More details on the assessment of each sub-component of the ecosystem can be found in section 5 of this document where the roadmap's initiatives and use cases are detailed.

[21] Supporting Soil Health Initiative

[22] International Center for Tropical Agriculture

[23] Ethiopian Commodity Exchange

[24] National Market Information System

[25] Interactive Voice Response

| | Solution / Initiative area | Maturity | High Level Status Summary[20] |
|---|---|---|---|
| | Analytics Layer | Nascent | Some predictive weather and crop analytics at a national level through e.g. EDACAP[26]; and MINT[27] launched the AI R&D Centre of Excellence; lack of private sector activity presents challenges to ability to organically scale (e.g., Innovation Hub is an FAO[28] initiative) |
| | Data and Content Layer | Exists, Needs strengthening / Not at Scale | A lot of data is collected (570+ data sets in the Ag Datahub), but it is either limited in scope, poor quality, or not standardized or integrated SSHI trying to overcome this challenge; key focus for players e.g., CoW[29] and aLIVE[30] on standards; National/Farmer ID in pilot |
| Enabling Environment | Government & Policy | Exists, Needs strengthening / Not at Scale | Strong policies and frameworks, but limited governance or data standards |
| | Digital Infrastructure | Exists, Needs strengthening / Not at Scale | Digital infrastructure available but cost is limiting accessibility; limited cloud and computing |
| | Human Capital | Nascent | Low overall adult literacy is causing barriers to digital adoption, and digital skills ranked 119/134 countries[31] |
| | Physical Infrastructure | Exists, Needs strengthening / Not at Scale | Existing physical infrastructure is semi-reliable, with satellites progressing towards more advanced physical infrastructure |
| | Agricultural Markets | Nascent | Inputs are limited, and currently hard to track, while value addition and access to improved markets is nascent |
| | Innovation and Technologies | Nascent | Limited innovation beyond government or NGOs, such as MINT or FAO's DAIH[32] |

[26] Ethiopian Digital AgroClimate Advisory Platform
[27] Ministry of Innovation and Technology
[28] Food and Agriculture Organization
[29] Coalition of the Willing
[30] A Livestock Information System Roadmap for Ethiopia
[31] Digital Skills Gap Index Wiley Report (2021)
[32] Digital Agriculture Innovation Hub

# 5

# Digital Agriculture Roadmap (DAR) 2032

## 5.1 DAR GUIDING PRINCIPLES

DAR's development and implementation is guided by four principles which have and will continue to be instrumental in achieving successful digital transformation in Ethiopia's agricultural sector.

**DAR guiding principles**

DAR has four guiding principles:

| 01 | 02 | 03 | 04 |
|---|---|---|---|
| **Leverage Existing Initiatives:** Build off, scale, and align with existing initiatives, when possible, to accelerate implementation and impact of DAR | **Ensure Coordination:** Develop appropriate governance structures and processes for the ecosystem to facilitate alignment, coordination and cooperation amongst stakeholders | **Empower the Private Sector:** Attract private sector participation and partnership and leverage the private sector's capacity and capability to support in DAR implementation | **Prioritize and Phase Initiatives:** Focus on initiatives with that have the highest potential for impact and can be implemented within the current ecosystem first before pursuing those interdependent initiatives in later phases |

These principles promote the optimization of resources by leveraging existing initiatives and institutional knowledge, which accelerates progress and prevents redundancy. Coordination is vital for maximizing limited resources by aligning stakeholders - including government bodies, NGOs, and the private sector – and ensuring that efforts work in synergy, and limit duplication. By empowering the private sector, the roadmap taps into innovative and scalable solutions that drive sustainability and economic viability. Finally, prioritizing and phasing initiatives allows resources to be focused on initiatives with the greatest impact and that are most feasible in the current ecosystem.

## 5.2 DAR'S INTEGRATION WITH DAEAS

In 2022, MoA and ATI worked to develop the Digital Agriculture Extension and Advisory Services (DAEAS) Roadmap 2030 for Ethiopia. The DAEAS Roadmap roll-out led to the view that Ethiopia's Digital Transformation efforts in agriculture needed to go beyond extension & advisory, and thus the Digital Agriculture Roadmap (DAR) was developed. The DAEAS Roadmap is a sub-set of the DAR, but has been integrated in three key ways: Solution areas and use cases, digital stack and enabling environment initiatives, and finally in lessons learned.

**Solution areas and use cases:** One of the DAR solution areas is 'Extension and Advisory'. Though the DAEAS Roadmap did not include use cases (rather what the DAR defines as underlying initiatives to support extension and advisory), the DAR has captured all extension and advisory activities and channels in a single use case called 'Extension and advisory'. Users of the DAR are recommended to consult the DAEAS roadmap for further details on recommendations for this use case. Furthermore, some of the DAEAS initiatives have been incorporated into use cases in other solution areas, such as 'Input demand and supply tracking', which part of the 'Procure and distribute inputs' use case, the 'track and trace inputs' use case, and the 'input demand and supply analytics' initiative. A full mapping of the DAEAS initiatives to DAR use cases and initiatives can be found in 8.3 Mapping of DAEAS Recommendations to DAR.

**The digital stack and enabling environment initiatives:** All DAEAS initiatives that were not incorporated into use cases have been incorporated into the DAR digital stack and enabling environment, either as standalone initiatives, or aligned to other initiatives. Some of the DAEAS initiatives were adjusted or further detailed based on progress since 2022 (e.g., 'Off-grid electricity access expansion in rural areas' has been adjusted to 'Solar panels for FTCs[33] or OSSs[34]'). A full mapping of the DAEAS initiatives to DAR use cases and initiatives can be found in 8.3 Mapping of DAEAS Recommendations to DAR.

**Lessons learned:** The process of developing and implementing the DAEAS roadmap informed the methodology of the DAR development. This included early alignment on the vision and key objectives to drive consensus, tailoring the approach to the country context, with clear adherence to existing national strategies and policies, and a focus on farmer value and product output throughout. Finally, DAEAS demonstrated the need for continual engagement with implementing partners and donors to co-create sustainable, fundable and feasible business cases. DAR utilized these lessons throughout the development process.

[33] Farmer Training Center

[34] One Stop Shop (ATI initiative)

## 5.3 DAR PHASING AND OBJECTIVES

Recommendations in the solution areas and use cases, digital stack, and enabling environment will be implemented over two phases to ensure efficient and effective use of resources.

**Phase One "Build the Digital Foundation" (2025-2029)** aims to lay the groundwork for a digitalized agricultural ecosystem through implementation of key enabling initiatives while developing high impact use cases to empower farmers and pastoralists. This phase of the roadmap has 12 objectives which are outlined below:

1. **Agricultural Intelligence -** National intelligence that improves decision making to get better services to farmer and pastoralists
2. **Supply Chain -** Services that guarantee quality products on time for farmers, pastoralists, and off-takers
3. **Financial Services -** Universal access to financial services that improve input & machinery access, insure crops and make payments more efficient
4. **Pricing and Market Services -** Transparent and timely pricing and reliable market linkage with quality assurance measures
5. **Extension and Advisory -** Timely, demand-based, customized extension & advisory
6. **Integration Layer -** Interoperable, obtainable data sets supported by analytics to increase insight extraction
7. **Data and Content -** Reliable & extensively accessible data to enable use cases
8. **Government and Policy -** Robust and inclusive data policy and guidelines to drive insights, data sharing and decision making
9. **Digital Infrastructure -** Innovative device & connectivity solutions that allow farmers to adopt use cases
10. **Human Capacity -** A population that has been invested in & empowered to build and use digital agriculture cases
11. **Governance -** Comprehensive & stream-lined governance to enable effective strategic management & implementation
12. **Innovation and technologies -** An empowered private sector that allows for development of priority innovative tools

This first phase is critical to lay the foundation for a well-functioning digital ecosystem and to deliver the highest impact to farmers, pastoralists and value chain actors. The use cases and digital stack and enabling environment initiatives prioritized for Phase One are part of the comprehensive lists of solutions and enabling initiatives required to fully digitalize agriculture in Ethiopia.

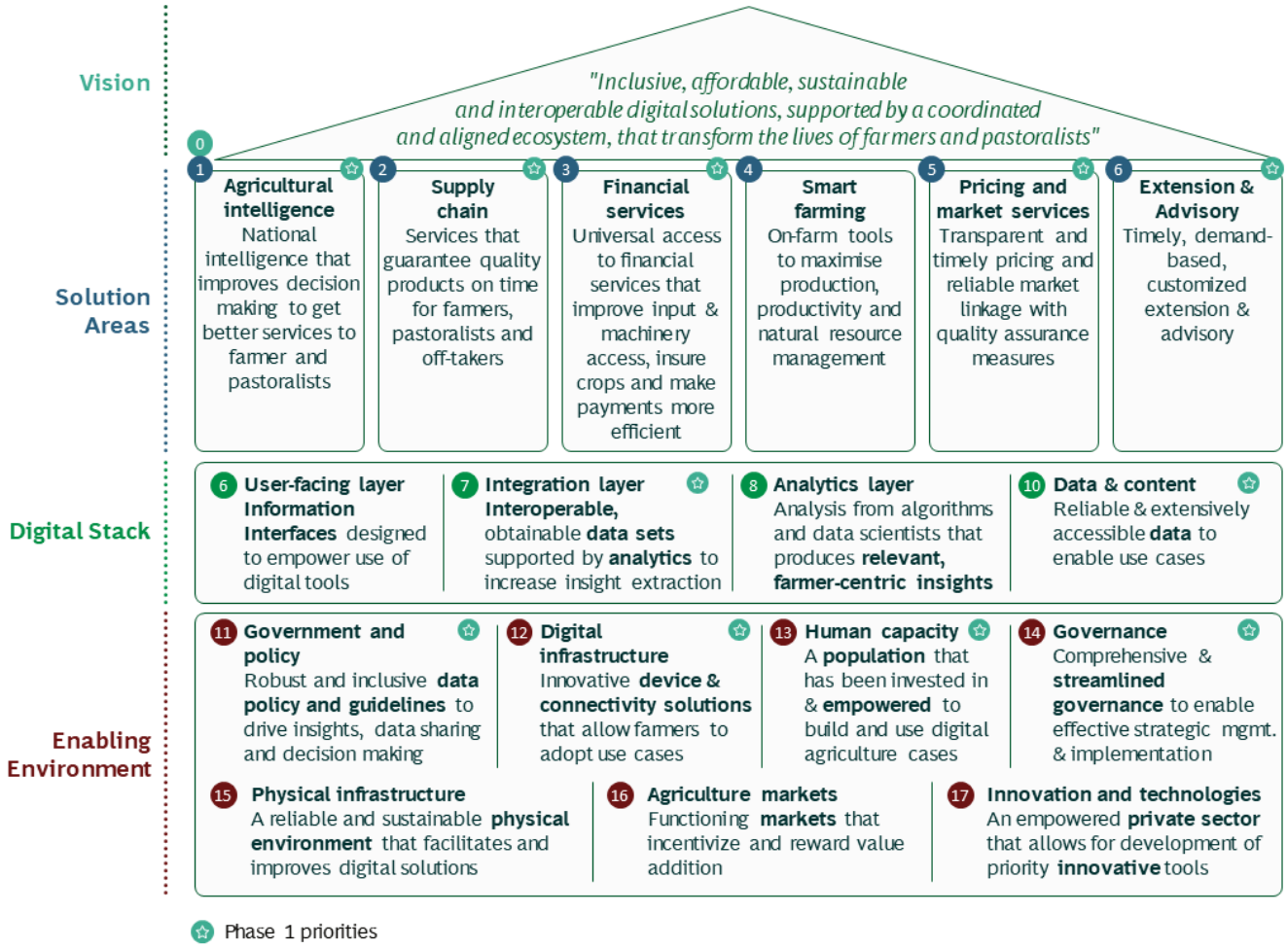
**Phase Two "Diversify and scale the ecosystem" (2030-2032)** will continue to build use cases into the ecosystem and improve data collection. Phase Two of the roadmap aims to achieve five additional objectives while continuing to build upon and strengthen the objectives achieved in Phase One. DAR Phase Two targets to enhance the ecosystem by achieving the following 5 outcomes:

1. **Smart Farming -** On-farm tools to maximize production, productivity, and natural resource management
2. **User -Facing Layer -** Information interfaces designed to empower use of digital tools

3. **Analytics Layer -** Analysis from algorithms and data scientists that produces relevant, farmer-centric insights
4. **Physical Infrastructure -** A reliable and sustainable physical environment that facilitates and improves digital solutions
5. **Agricultural Markets -** Functioning markets that incentivize and reward value addition

Combined, these 17 objectives target to enhance and strengthen the entire digital agriculture ecosystem, with each objective linked to one of the ecosystem's sub-components.[35] These 17 strategic objectives are combined and outlined in Figure 4 below.

**Figure 4: DAR Strategic Objectives**

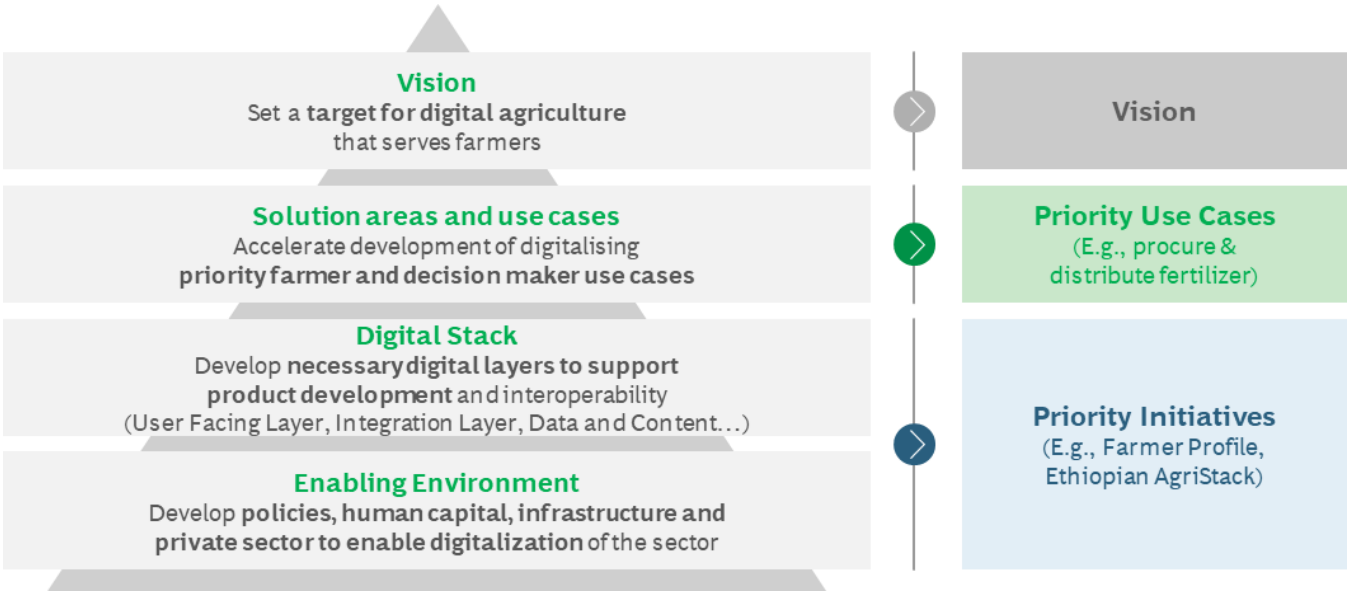



[35] As defined in Figure 2 from section 4.3

## 5.4 DAR STRATEGIC FRAMEWORK AND VISION

DAR recommendations are guided by its vision statement and structured across the three layers of the ecosystem assessment framework– solution areas and use cases, the digital stack, and the enabling environment.

**Figure 5: DAR Strategic Framework**




In the context of digital agriculture and the DAR, a digital use case within a solution area refers to a specific application or set of practices designed to address identified challenges within the agricultural value chain by leveraging digital tools. Use cases can be technological, such as software applications for farm management or market access platforms, or procedural, such as new approaches to crop monitoring or supply chain logistics.

The digital stack refers to the required data and technology components that support the implementation and functionality of digital agricultural use cases. This includes data infrastructure, user-facing applications, and integration platforms that connect various data sources. The stack is designed to ensure that solutions are interoperable, scalable, and capable of evolving with changing technological landscapes and farmer needs. It often involves components like middleware, which facilitates the integration of different systems and services, thereby enhancing the overall efficiency and effectiveness of digital solutions.

Lastly, the enabling environment encompasses the policies, regulations, institutional frameworks, support systems and infrastructure that facilitate the adoption and scaling of digital agriculture solutions. It includes aspects such as regulatory frameworks, financial incentives, educational systems, and infrastructural developments that

together create a conducive atmosphere for the deployment of digital technologies in agriculture.

## DAR VISION

DAR's 8-year digital agriculture vision is

> "Inclusive, affordable, sustainable and interoperable digital solutions, supported by a coordinated and aligned ecosystem, that transform the lives of farmers and pastoralists"

## 5.5 SOLUTION AREAS AND USE CASES

The overall objective of the Digital Agriculture Roadmap is to digitally empower Ethiopian farmers and pastoralists across the entire agriculture value chain. In order to achieve this digital transformation, the DAR identified six solution areas within the agriculture ecosystem.

The six solution areas identified as part of DAR are:

1. **Agricultural intelligence –** National intelligence that improves decision making to get better services to farmer and pastoralists
2. **Supply chain management -** Services that guarantee quality products on time for farmers, pastoralists and off-takers
3. **Financial services –** Universal access to financial services that improve input & machinery access, insure crops and make payments more efficient
4. **Pricing and market services -** Transparent and timely pricing and reliable market linkage with quality assurance measures
5. **Smart farming -** On-farm tools to maximize production, productivity and natural resource management
6. **Extension and advisory services -** Leveraging technology to provide real-time information, best practices, and personalized guidance to farmers for improved agricultural outcomes[36]

DAR defines a digital use case as a specific application or set of practices designed to address identified challenges within the agricultural value chain by leveraging digital tools. A DAR use case must ultimately benefit the farmer or pastoralists but the farmer or pastoralists does not necessarily need to be the end user of the use case.[37]

A total of 22 use cases across these six solution areas have been identified through a comprehensive review of international and local reports, national strategy documents, and stakeholder interviews. DAR undertook a comprehensive and robust prioritization process based on the feasibility of implementation in Ethiopia and the potential for impact. This process determined which use cases would be prioritized for Phase One and which would be addressed in Phase Two of the roadmap.[38]

[36] Extension and advisory services were initially addressed in the DAEAS Roadmap. All actions identified in DAEAS have been incorporated into the DAR roadmap

[37] E.g., the government is the end-user of the use case 'Procure and Distribute Inputs' as this use case aims to support the government in demand estimation of centrally procured inputs such as fertilizer. However, the farmer would ultimately benefit from the use case because fertilizer would be distributed more accurately and effectively to farmers throughout the country

[38] Key inputs into the prioritization process were benchmarks from other geographies (to assess impact and feasibility) and stakeholder feedback from both 1-on-1 engagements as well as the National Convening. More details on the prioritization process can be found in appendix section 0

### 5.5.1 Agricultural Intelligence

#### Solution area objective

*National intelligence that improves decision making to get better services to farmers and pastoralists*

#### Solution area description and use cases

Use cases in this solution area are focused on creating macro level data and decision support for businesses and government. This solution area consists of four use cases, two of which have been prioritized for Phase One of the roadmap. The table below shows the phasing, descriptions, and the target end users of each use case.

**Table 3: Agricultural Intelligence Use Cases**

| | Use case | End user | Description |
|---|---|---|---|
| **Phase 1** | Deliver timely interventions to protect crops or livestock | Government | Support farmers by using data to track and monitor disease outbreaks, adverse weather events and pest attacks, and intervene directly or through advisory |
| | Procure and distribute inputs | Government | Support farmers by getting inputs to them more efficiently through top-down demand data assessment and smart procurement |
| **Phase 2** | Develop carbon and climate credentials for markets | Government | Support farmers by calculating the carbon footprint or sequestration of different agriculture projects (e.g., agroforestry) to link to and verify farmers for sustainable supply chains, and to provide targeted climate-related advisory |
| | Improve livestock management | Government | Support farmers by tracking and monitoring livestock data including location, breed and health to plan optimal water and pasture routes (delivered through EWS[39] or direct intervention), develop breed and health insights and improve breeds through artificial insemination |

#### Ecosystem assessment – Improvements

In the past 5 years, the Ethiopian ecosystem has made limited progress in agricultural intelligence due to ongoing issues in data quality and availability. However, there are initiatives that have been developed to provide macro-level or national insights. For example, the EDACAP (Ethiopian Digital AgroClimate Advisory Platform) launched in 2019 and provides weather and climate forecasting and insights based on climate-informed crop modelling and has an API-enabled web layer to facilitate intelligence across the ecosystem. CIAT's Clim-ARM[40] project was launched in 2022 and is also operating in this

[39] Early Warning Systems

[40] International Center for Tropical Agriculture, Climate Agricultural Risk Management

space, predominantly using climate analytics for macro-level risk management.

There have also been advancements in soil data, through the Supporting Soil health Initiative (SSHI), led by the Coalition of the Willing (CoW). This initiative has harmonized and standardized soil data sets so that they can be used for intelligence and decision-making on topics such as soil health, input use, production and crop varieties. This soil data is being used by initiatives such as CGIAR and CIAT's site-specific fertilizer recommendations. Livestock data is also progressing through the aLIVE[41] roadmap, which has made recommendations for livestock data and will begin implementation in 2024.

### Ecosystem assessment – Areas to strengthen

Despite some progress in weather and soil data, agricultural intelligence is still a relatively nascent solution area and will require significant work to enable decision making at a national level.

**Data:** For high quality agricultural intelligence, high quality data is required. There is currently limited quality data especially for foundational datasets, such as land data (size, use and ownership), farmer profile data (name, inputs used) and crop data (production, crop type and variety sown). There are initiatives or pilots ongoing to collect quality data (including the farmer profile pilot launched in 2024, the National Rural Land Administration Information System (NRLAIS) which has digitalized 60% of land registries and the Central Statistics Agency's production data, but these will need to be rapidly scaled or improved to support use-case specific insights. A robust mechanism for data exchange will also be needed, and so a data stack should be built, leveraging existing infrastructure such as the Ag Datahub in MoA to optimize implementation.

**Analytics:** Once quality data has been collected, advanced analytics capability will be needed to produce relevant and use case-specific insights. The Ministry of Agriculture should develop an in-house analytical capability through recruitment, secondment and training, but should also work closely with research centers such as CIAT and CGIAR to build upon their predictive models in spaces such as climate (EDACAP) and inputs (site-specific fertilizer recommendations).

**Private sector participation:** There is currently limited opportunity for private sector integration in agricultural intelligence, but integrating the private sector would allow for better solutions and services across the ecosystem, and a richer data store. For example, an insurer would be able to provide better services if they had access to more accurate climate forecasting, and in turn could supply data collected from the farmer on their production to the data stack. The private sector could be encouraged to partake in the ecosystem by strengthening consent and sharing mechanisms for data, as well as developing awareness campaigns and training to highlight the business advantages of participation.

**Infrastructure:** A number of agricultural intelligence use cases, such as procure and distribute inputs, and deliver timely interventions, require a reliable distribution network for their success. Currently, only 22% of rural households in Ethiopia are less than 2km from a road, creating challenges in access to services.[42] These challenges could be addressed by a thorough road assessment in partnership with the Ministry of

[41] A Livestock Information Vision Ethiopia
[42] RAI World Bank (2019)

Transport of Transport and Logistics, with improved roads developed in strategic routes for optimum distribution.

**Table 4: Select Ongoing Agricultural Intelligence Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| EIAR, AGP, CIAT, CIMMYT, IRI, CGIAR, CCAFS | EDACAP - Ethiopian Digital AgroClimate Advisory Platform | • Web platform designed to support decision-making and facilitate learning<br>• Provides interactive AgroClimate information and advisory services based on crop-climate models to enhance crop management decisions and mitigate production risks from climate variability and change<br>• Offers location-specific 3–10-day weather forecasts<br>• Offers ENSO predictions, with seasonal climate phase forecasts for the upcoming three months |
| Supporting Soil Health (SSH) initiative | AI powered fertilizer decision support tool | • Addresses key soil and systemic issues in agriculture, such as problematic soils and nutrient depletion, limited institutional capacity, and lack of advanced technologies<br>• Focuses on enhancing content dissemination<br>• Develops data tools like the Fertilizer Decision Support Tool (DST) and high-resolution soil maps<br>• Manages extensive soil data through national systems |
| MoA, Development Gateway, Livestock Improvement Corporation | aLIVE | • The project is working towards improving the accessibility, interoperability, reliability, and use of livestock data<br>• The core component of the project is ensuring the interoperability of five key systems: two livestock health systems, a livestock market information system, a genetics data system, and a livestock identification and traceability system |

## Phase One priority use cases

### 1. Deliver timely interventions for crops and livestock

This use case will support farmers in tracking and monitoring disease outbreaks, adverse weather events, and pest attacks, and enable the government to intervene either directly (e.g., provide food to livestock) or through advisory. The main objective of this use case is to decrease agriculture and livestock losses from pest and disease outbreaks and increase resilience to climate and weather impacts.

**Key activities for implementation:**

- Identfiy necessary data requirements for the use cases (e.g., weather data from EDACAP) and evaluate whether existing data sources are fit for purpose.
- Define strategies for acquiring or developing required datasets.
- Identify what specific interventions (e.g., drought on livestock routes, types of disease) the use case will target and prioritize and sequence interventions based on available data and potential for impact.
- Train and build advanced analytics and predictive model for early warning system for prioritized interventions with support of research centers and ongoing initiatives.
- Pilot the model in an area of Ethiopia most susceptible to the prioritized interventions, and ideally for both a livestock and crop intervention simultaneously.
  - Pilot will involve improved data collection, an MVP for data flow, a DA application and dashboard, and alignment with existing extension channels such as 8028.
- Scale system to other interventions, implementing the lessons learned from the pilot and build in other data flows from DAs and extension channels, such as pest and disease outbreaks.

**Table 5: Dependencies to fully scale deliver timely interventions use case**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Data stack with APIs | Integration layer | Ensures seamless integration and real-time data exchange, enabling quick response and coordination of interventions |
| Production, weather, and farmer data | Data & content | Provides crucial information and data to train models for anticipating and addressing issues such as pest outbreaks or adverse weather conditions |
| Devices for DAs | Digital infrastructure | Facilitates real-time data collection and dissemination, allowing DAs to quickly identify and respond to emerging issues in the field |
| Analytics capability for digital Ag team | Analytics layer | Allows for the rapid analysis of large datasets to identify trends and anomalies, ensuring timely and data-driven interventions |

### 2. Procure and distribute inputs

This use case employs data (e.g., soil, land, weather, farmer) and advanced analytics to assess demand more accurately for inputs at the individual farmer or pastoralist level and to help guide procurement decisions. The legacy input procurement process faces challenges of lengthy and manual demand aggregation and limited site-

specific data, causing uneven assessment of demand. The goal of this use case is to get inputs to where they are most needed, in the right blends, more quickly and efficiently, to ensure more productive crops and livestock and better use of government spend on inputs. The use case focuses on fertilizer to begin, as this is a government procured input with a large deficit and government-led distribution.

