Democratization of Digital
Food Systems Summit Proto Cluster
Working Paper

DRAFT 4.0

Digital technologies have the power to increase inclusion and visibility in the food system, by linking farmers directly to markets, speeding their payments and their fair returns. It can improve access to information, rural advisory services, resources, finance, and equipment. For smallholder farmers, it provides the opportunity to increase yields in scalable ways, empowering them to feed their families and communities, and providing a key tool to reverse identified in the 2021 SOFI report. Digital Agriculture can also allow farming to be more nature positive, by making the most efficient use of resources and farming with precision to each ecological zone – even zones within a field. It can also help measure the potential positive impacts in the food system when using these technologies to enhance production management through tools such as near-infrared sensing to see how our soils and crops are doing.

Digitization has the potential to provide a path to empower equal opportunities for the development of productive farms across diverse groups such as indigenous, rural smallholder, or developing countries/areas, providing a path to increase yields, and links to transport, market, and capitalize networks. However, low-income farmers generally lack access to the hardware, connectivity, and digital literacy to effectively leverage this technology. To unlock all these benefits, the Food Systems Summit is a chance to democratize digital agriculture, making it more accessible for all.

1. Call for rural infrastructure and bandwidth: Without access to broadband, entire communities are left behind in today's information-driven economy, particularly those in rural areas. A reformed food system must address the lack of connectivity and related infrastructure to connect communities and create greater opportunities for the rural poor.

2. Increased availability of cloud computing in rural areas: Cloud computing can be used to aggregate data from tools like soil sensors, satellite images, and weather stations to help farmers make better decisions about managing their crops and understanding their production environment. Cloud computing has the advantage that smallholders only need lower technology handsets as the computing power and intelligence will reside in the cloud and can be shared across multiple platforms and uses. However, cloud access prices are frequently prohibitive in rural areas and developing countries. Nations should be putting a priority on accessibility. Simplified access also needs to be a key part of the solution.

3. Digitization in Agriculture must consider subsidization at various levels: Subsidization of new technologies like electric vehicles and green energy has helped to advance their adoption. In a similar way, support for the adoption of digital technologies in agriculture will potentially advance green and inclusive solutions for the sector. For the specific goal of serving low-income, smallholder populations, the challenge is not simply convincing them to adopt the technology but removing the constraints that limit their access. There is a robust ecosystem of AgTech companies interested in expanding their business into these communities – much like telecoms have already done with airtime and mobile money services. However, in rural areas across the world, the poor are still extremely limited in their access

to the smart phones, data plans and digital literacy necessary to achieve these benefits in AgTech services. New financing, in the form of grants, concessional loans from Development Finance Institutions, or even innovative new mechanisms like carbon markets – will be critical to ensuring this goal is reached.

4. Coherent rules and regulations: Local, national, and regional governance systems often involve decades-old regulation systems and don't recognize new technologies and the systems to accelerate their use for the benefit of the sector. Good governance will be central to democratization of precision agriculture that includes good practices to allow sharing and exchange internationally in a way that is beneficial to the parties involved and protects data ownership.

5. Call for collective efforts to support data for decision making: Data collected and shared in real-time will allow for the determination of patterns such as weather, pinpoint operational inefficiencies, share disease forecasts & management, and problems with soil quality.

6. Digital inclusivity (value chain, blockchain-related): Digital technologies are changing agriculture and the food system. Examples abound at different stages of the agri-food value chain and can support trade in agriculture and food products, by connecting private sector suppliers to new markets.

7. Ag Protect: Globally, agriculture is very vulnerable to climate-related disasters, particularly in developing countries. In those regions, as agriculture is primarily rain-fed and produces the majority of the food for these regions, any weather-driven impacts such as floods, droughts, changes to the duration, and patterns of the rainy season can have very significant food security and socio-economic impacts. Additionally, maintaining healthy soils is critical for sustainable crop production – particularly when growing conditions are not ideal.

Optimizing the use of digital agriculture can reduce the carbon footprint of agriculture. Digital technologies should be used to maximize soil carbon sequestration, reduce inputs and measure GHG impacts. This can include:

- Use of remote sensing for global outputs of environmental health
- Early warning systems for drought and weather-related issues
- Rapid response mechanism

An Ag Protect program is proposed to include:

The increase in weather variability is a higher risk for crop production and hence associated food production and hence requires a greater degree of management to maintain soil health and crop productivity. **Healthy soils** increase the capacity of crops to withstand weather variability, including short-term extreme precipitation events and intra-seasonal drought.

Land use needs to be looked at in a strategic and collective sense so that while data can be collected at the micro-level, it needs to be harmonized to a macro-level for the development of an optimized warning systems.

This will enable the connection from the ground growers through the extension of advisory agencies and agri-companies as well as linkages to the finance facilities to be harmonized for the betterment of the producers.

By using the **data points** all along the supply chain, a more integrated solution can be developed. The utilization of deployed IOT systems can facilitate the collection of data streams – these data streams can then be collectively harnessed to enable a better understanding of the **land management practices**, weather issues, and potential weather/soil-related risks associated with a region/area.

