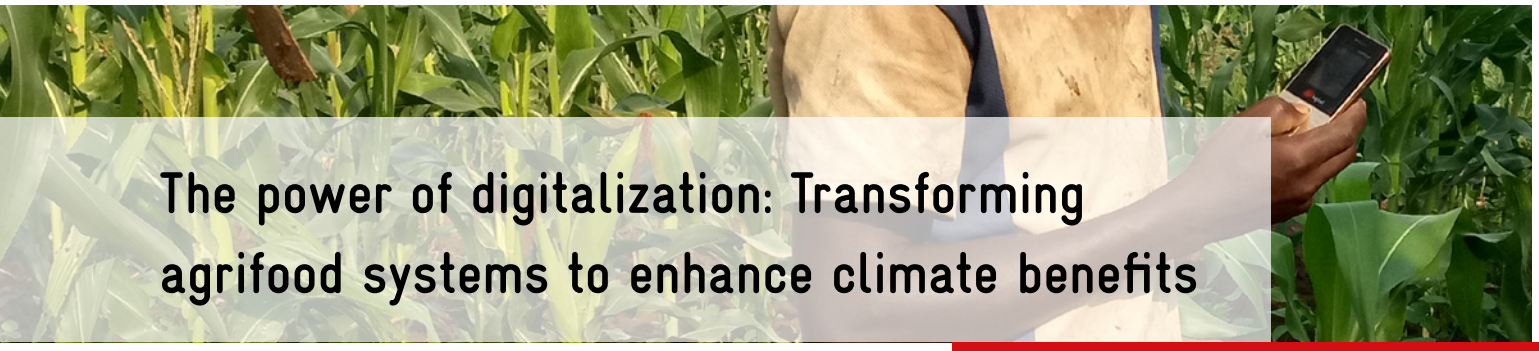

The power of digitalization: Transforming agrifood systems to enhance climate benefits

An overview brief for development cooperation practitioners on how to start a digital transformation in agrifood projects

Key Messages

- Agrifood systems often do not function efficiently and are the single largest driver of environmental degradation. They are a major cause of climate change and at the same time vulnerable to its impacts. Although better soil management can sequester significant amounts of atmospheric carbon, the technologies to transition agrifood systems to net zero emissions are not yet available.
- Digitalization offers a great opportunity to make agrifood systems more functional for farmers, consumers and the environment.
- A lack of information and in particular the high transaction costs for small farmers to access information, coupled with information asymmetries, are key transformation barriers that digitalization can address.
- From farm to fork digital technology has the potential to accelerate sustainable intensification of diversified production and healthy diets with a low carbon footprint.
- Farmers, through digital technology, can directly interact with consumers through digital platforms. This enables direct product marketing and consumer can directly influence sustainable production patterns through their daily food choice.
- Digitalization bears risks contributing to information monopolies that bring further disadvantages to small farmers. Therefore, data governance and security are key to address.
- Fostering and steering the digital transformation provides the opportunity for climate and development cooperation projects to make the agrifood sector more functional. This requires a) new partnerships, b) digitalization readiness and c) a focus on digital quick wins.
- The youth can act as digital entrepreneurs, offering farm-facing services that improve farming practices and are inclusive by engaging the aging farming community. Innovation accelerators are an efficient tool to support such entrepreneurship.

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Climate Challenges in agrifood systems

Agrifood systems play a crucial role in reducing hunger and poverty and providing a nutritious diet for all. However, in their current state they often do not function well and are the single largest driver of environmental degradation and transgression of planetary boundaries (Solymosi et al., 2019). They are a major cause of climate change and at the same time highly vulnerable to its impacts.

Plenty of food is produced on the planet while 820 million people are still undernourished and this number has been rising since 2014 (Schroeder et al. 2021). Malnourishment is increasing even faster and this is not just a problem of developed countries as more and more developing countries are strongly impacted. In total two billion people are overweight (EAT Lancet Commission, 2019). About 30 per cent of the food currently produced is either lost or wasted. More than 25 per cent of the agricultural land is degraded and soil fertility is declining, making agrifood systems ever more vulnerable to climate change and increasing sector specific GHG emissions.

Without a rapid adoption of climate-smart agriculture, an increasing amount of the 9.7 billion people on Earth by 2050 will be undernourished. At the same time, the agrifood sector is already contributing 29 per cent of global emissions and the production of animal protein alone accounts for 14.5 per cent of all GHG emissions. Compared to most other sectors neither the technology nor a transformation pathway for net zero emission agrifood production exists. Therefore, it is crucial to make food systems first more climate resilient and secondly more efficient, in order to minimize the risk that the emissions from the sector alone will overstretch our planetary boundaries. Figure 1 shows that production and demand side measures are required to achieve climate-smart nutrition. Production measures focus on food and feed production while demand side measures include the food processing and consumption related measures.