**Key activities for implementation**

- Build an analytics dashboard and DA/farmer-facing application to collect data.
- Recruit, second or train an in-house analytics team to produce predictive analytics.
- Build a data stack with APIs, building upon the existing Ag Datahub.
- Collecting key datasets, including farmer profile, crop sown, production and land data.
- Develop data policy and standards for relevant data (e.g., farmer profile data).
- Train DAs in data collection, app usage and fertilizer prediction validation, and onboard fertilizer vendors.
- Scale to other inputs such as seed, agrochemicals, and animal feed.

**Table 6: Dependencies to fully scale Procure and Distribute Inputs Use Case**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Data governance and sharing policy, standards, assurances, and incentives | Government and policy | Establishes a framework for collection, and sharing of demand input demand data as well policies concerning data privacy |
| Digital program in ATVETS | Human capital | Provides DAs the necessary training on digital tools, enhancing their capacity to effectively manage, understand and utilize digital systems for input procurement |
| Free access for DAs and farmers to key apps | Digital infrastructure | Ensures that DAs and farmers have access to the necessary tools for real-time data entry and access to information |
| Land & farmer-linked production data | Data and content | Offers detailed insights into production needs and capacities, enabling precise demand forecasting and targeted input distribution |
| Farmer profiles and unique ID | Data and content | Provides a reliable identification system for farmers, ensuring that inputs are distributed accurately and efficiently to the intended recipients |

## Procure and distribute fertilizer - use case deep-dive

The procure and distribute inputs business case has been designed to tackle key challenges across the fertilizer value chain. Currently there are three major challenges that the use case could solve for:

**01**

10% farmers have no access to fertilizer and 45% have insufficient access to fertilizer due to a lack of site-specific data resulting in uneven fertilizer assignments

**02**

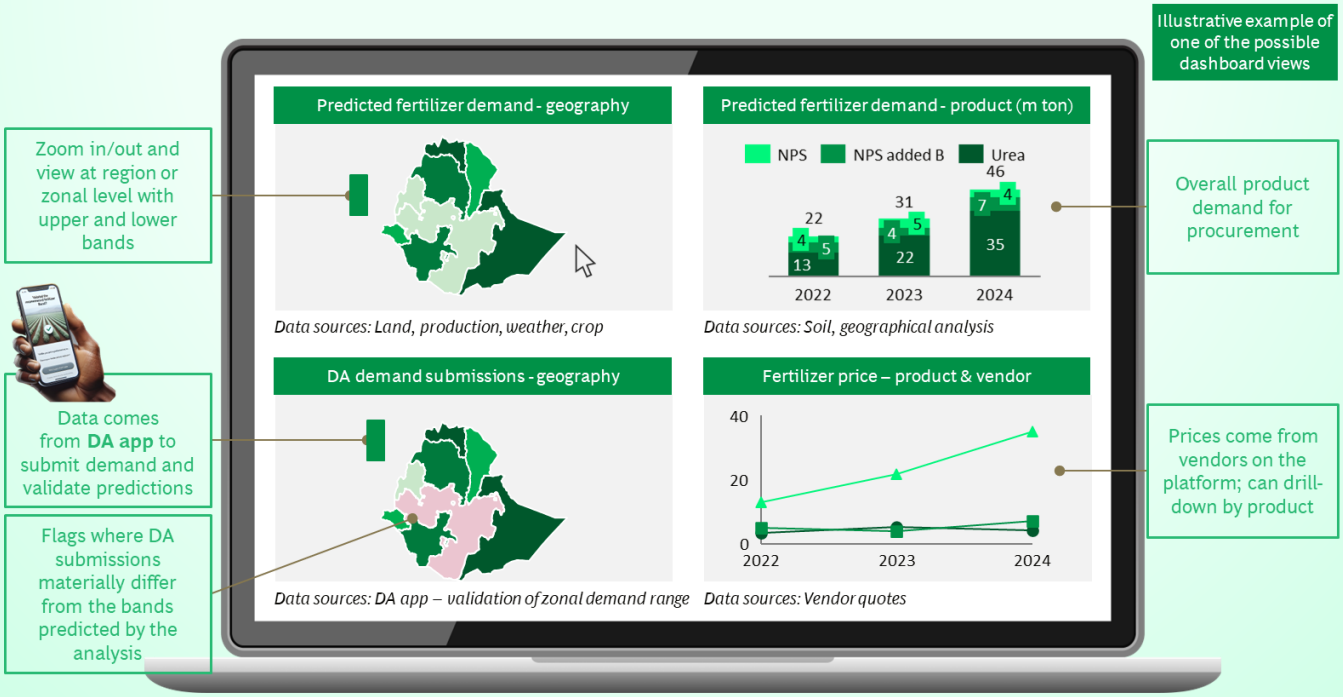
40% farmers are receiving fertilizer late lengthy manual processes for demand submission and assessment have contributed to delays

**03**

10% farmers receive incorrect fertilizer as there is no digitalized data linking farmers to their land or demand assessment

To solve for these challenges, farmer or DA assessments will be supplemented with additional data that is analyzed using predictive modelling to build a more accurate demand picture. DAs will then be able to validate or query predictions through an app, and MoA will then use this information to deliver the right fertilizer in the right blends on time.

**Figure 6: Illustrative example of input demand dashboard**

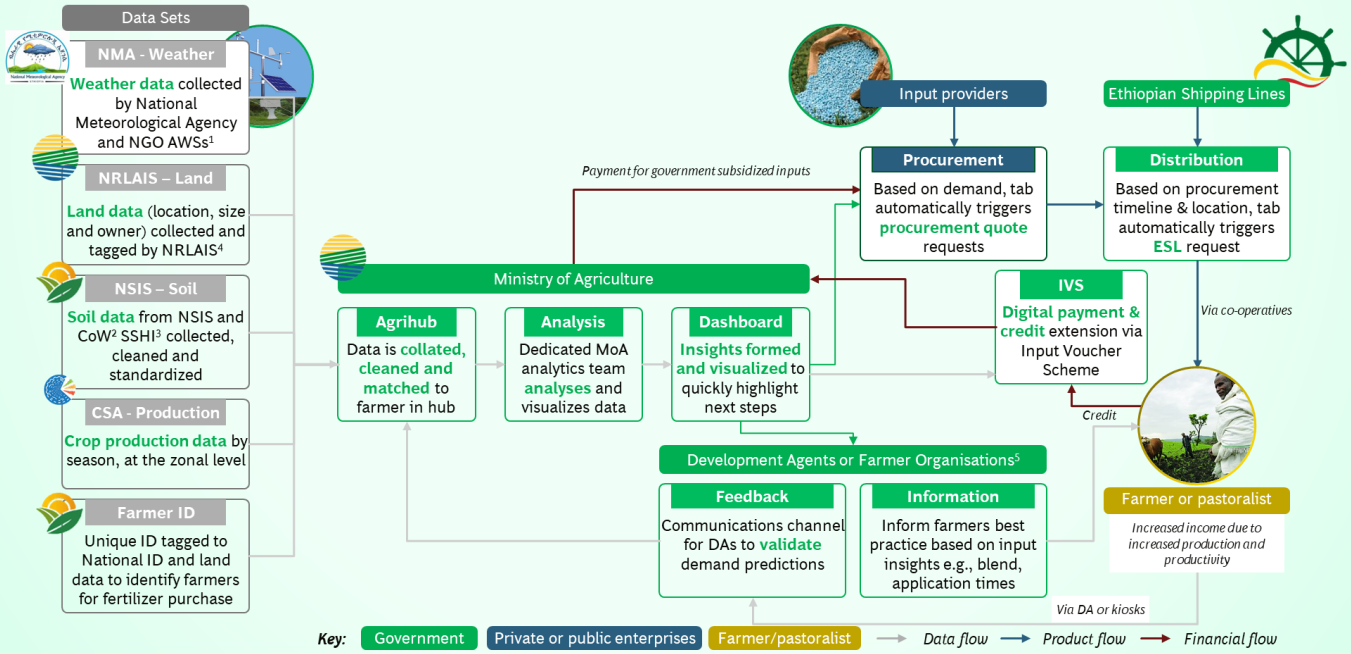


Insights will be visualized through a dashboard (see Figure 6) that will show demand by geography, areas in which DAs have queried predictions, demand by product, and pricing by product. This will support effective decision making and procurement.

To ensure the success of this use case, the digital stack and enabling environment will need to be strengthened in five of the most nascent areas:

1. **Personalization:** Personal interfaces should be built using farmer profiles to deliver targeted information on fertilizer application either via DAs or digital solutions.
2. **Analytics:** Existing initiatives such as CIAT site-specific fertilizer and EDACAP climate analytics should be leveraged, while an in-house capability is developed.
3. **Human capital:** ATVETs training on data collection and digital solution use should be prioritized to empower and equip DAs.
4. **Agricultural markets:** Savings from the use case should be used to readjust foreign currency allocations to increase the amount of fertilizer available.
5. Data: Three foundational datasets should be scaled for the use case: land data, production and crop sown data, and farmer data (as weather and soil data are relatively strong).

**Figure 7: Procure and distribute inputs target solution**




1. Automated Weather Stations 2. Coalition of the Willing 3. Supporting Soil Health Initiative 4. National Rural Land Administration Information System 5. Co-operatives, Unions, FPCs etc.

This use case will see significant social and economic impacts, with an estimated 30m farmers positively impacted (of which 14m are female), an 8% average income increase per farmer, an annual production increase of 30m quintals across crops, and increased climate resilience from improved blends, increased foreign currency from increased production and export, and more efficient procurement spend.

## 5.5.2 Supply Chain Management

### Solution area objective

*Services that guarantee quality products on time for farmers, pastoralists, and off-takers*

### Solution area descriptions and use cases

Supply chain management use cases are focused on creating safety and traceability for both inputs and outputs while enabling transport and storage optimization through digital solutions across the agriculture value chain. This solution area has three use cases, one of which has been prioritized for Phase One of the roadmap. The table below shows the phasing, descriptions, and the target end users of each use case.

**Table 7: Supply Chain Management Use Cases**

| | Use case | End User | Description |
|---|---|---|---|
| **Phase 1** | Track and trace inputs | Government; logistics providers | Enhance support for farmers by accelerating input distribution and minimizing leakage through efficient, trackable, and transparent logistics via QR codes and NFC tags, with quality verification mechanism for farmers |
| **Phase 2** | Transport and store outputs safely | Farmers & pastoralists | Link farmers to storage and transport solutions that are well priced and safe |
| | Track and trace output inventory | Agriculture output buyers | Provide efficient, automated, and transparent logistics and distribution solutions at a fair price for output buyers, with well documented and verifiable history and quality assurances for output product |

### Ecosystem assessment – Improvements

In the past 5 years, the Ethiopian ecosystem has begun to make progress in the supply chain, with recent developments targeting traceability solutions for both inputs and outputs. The Ethiopian Digital Inputs Tracking System (EDITS) has launched a pilot this year to track fertilizer from port to farm gate to support timely delivery and quality inputs, though this is still nascent and will require strengthening and scaling. For outputs, integration of traceability solutions into the Ethiopian Commodity Exchange via an IBM-enabled national system has been developed for select high-value export crops such as coffee.

There have also been some advancements for the private sector, as Lersha has begun to expand into input aggregation, but this is currently limited to aggregation to negotiate improved rates, rather than for access or quality control.

### Ecosystem assessment – Areas to strengthen

Though progress has been made in supply chain management, advancements are relatively recent, and therefore will require strengthening and scaling to create a robust supply chain. Furthermore, physical infrastructure will need to be strengthened to improve distribution and

logistics so that farmers and pastoralists can reap the benefits of successful digital solutions.

**Input tracing:** The EDITS will require rapid scaling as input on-selling and tampering has been identified as a key pain point for farmers. The pilot launched in 2024 for fertilizer, but should be quickly scaled across regions and inputs such as agrochemicals based on lessons learned.

**Livestock tracing:** The ECX[43] traceability solution integration is applicable to specific outputs within the exchange, but traceability solutions are needed for a broader range of products, including increasingly for livestock for export markets. This will need a much-improved livestock database; the aLIVE[44] livestock roadmap makes specific recommendations for this, and should serve as guidance for the development of livestock traceability solutions.

**Infrastructure:** Transportation and distribution are key to supply chain management, and therefore, a reliable physical network is necessary for supply chain success. Currently, only 22% of rural households in Ethiopia are less than 2km from a road, creating challenges in access to services.[45] These challenges could be addressed by a thorough road assessment in partnership with the Ministry of Transport and Logistics and aligned to the World Bank funded Road Connectivity and Access Program (RCAP), with improved roads developed in strategic routes for optimum rural distribution. Furthermore, limited port and warehouse handling capacity is currently creating distribution delays, and so alternative options or optimized shipping should be explored to increase port and warehouse efficiency, including better utilization of cooperatives as distribution hubs.

**Regulation:** Quality, health and safety data is tracked via bar codes for inputs, but there are challenges today in capacity for regulation and enforcement that limit effectiveness of these measures. As tracking and tracing improves through digital solutions, capacity building will be needed to ensure inputs can be suitably regulated through digital mechanisms and procedures for enforcement of regulatory standards are clear and consistent across regions.

[43] Ethiopian Commodity Exchange
[44] A Livestock Information Vision Ethiopia
[45] RAI World Bank (2019)

**Table 8: Select Ongoing Supply Chain Management Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| Lersha | Input aggregation | • Focus on improving the agriculture value chain through aggregation of inputs for farmers |
| Ethiopian Commodities Exchange (ECX) | Electronic Agriculture Transformation Traceability System (eATTS) | • Collaboration between Ethiopia Commodity Exchange (ECX) and IBM<br>• Launched as a pilot in 2015<br>• Objective is to benefit over 5,000,000 smallholder farmers producing various commodities traded at the ECX<br>• Initially focused on the coffee sector to enhance the export of high-quality Ethiopian coffee and improve market access for specialty coffee.<br>• Supported by IBM and Frequenz IRIS technology, allowing for electronic tracking of bags<br>• Linked to over 2,500 geo-referenced washing, hulling, and cleaning stations across various regions in Ethiopia |
| World Bank, Ministry of Finance, Ministry of Urban and Infrastructure | Ethiopia Rural Connectivity to Support Food Security Project | • The main objective of this program is to interconnect rural communities and isolated areas during all weather conditions<br>• The program is expected to run from March 2024 to May 2029<br>• The project involves construction of roads and upgrading current roads to make them climate resilient along with construction of pedestrian and drainage structures |

## Phase One priority use cases

### 1. Track and trace inputs

This use case aims to ensure the efficient transportation of inputs from the country's point of entry, through various farmer unions and federations, and ultimately to the farmers in their respective kebeles. It also focuses on maintaining traceability and visibility for the farmer throughout the entire process. The input supply chain currently faces challenges such as looting, reallocation of over and under stocked inventory and trade of illicit inputs which this use case aims to solve for by leveraging technologies such as QR codes and NFC[46] tags all linked to the profile of the farmer to whom the inputs have been allocated. This use case is currently being implemented and scaled by ATI under the Ethiopia Digital Input Tracking System (EDITS) projects.

#### Key activities for implementation

- Assess software requirement and create ToRs for hiring software development firms.

[46] Near-Field Communication

- Carry out data collection and validation of initial requirements through visits to key locations such as the Djibouti port, warehouse, and local unions.
- Create a detailed budget and implementation plan for scaling beyond the in-progress pilot, ensuring alignment with other MoA programs such as the e-voucher system.
- Integrate the input tracking system with the e-voucher system, and update as relevant pending developments in digital payment systems and the National Rural Land Administration Information Service (NRLAIS), ensuring smooth implementation.

**Table 9: Dependencies to fully scale Track and Trace Inputs Use Case**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Farmer profiles and unique ID | Data & Content | Ensures accurate identification and that inputs reach the intended farmers efficiently |
| Input warehouses and distribution hubs | Physical Infrastructure | Provides centralized locations for storing and distributing inputs, facilitating efficient logistics, inventory management, and timely delivery to farmers |
| Digital kiosks for farmers and DAs | Digital Infrastructure | Offers accessible points for farmers to access real-time information, submit requests, and receive updates, enhancing transparency |
| Device access for extension workers | Digital Infrastructure | Ensures that extension workers have the necessary tools to collect data, monitor input distribution, and provide support to farmer |

### 5.5.3 Financial Services

#### Solution area objective

*Universal access to financial services that improve input & machinery access, insure crops and make payments more efficient*

#### Solution area description and use cases

This solution area focuses on increasing access to financial services such as credit, financing, and insurance by leveraging e–vouchers, mobile payments and digital banking and insurance solutions. Five use cases have been identified in this solution area with two prioritized for Phase 1 of the roadmap. The table below shows the phasing, descriptions, and the target end users of each use case.

**Table 10: Financial Services Use Cases**

| | Use case | End user | Description |
|---|---|---|---|
| **Phase 1** (prioritized) | Access credit | Farmers & pastoralists | Enhance farmer and pastoralists access to loans by providing necessary data inputs for credit assessments, scaling the e-voucher for input credit, and supporting bundled access to credit for agriculture inputs, land or projects |
| | Access to insurance | Farmers & pastoralists | Enable subscription to different insurance packages, undergo value assessments, pay premiums individually or in groups, and receive timely compensation after an insurance event, by providing necessary data inputs and aligning and partnering with insurers and reinsurers |
| **Phase 2** | Lease or purchase machinery | Farmers & pastoralists | Support the establishment and spread of digital tools that provide access to credit services, deposit schemes, as well as leasing platforms that enable farmers to more easily access machinery |
| | Access investment | Farmers & pastoralists; Investors | Provide an enabling environment and agriculture-specific channel (e.g., a digital platform) for investors, donors and NGOs to fund agriculture projects by channeling funds directly to implementing partners on specific projects |
| | Access to mobile banking and mobile money | Farmers & pastoralists | Support the expansion of mobile money and banking applications to farmers and pastoralist and co-develop use cases with fintechs and banks, thus enabling them to make payments for inputs and receive payments for outputs quickly and cheaply |

**Ecosystem assessment – Improvements**

In the past 5 years, the Ethiopian ecosystem has made significant progress in terms of digital financial services, particularly in user-facing digital financial services. For example, Telebirr launched in 2021 and has rapidly scaled to reach 40 million users (55% of adult population) and disbursed 9 billion ETB in digital credit. Telebirr has been joined by Safaricom's M-Pesa, which launched in Ethiopia in 2023 and is still scaling. Digital banking services have also grown with many Ethiopian banks launching their own digital banking apps such as Michu by the Cooperative Bank of Oromia and Apollo by Abyssinia Bank. Lersha has also recently developed a personalized 'expert scoring'[47] system to assess the potential creditworthiness of farmers and provide input loans to them.

Integration and interoperability of these payments systems are also developing, with private sector fintech startups such as Chapa and Afripay offering services such as payment gateways, payment APIs to allow for interoperability, and point of sale (POS) services. Mobile money services such as TeleBirr are also expanding their applications and services and integrating with services such as Deliver Addis, a food delivery app.

**Ecosystem assessment - Areas to Strengthen**

Despite progress in digital financial applications, much work needs to be done if largely rural farmers and pastoralists are to benefit from digital financial services.

Mobile banking: Mobile banking services still have low penetration in rural areas and with farmers and pastoralists due to low digital and financial literacy, lack of proper identification, unaffordable data plans and smart phone devices, as well as poor 4G connectivity in rural areas. Digitally equipped Development Agents (DAs) or Digital Kiosks at FTCs or one stop shops offer potential as a work around for expensive data and phones, but they still must overcome digital literacy, financial literacy, and connectivity challenges. Successful rollout and expansion of the Ethiopian National Digital ID Program (Fayda) should address identification issues that have kept farmers unbanked.

Financial and transaction data: Moreover, limited financial data (e.g., historical transaction data) and credit history for farmers and pastoralists hinders the ability of lending institutions to assess credit worthiness and provide financing. Limited transaction data is compounded by low quality or insufficient data on the farmer itself (e.g., farmer profile) such as production history, land data, average crop yield, etc. A farmer profile with accurate and comprehensive data on a farmer's production activities would greatly enable access to finance and insurance. A pilot for a farmer profile is underway as of 2024, but should be rapidly scaled.

Agriculture-specific services: Data availability challenges are compounded by traditional finance institutions often having limited experience and expertise in providing loans to the agriculture sector. This challenge could be addressed by embedding more agronomists within banks to assess risks in the agriculture sector or by creating an agriculture development bank with a clear mandate to support the sector's development.

[47] Called an Expert score because data required for a traditional credit score (e.g., transaction history) is not available and instead 19 available data points are used as a proxy for credit worthiness

Input access: Separate from access to financing, a small domestic manufacturing base for farm equipment (e.g., tractors) and inputs, combined with an unfavorable macroeconomic environment that limits the availability of foreign currency for imports, is a major challenge. This hinders availability and access to machinery and farm inputs (e.g., fertilizer) within the country.

**Table 11: Select Ongoing Financial Services Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| MoA & JICA | Indexed-based Crop Insurance Promotion (ICIP) | • Launched in 2019 with the objective to expand access to insurance among farmers in Ethiopia<br>• As of 2023, the project has increased digital financial literacy among over 57,000 smallholders with approximately 10,000 farmers purchasing insurance schemes and more that 2,500 receiving payouts<br>• Proposed and organized the Dialogue Platform Meeting for Supporting Agricultural Insurance in Ethiopia, in partnership with the MoA and WFP, to discuss policies and coordinate efforts |
| Hello Erf & Hello tactor | Machinery Leasing Platforms | • Hello Erf is an Ethiopian agritech solution enhancing smallholder farmers' productivity by connecting them with mechanization service providers through a central call center, ensuring access for all, and providing real-time tracking and order aggregation<br>• Hello Tractor, is a Kenya-based agritech startup that recently entered the Ethiopian market and is expanding its operations |
| ATI | Credit for Inputs Digital E-voucher System | • E-voucher System was developed by ATI and the MoA to help smallholder farmers access credit for inputs, transitioning from paper to electronic format to streamline processes, reduce errors, and save costs.<br>• The system collaborates with local microfinance institutions and rural savings and credit cooperatives<br>• Vouchers can be redeemed at nearby cooperative stores |

## Phase One priority use cases

### 1. Access to credit

This use case aims to enhance farmers' and pastoralists' access to loans by providing and analyzing the necessary data for credit assessments. The results of these assessments will be shared with banks and microfinance institutions to determine the appropriate loan amounts and interest rates. Additionally, it involves providing inputs to farmers on credit, which can be repaid after harvest through systems such as the e-voucher system.

In addition to collaboration with MINT and INSA for digital, data, and cybersecurity expertise and regulatory alignment, this use case will require close collaboration between MoA, the National Bank of Ethiopia, commercial banks, microfinance institutions, local fintechs, and mobile money providers to support the delivery of credit and loans to farmers and pastoralists. Lersha is also an

ecosystem partner to engage as they recently developed their own 'expert scoring system' in collaboration with JICA. Lessons learned from Lersha's experience could potentially be leveraged for this use case.

### Key activities for Implementation

- Build partnerships with commercial banks and microfinance institutions to gather input and collaborate on developing usable credit scoring algorithms to help de-risk lending to farmers.
- Create credit scoring algorithms by enhancing data on farmers and piloting the algorithm with the digital e-vouchers or select bank and microfinance institutions.
- Ensure back-end compatibility of the credit scoring algorithm through APIs with private sector players such as Lersha.
- Refine and scale the use case, embedding other features such as insurance functionality and optionality.

**Table 12: Dependencies to fully scale Access to Credit Use Case**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Digitized payments through rural service points and other channels | User facing layer | Ensures secure and efficient disbursement and repayment of loans, facilitating financial transactions for farmers and reducing the risks associated with cash handling |
| Data stack with APIs | Integration layer | Enables seamless integration and exchange of data between various systems, providing a comprehensive view of farmers' financial and agricultural activities necessary for accurate credit assessment |
| Transaction data | Data layer | Provides essential insights into farmers' financial behavior and transaction history, helping to evaluate creditworthiness and tailor loan products to individual needs |
| Data governance and sharing policy and guidelines | Government and policy | Ensures that data is managed securely and shared responsibly, protecting farmers' privacy and maintaining data integrity |

## 2. Access Insurance

The objective of this use case is to increase the accessibility of insurance products to farmers and pastoralists by enabling them to subscribe to different insurance packages, undergo value assessments, pay premiums individually or in groups, and receive timely compensation after an insured event. MoA will achieve this by improving the quality and availability of key data points (e.g., historical production data) through scaling the farmer profile initiative and working with the National Meteorology Agency (NMA) to improve weather data for risk assessments. Partnerships and policy and technical support for insurers and reinsurers to reach farmers are also important for the implementation of this use case.

The success of this use case will depend on close collaboration across the Ethiopian ecosystem, potentially including local insurance companies, microfinance institutions, and mobile money operators.

### Key Activities for Implementation

- Build partnerships with reinsurers and microfinance institutions to understand requirements for offering (re)insurance
- Create risk assessments and identify premium amounts by working with research centers and weather forecasters, and by building advanced analytics on this data
- Pilot the use case bundles with existing credit facilities such as the input voucher system covering losses due to adverse weather conditions, pest, and disease attacks to enable farmers and pastoralists pay off loans and have income in the case of poor yields
- Digitize payouts and approvals through partnerships with mobile network operators, banks, and fintechs offering mobile money and by using AI-powered digital claim assessment tools

**Table 13: Dependencies to fully scale Access to Insurance Use Case**

| Use Case Dependencies | Rationale | Ecosystem sub-component |
|---|---|---|
| Access credit | Use Case | Use Case potentially bundled with credit applications and the same data sets to assess credit risk (e.g., land, production, etc.) are important for insurance products. |
| Digitalized payments through rural service points and other channels | User facing layer | Ensures secure and efficient farmer compensation payment of principle, and reduces the risks associated with cash handling |
| Data stack with APIs | Integration layer | Enables validation of farmer information such as land and crop data and can also be used to register insurance products and validate receipt of insurance payouts |
| Weather and production data | Data Layer | Critical for accessing climate risk while pricing different products and triggering payouts due to adverse weather events |
| Data governance and sharing policy and guidelines | Government and policy | Ensures that data is managed securely and shared responsibly, protecting farmers' privacy and maintaining data integrity |

### 5.5.4 Pricing and Market Services

#### Solution area objectives

*Transparent and timely pricing and reliable market linkage with quality assurance measures*

#### Solution areas description and use cases

Use cases in this solution area focus on providing farmers access to live pricing as well as other important pieces of market information such as price forecasting and expected demand. They also focus on matching supply of agricultural output to demand. This solution area has five use cases, one of which has been identified as priority for Phase One of the roadmap. The table below shows the phasing, target end users, and descriptions for each use case.