Early warning systems are usually cost-effective non-structural measures. The solution is the development of a decision support tool (Ag-Protect) that can utilize:

- Soil mapping initiatives
- Land use data
- Localized weather collection nodes
- Linked to databases on soil properties such as:
    - Soil type
    - Organic matter/soil carbon
    - Structure

This will build into a decision support tool(s) that can be linked to advice programmes/extension services in order to enable farmers/growers to utilize the benefits of the warning system. The Consortium has linkages into Guatemala (Disagro), Tanzania and Kenya through commercial, research, and strategic partnerships that would enable the successful deployment of a focused decision support tool.

The need: Agriculture bears much of the impact, and in developing countries it is the most affected sector, absorbing up to 80 percent of all **direct impacts, with multiple effects on water availability, agricultural production, food security, and rural livelihoods.** Therefore, any solution must also assess the risk and vulnerabilities of the entire agricultural systems, i.e. not only look at the vulnerability of crops but the solution should look into the whole system such as soil health, cropping programmes, the economics of different crop strategies, technology availability, infrastructure capacity.

Soil management practices, **irrigation systems**, cropping systems, and weather conditions all influence soil health. Therefore, a healthy soil that is well managed can increase **soil water infiltration and storage, storage and supply of nutrients to plants, microbial diversity, and soil carbon storage**. Linked to this is the understanding of the role of the **soil catchment area for water capture** and conservation during times of flood and drought.

Each farm holding needs to be part of the bigger water basic catchment area so that the collective weather impacts can be managed in a strategic way in order to manage water supply in that region and promote farming and land-use practices that support healthy soils. The process should involve a review of each stage in the value chain, from inputs and production through post-harvest management, aggregation, and processing to wholesale and retail marketing.

Why and how it will work: An early warning system utilizes **existing infrastructure and data** in a more coherent way and for a different purpose to the original objective for that data collection system. So, soil data that may have been gathered for site-specific agronomy purposes can be combined with multiple soil data points to get a more holistic picture of soil and land use in a particular region. Early warning systems can be an important adaptive measure for climate change management by using integrated data systems to support a range of end-users and communities and thereby protect lives, infrastructures, land, and jobs and supports long-term sustainability.

The Ag Protect system will only work well if it can easily access soil data, metrological data, land use data, disease data, etc and combine this with machine learning tools to develop the decision support tools needed by the private sector, individual landowners, communities, governments, etc to assist in their planning and management. The data that the system will need can come from remote sensing, embedded sensors, IOT deployed sensors, as well as databases such as soils, financial markets (forward selling of crops/ insurance markets, etc). The output of the system will be a decision support tool that ranks the risk of a potential disaster event for a region and that risk is weighted based on the region's vulnerability (types of crops grown i.e. are the soil vulnerability issues, monocultures, etc) combined with weather modelling regional vulnerability risks. These outputs can be linked to a series of potential correction measures that could potentially reduce the risk e.g. by changing monocultures, greater use of cover crops, stagger harvesting/planting periods, development of water retention facilities, etc. Early warning systems are usually low-cost/cost-effective non-structural measures because they can utilize existing data sources and systems. Resources are needed to maintain the system and further improve it.

DUAL PATHWAYS APPROACH FOR AG PROTECT

Ag Protect proposes a dual pathways approach. This approach includes two aggregated processes:

1) At the Interface level, focusing on the functionalities and performance of the system as a whole; and

2)At the Implementation level, focusing on spaces of learning (Input) and experimentation (Intelligence). At the Implementation level, actors from ag value chains allocate time, knowledge, and resources to achieve change.

The outcomes from the two levels (Implementation and system) need to be integrated and aligned for the effective functioning of AG PROTECT.

Alignment with existing efforts: The EU has provided early warning system-related strategies such as, **COPERNICUS** which is the European Programme for the establishment of a European capacity for Earth Observation. COPERNICUS climate change services are dedicated to the monitoring and forecasting of the Earth's subsystems and contribute directly to the monitoring of climate change. **Metroalarm** is a joint effort between European meteorological services that provides alerts on extreme weather events. FAO provides tools such as **RIMA** to help countries monitor or detect impending hazards. Systems such as **African Risk Capacity** have trialled local weather data collections to improve drought forecasting and have shown tin be a better investment than the status quo. CGIAR has a

programme on climate change and agriculture and has been looking at the development of early warning systems and contingency plans in relation to extreme weather events. Ag Protect will look to utilise any suitable existing data collection source and enable data sharing so that it can be optimised for different uses at different points in the system.

This system will acknowledge that the multi-dimensions of data collectors (individuals, organizations, and the Decision Support environment) can be connected and reciprocate data sharing.

To strengthen the "Early Warning System and Disease Prevention" mechanism capacity, data and intelligence need to be processed concurrently.

In this context, the "Ag Protect" interface emphasizes the importance of partnerships and networks in creating that interconnectedness, bringing field-level data together and organizations to co-create new knowledge. To this end, Ag Protect pays special attention to developing an enabling environment to improve soil health, crop profiling, and water management.