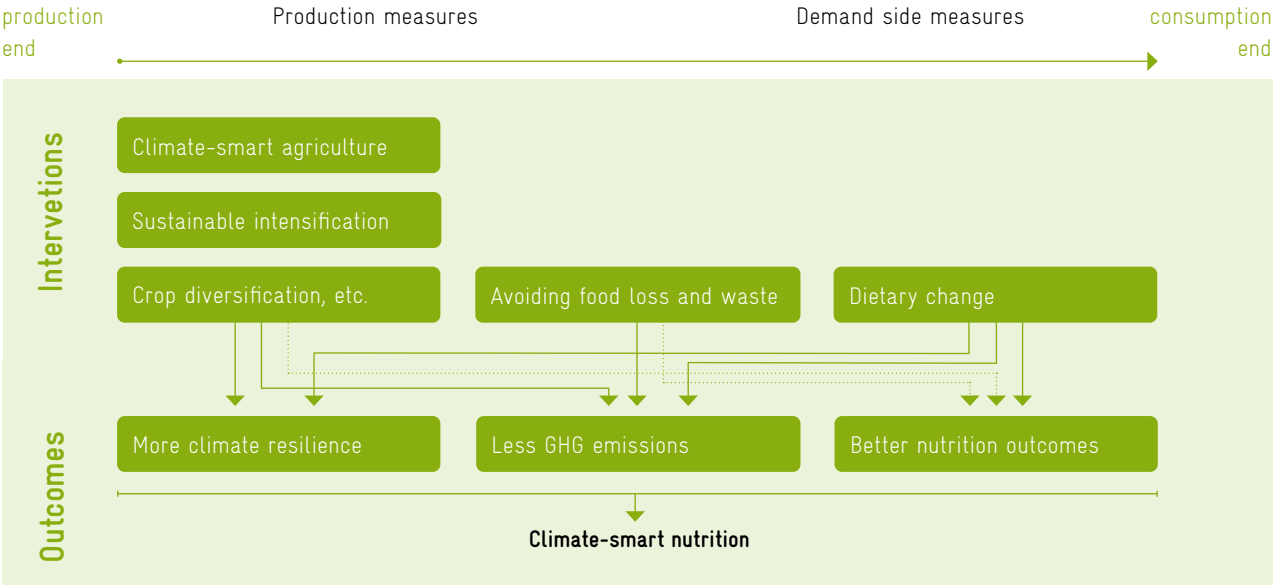

Figure 1: How to achieve climate-smart nutrition?

Source: UNIQUE forestry and land use

Climate-smart production and demand-side interventions in the agrifood sector suffers from a lack of information and the high transaction costs to access information, coupled with information asymmetries (Schroeder et al. 2021). In particular, agroecology approaches that are effective in contributing to land degradation neutrality, but require a high level of information (Snapp et al. 2021). However, government extension support is often weak and extension provided by a network of civil society and the private sector is often scattered and only temporarily available. Extension approaches, furthermore, often do not address how to adapt farming practices to climate change and at the same time reduce GHG emissions.

There are 580 million farms globally, including 500 million family farms. These can store an additional 3.3–6.8 $GtCO_2e$ in the soil by adopting sustainable land management practices, which will simultaneously improve soil health and climate resilient production potential. Consumers have limited awareness that they can request such beneficial farming practices through their diet choice.

The Power of digitalization

Due to urbanization, farmers and consumers increasingly live apart from each other. Consumers want to be assured about food safety, taste and the means of production (for example conventional, organic, net-zero emission production etc.), but usually farmers are too far away to be asked directly. Digitalization can bridge this information gap. It offers the means to inform producers and consumers in real time.

Digital tools at farm level can improve production efficiency, for example through a targeted application of nutrients if digital soil images can be used to determine nutrient deficiencies. Digital learning can complement farmer to farmer visits or make available to farmer results of the latest science in a usable format.

Farmers can directly interact with input and output market actors through digital platforms enabling mutual benefits for farmers, consumers and all actors in the value chain.

Digital finance through smart phones can greatly reduce transaction costs. Improved logistics reduce food loss and waste, while increasing profit margins for the farmers. Uber models to pool crops at farm gate for cost efficient transport to markets or machinery rent service models are among the fast-growing business areas.

However, new technology and disruption also faces substantial risks that disadvantage poor and already marginalized farmer groups. Digitalization can lead to a digital divide, in which a few actors monopolize data. Therefore, issues like data governance and competition have to be enforced.

Capacity development is increasingly digital by default, but for many development practitioners it is not obvious how to get started. The following section will provide guidance on getting a digital transformation started in agrifood systems and climate related development cooperation projects.