**Table 14: Pricing and Market Services Use Cases**

| | Use case | End user | Description |
|---|---|---|---|
| **Phase 1** | Access better markets and buyers | Farmers & pastoralists | Link farmers with markets via digital platforms domestically and abroad to reduce middlemen and maximize sales volume and revenues, thus increasing farmer income |
| **Phase 2** | Manage farm business activities | Farmers & pastoralists | Support farmers' business operations by enabling or providing digital solutions in bookkeeping, inventory, and farm resource management to improve accuracy and reduce costs |
| | Understand up-to-date transparent pricing for products | Farmers & pastoralists | Support farmers' crop and livestock planning and selling decisions by providing improved access to live and predictive pricing for a broad range of crops and livestock |
| | Assure quality of outputs | Farmers & pastoralists, off-takers | Provide farmers standardized digital quality certifications for their produce, serving as verifiable proof of quality of output during interactions with buyers |
| | Sort and grade output | Farmers & pastoralists | Support farmers to get a measure of the quality of their output both in general and in relation to the overall harvest of that particular season, to enable targeted market linkage and advisory |

#### Ecosystem assessment – Improvements

In the past 5 years, advancements especially through the Ethiopian Commodity Exchange (ECX) and the National Market Information Service (NMIS) have progressed the digitalization of pricing and market services. The ECX is the first Sub-Saharan African electronic commodity exchange and has integrated data orchestration tools as well as a secure payment system. There is also a predictive analytics element for ECX quality control, that has improved output quality.

The NMIS platform has grown from 2 commodities to 19 and from 31 markets to 311 since 2019, with 1.2m callers for up-to-date pricing. The National Livestock Market Information Service (NLMIS) was also launched in 2019 and now covers 56 market centers up from 47.[48] Both platforms use mobile push services with daily market information via text message or interactive voice response (IVR).

### Ecosystem assessments – Areas to strengthen

Despite progress in digital pricing and marketing applications, there is still opportunity to better connect farmers, pastoralists and markets, as well as to optimize pricing and value addition.

**Scope:** Despite clear progress for the ECX, NMIS and NLMIS, the geographical and commodity reach is still limited, meaning few farmers are able to benefit from timely, location specific pricing for their chosen crop. Supporting initiatives to scale the NMIS is recommended, as this existing channel is already used by farmers due to the optionality of low-technology interfaces such as voice call.

**Forecasting:** While analytics on the Ethiopian Commodities Exchange have advanced in recent years, there is still limited use of advanced price forecasting, especially to support farmer decision making for crop scheduling or livestock rearing cycles. Predictive price forecasting can also help farmers make improved market decisions; by understanding likely pricing in different markets, farmers can optimize and limit the involvement of middlemen.

**Price data:** All price information currently comes from Development Agents (DAs) and government NMIS agents, meaning that price submission processes are relatively manual and a wealth of price data from the private sector is lacking. Improved access to devices and subsidized data packages for DAs would improve the efficiency of DA interaction with the NMIS and NLMIS platforms. To increase the amount of data on pricing from the private sector, incentivization and robust safety and consent mechanisms will be required. A business case for private enterprises that highlights the financial benefits of removing middlemen through increased price visibility could overcome the challenge of limited data sharing, while consent tools in the data stack can reassure data providers that their information is being securely shared with the correct stakeholders.

**E-commerce:** A private sector led e-commerce platform is missing for marketing of commodities. An e-commerce data proclamation is in the process of ratification by MinT, which may go some way to encouraging the development of an agriculture-specific platform. Furthermore, the proposed data stack with APIs will create an ecosystem that will allow for private sector actors to build and engage with e-commerce platforms, by improving data access and software functionality. This should be prioritized to facilitate an efficient market with clear pricing and market visibility.

[48] NMIS and NLMIS materials (2024)

**Table 15: Select Ongoing Pricing and Market Services Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| ATI & Ministry of Trade and Industry | National Market Information System (NMIS) | • Launched in 2019, the system gathers, processes, and disseminates timely and accurate market information on agricultural commodities such as wheat, maize, tef, sesame, and haricot beans<br>• Intended to assist smallholder farmers and other market actors in making informed market decisions, including where and when to buy or sell commodities<br>• The information is disseminated through various channels including a 6077 hotline, email subscriptions, website, and radio broadcasts |
| ATI & Ministry of Trade and Industry | National Livestock Market Information System (NLMIS) | • Launched to address the lack of market information, improve access to market data across 47 monitored livestock markets, and enhance market linkages for domestic and export opportunities<br>• Price and volume data is collected via SMS-enabled cell phones and a data coding system, making information accessible through SMS queries and an internet portal<br>• System benefits include linking producers with traders, reducing broker influence, and enhancing market transparency |
| MinT | Electronic Transaction Proclamation | • This proclamation was adopted in 2020 and partially regulates e-commerce in Ethiopia<br>• It clearly defines e-commerce operators, e-commerce platform operators and e-commerce intra platform operators and jointly classifies them as e-commerce service providers<br>• It also legally differentiates between the middle men and actual product and service providers on e-commerce platforms |

## Phase One priority use cases

### 1. Access better markets & buyers

This use case aims link farmers to off-takers, both locally and internationally, who can purchase their output at fair prices. The main objective is to transition from an informal, middleman-dominated market to a more regulated aggregator market, ensuring that most of the value flows to the farmers through transparent pricing. This is achievable through collaborations and partnerships with various output off-takers, farmer unions, and across government with involvement from various ministries.

**Key activities for implementation**

- Carry out a comprehensive demand-side stakeholder mapping, both locally and internationally, to understand current and potential Ethiopian output off-takers, and categorize them in terms of interest.
- Engage high-interest off-takers to understand their priorities, build business relations, and co-create the use case with them to ensure alignment with needs.
- Design and implement awareness and socialization campaigns for farmers on the benefit of clustering in cooperatives and unions and develop incentives to drive formation and participation of unions and cooperatives.
- Develop transparent price discovery mechanisms for agriculture output based on demand & supply or transparent auctioning through farmer unions and cooperatives.
- Leverage cooperatives and unions as well as digital technologies such as NMIS and 8028 to disseminate up-to-date and predictive pricing information to farmers.
- Collaborate with logistics providers to ensure smooth transportation of output from the farmer clusters where output is aggregated to the buyers.

**Table 16: Dependencies to fully scale Access Better Markets and Buyers Use Case**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Digitized payments through rural service points and other channels | User facing layer | Critical to ensure farmers and pastoralists receive payment for the sale of their output to different off-takers |
| Price data | Data and content | Critical for farmers and pastoralist to make informed decisions on which crops to plant or which livestock to rare based on the potential income their output could fetch |
| Incentivized cooperative and union aggregation and value addition | Agricultural markets | Enables farmers to have one voice and stronger bargaining power when negotiating with potential buyers, also easing aggregation of output for off-takers |

### 5.5.5 Smart Farming

#### Solution area objective

*On-farm tools to maximize production, productivity, and natural resource management.*

#### Solution area description and use cases

Use cases in this solution area focus on developing precision, on-farm technology to enhance production, including management, tracking, and varietal development. This solution area has four use cases, all of which will be targeted in Phase Two of the roadmap. The table below shows the phasing, descriptions, and the target end users of each use case.

**Table 17: Smart Farming Use Cases**

| | Use case | End user | Description |
|---|---|---|---|
| **Phase 2** | Improve crop varieties | Researchers | Support researchers in improving data quality and interoperability to help develop advanced crop varieties for farmers, and introduce digital tools such as digital testing, predictive analytics, and genome sequencing |
| | Use and maintain farm machinery | Farmers | Support farmers in accessing machinery and enable the development of digital tools sch as IoT to ensure timely and effective maintenance |
| | Irrigate crops | Farmers | Provide access to data and an enabling environment that will support the development of tools to improve irrigation efficiency and accuracy, reducing water consumption |
| | Dispose of and manage farm waste | Farmers & pastoralists | Ensure safe and cost-effective management of waste, including using waste in other industries |

#### Ecosystem assessment – Improvements

Progress in smart farming has remained relatively stagnant over the last five years, but there have been some improvements to highlight. For example, a CIAT pilot launched in 2021 is working on irrigation with some digital functionality.[49] Another example is Hello Tractor which has developed elements of machinery maintenance and use into their offerings, such as the internet of things (IoT) in Hello Tractor vehicles which alerts users to predictive maintenance requirements.

Furthermore, some improvements have been made in data that could be relevant to on-the-farm decisions, such as the Ethiopian Digital AgroClimate Advisory Platform (EDACAP), CIAT's Clim-ARM[50] project and the Supporting Soil Health Initiative that were highlighted in section 5.1.1. This data could be packaged to better support

[49] Small-scale irrigation with youth by Alliance Bioversity and CIAT

[50] Climate Analytics into Agricultural Risk Management

farmers in their activities, especially for crop planning.

### Ecosystem assessment – Areas to strengthen

In the past 5 years, there has been limited progress in smart farming use cases. High cost barriers of on-the-farm digital solutions and low mobile internet penetration, especially in rural areas, have hindered progress. Furthermore, as in agricultural intelligence, the lack of quality data is preventing relevant insights from being developed and ultimately translated into actionable solutions. Therefore, three areas will need to be strengthened for success in smart farming use cases.

**Mobile data access:** There is low mobile internet penetration in rural areas and with farmers and pastoralists due to low digital and financial literacy, unaffordable data plans and smart phone devices, and poor 4G connectivity. This means many on-farm digital solutions such as smart irrigation, are inaccessible to farmers. Digitally equipped Development Agents (DAs) or Digital Kiosks at FTCs[51] or one stop shops offer potential as a work around for expensive data and phones, but they still must overcome digital literacy, financial literacy, and connectivity challenges. Awareness campaigns around the financial benefits of smart farming solutions may also incentivize farmers to invest in both device and internet access, but also their own digital literacy training.

**User facing solutions:** Currently, any insights produced from agricultural data remain at the governmental level, or are highly local and communicated in person, from DA to farmer. This means that farmers and pastoralists do not have a full suite of information at their disposal to make decisions on what is best for their farm. Once mobile data access increases, and there is a clear market, enterprises should be encouraged to produce digital solutions for farmers through incentives such as tax breaks, as well as access to quality agriculture data through the data stack ecosystem.

**Machinery access:** A small domestic manufacturing base for farm equipment (e.g., tractors or irrigation equipment), combined with an unfavorable macroeconomic environment that limits the availability of foreign currency for imports, is a major challenge. This hinders availability and access to machinery within the country and means machinery rental or purchase is too expensive for many smallholder farmers. A thorough assessment of the machinery value chain can identify potential interventions to improve access and affordability.

[51] Farmer Training Centre

**Table 18: Select Ongoing Smart Farming Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| CIAT | Small scale irrigation farming | • This was piloted in Angolela Kebele and engaged 12 youth in small-scale irrigation farming, utilizing existing water harvesting ponds to cultivate crops such as beans, potatoes, onions, and carrots, generating significant income and providing employment<br>• Following the successful pilot, plans are in place to scale up the scheme to other areas within the region, map and analyze existing small-scale irrigation schemes, and develop optimal irrigation practices to enhance food and nutrition security for smallholder farmers |
| Hello Tractor | Pay on demand mechanization | • Hello Tractor matches demand for mechanization in a woreda to tractor operators through their network of agents<br>• This enables farmers to pay for mechanization as a group as and when they require the service as opposed to each farmer owning a tractor<br>• Hello Tractor leverages IoT technology to deliver predictive maintenance alerts to its clients, ensuring timely servicing and optimal performance of their farm equipment |

### 5.5.6 Extension and Advisory

#### Solution area objective

*Timely, demand based, customized extension & advisory services*

#### Solution area description and use cases

The ambition to digitalize extension and advisory services was addressed extensively in Ethiopia's Digital Agriculture Extension and Advisory Services (DAEAS) roadmap. The DAEAS roadmap and its initiatives have been fully integrated into DAR as described in section 5.2. In this section, the roadmap just provides an updated overview of the ecosystem assessment for extension and advisory services within Ethiopia.

#### Ecosystem assessment – Improvements

Although extension and advisory is still predominantly in-person, through a network of ca. 50,000 - 60,000 government Development Agents, there has been progress towards digital initiatives. The ATI 8028 hotline, which operates through both Interactive Voice Response (IVR) and Short Message Service (SMS), reaches 6 million farmers annually with its free extension and advisory services. Digital Green is also piloting an AI-enabled extension chatbot called FarmerChat, which provides personalized, real-time advisory.

#### Ecosystem assessment - Areas to Strengthen

Despite progress in extension, and the momentum created by the DAEAS Roadmap, there is still opportunity to better connect farmers and pastoralists to improved extension and advisory services.

**Pluralistic extension:** The engagement of domestic private enterprises is still nascent with a limited number operating extension services for farmers. Moreover, regulatory challenges are preventing market entry for international private sector companies, with the average time to register and establish a DAEAS business reported to be around a year.[52]

**Device and data costs:** The ability to access the internet is currently too expensive for many in the country, with data costing 5% of the GNI per capita in Ethiopia vs 3% for LMICs[53] and a smartphone costing 96% GNI per capita vs 34% in Kenya.[54] These prices mean many of rural farmers and pastoralists are unable to afford internet access, and thus do not have the ability to access many of the recommended digital services.

**Data:** The lack of accessible and interoperable data across the ecosystem is currently preventing the development of more targeted, automated and personalized advisory. There are major gaps in key foundational data sets, such as the farmer profile (which would allow for personalization), and crop sewn data. Existing data sets are hard to use due to the lack of consistent standards and limited accessibility, especially for the private sector. Data sharing also remains a critical challenge due to limited incentives and regulatory framework.

[52] DAEAS stakeholder interviews
[53] Lower Middle-Income Country; ITU price baskets data (2022)
[54] Alliance for Affordable Internet (2021)

## Select ongoing initiatives

**Table 19 Select Ongoing Extension and Advisory Services Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| Digital Green | Video based extension and advisory | • Digital Green has developed a video-based extension advisory service that organizes farmer groups to watch a pre-recorded video on agricultural best practices and discuss and learn through a facilitator |
| Farm Radio International | Radio-based extension advisory | • Farm Radio uses radio to share information with farmers, amplify their voices, and support positive changes<br>• The organization collaborates with development partners and local radio stations to develop content tailored for farmers and broadcast useful farming-related programs to farming communities |
| Sasakawa Africa Association (SAA) | Talking Book audiovisual - based extension service | • SAA uses an audio-enabled device, known as Talking Book, to enable SHFs to listen to prepared audio messages on improved agricultural technologies<br>• In addition, they provide video-based training to farmers using the Digital Classroom System (DCS) on improved agricultural practices along the value chain<br>• The DCS can be interfaced with Digital Green's video-based extension advisory service |

## 5.6 DIGITAL STACK

The digital stack refers to the layered structure of technology components that enable digital agricultural solutions. This includes key data sets, analytical solutions and features to enhance data integration and interoperability. The stack ensures solutions are interoperable, scalable, and adaptable to technological changes and farmer needs.

The digital stack has four layers or sub-components:

- **The user facing layer** - Interface between the digital solution and its end-users
- **The integration layer** - Middleware that facilitates the smooth flow and integration of data across different systems and services
- **The analytics layer** - Core component that manages and processes data, ensures integrity and accessibility and develops insights
- **The data and content layer** – Information and data sets required to enable digital agriculture use cases e.g., crop information, weather data, market trends, and educational resources

The phasing of digital stack initiatives for the roadmap involved a two-step process. First, a long list of initiatives relevant for Ethiopia was developed using inputs from the national convening, stakeholder interviews, and the DAEAS roadmap, resulting in a list of 13 digital stack initiatives. These initiatives were then prioritized based on the Ministry of Agriculture's implementation feasibility, alignment with relevant Ethiopian strategy and policy documents, and stakeholder priorities resulting in two priority Phase One initiatives. More details on the prioritization methodology and results can be found in section 8.4.2 Enabling Initiatives Prioritization within the appendix of this roadmap.

Additionally, an assessment of the ecosystem's improvements and areas to strengthen have been left out the Digital Stack analysis, as these topics have been addressed extensively in section 5.5 Solution areas and use cases.

### 5.6.1 User facing layer

#### Layer objective

*Interfaces designed to empower use of digital tools*

#### Layer description and enabling initiatives

The user-facing layer consists of initiatives that help end users interact with digital solutions. This includes the required capabilities to develop user facing tools and visualisations, payment mechanisms that enable users to engage with digital financial services, and delivery channels for use cases and solutions. The table below shows the phasing, and descriptions of each initiative.

**Table 20: User Facing Layer Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 2** | Software development curriculum to build capability for user-facing layer | Develop curriculum for schools, universities, and vocational education to increase capacity and capability of agriculture software developers in Ethiopia |
| | Digitalized payments through rural service points and other channels | Enable payments digitally through partnering with payment tools from Telcos and banks to catalyze uptake of digital payment in agriculture by supporting farmer service points such as merchant cooperatives, coops and village kiosks |
| | Decision-making dashboard for MoA | Build an interactive digital platform that aggregates and visualizes critical agricultural data such as farmer data, crop data, weather patterns, market prices, land data as well as resource allocation to provide real-time insights and analytics to support informed decision-making and streamline operations |

#### Select ongoing initiatives

**Table 21: Select Ongoing User Facing Layer Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| MoA, ATI, EIAR, EthioTel | 8028 hotline | • An innovative agricultural extension service launched by ATI in collaboration with the MoA, EIAR, Ethio Telecom<br>• This service provides smallholder farmers with agronomic advice and information through an Interactive Voice Response (IVR) and Short Message Service (SMS) system<br>• Available for free, it offers information on various crops and farming activities in regional languages<br>• The hotline's two-way functionality allows farmers to receive real-time advice and customized content based on their specific needs |

| Organization | Initiative | Description |
|---|---|---|
| Digital Green | Farmer. CHAT - AI powered chatbot for extension and advisory | • This AI-powered chatbot acts as a content retrieval and delivery mechanism, providing customized content and addressing location-specific issues<br>• The platform includes a protocol for secure data sharing, allowing continuous improvement of localized advisory services<br>• External data sources such as research, weather, and soil databases are dynamically updated to provide the most current information |
| Telebirr | Mobile payments and digital financial ecosystem | • EthioTelecom's Telebirr is a mobile money wallet and ecosystem of financial services<br>• The app has a user-friendly interface for digital payments and products<br>• The app launched in 2021 and has rapidly scaled to reach 40 million users (55% of adult population) and disbursed 9 billion ETB in digital credit |

## 5.6.2 Integration layer

### Layer objective

*Interoperable, obtainable data sets supported by analytics to increase insight extraction*

### Layer description and enabling initiatives

This layer consists of initiatives created to facilitate the smooth flow, integration, interoperability, and access of data across different systems and services. DAR contains two initiatives within the integration layer, one of which is prioritized for Phase One of the roadmap. The table below shows the phasing and descriptions of each of these two initiatives.

**Table 22: Integration Layer Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 1** | Data stack with APIs | Create a digital ecosystem for facilitating the delivery of digital services to farmers, including APIs, consent, and data standards |
| **Phase 2** | Digital Agriculture Forum to promote interoperability | Establish and govern a platform designed to facilitate the seamless integration and compatibility of various digital agriculture tools and systems, bringing together stakeholders from across the ecosystem to share knowledge, establish common standards, and foster cooperation |

### Select ongoing initiatives

**Table 23: Select Ongoing Integration Layer Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| MoA Ag Datahub | | • The datahub collates and stores 570+ data sets and will allow for visualization, exploration, analytics, and querying of the data<br>• The Hub has built APIs which can be made fully accessible pending policy decisions<br>• Data standardization has been developed for some data and is being expanded to other datasets as part of the development process with key stakeholders |
| Digital Green | FarmStack | • FarmStack powers the secure transfer of data through an open-source protocol<br>• Enables organizations to exchange data securely, informing tailored solutions for farmers and reducing costs<br>• Ensures that personal identifiable data and proprietary information are protected, giving organizations and farmers confidence in data handling<br>• Allows farmers to consent to data use, ensuring their data is used only for permitted purposes and not shared without their knowledge |

| Organization | Initiative | Description |
|---|---|---|
| | | • This initiative is still nascent in Ethiopia |
| NRDS[55] Management Information Systems Data Lake | | • Links 13 different systems by standardizing data and building interoperability between the different natural resource data sets<br>• The data lake will eventually be integrated with the Agri Data Hub |

## Phase One priority initiatives

### 1. Data stack with APIs

This initiative aims to develop a digital public infrastructure (DPI) asset for the agriculture sector in Ethiopia to facilitate the delivery of digital services to farmers. The initiative proposes to build an integration software that will pull from the wealth of datasets currently in the country, leveraging the work already done to build the Ag Datahub. The stack will be built on open standards that will support the standardization of these data sets and make the data and insights extracted from the datasets accessible to the entire ecosystem through open APIs. The objective of this initiative is to enable stakeholders across the ecosystem to safely share, access and analyze data to produce better insights, innovations and solutions for farmers and pastoralists.

#### Key activities for implementation

Implementation will be completed in four phases, modelled on the Government of Odisha's phased approach to their GO-SUGAM data stack:

- Phase 1: Systems
  - Ensure 13 systems are integrated in Ag Datahub
  - Build additional back-end infrastructure required (inc. reviews and processes)
- Phase 2: Develop ecosystem
  - Integrate private sector via a single accessible API & platform
  - Get feedback from the private sector and refine
- Phase 3: Create consent mechanisms
  - Develop robust consent mechanisms for data sharing
- Phase 4: Scale insights
  - Build a decision-making center leveraging the procure & distribute inputs use case
  - Create data flows to develop more use case insights

[55] National Resource Development Sector

**Table 24: Dependencies to fully scale the Data Stack with APIs Enabling Initiative**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Farmer profiles and unique ID | Data and content | Critical foundational dataset to form the data stack to link data to specific farmers to services and extension personalization |
| Land & farmer-linked production data | Data and content | Critical foundational piece of data to form the data stack (land use, crop sown and crop produced all required for majority of use cases) |
| Decision making dashboard for MoA | User facing layer | Will form visualization of data stack insights |
| Dedicated analytics unit within MoA | Analytics layer | Will develop the insights from the data in the data stack |
| Data governance and sharing policy, standards, assurances, and incentives | Government and policy | Critical to boast interoperability of the different data sets being access through the datahub |
| Digital agriculture team | Human capital | Will require well-equipped personnel to build and run the data stack |
| Digital training platform | Human capital | Will train the entire ecosystem to use the data stack and adopt standards, and encourage adoption and data sharing |

**Data Stack with APIs deep-dive:**

The data stack with APIs business case has been designed to facilitate the five high priority use cases to begin, and to facilitate the entire digital agriculture ecosystem. The data stack will be a key piece of Digital Public Infrastructure (DPI), and will build on principles such as open standards and policies, iterative development, and interoperable data. It will leverage the work started by the Ag Datahub, and build more functionality to develop this platform into DPI.

A best practice data stack includes seven elements, as seen below in Table 25.

**Table 25: Data stack elements**

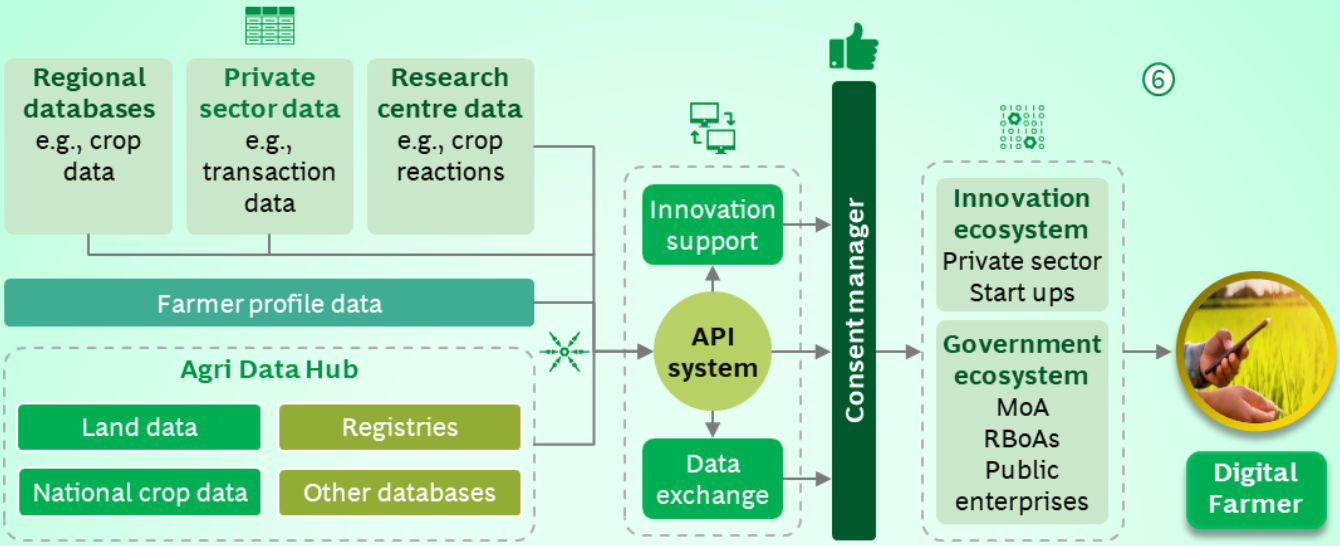
| Element | Description | Examples |
|---|---|---|
| Data sets | • Collection of data across topics<br>• Includes database management and storage | • Supporting Soil Health Initiative (SSHI) soil data<br>• NASA database |
| Accessible APIs | • System that allows different software applications to communicate, possibly via middleware | • Deliver Addis (integrates maps, directory, payment)<br>• Apple Store |
| Data standards | • Clear rules and models to better submit and share quality data consistently<br>• Accessible and replicable | • Common models for soil data collection in the SSHI<br>• XML or HTML |
| Data policy | • Documented, ratified agreements to better publish, access, share and use better quality data | • MinT's personal data policy<br>• GDPR |
| Privacy and consent | • Explicit methods to understand and agree to what data is being shared and with whom | • USSD technology with agreement<br>• Accepting cookies on websites |
| IT systems | • Servers, storage and analytics tools to enable data collation, management and use | • Agri Data Hub<br>• Amazon Web Services |
| Innovation support | • System with easy-to-use software, formal or informal feedback mechanisms and open data | • Telebirr (encourages innovative mobile banking solutions)<br>• Agri Stack India |

The Ethiopian agriculture data stack is nascent or developing in all of these areas except for data sets, as there is a wealth of agricultural data of varying quality in Ethiopia, and data policy, as policies such as the Personal Data Protection policy have recently been ratified by MinT. Despite the amount of data, three foundational data sets will need to be strengthened for the success of the data stack: land data, production and crop sown

data, and farmer data (as weather and soil data are relatively strong).

The data stack proposed will therefore develop each of these seven elements, building upon the Ag Datahub, to unlock multiple use cases and augment the entire agricultural ecosystem to provide benefits to farmers. The data stack will operate as shown in Figure 8

**Figure 8: Agricultural data stack flow**




The use case will unlock impact in every use case, as well as improve government decision making resulting in more effective services for farmers, increase data sharing due to safe authentication, lower costs and risks across services through improved data, and accelerate innovation.

### 5.6.3 Analytics layer

#### Layer objective

*Analysis from algorithms and data scientists that produces relevant, farmer-centric insights*

#### Layer description and enabling initiatives

This layer consists of initiatives focused on deriving actionable insights form agriculture data to support decision making processes of different ecosystem stakeholders such as government, input suppliers, off-takers and agribusinesses. This layer consists of two initiatives which will be implemented in Phase Two of the roadmap. The table below shows the descriptions of these two initiatives.

**Table 26: Analytics Layer Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase Two** | Input demand and supply analytics[56] | Develop capabilities to derive insights from input demand and supply data to inform decision-making on optimal quantities, varieties and blends of inputs to procure for specific farmers, and to determine the optimal pricing for these inputs |
| | Dedicated analytics unit within MoA | Create a team within MoA with the relevant skills to derive insights from agriculture data that will support the decision-making process for the sector |

#### Select ongoing initiatives

**Table 27: Select Ongoing Analytics Layer Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| CIAT | Clim-Arm | • Clim-ARM leverages scientific and technological advances to link actionable predictions about hazards with risk management strategies, addressing some of the risk in agricultural value chains |
| CIAT, CGIAR | Site sLpecific fertilizer recommendations | • This project leverages predictive analytics to develop site-specific fertilizer recommendation for wheat, maize, barley, and teff<br>• Implemented with support of the Supporting Soil Health Initiative |

[56] Limited capabilities for fertilizer will be developed as part of the implementation of the procure and distribute inputs business case. This imitative in phase 2 will focus on building off of the foundational capabilities developed through that use case.

### 5.6.4 Data and Content

#### Layer objective

*Reliable & extensively accessible data to enable use cases*

#### Layer description and enabling initiatives

The initiatives in this layer are focused on core data sets and registries that will provide the information required for use cases. This layer provides accurate, relevant, and timely data to support various applications and decision-making processes and 6 initiatives, two of which are priority for Phase One of the roadmap and four to be implemented in Phase Two of the roadmap. The table below shows the phasing of the initiatives as well as their respective descriptions:

**Table 28: Data and Content Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 1** | Farmer profiles and unique IDs | A database with information about individual farmers, such as their personal details, farming practices, and crop and livestock history with unique identifier for each farmer to ensure accurate tracking and personalized service delivery, facilitating targeted support and efficient management of agricultural programs |
| | Land & farmer-linked production data[57] | Data on historic crop and livestock production as well as a crop sown registry that connects specific parcels of land or livestock production to individual farmers and their agricultural activities |
| **Phase 2** | Transaction and warehousing data | Records of all transactions related to the purchase, sale, and storage of agricultural inputs and outputs with details on quantities, prices, dates, and parties involved, providing insights into supply chain efficiency, inventory levels, and market dynamics |
| | Weather data | Real-time, historical and forecasted information on weather conditions such as temperature, precipitation, humidity, and wind speed |
| | Soil data | Detailed information about soil properties, including composition, moisture levels, pH, nutrient content, and fertility essential for determining suitable crops, planning fertilizer strategies, and improving soil health management practices |
| | Price data | Market information on the current, historical and forecasted prices of agricultural inputs and outputs including prices at various stages of the supply chain, from farmgate to retail, and helps farmers and stakeholders make informed decisions about selling, buying, and investing in agricultural activities |

[57] Land and farmer production data was added to Phase 1 as it is closely linked with the farmer profile initiative and improving this data within the country is required for successful implementation of key use cases and initiatives (e.g., procure and distribute inputs, data stack with APIs). This initiative was not initially prioritized as a result of the DAR prioritization process described in detail in appendix section 0

### Select ongoing initiatives

**Table 29: Select Ongoing Data and Content Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| MoA | NSIS | • A comprehensive soil assessment initiative that has covered 748 woredas and 62 confluence points, and gathered hundreds of thousands of soil samples from the entire country to develop 22 different soil property maps and fertilizer recommendations for each region<br>• The dataset contains 70,000+ records of the Ethiopian soil property data |
| Prime Minister's Office | National ID Program Fayda | • The Ethiopian National ID program is being built off MOSIP's open-source identification platform<br>• The National ID will incorporate 3 agriculture facing features; a land administration system, enrollment to the rural productive safety net programs and farmer IDs |
| MoA | National Rural Land Administration Information System (NRLAIS) | • NRLAIS is working towards digitalization of formally paper-based land records<br>• The information system is built off international open -source standards such as the Land Administration Domain Model (LADM) |

## Phase One priority initiatives

### 1. Farmer profiles with unique IDs

This initiative aims to build a comprehensive database of farmer-specific information that will be tagged to a unique individual through a distinct farmer ID number. The farmer profile will track essential data such as the farmer's name, unique identification number, crops sown and produced, and livestock reared. Additionally, it will integrate with land ownership data from the NRLAIS system, and livestock data as defined in the aLIVE roadmap to link specific farmers and pastoralists to parcels of land and livestock. This initiative will serve as a cornerstone for multiple use cases and enabling initiatives within the roadmap, and the expansion of the farmer profile project will also enable the collection and utilization of better land and production data.

Effective implementation of this initiative will require collaboration across Regional Agriculture Bureaus and other Ministries and government departments. The initiative could be scaled by leveraging existing registration through schemes and subsidies run by development partners, thus increasing adoption for limited incremental cost.

#### Key activities for implementation

- Hire HQ and regional staff, including project leads and officers, to coordinate and manage the implementation at both federal and regional level.
- Access and consolidate farmer data from various initiatives, involving short-term staff

for data standardization, harmonization, and quality assurance.

- Collaborate with key stakeholders to prioritize use cases aligned to the DAR priority use cases for the pilot phase and outline relevant data indicators.
- Develop the necessary data governance and policy with other government agencies so that personal data is stored and used compliantly and safely.
- Prioritize pilot areas, install necessary software on devices, onboard data collectors and validators, and conduct initial data collection and analysis to test and refine collection methods and visualization tools.
- Conduct awareness and training sessions for target farmers and relevant stakeholders to ensure understanding and effective use of the farmer profiles, and incorporate feedback for continuous improvement.
- Acquire laptops, servers, and devices to scale data collectors, and secure data connection services to support the infrastructure.
- Establish guidelines for data collection, sharing, and use, and integrate other relevant databases to ensure comprehensive and accurate farmer profiles.

**Table 30: Dependencies to fully scale the farmer profile Enabling Initiative**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Device access for extension workers | Digital Infrastructure | Critical to aid the data collection process |
| Improve DA management | Human capital & Infrastructure | Critical to aid the data collection process as DAs may support collection or maintenance and updates of data |
| Land & farmer-linked production data | Data and content | Data sets from sources like the NRLAIS are critical to like farmers to specific parcels of land |
| Data stack with APIs | Integration layer | Critical for linking land information and crops planted on that land with the identities of the farmers and their FAYDA numbers, ensuring accurate and comprehensive farmer profiles |
| Telco service targets and incentives for rural areas | Digital infrastructure | Network connectivity in rural areas is critical for data collection |

## 5.7 ENABLING ENVIRONMENT

The enabling environment refers to the pre-requisites for digital agricultural transformation, and the initiatives under this layer will promote innovation and ensure sustainable growth within the agricultural sector. It is focused on the development of policies, human capital, infrastructure, and private sector to enable digitalization of the sector. An effective enabling environment is crucial for overcoming barriers to technology development and adoption and for ensuring that digital solutions reach their full potential in transforming agricultural practices.

The enabling environment has six areas:

- **Government and Policy** - Robust and inclusive data policy and guidelines to drive insights, data sharing and decision making
- **Digital Infrastructure** - Innovative device & connectivity solutions that allow farmers to adopt use cases
- **Human Capital & Infrastructure** - A population that has been invested in & empowered to build and use digital agriculture cases
- **Physical Infrastructure** – A reliable and sustainable physical environment that facilitates and improves digital solutions
- **Agricultural markets -** Functioning markets that incentivize and reward value addition
- **Innovation & Technologies -** T An empowered private sector that allows for development of priority innovative tools

The phasing of enabling environment initiatives for the roadmap involved a two-step process. First, a long list of initiatives relevant for Ethiopia was developed using inputs from the national convening, stakeholder interviews, and the DAEAS roadmap, resulting in an extensive list of 19 enabling environment initiatives. These initiatives were then prioritized based on the Ministry of Agriculture's implementation feasibility, alignment with relevant Ethiopian strategy and policy documents, and stakeholder priorities resulting in four Phase One priority initiatives. More details on the prioritization methodology and results can be found in section 8.4.2 Enabling Initiatives Prioritization within the appendix of this roadmap.

### 5.7.1 Government and Policy

#### Area objective

*Robust and inclusive data policy and guidelines to drive insights, data sharing and decision making*

#### Area description and enabling initiatives

This layer encompasses the rules, guidelines, and initiatives established by authorities to enable the growth of digital innovations within the agricultural sector. It also shapes the ecosystem in which digital solutions operate by providing a supportive framework that includes data governance and sharing policies, standards, assurances, and incentives. This layer has three initiatives, one of which has been prioritized for Phase one of the roadmap. The table below shows the different initiatives, their phasing, and descriptions.

**Table 31: Government and Policy Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 1** | Data governance and sharing policy, standards, assurances, and incentives | The MoA should develop and implement an overarching, principles-based data governance, to ensure that different agriculture sub-sectors agree appropriate commonalities throughout their respective data sharing and management rules and protocols. |
| **Phase 2** | Support market entry of international products to Ethiopia (with local partner) | Support international companies through policy and process interventions to launch their products in Ethiopia in partnership with local stakeholders to widen the product ecosystem in Ethiopia. Such frameworks should be co-created with relevant stakeholder consultations and engagement to ensure fairness and balancing of competing interests. |
| | Streamline extension content approval process | Reduce the time taken to approve extension and advisory content in the Ministry of Agriculture and research institutions by assessing and adjusting the process |

#### Ecosystem assessment – Improvements

Overall, there are strong non-digital agricultural policy frameworks with improvements made since 2019. These include policies around natural resource management, market liberalization for inputs such as agrochemicals and commodities such as sugar, and the poverty reduction program.

There are also new cross-sectoral digital and data policies that have started to enable advancements in the agricultural sector. For instance, Digital Ethiopia, 2025 sets out a vision for how digitization is expected to take place across the Ethiopian economy to augment output and benefits within the country. There are also more focused policies and laws including the Personal Data Protection Proclamation (PDPP) by MinT which was ratified in April 2024, and recently endorsed policies for e-transaction data and rural connectivity and banking. There is also a draft National Data Sharing Policy that is a work in progress, being spearheaded by the Ministry of Innovation and Technology (MiNT).

Within agriculture, MoA has also started to develop data governance strategies and policy, particularly through the Agri Data Hub. This has been established to collate and consolidate data, with data governance and policies being prepared by the Ethiopian Communications Authority, and through engagement with non-governmental actors such as CAB International (CABI), the Coalition of the Willing (CoW) and GIZ. An example of this community-based effort is the SADS Directive, which was co-created through a Coalition of the Willing (CoW), to create specific data sharing mandates around the soil and agronomy data. This co-creation model has been acknowledged for its success in bridging diverse stakeholders and building trust which in turn has facilitated data access and sharing. Similarly, the aLIVE project in collaboration with Development Gateway is helping MoA to improve data quality, accessibility and standardization of livestock data.

### Ecosystem assessment - Areas to Strengthen

Although there has been progress in agricultural policy and data policy, there has been fragmentation, overlap, and limited work at the cross-section of the two. This has manifested in three major challenges.

**Digital agriculture policy:** As there has not been a comprehensive digital agriculture policy to-date, the DAR will aim to set a path for progression. The DAR will work towards all ecosystem actors aligning on digital agriculture strategy and policies, not only by developing clear policy and guidelines for specific use cases, but also by outlining and socializing strategic priorities. This participatory approach to digital ag policy and data governance will increase collaboration, reduce the duplication of effort, and unite the ecosystem around a common vision.

**Data storage and integration:** Though the MoA Agri Data Hub has seen significant progress, there are still outstanding issues for data storage. Personal data that would be included in creating comprehensive and secure farmer profiles, will need secure storage and regulatory oversight. Additionally, to ensure compliance with laws like the recently ratified data protection proclamation, and any future laws, a safe and consent-driven mechanism to store, access and share, process and use this personal data will need to be built with approval from MinT and INSA, and any other relevant governmental agencies. Furthermore, a clear plan of action and steps will be required to create interoperability between the databases and systems in MoA, as well as make them accessible to the broader ecosystem with suitable governance.

**Regional policy:** As there is no digital agriculture policy, there is limited consistency in both activity and the enforcement of existing policy across regions[58]. The DAR should be advocated and supported amongst Ethiopia's regions, to ensure alignment with its recommendations for use cases and initiatives. This alignment will aid in ensuring buy-in with the overall objectives of DAR, and yet, be developed with recognition and understanding of regional differences and subjective contexts which will shape how it is implemented on the ground. The data stack will also aim to bring some harmonization and increase consistency **with respect to** adherence to policy between the center and regions due to the ability to access the same data and decision-making tools.

[58] Regional Bureaus of Agriculture within Ethiopia are autonomous and close alignment and cooperation within them on data policy and DAR is essential for the roadmap's success

### Select ongoing initiatives

**Table 32: Select Ongoing Government and Policy Ongoing Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| MINT | Personal Data Protection Proclamation (PDPP) | • A comprehensive legal framework designed to fortify individual privacy and regulate the management of personal data within Ethiopia<br>• Lays out protections for individual rights over data including right to access, rectify, erase, and restrict the processing of data<br>• Outlines responsibilities and rules for organizations handling data and collecting data (e.g., consent based)<br>• The data protection law is enforced by the Ethiopia Communications Authority |
| CIAT, GIZ, EIAR | Coalition of the willing (CoW) | • The CoW works towards better soil and agronomy data access, management and sharing in Ethiopia<br>• CoW's goal is to increase the usability of data while protecting security, privacy, and data rights by providing guiding principles and rules to the soil and agronomy community<br>• CoW managed to collect 20,000 legacy soil profile data and over 38,000 crop responses to fertilizer data and create a data set that can be leveraged for building data driven solutions such as site-specific fertilizer recommendations |
| MoA, GIZ, CABI, CoW | Soil and Agronomy Data Sharing Directive (SADS Directive)<br>Soil and Agronomy data collection and management standards/guidelines | • SADS is a joint initiative to ensure FAIR[59] and responsible data practices for soil and agronomy data in Ethiopia to reduce waste & loss of data, as well as duplication of effort<br>• The standards aim to improve data collection, data quality, data standardization and interoperability, data management, sharing and use |

### Priority Phase One Initiative

#### 1. Data governance and sharing policy, standards, assurances, and incentives

As identified, there are some sub-sectoral data governance frameworks which exist (like the SADS Directive) or are being developed (as with aLIVE). Each priority use-case under the DAR can be considered a sub-sectoral ecosystem which will require its subjective data sharing and data management rules, protocols, and technical standards. However, to do this consistently and in a manner that the pan-agriculture governance is cohesive and not fragmented or duplicative, it is imperative that the MoA create a principles-based, light touch Data Governance Guidance. This guidance should clearly articulate the minimum

[59] Findable, Accessible, Interoperable and Reusable

expectations within each of the practice areas and how these practices link to compliance with the wider legal requirements of Ethiopia. There is no 'one size fits all' or 'off the shelf' process because of the complexity of the agricultural ecosystem. As a result, the overarching guidance needs to be strategic and agile enough to sufficiently cover all MoA activities and provide enough nuance that adequately guides sub-sectors on key issues of data governance, facilitating meaningful addressing of subjective challenges within their respective ecosystems. It is also important that any MoA data policy and framework be developed in alignment with MiNT and national data policies such as the recently ratified PDPP. Successful implementation of this policy will enhance data quality, improve data sharing, and support better decision-making processes, thereby enabling DAR and the development of more effective and efficient digital agricultural products and services.

With this overarching Guidance in place, sub-sectors in agriculture can formulate more specific data policies and frameworks. These would cover data standards to facilitate the integration and interoperability of datasets across the sector, provide guidelines for the collection and use of data, and govern access and sharing of agriculture data.

The MoA's overarching Data Governance Guidance can draw upon global best practice such as that contained within the CABI FAIR Process Framework and the Open Data Institute's (ODI) 9 best practice data governance practices which are outlined below.

1. **Accountability –** open and transparent oversight and accountability structures with clear roles and responsibilities for data.
2. **Privacy –** open and transparent processes for handling and sharing personal information legally.
3. **Security –** open and transparent processes for handling and sharing information securely.
4. **Standardization –** open and transparent processes outlining why and how data is collected, used, and shared.
5. **Resourcing –** open and transparent plans and funding for the ongoing management and maintenance of data.
6. **Capability –** open and transparent ability to implement data processes, including both technological and human.
7. **Engagement –** open and transparent approaches to engagement and participation with data providers and users.
8. **Ethics –** open and transparent processes that outline how data is handled in accordance with a defined ethical framework.
9. **Permissions –** open and transparent processes for managing the permissions under which data is consumed and shared.

**Key Activities for Implementation**

- Convene various sub-sectors and relevant stakeholder
  - Understanding of sub-sectoral requirements (enablers and blockers) regarding data governance and policy.
  - Co-developing and aligning on a shared vision of data governance incorporating FAIR principles.
- Draft initial Data Governance Guidance
  - Create step-by-step implementation plan, including FAIR and responsible data practices.

  - Validate and iterate through workshop engagements.
  - Iterate and refine through engagement with other Ministries (especially MiNT on the national data sharing policy).
- Publishing Guidance and capacity building
  - Clarity in roles and responsibilities
  - Periodic reviews and amendments to the Guidance as needed.

Moreover, even before sector data governance policy is established, it is important that all digital agriculture use cases and initiatives that have a data component ensure full compliance with the policy. It is recommended that the team implementing DAR as well as ecosystem stakeholders developing digital agriculture use cases follow a checklist to ensure alignment with the policy and proper data governance. This checklist should include but is not limited to the following components:

- Conduct a comprehensive Data Privacy Audit for the use case to ensure that a privacy-by-design approach is followed and that the use case is aligned with national privacy and data regulations such as the PDPP. A privacy audit is particularly relevant for use cases and initiatives that handle a lot of personal data such as the farmer profile.
- Clearly define which entities are responsible for ensuring proper data ownership and management of all data assets necessary for implementation the use case/ initiative.
- Complete a thorough need and gap assessment for data to understand key requirements and how fit-for-purpose existing data assets in the country are to implement each use case / initiative.
- As part of the data assessment, owners for the necessary data assets should be identified and then engaged to develop and implement best practice data sharing principles.

## 5.7.2 Digital Infrastructure

### Area objective

*Innovative device and connectivity solutions that allow farmers to adopt use cases*

### Area description and enabling initiatives

The digital infrastructure area encompasses the foundational elements that support connectivity and the use of digital tools, such as smartphones, tablets, and data packages. This infrastructure is critical for enabling farmers and extension workers to access and utilize digital resources and solutions effectively. This layer consists of five enabling initiatives, one of which has been prioritized for Phase One of the road map. The initiative descriptions and phasing are shown in the table below:

**Table 33: Digital Infrastructure Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 1** | Digital Kiosks for Farmers and DAs | Provide farmers and DAs with internet access through publicly accessible standing computer terminals in accessible locations such as FTCs, cooperatives, and administration offices to enable access to digital extension and advisory content, and services such as online input marketplaces, input tracking, and digital financial services |
| **Phase 2** | Device access for extension workers | Provide extension workers and development agents access to smartphones or tablets to facilitate digital solutions for DAs |
| | Free access for DAs and farmers to key apps | Provide free or subsidized access to essential applications and websites for digital agriculture solutions (e.g., extension platforms or financial services) for farmers and development agents |
| | Phone payment plan for farmers | Provide farmers access to mobile devices on credit and create dynamic farmer specific payment plans based on farmer specific metrics such as land size, predicted yield (national and individual) and historical income |
| | Telco service targets and incentives for rural areas | Work with and incentivize mobile operators to create internet, calls, and SMS packages for people in rural areas to make internet access affordable |

### Ecosystem assessment – Improvements

Digital infrastructure has made progress in the last five years, with 85% of the population now covered by 3G networks, slightly above the Sub-Saharan average of 84% (Figure 9).[60] Ethiopia now also has 70% of the population covered by 4G networks. [61] Moreover, network performance is favorable compared to Sub-Saharan African counterparts; Ethiopia's network performance outperforms Kenya as assessed by the GSMA in 2023.

[60] GSMA Mobile Connectivity Index (2023)

[61] GSMA Mobile Connectivity Index (2023)

**Figure 9: Network coverage in Ethiopia (EthioTelecom and GSMA)**


The introduction of Safaricom in addition to EthioTelecom has resulted in improvements in coverage and performance, and is expected to lower data, voice and text prices due to increased competition once Safaricom has been fully established in the country.

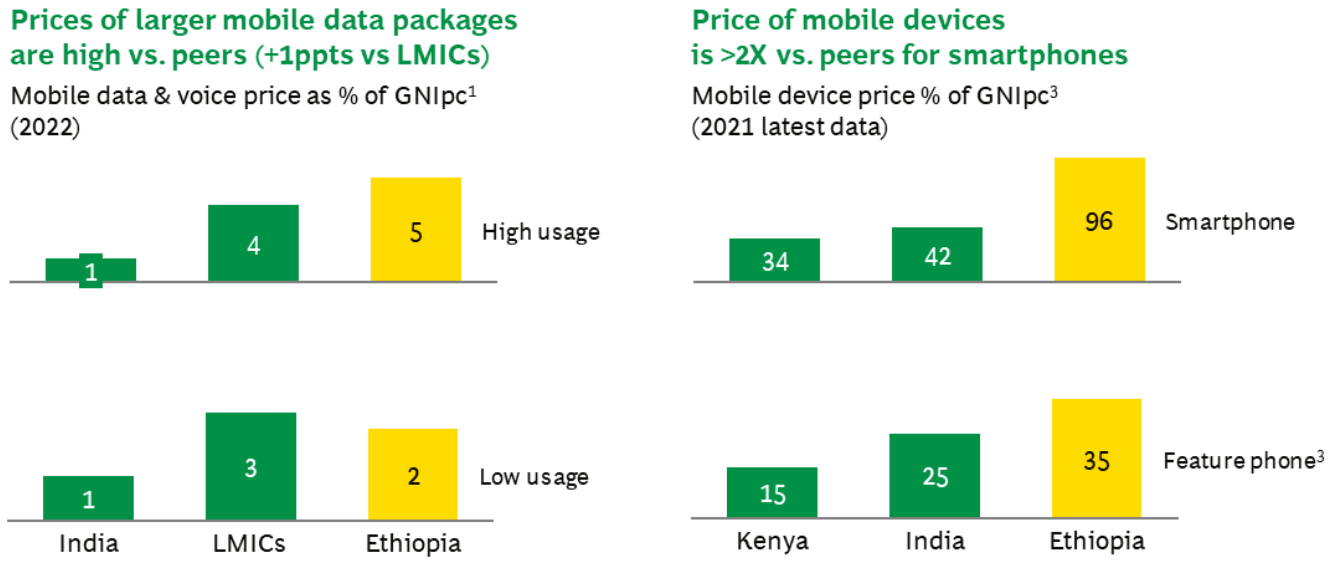
## Ecosystem assessment - Areas to Strengthen

Despite these improvements, digital infrastructure needs strengthening in three key areas, as today there are only weak levels of base digital use, with only 59% mobile ownership vs. 93% in Kenya[62] and only 17% internet penetration vs 43% in Sub-Saharan Africa.[63]

**Price:** The ability to access the internet is currently too expensive for many in the country, with data costing 5% of the GNI per capita in Ethiopia vs 3% for LMICs[64] and a smartphone costing 96% GNI per capita vs 34% in Kenya.[65] These prices mean many of rural farmers and pastoralists are unable to afford internet access, and thus do not have the ability to access many of the recommended digital services (see Figure 10).

[62] Usage and penetration Ecofin (2023)
[63] GSMA Mobile Connectivity Index (2023)
[64] ITU price baskets data (2022)
[65] Alliance for Affordable Internet (2021)

**Figure 10: Comparison of Ethiopian data and smartphone prices vs. peers**




**Conflict:** Ongoing conflict in in certain areas of Ethiopia has resulted in sporadic internet access even for those who can afford it. The political and social climate should be considered when developing solutions so that those in areas without internet access for prolonged periods of time can still access new digital solutions; examples may be developing low-tech channels (such as radio, IVR or text) or community accessed agriculture-specific channels (such as digital kiosks).

**Private sector infrastructure:** There is limited private sector presence of strong advanced computing capabilities or cloud infrastructure, which restricts the ability for the private sector and especially SMEs from engaging or innovating within the agriculture ecosystem. There are two small known advanced computing companies – Sun Data World and HomeLink – and while cloud infrastructure is present, server space is still highly cost-restrictive for small businesses at between $50-100 p.a..[66] Cross-governmental engagement on incentivization in this space is necessary to build the required domestic capacity for a functioning ecosystem.

**Table 34: Select Ongoing Digital Infrastructure initiatives**

| Organization | Initiative | Description |
|---|---|---|
| MoA, ATI | Digital Kiosks | • ATI, in collaboration with MoA, is working to roll out digital kiosks to provide farmers with access to extension and advisory content.<br>• These kiosks will also serve as a mechanism for farmers to access market linkages, make input purchases, and access mechanization services, all leveraging the internet. |

[66] Quotes from Ethiopian server and hosting services

| | | |
|---|---|---|
| | | • The kiosks will be stationed at farmer training centers, farmer cooperatives, and Kebele administration offices. |

## Phase One priority initiatives

### 1. Digital Kiosks for Farmers and DAs

Digital Kiosks are standing digital terminals in rural areas that are pre-loaded with applications and connected to the internet. Digital Kiosks facilitate the delivery of extension and advisory services, as well as access to mechanization services, credit options, and other agricultural services via the internet. It will also enable DAs without internet access to perform tasks that require online connectivity, such as data collection, more effectively. These kiosks will be strategically placed in central locations where farmers and DAs frequently gather, such as FTCs, cooperatives, and Kebele administration offices.

Effective implementation of this initiative will require collaboration across MoA, particularly at the Regional Bureau level, and among agricultural service providers, including extension content creators, mechanization service providers, banks, and off-takers. Additionally, support from development partners will be essential to enhance digital literacy among farmers and DAs, ensuring the usability of the kiosks.

#### Key activities for implementation

- Define the technical specifications and features needed for the digital kiosks to ensure they meet the requirements for extension and advisory services, market linkages, and other agricultural applications.
- Create partnerships with different agriculture service providers to socialize the kiosks and encourage onboarding of their services on the kiosks.
- Select suitable FTCs, cooperatives, and Kebele administration offices, that will serve as pilot locations ensuring accessibility and convenience for farmers and DAs.
- Develop and implement digital literacy programs to train farmers and DAs on how to effectively use the kiosks and leverage the internet for agricultural services.
- Conduct procurement processes for the kiosks, ensuring the acquisition of high-quality devices, and oversee their installation at the selected pilot locations.
- Establish a comprehensive maintenance plan to ensure the kiosks remain functional and accessible, including regular updates, repairs, and technical support.
- Scale up the kiosks targeting more remote areas with less device penetration.