How to start a digital transformation in agrifood projects

In most technical cooperation projects related to agrifood system development digitalization is a cross-cutting theme, but not a focus at output level. Accordingly, project staff often have little digitalization experience beyond using basic office software and smartphone for accessing the internet and social media. The suggestions below provide impulses on how to get started with fostering digitalization in agrifood projects.

Establish partnerships for knowledge on digitalization – with projects and initiatives that have a dedicated digitalization focus and offer knowledge and learning material, for example the GIZ Toolkit-Digitalization or the World Bank Data-driven Digital Agriculture Platform.

Assess digital readiness in the target country and the cooperation system – Requirements for any digitalization effort are a) an adequate digital infrastructure (electricity and internet access in rural areas and affordable devices such as smartphones), and b) capacity and skills to drive digitalization. A readiness assessment will help to develop the framework of a digital strategy related to a project.

Screen own projects under preparation and implementation systematically – Find out where entry points for digital innovations could be along the entire value chain. Entry points might be digital farm advisory services such as *RiceAdvice* or digital platforms connecting farmers with tractor operators such as *TROTRO Tractor* in Ghana (see box).

RiceAdvice is providing rice farmer digital production relevant information including weather services and low emission rice production systems in Africa, riceadvice.info.

TROTRO Tractor is a tractor renting platform, where farmer can order seed drilling or other services via SMS to trotrotractor.com. The service offers farmers timely and cost-effective access to mechanization without the capital expenditure related to buying such equipment.

Focus on quick digital wins to get started smoothly – Achieving project objectives through digitalization should start with clearly defined and rather small digitalization activities that enable learning and have a high chance of success. Such digital quick wins could be:

- Transforming training workshops for example on sustainable land management into digital workshops. Many projects adopted such small digitalization projects during COVID and gained confidence to engage in more demanding digitalization projects with disruptive impact.
- Replacing pen and paper-based data collection with app-based data collection. This has higher initial costs for programming Apps, dashboards and cloud data base systems, but transport and staff are often the major cost items and many projects have gained in analytical power through these measures.

More complex digitalization projects, for example related to land consolidation and establishing a digital land cadastre, can disrupt and transform agrifood systems by improving land tenure. However, they require substantial digital skills within the project and among partners. They also engage with personal and sensitive data and therefore often require General Data Protection Regulations as a pre-condition. For projects where digitalization is a cross-cutting theme but not a key output it is not recommendable to start with complex digitalization projects.

E-commerce platforms to link farmer with consumer – There are an increasing number of e-commerce platforms linking farmer with retail businesses (B2B platforms) or directly with consumer. In Africa Twiga Foods in Kenya is the leading B2B e-commerce platform, sourcing from farmer. The organic ecommerce platform Jaivikkheti in India is also linking farmers with retail as well as bulk buyers. In addition, Jaivikkheti is providing market intelligence for organic producer.

Engage women and youth entrepreneurs in digital agrifood systems – In most developing countries the average farmer is older than 50 years. The youth often do not have access to sufficient land, but want to stay in their rural home area, where they have their social network, if a meaningful job perspective is on the horizon. Farming information services, for example providing transport and market access to farmers or offering digital extension services, can be the foundation for a large number of new Small and Medium Size Enterprises (SME), which can offer attractive self-employment or employment for women and young people. Innovation Accelerators are an efficient instrument to support a cohort of respective digital entrepreneurs. The Kenya Agricultural Sector Transformation and Growth Policy provides a good example how to align sectoral policies with cross-cutting priorities such as digitalization, youth development and farm-facing development of SME.

Software development support – Software development often requires both technical cooperation and investment support including early market offtake support specifically when targeting small-scale farmer. Development cooperation may finance the development of software and cover initial farmer subscription fees until a critical mass of user are reached that can cover the software investment including maintenance or cloud database data hosting fees.

Be aware of data governance and protection – As a matter of principle, it is crucial to prevent information asymmetry and to empower farmer to benefit from his or her data. The EU General Data Protection Regulation (GDPR) provides safeguards on data security and ownership. Standard contracts, considering safeguards and national data protection laws have to be developed.

How to go further

This brief outlined the opportunity to make agrifood systems more functional through digital transformations, especially with regard to climate resilience and GHG emission reductions. The complementary publication "**Digital solutions for small-scale farming: Fostering climate resilient and low carbon agrifood systems**" presents in more detail the approach to assess and adopt digital technology that support smallholder farming.

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Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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Editor:
Mirco Lomoth

Layout:
SCHUMACHER
Brand + Interaction Design GmbH,
www.schumacher-design.de

Photo credits:
UNIQUE forestry and land use GmbH

Berlin, 2021

On behalf of:
Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety
of the Federal Republic of Germany