**Table 35: Dependencies to fully scale Digital Kiosks Enabling Initiative**

| Use Case Dependencies | Ecosystem sub-component | Rationale |
|---|---|---|
| Streamline extension content approval process | Government and Policy | Critical to ensure a wide variety of extension content on the digital kiosks and that the content is promptly updated |

| | | |
|---|---|---|
| Telco service targets and incentives for rural areas | Digital Infrastructure | Ensure reliable access to the internet for the digital kiosk |
| Digital literacy for farmers and DAs | Human capital and infrastructure | Critical to ensure usability of the kiosks by farmers and DAs |
| Solar panels for FTCs or OSSs | Physical infrastructure | Cheap and sustainable energy source for the kiosks in areas with electricity access is unreliable |
| Competitive incubation / product dev. environment with forum | Innovation and technology | Enables development of farmer facing digital agriculture products and services that can leverage the kiosks as a channel to reach farmers |

## 5.7.3 Human Capital & Infrastructure

### Area objective

*A population that has been invested in and empowered to build and use digital agriculture cases*

### Area description and enabling initiatives

This area focuses on developing the digital skills, knowledge, and expertise required for the effective adoption and utilization of digital products and services in the agricultural sector. Human Capital encompasses human resources and the initiatives necessary to improve digital literacy to drive digital transformation in the sector. It has five enabling initiatives, two of which will be priority for Phase One of the roadmap, the other three being priority for Phase Two of the roadmap. Table 36 below illustrate the phasing and outlines the descriptions of these initiatives:

**Table 36: Human Capital & Infrastructure Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 1** | Digital literacy for farmers and DAs | Deliver digital and financial literacy campaigns to farmers, pastoralists and DAs focused on tools that will drive adoption and optimal use of digital solutions (e.g., use of smartphones or digital kiosks) |
| | Digital agriculture team | Create a dedicated team with the right digital, policy and strategy expertise to support digital agriculture development in Ethiopia and deliver the DAR |
| **Phase 2** | Digital training platform for MoA/RBoA | Develop a digital platform offering tailored agricultural digital skills courses and certifications for Ministry of Agriculture and Regional Bureau of Agriculture staff |
| | Digital program in ATVETS | Develop digital agriculture courses and ATVETS and formulate and provide a digital curriculum that focuses on areas such as data collection methods and standards, digital financial services, and use of precision agriculture tools |
| | Improve DA management | Develop platforms and tools that improve visibility of the activities of extensions workers and development agents, and enable them to work more efficiently |

### Ecosystem assessment – Improvements

There have been limited advancements in human capital in the last 5 years. Some progress has been seen through campaigns such as Mastercard Foundation and National Bank of Ethiopia's training modules on digital financial literacy, as well as Mastercard Foundations Agriculture-focused Dignified Employment for Youth (ADEY) in Ethiopia program, though this is less focused on digital capacity building.

### Ecosystem assessment - Areas to Strengthen

There are two main areas to strengthen for human capital in Ethiopia: Improving digital literacy to increase adoption and developing human capital to build and run use cases.

**Digital literacy:** Low overall adult literacy is causing barriers to digital adoption, as adult literacy rates are only around ~52% with women

10-15% less literate than men.[67] These statistics are relatively low compared to Sub-Saharan African peers and prevent the adoption of on-screen digital solutions (versus, for example, interactive voice response, or radio). Furthermore, Ethiopia ranked 119 out of 134 countries on digital skills, which provides barriers to scaling more robust digital technologies such as mobile apps.[68] Campaigns across segments can improve this, as well as alignment with national policies on digital education in schools.

**Human capital:** There are also no existing digital agriculture training or educational pathways; ATVETs do not deliver digital agriculture specific curricula according to a recent MoA assessment. Furthermore, MoA have not traditionally hired software engineers, data scientists or IT professionals given the relatively recent shift of focus to digital agriculture. A combination of training in ATVETs, recruitment, secondment and international knowledge exchange could boost the digital capacity and capability to build and run use cases

**Table 37: Select Ongoing Human Capital & Infrastructure Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| World bank, Ministry of Science and Higher Education | Digital Skills Country Action plan (DSCAP) | • The DSCAP is a structures approach to develop digital skills in Ethiopia and targets 50 public universities, 800,000 students, and 35,000 instructors, with the goal of establishing state-of-the-art facilities and systems for reliable online education in higher education in Ethiopia |
| Prime Minister's Office, MINT | Digital Ethiopia 2025 | • Digital Ethiopia 2025 is a digital strategy developed by the Ethiopian government to leverage digital opportunities and propel Ethiopia towards a knowledge-based and innovative economy<br>• Digital literacy programs around training, device penetration, and relevant local content were designed<br>• Aim to help 70% of Ethiopia become digitally literate by 2025 |
| Mastercard Foundation, National Bank of Ethiopia | Digital Financial Literacy training module | • The goal of this module is to elevate financial literacy among youth and Micro, Small, and Medium-sized Enterprises (MSMEs) with a goal of achieving 75% awareness by 2025<br>• The module encompasses topics like savings, digital banking, and business planning, with a distinctive focus on supporting women entrepreneurs |

[67] World Bank Development Indicators (2020)
[68] Digital Skills Gap Index Wiley Report (2021)

## Phase One priority initiatives

### 1. Digital Literacy for Farmers and DAs

This two-part initiative aims to deliver digital and financial literacy campaigns to farmers, pastoralists, and DAs. Farmer and pastoralists will be targeted with digital literacy campaigns that will include training on the use of smartphones, digital kiosks and other devices as well as how these devices can be leveraged to access agriculture use cases. These campaigns will be delivered through media (radio, television and social media), by DAs and in Farmer Training Centers. Tailored digital and financial literacy training will enable farmers to effectively interact with DAR use cases.

For DAs, a digital curriculum and module will be added to learning in ATVETs and Agricultural Universities, and will improve digital and financial skills.

Effective implementation of this initiative will require engagement across the ecosystem with input from the MoA extension department as well as collaboration with relevant educational institutions. The initiative will also aim to learn lessons and build off the success of similar digital and digital financial literacy campaigns in the country.

**Key activities for implementation**

**Farmers and pastoralists :**

- Segment farmers into profiles, identify skill gaps and upskilling required for each profile
- Develop partnerships with MNOs (EthioTel and Safaricom), IVR providers, and major TV channels and leverage these partnerships as alternative medium for delivering content to target learners.
- Taking a human centric design approach, develop a digital literacy and digital financial literacy curriculum that would be most impactful for each target learning segment. Similarly, identify what digital use cases would add the most value for each target learning segment and design the literacy campaign to be attached to learning or availing that digital use case.

**DAs:**

- Partner with potential physical learning centers such as ATVETs and agricultural universities to serve as locations to deliver training curriculum.
- Identify skills gaps to design the new curriculum using a human centric approach.

**Table 38: Dependencies to fully scale Digital Literacy for Farmers and DAs Enabling Initiative**

| Use Case Prerequisite/ dependencies | Rationale | Ecosystem Area |
|---|---|---|
| Digital kiosks | Critical avenue for delivery of digital literacy trainings for farmers and DAs | Digital Infrastructure |
| Digital program in ATVETS | Platform for delivery of digital literacy to DAs | Human Capital & Infrastructure |

## 2. Digital Agriculture Team

This initiative involves the creation of a digital agriculture delivery unit to drive DAR forward and oversee the implementation of priority digital agriculture use cases and enabling initiatives. This unit will require capabilities in product and project development, data analytics, policy and strategy creation, and the design and execution of digital literacy campaigns. Additionally, the unit will work with development partners and the private sector to coordinate ecosystem efforts, prevent duplication and ensure alignment with national and ministerial priorities.

More Detail on the Digital Agriculture Team's role in overseeing DAR can be found in section 6.1 Governance

### Key activities for implementation

- Socialize and gather input on digital agriculture governance, reach out to potential candidates for the steering committee and subcommittees, and integrate in relevant regional entities such as RBoAs and regional ATI offices.
- Evaluate existing capabilities and conduct a gap analysis, develop a recruitment strategy to fill missing capacities, and establish processes to integrate the existing analytics team.
- Assess financial resource needs and internal funding capacity, hold bilateral meetings with potential funders to secure funding commitments for secondments and to acquire required expertise.
- Clearly define the roles and responsibilities for the Digital Agriculture Team as well as the related governance entities to support the team – the steering committee, data governance, and external coordination subcommittees.

## 5.7.4 Physical Infrastructure

### Area objective

*A reliable and sustainable physical environment that facilitates and improves digital solutions*

### Area description and enabling initiatives

The physical infrastructure area encompasses the essential assets and facilities needed to support agriculture. This consists of two initiatives, both of which will be implemented in Phase Two of the roadmap. The table shows the enabling initiatives and their descriptions.

**Table 39: Physical Infrastructure Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 2** | Input warehouses and distribution hubs | Set up smart warehouses and distribution centers either owned by MoA or through partnership with cooperatives or unions and digitalize input distribution logistics at warehouses through integrated technology solutions |
| | Solar panels for FTCs or OSSs | Provide solar electricity to areas underserved by grid electricity to power devices such as digital kiosks |

### Ecosystem assessment – Improvements

Physical infrastructure has progressed primarily through increased storage facilities, including federal, regional and co-operative or union owned warehouses. There are a few central storage facilities that are largely concentrated in Addis Ababa, but more have been built in agricultural centers such as Bishoftu. Moreover, the ACC and FPC programs, along with co-operative programs, have enabled the development of improved warehousing and storage for farmer groups.

A Chinese-backed satellite was also launched in 2019 and is owned by the Ethiopian government. This key piece of physical infrastructure can provide free remote sensing data, relevant to use cases requiring crop, forestry and land use data.

### Ecosystem assessment - Areas to Strengthen

Despite these advancements and a relatively mature physical infrastructure landscape, three areas could be strengthened.

**Road transportation:** Transportation and distribution are key to supply chain management for both inputs and outputs, and therefore a reliable physical network is necessary for supply chain success. Currently, only 22% of rural households in Ethiopia are less than 2km from a road,[69] and road quality in Ethiopia is assessed as 3 out of 7 in the 2023 road quality index (below the global average of 4.05), with no overall changes since 2019.[70] These challenges could be addressed by a thorough road assessment in partnership with the Ministry of Transport and Logistics and aligned to the World Bank funded Road Connectivity and Access Program (RCAP),

[69] RAI Index (2019)

[70] World Population Review Road Quality Index (2023)

with improved roads developed in strategic routes for optimum rural distribution.

**Warehousing:** Despite advancements, the quantity and quality of storage facilities could be strengthened further. Programs that focus on co-operative development should be expanded, and initiatives such as financial support for building storage solutions should be scaled. Furthermore, limited port and warehouse handling capacity is currently creating input and output distribution delays, and so alternative handling options should be explored to increase physical infrastructure efficiency and utilization.

**Cell towers:** Though coverage in Ethiopia is in line with Sub-Saharan Africa for 3G, at 85% of the population,[71] cell tower coverage should be reassessed following conflict to quickly repair damaged towers and consider population distribution changes that may impact coverage and cell tower locations.

### Select ongoing initiatives

**Table 40: Select Ongoing Physical Infrastructure Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| ATI | Cooperative storage pilot | • A few central storage facilities have been setup largely in Addis Ababa, but more have been built in agricultural canters such as Bishoftu |
| Ethiopian Space Science and Technology Institute | Satellite crop monitoring | • In 2019 Ethiopia launched with support from China launched a satellite into space which monitors crops and weather |
| World Bank, Ministry of Finance, Ministry of Urban and Infrastructure | Ethiopia Rural Connectivity to Support Food Security Project | • The main objective of this program is to interconnect rural communities and isolated areas during all weather conditions<br>• The program is expected to run from March 2024 to May 2029<br>• The project involves construction of roads and upgrading current roads to make them climate resilient along with construction of pedestrian and drainage structures |

[71] GSMA Mobile Connectivity Index (2023)

## 5.7.5 Agricultural Markets

### Area objective

*Functioning markets that incentivize and reward value addition*

### Area description and enabling initiatives

This area focuses on the development of tools and platforms that connect farmers with markets, facilitating the buying and selling of agricultural products. This layer has one initiative in the roadmap which shall be prioritized for Phase Two of the roadmap, its description is available in the table below

**Table 41: Agricultural Markets Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 2** | Incentivized cooperative and union aggregation and value addition | Create initiatives to incentive farmers to cluster into cooperatives and unions to improve market power and to increase value addition activities |

### Ecosystem assessment – Improvements

The agriculture market has begun to see improvements in line with the Ministry of Agriculture's objective of market-oriented crop and livestock production. Value addition capabilities are growing for some commodities such as oil seeds, although this is still limited. There are burgeoning roles for cooperatives and unions in output aggregation as well as input demand collection and distribution, though links between MoA and cooperatives could be formalized or strengthened.

### Ecosystem assessment - Areas to Strengthen

There are four areas to strengthen to develop agricultural markets.

**Input access:** A small domestic manufacturing base for farm equipment (e.g., tractors) and inputs, combined with an unfavorable macroeconomic environment that limits the availability of foreign currency for imports, is a major challenge. This hinders availability and access to machinery and farm inputs (e.g., fertilizer) within the country. Exploring other options for input procurement or international business policy may increase the ability to access inputs.

**Input tracking:** The lack of an input tracking system currently leads to looting or on-selling, increasing the price of inputs and creating an uneven distribution profile compared to demand. The development of the Ethiopian Digital Input Tracking System should be well resourced in order to better track fertilizer, and lessons learned can be applied to other relevant inputs.

**Value addition:** As noted, despite some value addition, capabilities are low for the majority of outputs. Market-oriented extension and advisory, as well as the empowerment of cooperatives, farmer groups and unions can increase value addition capabilities.

**Sales channels:** Sales are still almost exclusively through physical market channels, with a significant presence of middlemen, limiting farmer bargaining power and increasing prices for the end consumer. Moreover, physical channels do not incentivize aggregation, or linkage to international or export markets. E-commerce platforms or improved digital market linkage would allow farmers to improve their income and increase value chain efficiency.

### Select ongoing initiatives

**Table 42: Select Ongoing Agricultural Markets Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| ATI | Ethiopian Digital Input Tracking System (EDITS) | • Pilot launched in 2024 to track fertilizer from port to farm gate to support timely delivery and quality inputs<br>• Uses QR codes and NFC tags[72] to track inputs |
| ATI | Cooperative support initiatives | • Cooperative warehousing support as well as seed supply initiatives that help cooperatives move beyond aggregation to value addition |

[72] Near Field Communications

## 5.7.6 Innovation & Technologies

### Area objective

*An empowered private sector that allows for development of priority innovative tools*

### Area description and enabling initiatives

The innovation and technologies area focuses on the adoption and development of cutting-edge technologies and practices within the digital agriculture ecosystem. This initiative area has three enabling initiatives, all of which will be implemented in Phase Two of the roadmap. The enabling initiatives and their descriptions are available in Table 43 below.

Moreover, as aligned with DAR's third guiding principle to empower the private sector, innovative technologies and private sector participation will be central to the development and implementation of all DAR digital use cases and enabling initiatives when appropriate to do so.

**Table 43 Innovation and Technologies Enabling Initiatives**

| | Initiative | Description |
|---|---|---|
| **Phase 2** | Competitive incubation / product dev. environment with forum | Set up incubators and innovation hubs to nurture digital agriculture application software developers' and device manufacturers' talent and give them visibility to investors in the industry to scale innovations |
| | Working space & training for ag techs | Offer office space to select digital agriculture startups in hubs to foster learning and efficiency through industry exposure and knowledge sharing |
| | Digital agriculture curriculum | Create courses and programs to be used in non-ATVET settings designed to impart knowledge and skills necessary for delivery of agriculture products and services via digital channels |

### Ecosystem assessment – Improvements

The Digital Economy 2025 strategy has encouraged the development of innovation over the past 5 years. One example of this is the Ministry of Innovation and Technology's AI Research and Development Centre for analytics which was launched in 2021 following the Digital Economy Strategy recommendations. This center has already produced innovations in the agricultural sector, including a coffee leaf disease detection and severity estimation analytical tool.

Donors have also supported innovation and technology progress, with FAO establishing a Digital Agriculture and Innovation Hub in Ethiopia which is exploring drone technologies for agriculture and water resource management. There are also innovative private companies such as Lersha or Hello Tractor, but private sector innovation is still limited.

### Ecosystem assessment - Areas to Strengthen

Despite these improvements, innovation and technologies are still nascent in Ethiopia in the agricultural sector, hindered by two main challenges.

**Private sector enablement:** There are ongoing initiatives within MinT to encourage and incentivize small businesses and entrepreneurship, ultimately enabling innovation. These include paperwork support, tax relief and advisory services. This is still nascent however, and cross-governmental engagement is required to align on agri-tech-specific incentives or enablers.

**Cost barriers:** Technology is still largely cost-prohibitive for many farmers and pastoralists, meaning the agricultural technology market is small. The small domestic manufacturing base for agricultural technologies and equipment (e.g., smart sensors or digitally enabled tractors), combined with an unfavorable macroeconomic environment that limits the availability of foreign currency for imports of key products required in relevant technologies create major cost barriers for innovators, manufacturers and farmers and pastoralists. This hinders availability and access to technologies, and does not incentivize innovation within the country.

**Table 44: Select Ongoing Innovation & Technologies Initiatives**

| Organization | Initiative | Description |
|---|---|---|
| Private Sector | Digital agriculture innovations | • Private sector companies such as Lersha, Hello Erf and different commercial banks have come up with various farmer facing agriculture products addressing ecosystem challenges such as market access, access to financial services and access to inputs |
| MINT | AI R&D center | • MINT launched an AI R&D Centre for analytics in 2021, which has produced a coffee leaf disease detection and severity estimation analytics tool |
| FAO | Digital Agriculture Innovation Hub | • Co-working space and financial support to enable innovation and entrepreneurship in the agriculture sector |

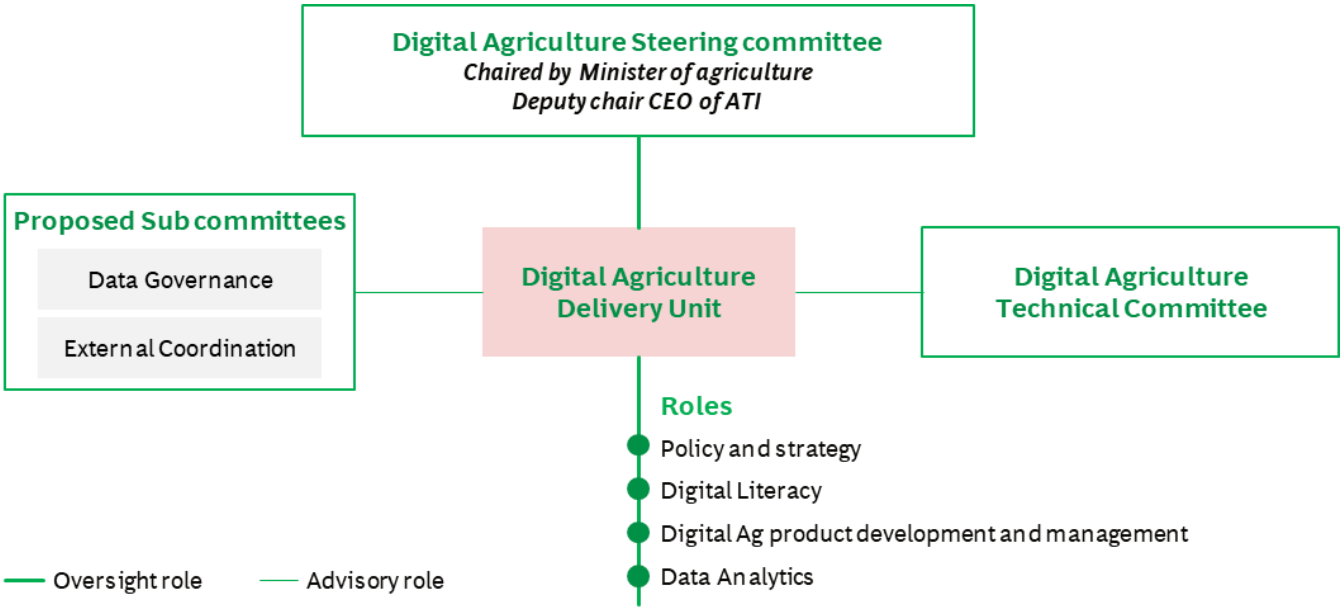
# 6

# Implementation plan

## 6.1 GOVERNANCE

A well-organized governance framework is essential for effectively overseeing DAR's key recommendations during their implementation. This structure should ensure accountability, transparency, and responsiveness among the diverse group of stakeholders participating in the DAR Roadmap implementation. The DAR's governance structure as outlined below in Figure 11 aims to address these key criteria while enhancing coordination across the digital agriculture ecosystem.

**Figure 11: Proposed DAR Governance Structure**




### Digital Agriculture Delivery Unit

As described in section 5.7.3 on Human Capital and Infrastructure above, the proposed digital agriculture team will take the form of a project delivery unit or PDU. This Digital Agriculture Delivery Unit is central to DAR governance and will be the team driving and coordinating implementation of the DAR on a daily basis.

Typically, project delivery units in public sector governance structures are responsible for the planning, coordination, development and management of projects from inception to completion. PDUs also ensure that projects align with government priorities, align with regulations and help to oversee stakeholder engagement.

The proposed Digital Agriculture Delivery Unit will take on these traditional PDU responsibilities within the digital agriculture realm, while also providing digital agriculture expertise support to the government on topics such as data analytics, digital literacy, policy development, and digital agriculture strategy. More details on the Digital

Agriculture Delivery Units proposed roles and responsibilities are outlined below.

Digital Agriculture Delivery Unit Roles and Responsibilities

1. **Policy and Strategy –** Support MoA in developing digital agriculture policies (e.g., data standard policy) as well as advising on any future updates to the DAR or other relevant digital agriculture strategies.
2. **Digital Literacy –** Support in the development and implementation of campaigns to improve digital literacy amongst farmers, DAs, government stakeholders and other ecosystem players.
3. **Digital Agriculture Product Development and Management –** Coordinate and oversee the end-to-end development of digital agriculture products for which the government should take a central role in developing. Once established, support in the ongoing management of digital agriculture products and services until they can be transferred to a more appropriate long-term owner.
4. **Data Analytics –** Provide data analytics supports to MoA to help inform decisions and inform planning.

The DAR PDU would be overseen by the DAR Steering Committee, which is recommended to meet quarterly (or more often as needed). The Steering Committee will provide. The Steering Committee would be chaired by His Excellency Minister of Agriculture Dr. Girma and deputy chaired by CEO of ATI, DR. Mandefro. The Steering Committee will be responsible for strategic decision-making, making investment choices and resolving issues that arise during implementation.

The Steering Committee and the Digital Agriculture Delivery Unit will be supported by the DAR Technical Committee. The Technical Committee is also recommended to meet at minimum once per quarter and will serve as an advisory group for the Digital Agriculture Delivery Unit and the Steering Committee.

DAR also proposes that the Digital Agriculture Delivery Unit be supported by two sub-committees, one dedicated to data governance and one dedicated to partner coordination. The Data Governance Sub-Committee would provide input and advise on any data governance and standards issues that arise during the implementation of DAR. The External Coordination Sub-Committee would serve as a platform to inform development partners and key ecosystem stakeholders on the implementation progress of the DAR and also ensure ecosystem resources are maximized by reducing duplication of initiatives and efforts. Permanent members of each committee should be determined by the Digital Agriculture Delivery Unit upon establishment.

Finally, the DAR recognizes that successful implementation use cases and enabling initiatives identified in the Roadmap will require close collaboration and communication with entities from across the whole of Ethiopia Government. Table 45 below highlights the role other government entities in the country have in supporting the agricultural sector and ensuring successful implementation of DAR. It will be the responsibility of the Steering Committee and the Digital Agriculture Delivery unit to ensure close coordination with the listed entities for the identified use cases.

**Table 45: Ethiopian Government Entities and their role in supporting agriculture sector and DAR**

| Govt. Entity | Role related to Agriculture Sector | Relevant Phase 1 Priority Use Cases & Initiatives |
|---|---|---|
| Prime Minister's Office | Responsible for guiding the country's agricultural and digital policies and strategies (e.g., Digital Ethiopia 2025) through policy formulation, coordination, linkage, monitoring, and evaluation<br>Responsible for the National ID, to which the farmer profile will align | • Overall digital strategy<br>• Farmer profile |
| Ministry of Agriculture | Responsible for designing and implementing agricultural and rural development policies in Ethiopia. | • All use cases |
| Ministry of water Irrigation and Energy | Responsible for managing water resources, water supply, sanitation, large and medium-scale irrigation, and electricity. The ministry contributes to quality water and energy supplies, enhancing food security. | • Deliver timely interventions<br>• Digital kiosks |
| Ministry of Transport and logistics | Responsible for the expansion of transport services, ensures equitable regional distribution, and regulates maritime and transit services. The logistics of agricultural inputs are under the mandate of the Ministry. | • Procure and distribute inputs<br>• Track and trace inputs<br>• Access better markets and buyers |
| Ministry of Innovation and Technology | Responsible for digital innovation and technology adoption in the country through policy support. | • Access better markets and buyers<br>• Data governance and sharing policy, standards, assurances and incentives<br>• Farmer profile<br>• Digital financial literacy |
| Ministry of Labor and Skill (MoLS) | Responsible for training professionals, including increasing the number of qualified Agricultural professionals through the federal Agricultural TVET colleges. | • Digital financial literacy (DAs)<br>• Digital agriculture team |
| Ministry of Education (MoE) | Responsible for expanding standardized education throughout the country and complementing and leveraging education sector development interventions with strategic communications and public awareness. | • Digital financial literacy (farmers, pastoralists and DAs)<br>• Digital agriculture team |
| Ministry of Trade and Regional Integration | Responsible for promoting regional integration, trade, and economic growth in Ethiopia. | • Access better markets and buyers<br>• Procure and distribute inputs |

| Govt. Entity | Role related to Agriculture Sector | Relevant Phase 1 Priority Use Cases & Initiatives |
|---|---|---|
| Ethiopian Agricultural Transformation Institute (ATI) | ATI is a strategy and delivery-oriented government agency created to help accelerate the growth and transformation of Ethiopia's agriculture sector. The Agency's mandate is focused solely on improving the livelihoods of smallholder farmers across the country. | • Track and trace inputs<br>• Access better markets and buyers<br>• Farmer profile<br>• Digital kiosk |
| Ethiopian Agricultural Re-search Institute (EIAR) | EIAR conducts research that provides market-competitive agricultural technologies. These technologies contribute to increased agricultural productivity, improved nutrition quality, sustainable food security, economic development, and conservation of natural resources and the environment. | • Deliver timely interventions<br>• Procure and distribute inputs |
| Ethiopian Statistics Service | The Ethiopian Statistics Service (ESS) collect and compile data from sample surveys, censuses, and administrative records, and analyze data and deliver report for various sectors including agriculture. | • Farmer profile<br>• Land and production data |
| Ethiopian Space Science and Geospatial Institute (ESSG) | ESSG uses satellite technology to track and manage farm resources, evaluate the impact of interventions, and provide spatial analysis. | • Procure and distribute inputs<br>• Land and production data |
| Ministry of Finance | Responsible for financial management and economic policy of the country, in addition to the allocation of economic assistance. | • Funding for all use cases<br>• Access credit<br>• Access insurance |
| National Bank of Ethiopia (NBE) | NBE plays a crucial role in promoting agricultural finance and financial inclusion in Ethiopia. It regulates and supervises financial institutions, provides financial support, and promotes market development | • Access credit<br>• Access insurance |
| Institute of Ethiopian Standards (IES) | IES sets and enforces standards for agricultural products. IES also provides development of standards, training, and technical support on the implementation of standards. | • Data governance and sharing policy, standards, assurances and incentives<br>• Access better markets and buyers<br>• Track and trace inputs |

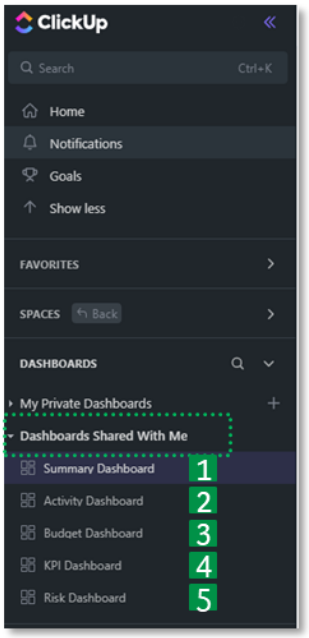
## 6.2 MONITORING PLAN

A robust monitoring strategy is essential to ensure that the DAR is both executed effectively and produces the intended outcomes. The purpose of the monitoring plan is to assess whether the DAR is effectively enhancing the livelihoods of farmers and pastoralists, and thus contributing to the vision and progressing towards the target state. By tracking Key Performance Indicators (KPIs), the tangible impacts of the strategy can be evaluated, and adjustments can be made to redirect towards impact if and where required.

KPIs will be monitored at various levels including for Phase 1 overall, for use cases and initiatives in Phase 1, and at a more granular level within these use cases and initiatives. The DAR's contributions to MoA 10-Year Strategy objectives will also be monitored. A cadence will be developed in conjunction with the DAR Project Management Office (PMO) or Project Delivery Unit (PDU) in which use case or initiative teams will provide updates on activities and monitor their KPIs to record the progress of their implementation. The DAR PMO or PDU will then gather and integrate updates and KPIs at all levels to provide insights, directional changes and recommendations. The DAR Steering Committee will then review these updates at an agreed cadence.

For tracking and evaluating the implementation performance, it is recommended that the DAR uses a cloud-based platform, ClickUp (see Figure 12), that was implemented by DAEAS monitoring. This tool will facilitate real-time collaboration and serve as a unified source of truth for tracking progress. It also enables automated progress reports and provides a public-facing version of the roadmap to ensure visibility for all involved parties, including implementing partners, donors, MoA and external stakeholders.

**Figure 12: Example ClickUp monitoring features**




**1 Summary Dashboad**

The summary dashboard shows a high-level view of implementation status for activities, KPIs, risks and Budget utilization

**2 Activity Dashboard**

The activity dashboard keeps track of deadlines and timelines for the major tasks associated with each action in the DAEAS Roadmap

**3 Budget Dashboard**

The budget dashboard tracks the allocated budget and budget for each action by showing the budget status fo each action

**4 KPI Dashboard**

The KPI dashboard shows a summary and detailed view of the KPIs outlined in each roadmpa action as well as high level goals associated with the roamap pillars

**5 Risk Dashboard**

The risk dashboard highlights risks for each roadmap action in three categories in urgent and medium categories. It also shows mitigation actions taken for each risk, if any

# 7

# Conclusion

Ethiopia is on the path to becoming a digital economy, and the Digital Agriculture Roadmap presents a comprehensive and strategic blueprint for the digital transformation of Ethiopia's agriculture sector. This roadmap is built on four guiding principles: leveraging existing initiatives, ensuring coordination among stakeholders, empowering the private sector, and prioritizing phased implementation. These principles will optimize resource use, foster innovation, and ensure the scalability and sustainability of digital solutions as the roadmap moves from strategy to implementation.

The DAR emphasizes the importance of integrating digital technologies across various facets of the agricultural value chain. By focusing on 22 priority use cases in the solution areas of agricultural intelligence, supply chain management, financial services, pricing and market services, smart farming, and extension and advisory services, the roadmap aims to address the most pressing challenges faced by Ethiopian farmers and pastoralists. These 22 critical use cases, phased until 2032, will significantly enhance productivity, resilience, and sustainability within the agricultural ecosystem.

The DAR also highlights the importance of building a robust enabling environment. The 32 priority enabling initiatives, including improving digital infrastructure, enhancing digital literacy, and developing comprehensive farmer profiles are pivotal to the success of the priority use cases. This includes establishing supportive government policies, enhancing physical and digital infrastructure, fostering innovation, and building human capital. The roadmap's phased implementation plan ensures that foundational initiatives are addressed first, laying the groundwork for more complex digital solutions. This approach minimizes risks and maximizes the impact of each initiative, creating a solid foundation for long-term success.

Stakeholder engagement has been a cornerstone of the DAR development process. The roadmap was created through extensive consultations with government agencies, industry experts, donor organizations, and local communities, and we acknowledge and thank all participants for their expertise and support. This collaborative approach has ensured that the DAR is not only aligned with national policies and strategies but also reflects the on-the-ground realities and needs of farmers. The involvement of a broad range of stakeholders will also be crucial for the successful implementation and sustainability of the roadmap.

Ultimately, the DAR is more than just a plan—it is a call to action. It sets a clear path forward for transforming Ethiopia's agricultural sector through digital innovation. The successful implementation of this roadmap will require continued commitment, strategic investment, and adaptive management. By working together, government bodies, private sector partners, development agencies, and local communities can achieve the vision of a digitally empowered agricultural sector, ensuring improved livelihoods for farmers and pastoralists across Ethiopia. This collective effort will make Ethiopian agriculture more productive, resilient, and ready to face future challenges, paving the way for a prosperous and sustainable future.

# 8

# Appendix

**Table 46: Steering Committee Composition**

| No | Name | Organization | Position |
|---|---|---|---|
| 1 | Girma Amente (Chair) | MoA | State Minister |
| 2 | Mandefro Nigussie (Deputy Chair) | ATI | CEO |
| 3 | Eyasu Elias (Prof.) | MoA | State Minister (NRM) |
| 4 | Fikru Regassa (PhD) | MoA | State Minister (Livestock and Fishery) |
| 5 | Meles Mekonnen (PhD) | MoA | State Minister (Agriculture and Horticulture) |
| 6 | Sofia Kassa (PhD) | MoA | State Minister (Input and Investment) |
| 7 | Efa Muleta (PhD) | MoA | State Minister |
| 8 | Stewart Collis | BMGF | Senior Program Officer |
| 9 | Parmesh Shah (PhD) | World Bank | Global Lead for Rural Livelihoods and Agricultural Jobs |
| 10 | Mawira Chitima (PhD) | IFAD | Country Director for Ethiopia |
| 11 | Erik Slingerland | Netherlands Embassy | First Secretary - Food and Nutrition Security for Netherlands Embassy in Ethiopia |
| 12 | Beker Shale (PhD) | ESS | Director General |

**Table 47: Technical Committee Composition**

| No | Name | Organization | Position |
|---|---|---|---|
| 1 | Anteneh Legesse | MoA | Director of ICT |
| 2 | Abreham Endrias | Lersha | CEO |
| 3 | Beza Bogale | Digital Green | Digital Product Lead |
| 4 | Zemen Haddis (PhD) | USAID | Deputy Director |
| 5 | Brenda Gunde | IFAD | Regional ICT 4D specialist |
| 6 | Fernando Rodrigues | ATI | Director of Analytics |
| 7 | Dawit Philipos | ATI | Senior Director |
| 8 | Girma Mamo (PhD) | EIAR | Climate, Geospatial and Biometrics Research Directorate |
| 9 | Lulseged Desta (PhD) | Alliance Bioversity & CIAT | Director |
| 10 | Efrem Tesfaye (PhD) | Development Gateway | Project Manager for aLIVE |
| 11 | Martin Parr (PhD) | CABI | Director |
| 12 | Nixon Gecheo(PhD) | AGRA | Senior Programme Officer |
| 13 | Melkamu Beyene (PhD) | AAU | Assistant Professor |
| 14 | Yosef Getachew | MoA | Deliver Unit |
| 15 | Degefie Tibebe (PhD) | Alliance Bioversity & CIAT | Spatial Analyst |

## 8.1 STAKEHOLDERS CONSULTED FOR THE DEVELOPMENT OF DAR

Table 48 below includes a list of all stakeholders engaged throughout the roadmap development process. These stakeholders were either consulted during interviews or attended the National or Partner Convening.

The National Convening was a workshop held on the 11th and 12th of March 2024 in Addis Ababa, bringing together local agriculture ecosystem participants, development and implementation partners, and government institutions to socialize the concept of DAR and gather input on prioritizing digital agriculture use cases and enabling initiatives.

The Partner Convening was a workshop held on the 21st of May 2024 in Addis Ababa bringing together various local and international digital agriculture ecosystem participants, development & implementation partners, and government institutions to socialize the draft roadmap and give input on the draft implementation plans for priority Phase One use cases and initiatives of the roadmap.

All other stakeholders were consulted through group discussions or one-on-one interviews. The DAR project team is thankful for their contributions.

**Table 48: List of Stakeholders Consulted for the Development of DAR**

| No | Type | Organization Name | Name | Special Recognition |
|---|---|---|---|---|
| 1. | Government | MoA | Girma Amente (PhD) | SteerCo Chair |
| 2. | Government | ATI | Mandefro Nigussie (PhD) | SteerCo Deputy Chair |
| 3. | Government | MoA | Prof. Eyasu Elias | SteerCo Member |
| 4. | Government | MoA | Fikru Regassa (PhD) | SteerCo Member |
| 5. | Government | MoA | Meles Mekonnen (PhD) | SteerCo Member |
| 6. | Government | MoA | Sofia Kassa (PhD) | SteerCo Member |
| 7. | Government | MoA | Efa Muleta (PhD) | SteerCo Member |
| 8. | Government | ESS | Beker Shale | SteerCo Member |
| 9. | Government | CIAT | Lulseged Desta (PhD) | TechCo Member |
| 10. | Government | AUU | Melkamu Beyene (PhD) | TechCo Member |
| 11. | Government | MICT | Yosef Getachew | TechCo Member |
| 12. | Government | ATI | Fernando Rodrigues | TechCo Member |
| 13. | Government | ATI | Dawit Phillipos | TechCo Member |
| 14. | Government | MoA | Esayas Lemma | |
| 15. | Government | MoA | Mengistu Tesfa | |
| 16. | Government | MoA | Yenenesh Egu | |

| No | Type | Organization Name | Name | Special Recognition |
|---|---|---|---|---|
| 17. | Government | MoA | Melake Assefa | |
| 18. | Government | MoA | Anteneh Legesse | TechCo Chair |
| 19. | Government | MoA | Andualem Walelegn | |
| 20. | Government | MoA | Thomas Cherenet (PhD) | |
| 21. | Government | MoA | Chala Wordofa Bonse (PhD) | |
| 22. | Government | MoA | Keberu Belayneh | |
| 23. | Government | ATI | Chimdo Anchala | |
| 24. | Government | ATI | Temesgen Gebeyehu | |
| 25. | Government | ATI | Awet Tekie | |
| 26. | Government | ATI | Habtamu Hailemariam | |
| 27. | Government | ATI | Bereket Gebrewahid | |
| 28. | Government | MInT | Fekade Getahun (PhD) | |
| 29. | Government | MInT | Minda Feleke | |
| 30. | Government | MInT | Abiyot Bayou (PhD) | |
| 31. | Research Institute | EIAR | Feto esimo (PhD) | |
| 32. | Research Institute | EIAR | Tadesse Anberbir | |
| 33. | Research Institute | EIAR | Girma Mamo | |
| 34. | Government | EthioTelecom | Mohammed Abdusemed | |
| 35. | Government | National ID Ethiopia | Yodahe Zemichael | |
| 36. | Government | AI Institute | Mohammed Edris | |
| 37. | Government | AI Institute | Amanuel Kumsa | |
| 38. | Government | Geospatial Information Institute | Tulu Besha (PhD) | |
| 39. | Development Partner | MasterCard Foundation | Haile Dolango | |
| 40. | Development Partner | World Bank | Elliot Mghenyi | |
| 41. | Development Partner | BMGF | Stewart Collis | SteerCo Member |
| 42. | Development Partner | BMGF | Amsale Mengistu | |
| 43. | Development Partner | BMGF | Wanjiku Kiragu | |
| 44. | Development Partner | World Bank | Parmesh Shah (PhD) | SteerCo Member |
| 45. | Development Partner | IFAD | Mawira Chitima (PhD) | SteerCo Member |
| 46. | Development Partner | REDFS | Erik Slingerland | SteerCo Member |

| No | Type | Organization Name | Name | Special Recognition |
|---|---|---|---|---|
| 47. | Development Partner | USAID | Zemen Haddis | TechCo Member |
| 48. | Development Partner | FAO | HageAli, Maya | |
| 49. | Development Partner | GIZ | Berhanu Genzebu | |
| 50. | Development Partner | IFAD | Brenda Gunde | TechCo Member |
| 51. | Development Partner | DANIDA | Tigist Kebede | |
| 52. | Development Partner | World Bank | Elliot W. Mghenyi (PhD) | |
| 53. | Development Partner | IFC | Desta Damena | |
| 54. | Development Partner | IFC | Selamawit Hailemichael Tumebo | |
| 55. | Development Partner | BMGF | Haddis Tadesse | |
| 56. | Development Partner | AfDB | Abdul Kamara (PhD) | |
| 57. | Development Partner | GIZ | Markus Koerner | |
| 58. | Development Partner | GIZ | Melaku Tadesse | |
| 59. | Development Partner | UNCDF | Ibrahim M. Hussein | |
| 60. | Development Partner | UNCDF | Melat Mebratu | |
| 61. | Development Partner | UNCDF | Endashaw tesfaye | |
| 62. | Development Partner | JICA | Yuhi Miyauchi | |
| 63. | Development Partner | Master Card Foundation | Samuel Yalew Adela | |
| 64. | Development Partner | Master Card Foundation | Mekdes Girmaw | |
| 65. | Development Partner | USAID | Yirgalem Gebremeskel | |
| 66. | Development Partner | AFD | Sonia Lioret | |
| 67. | Development Partner | EU | Mercedes Marin | |
| 68. | Development Partner | EU | Roberto Schiliro | |
| 69. | Development Partner | EU | Maxime Heyndrickx | |
| 70. | Development Partner | FAO | Dejan Jakovljevic | |
| 71. | Development Partner | FAO | Hailu Eregnaw | |
| 72. | Development Partner | AGRA | Nixon Gecheo (PhD) | TechCo Member |
| 73. | Development Partner | AGRA | George Marechera | |
| 74. | Development Partner | FCDO | Edward Barney | |
| 75. | Development Partner | Embassy of Ireland - Irish Aid | Niall Cremen | |
| 76. | Development Partner | GEAAP | Enas Abdulmalik | |

| No | Type | Organization Name | Name | Special Recognition |
|---|---|---|---|---|
| 77. | Development Partner | Embassy of Sweden /sida | Girum Bahri | |
| 78. | Development Partner | Embassy of Norway | Fikirte Regassa | |
| 79. | Development Partner | Embassy of Finland | Meseret Mengistu | |
| 80. | Development Partner | Italian Agency for Development Cooperation | Andrea Limiroli | |
| 81. | Development Partner | Swiss Development Cooperation | Renate Lefroy | |
| 82. | Development Partner | UNDP | Selamawit Alebachew | |
| 83. | Development Partner | KOICA | Yosef Tesfaye | |
| 84. | Development Partner | IGAD | Edmealem shitaye | |
| 85. | Development Partner | Norway Embassy | Mari Martinsen | |
| 86. | Development Partner | WFP | Jennifer Bitonde | |
| 87. | Development Partner | UNDP | Samuel G. Doe | |
| 88. | Development Partner | European Union Delegation | Teriessa Jalleta | |
| 89. | Development Partner | WFP | Allan Mulando | |
| 90. | Development Partner | Swiss Development Cooperation | Daniel Valenghi | |
| 91. | Development Partner | Swiss Development Cooperation | Amsalu Andarge | |
| 92. | Development Partner | Global Affairs Canada | Selamawit Enna | |
| 93. | Development Partner | Embassy of Ireland - Irish Aid | Hiwot Mebrate | |
| 94. | NGO | SNV | Yetnayet Girmaw | |
| 95. | NGO | Precision Agriculture for Development | Habtamu Yesigat (PhD) | |
| 96. | NGO | Development Gateway | Efrem Tesfaye (PhD) | TechCo Member |
| 97. | NGO | CABI | Negussie Efa | |
| 98. | NGO | Farm Radio International | Zelalem Nega | |
| 99. | NGO | Sasakawa Africa Association | Fentahun Mengistu (PhD) | |
| 100. | NGO | Digital Green | Kebede Ayele | |
| 101. | NGO | Digital Green | Beza Bogale | |
| 102. | NGO | Mercy Corps | Ferhana Jelaludin | |
| 103. | NGO | TechoServe | Belayneh Nekatibeb | |
| 104. | NGO | OXFAM | Tibebu Koji | |

| No | Type | Organization Name | Name | Special Recognition |
|---|---|---|---|---|
| 105. | NGO | Self Help Africa | Wubshet Berhanu | |
| 106. | NGO | Agriterra | Hailet Berhane | |
| 107. | NGO | BENEFIT | Helen Getaw | |
| 108. | NGO | GAIN | Ton Haverkort | |
| 109. | NGO | CARE | Zegeye Bante | |
| 110. | NGO | Farm Africa | Shewit Emmanuel Kidane Mariam | |
| 111. | NGO | OXFAM | Yilma Muluken | |
| 112. | NGO | Alliance2015 ETHIOPIA | Sara Worku | |
| 113. | NGO | GAIN | Wubet Girma | |
| 114. | NGO | SNV | Mahlet Yohannes | |
| 115. | Research Institute | CIMMYT | Kindie Tesfaye Fantaye (PhD) | |
| 116. | Research Institute | ICRISAT | Mezegebu Getnet | |
| 117. | Research Institute | CIAT | Sintayehu Alemayehu | |
| 118. | NGO | AGRA | Bisrat | |
| 119. | NGO | CABI | Martin Parr (PhD) | TechCo Member |
| 120. | NGO | CIAT | Degefie Tibebe (PhD) | TechCo Member |
| 121. | NGO | Precision Agriculture for Development | Habtamu Yesigat (PhD) | |
| 122. | Private Sector | Hello Erf | Gezachew Mesfin | |
| 123. | Private Sector | Safaricom Telecommunications | Girum Ketema | |
| 124. | Private Sector | Hello Tractor | Mao Yohannes | |
| 125. | Private Sector | Lersha | Abrhame Endrias | SteerCo Member |
| 126. | Research Institute | EIAR | Girma Mamo (PhD) | TechCo Member |
| 127. | Strategic Support | BCG | Chris Mitchell | SteerCo Member |
| 128. | Strategic Support | BCG | Zoe-Karl Waithaka | SteerCo Member |
| 129. | Technical Support | BCG | Michael Custer | Working Team Lead |
| 130. | Technical Support | BCG | Rosalind Parr | Working Team Member |
| 131. | Technical Support | BCG | Jonathan Sentomero | Working Team Member |
| 132. | Technical Support | BCG | Lunah Njeri | Working Team Member |
| 133. | Development Partener | JICA | Abera Awano | |

| No | Type | Organization Name | Name | Special Recognition |
|---|---|---|---|---|
| 134. | Government | MoA | Addis Mulugeta | |
| 135. | NGO | CABI | Ameen Jauhar | |
| 136. | Development Partener | UNDP | Asmare Adegeh | |
| 137. | NGO | Sasakawa Africa Association | Binyam Tesfaye | |
| 138. | Private Sector | Laesk Net Trading PLC | Birhanu Muluneh | |
| 139. | Development Partener | IFC | Bruck Sewnet | |
| 140. | Government | ATI | Dagachew Seyoum | |
| 141. | Private Sector | Acatch Technology | Daniel Yilma | |
| 142. | Government | National ID Ethiopia | Dawit M. Dam | |
| 143. | Government | EIAR | Liyuneh Gebre (PhD) | |
| 144. | Development Partener | GIZ | Teklu Erkossa(PhD) | |
| 145. | Private Sector | Laesk Net Trading PLC | Eskinder Teshome | |
| 146. | Government | ATI | Ezedin Abdella | |
| 147. | Private Sector | Acatch Technology | Fikru Kebede | |
| 148. | Private Sector | RE Technology Solutions PLC | Hanna Kifle | |
| 149. | Private Sector | Lersha | Hanna Mulugeta | |
| 150. | NGO | Digital Green | Hawinet Bekele | |
| 151. | Private Sector | Kifiya | Henock Chanyalew | |
| 152. | Government | MoA | Israel Solomon | |
| 153. | Development Partener | IFAD | Kadre Kadei | |
| 154. | Government | MoA/GIZ | Kebebew Ababu | |
| 155. | Development Partener | JICA | Keiko Ota | |
| 156. | Farmer | | Nigussie Akalu | |
| 157. | Farmer | | Kisu Geremew | |
| 158. | Farmer | | Yitages Kasaye | |
| 159. | Farmer | | Shibere Mengesha | |
| 160. | Farmer | | Belete Alemu | |
| 161. | Farmer | | Abera Workineh | |
| 162. | Farmer | | Kebede Tulu | |

| No | Type | Organization Name | Name | Special Recognition |
|---|---|---|---|---|
| 163. | Farmer | | Sidisu Moju | |
| 164. | Farmer | | Genet Fiseha | |
| 165. | Farmer | | Shewaye Zewdie | |
| 166. | Farmer | | Megertu Yadicha | |
| 167. | Farmer | | Sisay Mekasha | |
| 168. | Farmer | | Moti Gadisa | |
| 169. | Farmer | | Engidashet Abdi | |
| 170. | Farmer | | Deribe Jema | |
| 171. | Farmer | | Dejene Daba | |
| 172. | Farmer | | Gisa Tefera | |
| 173. | Farmer | | Martha Mulugeta | |
| 174. | Farmer | | Dereje Kebede | |
| 175. | Farmer | | Solomon Lema | |
| 176. | Farmer | | Alemayehu Terefe | |
| 177. | Farmer | | Etagegnehu Terefe | |
| 178. | Farmer | | Zewdua Wolde | |

## 8.2 POLICIES AND REPORTS LEVERAGED FOR DEVELOPMENT OF DAR

**Table 49: Policy Documents and Sector Reports Leveraged for DAR**

| Policy/ Document (year) | Year | Issuing institution/ entity | Relevance for DAR |
|---|---|---|---|
| Personal Data Protection Proclamation (PDPP) | 2024 | HPR | The personal data protection proclamation is a comprehensive legal framework designed to protect individual privacy and regulate the management of personal data in Ethiopia. As such any data generated by Ethiopian farmers must be held in a manner that complies with the law. |
| Towards Digital Agriculture in Ethiopia an overview of the status, challenges, enablersenablers, and prospects | 2023 | CIAT, CGIAR, Acatech, MoA | The document examines the current landscape, challenges, and opportunities of digital agriculture. The document also outlines strategic directions to follow for advancing digital agriculture in Ethiopia. |
| Agriculture 10-in-10 Strategy | 2023 | MoA | The document summarizes the 10 priority programs in agriculture to significantly improve food supply over the next 10 years. Therefore, special attention is given to raise production and productivity levels beyond the targets in the 10-year prospective plan. |
| Digital Farmer Services (DFS) Roadmap | 2023 | BCG | This document detailed out the development of a digital farmer solutions roadmap for a state government in India which prioritised 3 “Big Plays” to reach 40 to 45 million farmers and create a 15 – 25% boast in the farmers’ income |
| Ethiopia Start Up Eco-System Report | 2023 | JICA | The document reviewed the Ethiopian startup ecosystem and startups, providing a detailed look into their growth, success, failures, and sectors. One of the startup sectors detailed out in the document was Agri-tech, diving into the startups found at different points along the agriculture value chain |
| State of Mobile Internet Connectivity and Indices | 2023 | GSMA | The GSMA report gives insights into the global state of mobile internet connectivity and the challenges that remain. The insights we can get from the report include coverage area, regional variations, and digital inclusion |

| Policy/ Document (year) | Year | Issuing institution/ entity | Relevance for DAR |
|---|---|---|---|
| Price Baskets Report | 2023 | ITU | The document monitors and reports on global ICT prices. The ITU collects prices for three main ICT services - mobile-cellular, fixed-broadband, and mobile-broadband. The price data are used for international comparisons of affordability and access to ICT services. |
| Ethiopia DAEAS 10-Year Roadmap | 2022 | MoA | The roadmap aimed to provide high-quality, customized, and cost-efficient data and advisory information. The roadmap also tried to deliver initiatives through a solutions pipeline (digital innovations), digital stack (necessary digital elements), and enabling environment (policies, human capital, and private sector). |
| National Digital Skills Country Action Plan | 2021 | MoE | The action plan has a goal of preparing students in Higher Education and TVET institutions with the right level of digital skills that the future work environment demands. This also requires making ready the necessary policies and strategies, designing the appropriate curriculum, enhancing the teaching learning process to be supported by ICTs, developing the necessary infrastructure and resources. |
| National Financial Inclusion strategy | 2021 | NBE | The Inclusion strategy has highlighted a set of interventions that need to be completed, ranging from building financial infrastructure to promoting financial education. These interventions are very useful for the agriculture sector in Ethiopia. |
| National Digital Payments Strategy | 2021 | NBE | The strategy outlines a robust and responsible digital payment ecosystem in Ethiopia. Farmer-facing digital payment initiatives need to follow the directions outlined in the document. |
| a Livestock Information Vision Ethiopia (aLIVE) Program | 2021 | MoA, BMGF & Development Gateway | A roadmap for a livestock information system for Ethiopia to support better use of data for decision-making in the Ministry of Agriculture.It incorporates an interoperable national livestock information and analytic system that will define critical data needs and standards and guidelines to enable interoperability of data systems |
| Ten Years Plan of MoA | 2021 | MoA | The Ethiopian agricultural plan for the next 10 years aims to reduce poverty by meeting specific goals, which state that areas such as nutrition, |

| Policy/ Document (year) | Year | Issuing institution/ entity | Relevance for DAR |
|---|---|---|---|
| | | | farmer income, or exports will be prioritized for the coming decade. The document clearly outlines the direction the government wants to reach within the next decade. |
| Digital Ethiopia 2025 | 2020 | PMO | It is a comprehensive digital transformation initiative with objectives of inclusive digital transformation, in agriculture, manufacturing, IT services and Tourism |
| Technical Centre for Agriculture and Rural Cooperation | 2019 | CTA | The report highlighted the potential of digital technologies to transform African agriculture and improve the livelihoods of smallholder farmers and pastoralists. |
| Digital Ag in Rural areas Briefing Paper | 2019 | UN, FAO | The document delves into how digital technologies can improve agricultural productivity, efficiency, and sustainability. It also discusses the digital tools and platforms that can be utilized for digital agriculture transformations. |
| Agricultural Extension Strategy of Ethiopia | 2017 | MoA | The strategy aimed to improve the Ethiopian farmer extension system with digital communications to improve knowledge and management of agricultural resources. |
| USAID Digital Farmer Services (DFS) for Ag | 2017 | USAID | The primary objective is to increase access to financial services for smallholder farmers, addressing chronic challenges in the agricultural value chain, such as limited access to credit, savings, insurance, and payment channels |
| ICT Strategy of MoA | 2005 | MoA | The strategy looked to create an enabling environment for the digitalization of the extension and advisory services in Ethiopia by focusing on six themes and five action plans |

## 8.3 MAPPING OF DAEAS RECOMMENDATIONS TO DAR

Each initiative on the DAEAS Roadmap has been integrated into DAR. The following table demonstrates how DAEAS initiatives have been mapped to DAR use cases and initiatives.

**Table 50: Mapping of DAEAS recommendations to DAR**

| Number | Action item in DAEAS | Mapping | Mapped to DAR |
|---|---|---|---|
| 1 | Competitive incubation / product dev. environment with forum | 1-1 | Initiative: Competitive incubation / product dev. environment with forum |
| 2 | Partner with Mobile Network Operator (MNO) to create a farmer facing DAEAS | 1-1 | Use case: Partner with Mobile Network Operator (MNO) to create a farmer facing DAEAS |
| 3 | Support market entry of international products (in partnership with local players) | 1-1 | Initiative: Support market entry of international products (in partnership…) |
| 4 | Device access for extension workers (DAs, woreda experts) | 1-1 | Initiative: Device access for extension workers |
| 5 | Free access for DAs to key apps | Combined | Initiative: Free access for DAs and farmers to key apps |
| 6 | Phone payment plan for farmers | 1-1 | Initiative: Phone payment plan for farmers |
| 7 | Free access for farmers to key apps | Combined | Initiative: Free access for DAs and farmers to key apps |
| 8 | Telco service targets and incentives for rural areas | 1-1 | Initiative: Telco service targets and incentives for rural areas |
| 9 | Off-grid electricity access expansion in rural areas | Adjusted | Initiative: Solar panels for FTCs or OSSs |
| 10 | Internet kiosk at FTC run by women/youth groups | Reworded | Initiative: Digital kiosks for farmers and DAs |
| 11 | Farmer profiles and unique ID | 1-1 | Initiative: Farmer profiles and unique ID |
| 12 | Input demand & supply tracking | In use cases | Use cases: Procure and distribute and track and trace inputs, plus analytics initiative |
| 13 | Integrated ag. data access point (decentralized data hub) | Adjusted | Initiative: Data stack with APIs |
| 14 | Data sharing incentives | Combined | Initiative: Data governance and sharing policy, standards, assurances and incentives |

| Number | Action item in DAEAS | Mapping | Mapped to DAR |
|---|---|---|---|
| 15 | Ag. data quality standards and assurance system | Combined | Initiative: Data governance and sharing policy, standards, assurances and incentives |
| 16 | Fast-track pluralistic extension and ag. data sharing policies ratification | Part combined | Initiative: Data governance and sharing policy, standards, assurances and incentives |
| 17 | DAEAS National Forum linked to PMO | Not included | Only supports extension use cases, covered by proposed governance |
| 18 | Streamline content approval process | 1-1 | Initiative: Streamline content approval process |
| 19 | Working space and targeted training for ag techs | 1-1 | Initiative: Working space & training for ag techs |
| 20 | Digital training platform for DAs | Combined | Initiative: Digital & financial literacy for farmers and Das |
| 21 | Digital skills at ATVETs | Reworded | Initiative: Digital program in ATVETS |
| 22 | Improve DA management | 1-1 | Initiative: Improve DA management |
| 23 | Financial and digital literacy for farmers | Combined | Initiative: Digital & financial literacy for farmers and DAs |
| 24 | Expand dig. capacity MoA extension team | Combined | Initiative: Digital agriculture department in MoA |
| 25 | MoA & EIAR ICT human capacity building | Adjusted | Initiative: Digital training platform for MoA/RBoA |
| 26 | Digital training platform for MoA/BoA | 1-1 | Initiative: Digital training platform for MoA/RBoA |
| 27 | Digitize payments at rural service points | Adjusted | Initiative: Digitize payments at rural service points and other channels |
| 28 | Scale warehouse receipt financing | Multiple | Initiatives: Transaction and warehouse data, Input warehouses and distribution hubs |
| 29 | Digital contract farming platform | In use cases | Use case: Access better markets and buyers, Access to credit |
| 30 | Support innovative digital finance products targeting farmers | In use cases | Use cases: Financial services use cases |

Note that the only initiative that has not been included is the Digital Agriculture Forum with PMO, as this will be revisited when a dedicated digital agriculture team has been established. It will either be subsumed into the larger DAR governance structure, or linkages will be made to ensure ongoing alignment with the rest of the DAR implementation.

## 8.4 DAR USE CASE AND INITIATIVE PRIORITIZATION PROCESS AND RESULTS

### 8.4.1 Use case prioritization methodology

This process consisted of two broad steps. The first step was to identify a list of 22 use cases across 5 solution areas[73]. The second step was to prioritize these use cases based on their estimated impact and feasibility. Use cases that were prioritized would be addressed in the Phase One of the roadmap and the non-prioritized use cases would be addressed in Phase Two of the roadmap.

The initial 21 priority use cases were identified through the following three steps:

1. **Referencing –** Thorough review of local and international reports, national strategies, and stakeholder interviews, which resulted in 138 use case examples.
2. **Consolidation –** the 138 use case examples were then deduplicated and categorize then as either use cases as initiatives. This process narrowed the list down to 26 use cases.
3. **Applicable to Ethiopian Context -** These consolidated use cases were then sense checked for their applicability to the Ethiopian context through stakeholder interviews. The result was a final list of 22 use cases for the roadmap.

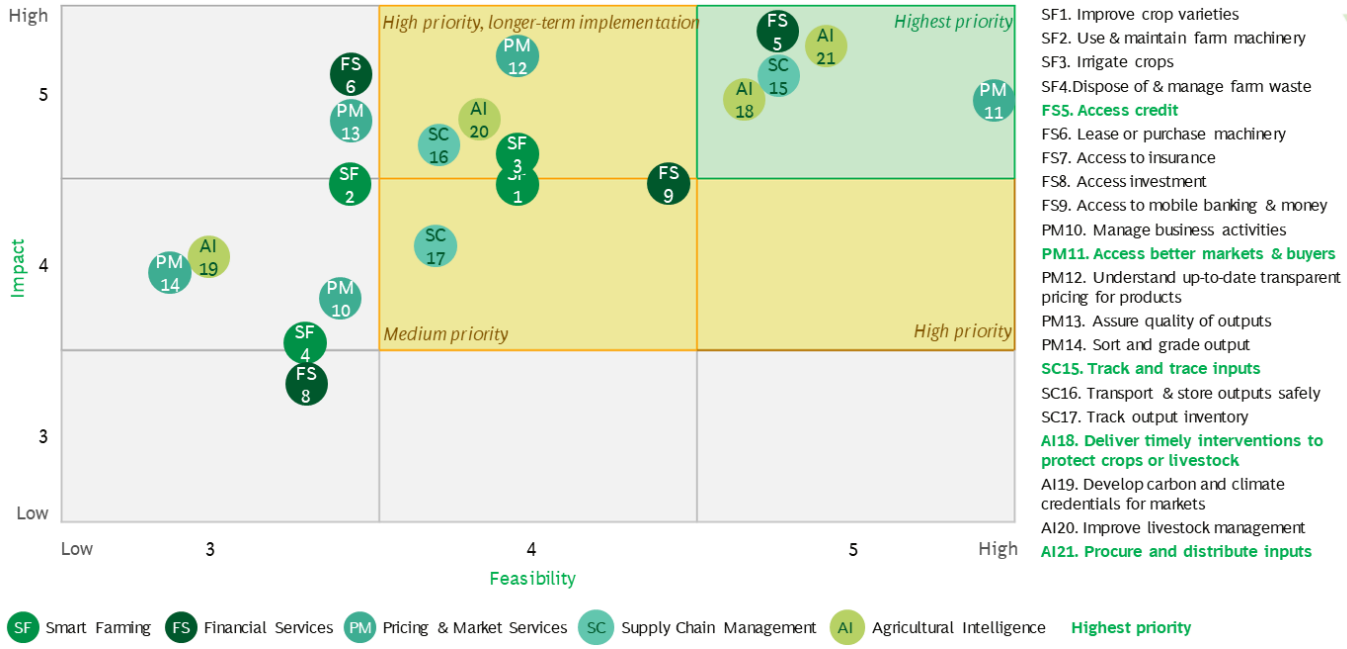
The 22 priority use cases were then prioritized to determine Phase One and Phase Two priorities for the roadmap. This prioritization process involved three inputs: Stakeholder feedback during the National Convening, one-on-one stakeholder interviews, and an assessment of impact metrics from local and international metrics. Across all three inputs, the prioritization considered both the potential impact of the use cases and the feasibility of implementation in Ethiopia. The results from the three inputs are outlined below.

**Prioritization Input 1 - National Convening**

During the national convening, attendees were asked to rate the 21 use cases (excluding extension and advisory use case) from 1 – 5 on impact and feasibility, with 1 being the lowest and 5 being the highest score. These use cases were then categorized as either high priority or medium priority based on the scoring matrix below in Figure 13. The top 5 use cases coming out of the national convening were: access credit, access better markets, track and trace inputs, deliver timely interventions and procure and distribute inputs.

[73] Excluding extension and advisory

**Figure 13: Convening Use Case Prioritization Results**




Impact and feasibility scores for prioritizing use case:

- ☐ <4 on impact and <4 on feasibility
- ☐ 4 on impact and 4 on feasibility
- ☐ 5 on impact and 5 on feasibility

**Prioritization Input 2 - One-on-One Stakeholder Interviews**

The DAR project team conducted over 30 interviews with stakeholders across the ecosystem to gather input on use case prioritization. During these interviews, stakeholders were asked to highlight their top three priority use cases based on their assessment of the use case's feasibility and impact. The number of times a use case was prioritized in one-on-one interviews was then aggregated across all interviews conducted, the results of which are shown in Table 51 below.

**Table 51: Results of use case prioritization from one-on-one stakeholder interviews**

| Smart farming | Financial services | Pricing and market services | Supply chain management | Agricultural intelligence |
|---|---|---|---|---|
| Use and maintain farm machinery | Access credit | Access better markets and buyers | Track and trace inputs | Deliver timely interventions to protect crops or livestock |
| Improve crop varieties | Access to insurance | Manage farm business activities | Track output inventory | Procure and distribute inputs |
| Irrigate crops | Lease or purchase machinery | Understand up-to-date transparent pricing for products | Transport and store outputs safely | Develop carbon and climate credentials |
| Dispose of and manage farm waste | Access investment | Assure quality of outputs | | Improve livestock management |
| | Access to mobile banking & money | Sort and grade output | | |

Number of stakeholders prioritizing use case:
☐ 0-3 times prioritized ☐ 4-5 times Prioritized ☐ 6+ times prioritized

**Prioritization Input 3 – Metrics from benchmarks**

Metrics from 21 international and local case studies were used to produce impact and feasibility scores. In cases where quantitative data was not available for the assessment, a qualitative assessment was made or the criteria was not leveraged for the analysis. For the assessment, the 4 impact criteria and 2 feasibility criteria outlined below were leveraged.

Impact Metrics

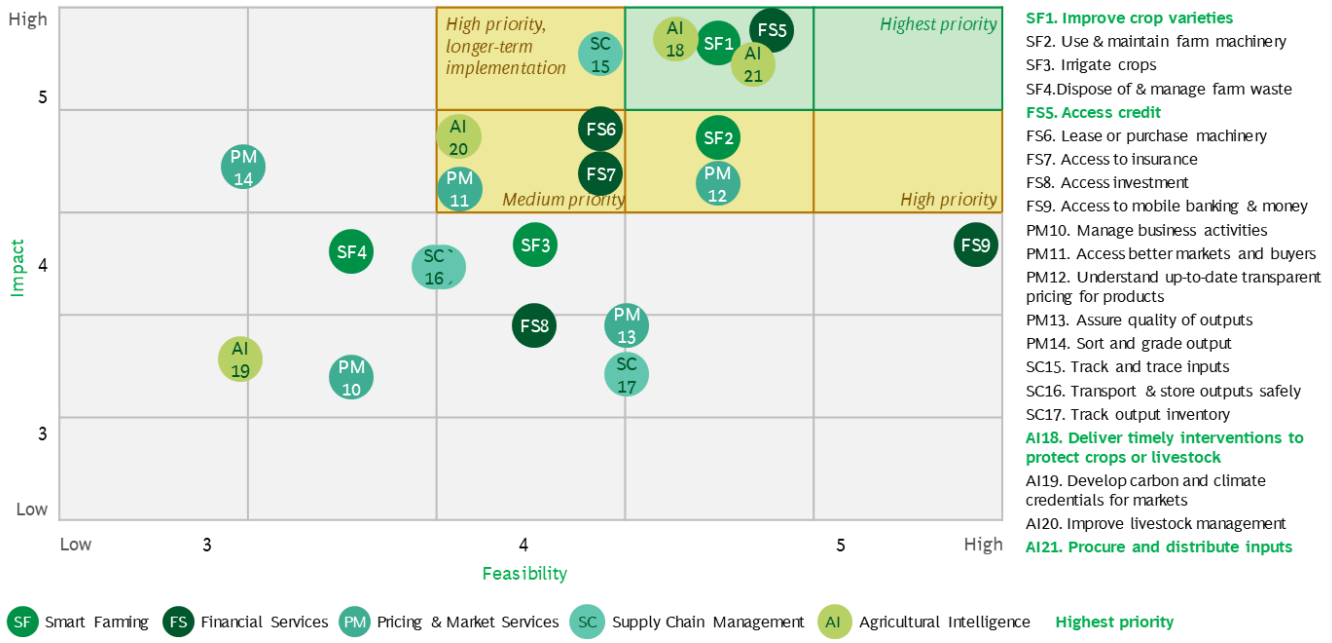
1. Income – estimated percent increase in farmer income from the benchmark use case
2. Production – Estimated percent increase in production from the benchmark use case
3. Number of impacted farmers – estimated percent of total farmers in a country reached from the benchmark use case and geography
4. Climate resilience and impact – Estimated resilience improvement or sequestration from the benchmark use case

Feasibility Metrics

1. Number of farmers onboarded per year for the benchmark use case
2. Number and scale of initiatives for the benchmark use case

Based on the results of the assessment of benchmark use case, each DAR use case was classified has high or medium priority through placement on the matrix figure 14 below. The top 4 use cases according to this input were: improve crop varieties, access credit, deliver timely interventions, and procure and distribute inputs.

**Figure 14: International Case Study Metric Prioritization Results**




Impact and feasibility scores for prioritizing use case:

- ☐ <4 on impact and <3 on feasibility
- ☐ 4 on impact and 3 on feasibility
- ☐ 5 on impact and 4 or 5 on feasibility

Aggregating the outcome of all three of these inputs resulted in the following 5 use cases being prioritized for Phase One of the roadmap, with the reaming 15 use cases to be addressed in Phase 2. Detailed overall prioritization results can be found in Table 52. The 5 phase one priority use cases are;

1. Access to Credit and Insurance[74]
2. Procure and Distribute Inputs
3. Track and Trace Inputs
4. Deliver Timely Interventions to Protect Crops or Livestock
5. Access Better markets and buyers

[74] Given similar data requirements and distribution channels, access to credit and insurance were combined in Phase 1 of the roadmap

### Table 52: Overall Use Case Prioritization Results

| No. | Use case | Convening priority | Stakeholder priority | Metric priority | Overall priority |
|---|---|---|---|---|---|
| SF1 | Improve crop varieties | | | ✓ | |
| SF2 | Use and maintain farm machinery | | ✓ | ✓ | |
| SF3 | Irrigate crops | | | | |
| SF4 | Dispose of and manage farm waste | | | | |
| **FS5** | **Access credit** | ✓ | ✓ | ✓ | ✓ |
| FS6 | Lease or purchase machinery | ✓ | | | |
| FS7 | Access to insurance | | ✓ | *Note: Bundled with credit* | |
| FS8 | Access investment | | | | |
| FS9 | Access to mobile banking and mobile money | | | | |
| PM10 | Manage farm business activities | | | | |
| **PM11** | **Access better markets and buyers** | ✓ | ✓ | | ✓ |
| PM12 | Understand up-to-date transparent pricing for products | ✓ | | ✓ | |
| PM13 | Assure quality of outputs | | | | |
| PM14 | Sort and grade output | | | | |
| **SC15** | **Track and trace inputs** | ✓ | ✓ | ✓ | ✓ |
| SC16 | Transport and store outputs safely | | | | |
| SC17 | Track output inventory | | | | |
| **AI18** | **Deliver timely interventions to protect crops or livestock** | ✓ | ✓ | ✓ | ✓ |
| AI19 | Develop carbon and climate credentials for markets | | | | |
| AI20 | Improve livestock management | | | | |
| **AI21** | **Procure and distribute inputs** | ✓ | ✓ | ✓ | ✓ |

✓ High priority ✓ Medium priority ✓ Overall height priority

### 8.4.2 Enabling Initiatives Prioritization

The Phase One priority enabling initiatives for the roadmap were determined through a comprehensive two-step process. The first step was to compile different enabling initiatives with input from the national convening, stakeholder interviews, and the DAEAS roadmap. This process resulted in a long list of 32 enabling initiatives. The second step was to prioritize initiatives based on their feasibility for implementation by the MoA, their alignment with existing Ethiopian digital and agriculture strategies, and stakeholder and & expert priorities.

For MoA implementation feasibility, an enabling initiative was categorized either high or medium as follows;

- High priority – Initiative can be fully implemented by MoA
- Medium priority - Initiative implementation is dependent on input from other government institutions

For alignment to Ethiopian strategies, an enabling initiative was categorized as either high or not categorized as follows;

- High priority – Initiative is aligned with MoA or Ethiopian digital strategy or policy document

**Table 53: Enabling Initiative Prioritization Based on MoA Implementation Feasibility and Strategic Alignment**

| | Area | Initiative | MoA implementation | Strategic alignment |
|---|---|---|---|---|
| Digital stack | User facing | Software dev curriculum to build capability | | ✓ |
| | | Digitized payments | | ✓ |
| | | Decision-making dashboard for MoA | ✓ | |
| | Integration | Digital Agriculture Forum for interoperability | ✓ | |
| | | Data stack with APIs | ✓ | ✓ |
| | Analytics | Input demand and supply analytics | ✓ | |
| | | Dedicated analytics unit within MoA | ✓ | |
| | Data & content | Farmer profiles and unique ID | ✓ | ✓ |
| | | Land and farmer-linked production data | ✓ | |
| | | Transaction and warehousing data | ✓ | |
| | | Weather data | ✓ | |
| | | Price data | ✓ | |
| | | Soil data | ✓ | |

| | Area | Initiative | MoA implementation | Strategic alignment |
|---|---|---|---|---|
| Enabling environment | Innov. & tech | Competitive incubation/product dev. environment | ✓ | |
| | | Working space & training for ag techs | ✓ | |
| | | Digital agriculture curriculum | | ✓ |
| | Digital infra | Device access for extension workers | ✓ | |
| | | Free access for DAs and farmers to key apps | | |
| | | Telco service targets and incentives for rural areas | | |
| | | Phone payment plan for farmers | | |
| | | Digital kiosks for farmers and DAs | ✓ | ✓ |
| | Ag markets | Incentivized aggregation & value addition | ✓ | |
| | Physical infra | Input warehouses and distribution hubs | ✓ | ✓ |
| | | Solar panels for FTCs or OSSs | ✓ | ✓ |
| | Human capital and infra | Digital agriculture department in MoA | ✓ | ✓ |
| | | Digital program in ATVETS | | ✓ |
| | | Digital training platform for MoA and RBoA | ✓ | ✓ |
| | | Farmer digital & financial literacy campaign | ✓ | ✓ |
| | | Improved DA management | ✓ | |
| | Gov & policy | Data governance and sharing policy, standards, assurances | ✓ | ✓ |
| | | Support market entry of international products | | |
| | | Streamline content approval process | ✓ | |

✓ Full MoA implementation ✓ Stakeholder dependencies ✓ Strategic alignment

For stakeholder input, an enabling initiative was categorized as either high or medium priority as shown in Table 54 and Table 55 below:

**Table 54: Stakeholder Digital Stack Initiative Prioritization Results**

| Digital stack | | | |
|---|---|---|---|
| **User facing layer** | **Integration layer** | **Analytics layer** | **Data and content** |
| Software dev curriculum to build capability | Data stack with APIs | Input demand and supply analytics | Farmer profiles and unique ID |
| Digitized payments | Digital Agriculture Forum for interoperability | Dedicated analytics unit within MoA | Land &farmer-linked production data |
| Decision-making dashboard | | | Soil data |
| | | | Weather data |
| | | | Transaction and warehousing data |
| | | | Price data |

Number of stakeholders prioritizing initiative:
☐ 0-4 times prioritized ☐ 5-9 times Prioritized ☐ 10+ times prioritized

**Table 55: Stakeholder Enabling Environment Initiative Prioritization Results**

| Enabling environment | | | | | |
|---|---|---|---|---|---|
| Innovation & tech | Digital infra | Ag markets | Physical infra | Human capital | Gov & policy |
| Competitive incubation/ product dev. env. | DA device access | Incentivized aggregation & value addition | Input warehouses and distribution hubs | Farmer digital & financial literacy campaign | Data governance and sharing policy |
| Working space & training ag techs | Phone payment plan for farmers | | Solar panels for FTCs r OSSs | Digital program in ATVETS | Support market entry of international products |
| Digital ag curriculum | Digital kiosks | | | Digital training platform for MoA and RBoA | Streamline content approach process |
| | Telco service targets and incentives for rural areas | | | Digital agriculture department in MoA | |
| | Free access for DAs and farmers to key apps | | | Improved DA management | |

Number of stakeholders prioritizing initiative: ☐ 0-4 times prioritized ☐ 5-9 times Prioritized ☐ 10+ times prioritized

The results of this prioritization were then aggregated. Enabling initiatives that were categorized as medium priority in at least two of the three prioritization steps and as high priority in the third step were classified as Phase One priority enabling initiatives[75] and were; A Data stack with APIs, Farmer profiles & unique IDs, Digital kiosks for farmers and DAs, Digital agriculture department in MoA, Farmer digital & financial literacy campaign, Data governance and sharing policy, standards, assurances. All other enabling initiatives were categorized as Phase Two priority enabling initiatives.

**Table 56: Overall Enabling Initiatives Prioritization Results**

| | Area | Initiative | MoA implementation | Strategic alignment | Stakeholder priority | Nera-team priority |
|---|---|---|---|---|---|---|
| Digital stack | User facing | Software dev curriculum to build capability | | ✓ | | |
| | | Digitized payments | | ✓ | | |
| | | Decision-making dashboard for MoA | ✓ | | | |
| | Integration | Digital Agriculture Forum for interoperability | ✓ | | | |
| | | Data stack with APIs | ✓ | ✓ | ✓ | ✓ |
| | Analytics | Input demand and supply analytics | ✓ | | | |
| | | Dedicated analytics unit within MoA | ✓ | | | |
| | Data & content | Farmer profiles and unique ID | ✓ | ✓ | ✓ | ✓ |
| | | Land and farmer-linked production data | ✓ | | ✓ | |
| | | Transaction and warehousing data | ✓ | | | |
| | | Weather data | ✓ | | | |
| | | Price data | ✓ | | | |
| | | Soil data | ✓ | | | |
| Enabling environment | Innov. & tech | Competitive incubation/ product dev. environment | ✓ | | | |
| | | Working space & training for ag techs | ✓ | | | |

[75] An exception was made for the Digital Agriculture team, which was prioritized for Phase One of the roadmap due to the dependency on this initiative for successful use case implementation

| | Area | Initiative | MoA implementation | Strategic alignment | Stakeholder priority | Nera-team priority |
|---|---|---|---|---|---|---|
| | | Digital agriculture curriculum | | ✓ | | |
| | Digital infra | Device access for extension workers | ✓ | | ✓ | |
| | | Free access for DAs and farmers to key apps | | | ✓ | |
| | | Telco service targets and incentives for rural areas | | | ✓ | |
| | | Phone payment plan for farmers | | | ✓ | |
| | | Digital kiosks for farmers and DAs | ✓ | ✓ | ✓ | ✓ |
| | Ag markets | Incentivized aggregation & value addition | ✓ | | | |
| | Physical infra | Input warehouses and distribution hubs | ✓ | ✓ | | |
| | | Solar panels for FTCs or OSSs | ✓ | ✓ | | Dept. prioritized due to dependencies |
| | Human capital and infra | Digital agriculture department in MoA | ✓ | ✓ | | ✓ |
| | | Digital program in ATVETS | | ✓ | | |
| | | Digital training platform for MoA and RBoA | ✓ | ✓ | | |
| | | Farmer digital & financial literacy campaign | ✓ | ✓ | ✓ | ✓ |
| | | Improved DA management | ✓ | | | |
| | Gov & policy | Data governance and sharing policy, standards, assurances | ✓ | ✓ | ✓ | ✓ |
| | | Support market entry of international products | | | | |
| | | Streamline content approval process | ✓ | | | |

✓ High priority ✓ Medium priority ✓ Overall height priority

## 8.5 DAR ECOSYSTEM ASSESSMENT – SUB-SECTION DESCRIPTIONS

| | Solution / Initiative area | Description |
|---|---|---|
| Use Cases | Agricultural Intelligence | Creating high level data and decision support for businesses and governments |
| | Supply Chain | Creating safety and traceability while enabling transport and storage optimization through digital solutions |
| | Financial Services | Getting credit and financing to farmers, through e–vouchers, mobile payments and digital credit and risk solutions |
| | Smart Farming | Developing precision technology to better produce, including management, tracking and varietal development |
| | Pricing & Market services | Enabling live pricing linkages and information services, as well as digitally linking supply and demand |
| | Extension & Advisory | Leveraging technology to provide real-time information, best practices, and personalized guidance to farmers for improved agricultural outcomes |
| Digital Stack | User Facing Layer | Interface between the digital solution and its users |
| | Integration Layer | Middleware that facilitates the smooth flow and integration of data across different systems and services |
| | Analytics Layer | Core component that manages and processes data, ensures integrity and accessibility and develops insights |
| | Data and Content Layer | Information in many forms e.g., crop information, weather data, market trends, and educational resources |
| Enabling Environment | Government & Policy | Rules and guidelines set by authorities that enable the growth of digital innovations, shaping the ecosystem in which these solutions operate |
| | Digital Infrastructure | Infrastructure supporting connectivity and digital tool use, such as smartphones, tablets, and data packages |
| | Human Capital | Digital skills, knowledge, and expertise as well as human resources, and the digital literacy required for adoption of tools |
| | Physical Infrastructure | Refers to the essential physical assets and facilities needed to support agriculture, including cell towers, roads, warehousing, and farmer centers |
| | Agricultural Markets | Encompasses platforms and tools that connect farmers with markets, as well as the markets and economic structure themselves |
| | Innovation and Technologies | The development and adoption of cutting-edge technologies and innovative practices within the digital agriculture ecosystem |

## 8.6 MAPPING OF ONGOING DIGITAL AGRICULTURE INITIATIVES

**Table 57: Ongoing Initiatives by Development Partners**

| Type | Organization | Description |
|---|---|---|
| Development Partner | African Development Bank (AfDB) | The AfDB is a key development partner that supports various initiatives in Ethiopia, including those related to agriculture, technology, and economic development. The AfDB plays a crucial role in financing and promoting sustainable development projects across the continent. |
| Development Partner | Bill & Melinda Gates Foundation (BMGF) | BMGF supports health, nutrition, agriculture, and gender empowerment programs in Ethiopia. Their goal is to enable people to lift themselves out of poverty and live healthy, productive lives. Specifically, in the agricultural sector, they work with Ethiopia's Agricultural Transformation Institute (ATI) to scale up agricultural extension services, combat crop and livestock diseases, support the development of the horticulture sub-sector, improve breeding practices, boost agricultural product markets, support women in agriculture, enable small holder farmers gain access to financial services, improve income of pastoralists, modernize crop improvement practices with EIAR. They also focus on strengthening Ethiopia's primary health care system and strengthening HR systems at MoA. |
| Development Partner | Food and Agricultural Organization (FAO) | FAO aims to achieve universal food security by ensuring consistent access to sufficient, high-quality food. In Ethiopia, FAO advises and assists the Ethiopian government in three key areas: crop production and productivity, livestock and fisheries production, and sustainable natural resource management, by combining innovative international best practices and global standards with national and regional standards. |
| Development Partner | French Development Agency (AFD) | AFD, a French government agency, fights poverty and promotes sustainable development in developing countries. In Ethiopia, AFD operates in fields such as energy, water, urban planning, agriculture, and private sector development. |
| Development Partner | Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) | GIZ partners with the MoA in more than 15 projects on agriculture, conservation and sustainable use of natural resources, and rural economic development as well as e- learning initiatives. Many of these projects are active in developing digital solutions, from surveying and data capture through data management to farmer-facing solutions in extension and agricultural services. GIZ also offers a 'Learning Experience Design Academy" for young professionals |

| Type | Organization | Description |
|---|---|---|
| Development Partner | European Cooperative for Rural Development (EUCORD) | EUCORD is a Brussles-based non-profit organization that is working to increase farmers' capacity to sustainably grow quality crops matched to the commercial needs of the agribusiness sector. EUCORD, with its partners, is currently implementing a project that aims to enhance malt barley supply of farmer organizations to malters through capacity building, access to finance, enterprise, and value chain development. It is also implementing a project related to PULSE crops to complement the Malt Barley project with crop rotation practices and promotion of climate smart agriculture. |
| Development Financier | International Finance Corporation (IFC) | IFC, a member of the World Bank Group, is the largest global development institution focused on the private sector in emerging markets and developing economies. IFC works in more than 100 countries, using its capital, expertise, and influence to create markets and opportunities for better lives. IFC contributes to Ethiopia by supporting the private sector to create markets and open opportunities for all through investing, providing advice, and mobilizing finance for private financial institutions and companies. IFC products and services are tailored to meet specific needs of clients by introducing them to better ways of doing business and new sources of capital. |
| Development Partner | International Fund for Agricultural Development (IFAD) | IFAD is an international financial institution with a focus on the rural poor people to enhance their productive capacity, benefits from market participation and strengthening the climate resilience of their economic activities. In Ethiopia, IFAD's key areas of investment include: (i) small-scale irrigation development; (ii) sustainable natural resource management; (iii) rural financial inclusion; (iv) community-driven development among pastoral groups; and (iv) knowledge exchange through partnerships with the private sector, research institutions and other stakeholders. |
| Development Partner | Japan International Cooperation Agency (JICA) | JICA is the government of Japan agency that assists economic and social growth in developing countries. It operates in more than 100 countries on six continents. In Ethiopia, JICA has focused on (i) agriculture and rural development, (ii) industrial promotion, (iii) infrastructure development, and (iv) education. Some of the key initiatives of JICA include index-based crop insurance promotion, nutrition-oriented community-based fish farming, issues-based trainings for commercialization, for productivity and stability improvement, etc. The initiatives are under three programs (i) agricultural commercialization, (ii) agricultural productivity and stability improvement, and (iii) natural resource management. |

| Type | Organization | Description |
|---|---|---|
| Development Partner | Mastercard Foundation | Mastercard Foundation is an international charity established by Mastercard in 2006 to advance education and financial inclusion to enable young people in Africa and in Indigenous communities in Canada to access dignified and fulfilling work. The foundation is active in Africa with its flagship initiative called Young Africa Works and the Mastercard Foundation Scholars Program. Young Africa Works has been implemented in Ethiopia since 2019 in the agriculture, manufacturing, tourism, and digital technology sectors with a goal of enabling 10 million young people to access dignified and fulfilling work by 2030. |
| Development Partner | Mercy Corps AgriFin | Mercy Corps AgriFin, a program within Mercy Corps Humanitarian NGO, works with a network of more than 180 partners across Africa to support the development of digitally enabled products and services for smallholder farmers (SHFs) to increase their productivity, incomes, and resilience by 50% while reaching at least 40% women. AgriFin helps its partners to design, test, and scale digitally enabled services, de-risking innovation and supporting inclusive service delivery. Since 2015, AgriFin has completed more than 200 engagements with partners, now reaching more than 16 million smallholders. |
| Development Partner | United States Agency for International Development (USAID) | The USAID is Ethiopia's largest development partner, working to enhance health, food security, and nutrition. Feed the Future Strategy, one of its flagship programs in Ethiopia, USAID has assisted the GoE's Agriculture Growth initiatives. The program has three components: (i) agriculture-led economic growth that is inclusive and sustainable, (ii) building people's and institutions' resilience, improving nutrition, and (iii) fostering a regulatory environment and private sector conducive to economic growth. |
| Development Partner | World Bank | The World Bank is one of the biggest development partners in Ethiopia. With respect to DAEAS, the bank has been funding projects including video mediate extension services of DG, under its Second Agricultural Growth Project (AGP2) that promotes digital agriculture extension to deliver agronomic advice to farmers. |
| Development Partner | European Association for International Education (EAIE) | EAIE is a non-profit member-led organization that serves as a center of expertise, networking and resources in the internationalization of higher education. It is also invoved in Agriculture content translation from other languages, development of data driven early warning systems, deployment of high-quality data capturing devices, data infrastructure for big data systems as well as implementing biotechnologies |
| Development Partner | REDFS | The Rural Economic Development and Food Security (RED&FS) Sector Working Group was established in 2008 in Ethiopia. It serves as a platform that brings together the Government of Ethiopia and its Development Partners who are active in the Agriculture Sector. . The group aims to address issues related to rural economic development and food security in Ethiopia. |

| Type | Organization | Description |
|---|---|---|
| Development Partner | CABI | CABI is an international, intergovernmental, not-for-profit organization that improves people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment. As a member, Ethiopia benefits from input into CABI's global development agenda, links to its international network of partners, and regular consultations to address members' needs. |
| Development Partner | AFD | The Agence Française de Développement (AFD) Group funds, supports and accelerates the transition to a fairer and more sustainable world. AFD is supporting Ethiopia in the fields of energy, water, urban planning and also supports the private sector. |
| Development Partner | United Nations Capital Development Fund (UNCDF) | The UN Capital Development Fund supplements capital assistance to developing countries, primarily the least developed, through grants, loans, and guarantees to support their economic development. UNCDF is engaged in Ethiopia in financial inclusion activities. |

**Table 58: Ongoing Initiatives by the Government of Ethiopia**

| Type | Organization | Description |
|---|---|---|
| Government | Ministry of Agriculture (MoA) | MoA oversees and leads agricultural and rural development in Ethiopia and is responsible for driving the digitilization of agriculture. It will collaborate with ATI and others on DAR initiatives. MoA is the primary owner and implementer of this roadmap. |
| Government | Ministry of Innovation and Technology (MInT) | MInT is mandated to lead Ethiopia's digital economy through policy formulation and implementation. MInT also manages projects related to digital infrastructure, digital skills, AgriTech startups, agriculture market information, national data center, and more. |
| Government | Ministry of Trade and Regional Integration (MoTRI) | MoTRI is responsible for formulating and implementing trade, investment, and industrial policies. MoTRI also developed digital platforms that link agricultural producers with customers. |
| Government | Ministry of Water and Energy (MoWE) | MoWE manages water resources, water supply and sanitation, large and medium-scale irrigation, electricity, and natural and man-made energy resources. MoWE implements projects related to rural electrification. |
| Government | National Bank of Ethiopia (NBE) | NBE is the central bank of Ethiopia. It is responsible in ensuring price stability and soundness of financial institutions. NBE prepared the national digital payments strategy (NDPMS) which includes building a digital agricultural platform that integrates new and advanced technologies to enhance food and livestock production |

| Type | Organization | Description |
|---|---|---|
| Government | Information Network Security Agency (INSA) | INSA safeguards the country's information and communication network technologies. It supports public and private institutions in crafting and implementing information security policies, standards, and procedures. Regarding DAR, INSA plays a crucial role in ensuring data sharing governance and policies that prioritize data security. |
| Government | Agricultural Transformation Institute (ATI) | ATI is a strategy and delivery-oriented institute created to accelerate the growth and transformation of Ethiopia's agriculture sector and impact the livelihoods of smallholder farmers across the country. ATI has four key Digital Agriculture initiatives: (i) 8028 farmer Hotline, an IVR and SMS based platform that provides advisory services to farmers;(ii) National Market Information System (6077 hotline) provides price and volume information of major crops in selected markets via IVR, SMS, web and email; (iii) Ethiopian Soil Information System (EthioSIS), a digital soil property map with fertilizer recommendations and (iv), Electronic voucher system, which is introduced to ensure that smallholders have access to credit and financial tools to obtain the agricultural inputs electronically. ATI is also implementing key initiatives from the DAEAS roadmap such as Ethiopian Digital Inputs tracking system (EDITS), development of farmer ID, deployment of digital kiosks providing device and internet access. |
| Government | Ethiopia Institute of Agricultural Research (EIAR) | EIAR is a federal agricultural research institute accountable to the Ministry of Agriculture (MoA). Its primary responsibility is to generate, develop, and adapt agricultural technologies that cater to the needs of agricultural development and its beneficiaries. Currently, EIAR is actively involved in various digital agriculture practices, including wheat rust early warning and advisory systems, Agro-climate advisory platforms, and the establishment of an agricultural data hub. |
| Government | Ethiopian Statistical Service (ESS) | ESS collects, compiles, analyzes, and disseminates sectoral data from sample surveys, censuses, and administrative records. As the official data source for the Ethiopian government, ESS provides critical data related to crops, livestock, horticulture, agricultural markets, extension services, and advisory services. Their reports are available in both hard and soft copies, and raw data can be obtained upon request. |
| Government | Artificial Intelligence Center (AIC) | AIC is responsible for formulating and implementing national AI policies, strategies, and regulatory frameworks. Its focus areas include AI robotics, big data, machine learning (ML), natural language processing, and computer vision. The center is actively working on enhancing crop productivity through AI applications that target disease management and crop data labeling. |

| Type | Organization | Description |
|---|---|---|
| Government | Ethiopian Electric Power | It is a state-owned electric producer engaged in development, investment, construction, operation, and management of power plants, power generation and power transmission in Ethiopia. As per the National Electrification Program of the Country, universal electrification is targeted by 2025 (65% from grid and 35% off-grid) and to increase the grid coverage to 96% by 2030. |
| Government | Ethiopian Space Science and Geospatial Institute | The institute coordinates research and development activities in the field of geospatial science and technology with the socio-economic needs of the focus areas of the country. the goal is to ensure access to geospatial information at the national level, including rural and urban land registration, land use planning, environmental conservation, agriculture, urban development, water resources conservation, natural resource conservation, biodiversity conservation and conservation, climate change, supports for mapping,etc. |
| Government | Ethiopian Electric Utility | Public interprise responsible for the distribution of electricity across the country. It provides various online services related to electricity supply, billing, meter reading, and customer care through their web portal3. |
| Government | Ethiopian Communications Authority | The Ethiopian Communications Authority (ECA) is an independent regulatory authority established with a mandate, to regulate the communications sector which includes telecommunications, postal and courier services, with the objective to promote the development of high quality, efficient, reliable and affordable communications service in the Federal Democratic Republic of Ethiopia. |
| Government | Ethiopian Commodity Exchange | The Ethiopia Commodity Exchange (ECX) is a commodities exchange established April 2008 in Ethiopia with the objective of to ensuring the development of an efficient modern trading system that would protect the rights and benefits of sellers, buyers, intermediaries, and the general public. |
| Regional Government | Oromia Trade Bureau | Oromia Trade Bureau is a regional trade bureau responsible for promoting and regulating trade activities within the Oromia National Regional State of Ethiopia. It has developed a digital platform to access agricultural market information. |

**Table 59: Ongoing Initiatives by Learning and Research Institutions**

| Type | Organization | Description |
|---|---|---|
| Higher Learning Institute | Addis Ababa University (AAU) | AAU, the oldest public higher education and research institution in Ethiopia, serves as a premier center for teaching, learning, research, and community service. Within AAU, several colleges, departments, and study centers conduct research in areas such as GIS, geospatial analysis, big data, |

| Type | Organization | Description |
|---|---|---|
| | | remote sensing, and artificial intelligence (AI) at both graduate and postgraduate levels. |
| International Research Institute | International Center for Tropical Agriculture (CIAT) | CIAT is a CGIAR research centre and supports smallholders to be more competitive, inclusive, and market oriented through research-based solutions. CIAT is working on bundled digital tools and the agricultural data hub. Digital agricultural advisory tools have four components: (i) fertilizer advisory, (ii) climate advisory, (iii) pest and disease advisory, and (iv) market intelligence. CIAT is active in setting up an agricultural data hub and data sharing among stakeholders and plans to start insurance related advisory. |
| International Research Institute | ILRI | The International Livestock Research Institute (ILRI) is a non-profit institution with projects that have delivered positive R&D outcomes in the livestock and agriculture sector. ILRI's research in Ethiopia is focused on poultry, dairy genomic evaluation, animal and human health, and sheep and goats. One of the digital solutions they have developed is the ClimMob platform for on-farm comparisons of technologies, part of an Africa RISING-funded research project to digitally improve crop production. |
| Research Institute | One CGIAR (Consultative Group on International Agricultural Research) - ILRI | One CGIAR is a global partnership that brings together international organizations engaged in food security research. In Ethiopia, One CGIAR collaborates with its member entities under ILRI's Accelerating the Impact of CGIAR Climate Research for Africa (AICCRA) program. Their focus is on promoting climate information services and climate-smart agriculture for both crop and livestock systems, to build resilience and adaptive capacity in Ethiopia's agri-food systems. To date, AICCRA Ethiopia has benefited 420k smallholder farmers and extension agents by accessing climate information services and validated climate-smart innovations and technologies. AICCRA Ethiopia collaborates with the Ministry of Agriculture (MoA), ATI, the Ethiopian Institute of Agricultural Research (EIAR), national universities, private sector partners, and NGOs. |
| Research Institute | International Maize and Wheat Improvement Center (CIMMYT) | CIMMYT is one of the CGIAR research for development centers working on helping farmers to achieve higher yields and incomes through agricultural research. One of the key initiatives of CIMMYT in Ethiopia is its contribution to development and operation of the Ethiopian Digital for Agricultural Climate Advisory Platform (EDACAP). The platform provides seasonal (3-6 months) and operational (1 to 15 days) climate agro-advisories to users using SMS, IVR, DAs, mobile application, website, and mass media. In collaboration with its partners, CIMMYT is also contributing to the development of the National Agriculture Data Hub. |

| Type | Organization | Description |
|---|---|---|
| Research Institute | International Crops Research Institute for the Semi-Arid Tropics (ICRiSAT) | The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a global organization that conducts research for development in Asia and sub-Saharan Africa, including Ethiopia. They focus on improving farming systems and agri-food value chains, addressing challenges of hunger, malnutrition, and environmental degradation. ICRISAT's work in Ethiopia involves collaborating with local institutions to enhance agricultural productivity and resilience to climate change, particularly for key crops like chickpea, pigeonpea, and sorghum. |

**Table 60: Ongoing Initiatives by MNOs and Private Companies**

| Type | Organization | Description |
|---|---|---|
| Mobile Network Operator | Ethio Telecom | Ethio-Telecom offers telecom and mobile banking services, including mobile, mobile payment, and internet services. They have a vast subscriber base, covering 98% of the population. Their payment solution, Tele birr, serves over 34 million customers. The 5G capacity can now accommodate 440 thousand customers. |
| Mobile Network Operator | Safaricom | Safaricom joined the Ethiopian Telco Industry in 2021 and expected to enhance the quality, affordability and coverage of mobile services, digital payment system, and internet access over time. The company has received approvals for tower development and Safaricom's most renowned SMS-based mobile payment and micro-credit service M-PESA, has been made operational. |
| Private Company | Debo Engineering | Debo Engineering is a startup private company that leverages AI, ML, IoT, image processing, and big data analysis in the agriculture sector. They have developed an application capable of detecting and classifying plant diseases through image detection. Additionally, the application provides recommendations for addressing these diseases. Their digital solution aims to enhance agricultural productivity and sustainability[4]. |
| Private Company | EthioChicken | Ethio Chicken produces and sells day-old chicks and chicken feed. Their goal is to improve nutrition, rural farmer livelihoods, and create income opportunities. They provide poultry management and business skill training to farmers engaged in poultry farming, along with advisory services through their agents. |
| Private Company | Hello Erf | Hello Erf links farmers with mechanization service providers and all types of farm machinery by combining IoT technology, call center, and mobile apps. Their goal is to increase productivity, reduce post-harvest loss, and create more rural jobs by making mechanization services easily accessible for smallholder farmers and profitable for service providers. |
| Private Company | Hello Tractor | Hello Tractor provides a digital platform that connects farmers in need of tractors with tractor owners who offer their tractors for rental. The platform also monitors tractor usage for farmers. |

| Type | Organization | Description |
|---|---|---|
| Private Company | Armada | Armada is an agritech startup that provides agricultural mechanization services, offering machinery rental, mechanization personnel training, and spare parts. Farmers can access these services by registering through a mobile application, call center, or through agents. |
| Private Company | Lersha-Green Agro Solution PLC | Lersha is a local private company that provides three intertwined services to small holder farmers using a mobile application, call center, and agents. Its services are (i) farm inputs sale, (ii) access to mechanization service, and (iii) agro-climate advisory and crop extension. The farm inputs sale is bundled with advisory services on how, where, and when to use the inputs. Lersha currently reached more than 100 thousand farmers with 1000+ Lersha agents and 172 mechanization providers. |
| Private Company | Viamo | Viamo is a private company specializing in digital training, digital campaigns, digital surveys, and digital marketing via mobile devices. The company works with NGOs, government agencies, donors and businesses and operates in more than 90 countries including in Ethiopia. |
| Private Company | WeFarm | Wefarm is a company that uses a digital platform to connect smallholder farmers in developing countries. The platform enables farmers to (i) share advice, ask questions and learn about agricultural topics; (ii) see product information and buy inputs or products online; and (iii) understand price information and sell their products online. The platform can be accessed via SMS for free, or online. |
| Private Company | iCog Labs | iCog Labs is a research and development company based in Addis Ababa, Ethiopia, collaborating with international AI research groups and serving customers around the world. They specialize in artificial intelligence, including machine learning based data analysis, computational linguistics, computer vision, mobile robots and cognitive robotics, cognitive architectures and artificial general intelligence. They contribute to international AI development teams, as well as software and hardware development projects on Ethiopian government and industry projects. |
| Private Company | Ethio Red Fox | Ethio Red Fox Agricultural Spraying Drone Company is a start-up company based in Ethiopia. It aims to provide fast and efficient Agricultural Technology solutions mainly using high-level drone technology for millions of smallholder farmers, cluster-based farms, commercial farms, and Governmental & nongovernmental Organizations. Once operationa the business aims to start providing its drone services on wheat rust monitoring, spraying, and advisory services. |
| Private Company | COOP | Cooperative Bank of Oromia (Coopbank) in Ethiopia is a unique institution owned by farmers' cooperatives. It offers a range of services including retail, cooperative, institutional, and diaspora banking. Coopbank also has a digital lending platform, Michu, for Micro, Small, and Medium Enterprises (MSMEs), and provides Sharia-compliant banking services. |

| Type | Organization | Description |
|---|---|---|
| Private Company | ebirr | E-Birr is a telecom value-added and Mobile Financial Service provider established in 2016 in Ethiopia by Safaricom. It offers a range of mobile financial services including utility payments, bank transfers, remittances, merchant payments, and airtime recharges1. E-Birr uses the Safarifone Mobile Financial Services technology, customized to fit the Ethiopian market. It also collaborates with the Cooperative Bank of Oromia under the brand COOPay-E-Birr. |
| Private Company | Kacha | Kacha is a digital financial platform in Ethiopia, offering services like mobile money, bill payments, remittances, and merchant payments. It's the first private payment instrument issuer licensed by the National Bank of Ethiopia. Kacha is committed to promoting financial inclusion and digital transformation in Ethiopia, with features like an agent portal for cash transactions, business and merchant portals for financial transactions, and a crowdfunding service. |
| Private Company | Pula | PULA is a Kenyan-based insuretech provider that offers agricultural insurance and technology services. PULA works to help farmers better prepare, plan, and respond to extreme weather events, pests, and other risks. Their goal is to transfer the climate risks affecting food production away from the smallholder farmer and place it with professional risk-takers, i.e., the insurance sector. This is part of their broader mission to create value for all stakeholders and promote financial inclusion |
| Private Company | Kifiya | Kifiya Financial Technology PLC is a technology and services company that develops scalable and secure technology platforms and has a distribution network that covers the whole of Ethiopia through 16 regional offices. In 2019, Kifiya transitioned into a technology ventures holding company focused on launching an ecosystem of vertically integrated digital businesses across various sectors. One of the digital solutions they have developed is Michu, Ethiopia's first uncollateralized digital lending product developed in partnership with the Cooperative Bank of Oromia and powered by Kifiya's Qena, an AI-driven digital lending platform. The company is dedicated to improving people's lives by leveraging innovative digital solutions, with a particular focus on improving the lives of farmers, women, youth, and MSMEs. |
| Private Company | Apollo | Apollo is a digital banking platform in Ethiopia powered by the bank of Abyssinia |
| Private Company | Chapa | Chapa is an Ethiopian Financial Service and Data Engineering Company. |
| Private Company | Ethswitch | EthSwitch is Ethiopia's National Switch owned by all banks (Private and Public) the National Bank of Ethiopia, MFIs, PIIs and PSOs. They provide interoperable, affordable, secured, and efficient e-Payment Infrastructure, clearing, dispute resolution and risk management services, to payment service providers in Ethiopia. They have also enabled interoperability of Digital Wallet, Mobile & Internet Banking systems run by banks, Microfinance Institutions (MFIs) and E-money issuers. |

**Table 61: Ongoing Initiatives by NGOs**

| Type | Organization | Description |
|---|---|---|
| NGO | Alliance for a Green Revolution in Africa (AGRA) | AGRA works to uplift Africa's smallholder farmers by transforming their struggles into thriving enterprises. It promotes digital solutions to connect agricultural ecosystems, integrating governments, markets, and villages. AGRA's services include digital finance, digital extension, e-commerce, and e-vouchers for seeds, fertilizer, and insurance. |
| NGO | Digital Green (DG) | Digital Green is a global development organization that aims to empower farmers through technology and data. They work on initiatives such as FarmStack, which enables secure data sharing across the agricultural ecosystem, Video Enabled Extension Services, where farmers watch pre-recorded community videos on best agricultural practices, and Farmers' Registry, an application used by DAs to register farmers' profiles and input demands. They are also developing AI enabled extension chatbots. |
| NGO | Precision Development (PxD) | PxD is a global development non-profit providing evidence-based, and life-improving services to people living in poverty by delivering personalized information to households (small holder farmers) via mobile phones and applications there by enable them to make informed decisions. As one of its key initiatives, PxD is collaborating with ATI to evaluate the impact and effectiveness of 8028 farmer Hotline and suggest improvements. |
| NGO | Sasakwa Africa Association (SAA) | SAA is an international NGO that provides agricultural extension services to help smallholder farmers increase productivity, income, and food security. SAA's activities are centered on promoting regenerative, sustainable, and resilient agriculture that is also nutritionally sensitive and market-oriented. It provides digital extension and capacity building to farmers, extension agents, youth, women, the disadvantaged, and other actors along the value chain. |
| NGO | SNV | SNV's work extends to more than 600 woredas implementing projects that build and sustain the agri-food system. They contribute to improving affordable access to basic services by ensuring safe and sustainable access to clean energy and water, thus enabling equitable lives for all. They facilitate job opportunities with a special focus on women and young people and work on food and nutrition security challenges, supporting sustainable markets, and building climate change resilience for smallholder farmers. |
| NGO | Farm Radio International (FRI) | FRI is an international non-profit organization that uses ICT enabled/ interactive radio to help farmers by sharing information, amplifying their voices, and supporting positive changes. The organization collaborates with local radio stations, develops content, provides training to broadcasters, and broadcasts farming related programs to farming. |

| Type | Organization | Description |
|---|---|---|
| NGO | ICCO Terrafina Microfinance | ICCO Terrafina Microfinance is a Dutch NGO that specializes in agricultural microfinance. In Ethiopia, they work with local Microfinance Institutions (MFIs) and Savings and Credit Unions (SACCOs) to boost agriculture and improve the livelihoods of smallholder farmers. They facilitate a guarantee fund for MFIs, link producers with MFIs, and projects aimed at increasing food security. They also provide capacity building for MFIs and SACCOs and develop tools to facilitate value chain financing. |

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