

## Challenge 2: Agricultural productivity and ecosystem functions

Increasing agricultural productivity to meet growing food demand and improve smallholder incomes, is a key goal for the agricultural sector. This must be achieved while maintaining critical ecosystem functions and services. In the face of challenges like erratic rainfall, rising temperatures, water scarcity, and volatile cash crop prices, small-scale farmers in sub-Saharan Africa and South and Southeast Asia involved in five projects on productivity and ecosystem functions, are demonstrating greater resilience and empowerment. Actors involved have adopted new production systems and added value to products, even those once considered waste, improving both productivity and resilience.

### What worked to ensure success of the projects

- Peer to peer learning including exchange visits, model farms, demos, farmer field days, and visits as well as the different approaches for learning and extension.
- Multiple stakeholders were engaged in discussions around a common agenda. In these processes, systems, and structures to tackle the challenge were related to the context, leading to a more cohesive and unified approach.
- Amplification of community voices was pursued through co-creation, design, mapping, and learning, along with the intentional integration of both scientific and indigenous knowledge.
- The use of Theory of Change (ToC) and Monitoring, Evaluation, and Learning (MEL) in the projects enhanced the clarity of project objectives and implementation, and established robust frameworks for tracking progress.

### Trade-off: the logic behind the projects

Farmers constantly face the complex task of making decisions that impact both the short and long term, affecting their families and the surrounding landscape. The projects addressing this challenge focused on managing trade-offs between productivity and ecosystem functions in underperforming systems. These farming systems also grapple with adapting to climate change while striving to remain climate-smart and avoid increasing greenhouse gas emissions. Hence, the challenge was to increase agricultural productivity sustainably to meet demands from a rapidly growing population, while simultaneously maintaining natural ecosystems and adapting farming systems to declining arable land and aggravated climate change.

### Redesigning learning and collaboration hubs

To build the capacity of both farmers and researchers, the projects utilized activities such as farmer field days, innovative platforms, model farmers, value addition training, peer-to-peer learning, cooking competitions, radio broadcasts, co-produced handbooks, established associations, workshops, and group discussions. These efforts successfully united diverse stakeholders to address common challenges and develop solutions for supporting and implementing new practices. These meeting spaces, serving as hubs for collaboration and learning, played a pivotal role in the projects' overall success.



Figure 1: Coffee-banana farming on Mt. Elgon.  
Photo: Jeninah Karungi-Tumutegyereize

### Crop diversification to spread risk

Intercropping banana and coffee significantly improved harvests and livelihoods for farmers on Mt. Elgon in Uganda by spreading risk through crop diversification. Traditionally, the region focused solely on coffee production for sale, making farmers vulnerable to market fluctuations and environmental challenges. By integrating bananas with coffee, farmers have diversified their income sources and reduced their dependency on a single crop. Research has shown that creating shaded areas and combining cash crops with staple foods enhances production resilience. In AgriFoSe2030 Challenge 2, this approach has proven effective in addressing risk management and boosting overall productivity. Model farmers have played a key role in demonstrating the benefits of this strategy, leading to its wider adoption across new areas on Mt. Elgon.

Similarly, sorghum-cowpea intercropping systems project in South Africa has demonstrated that the drought-prone area in the Zululand district can adapt to a dryer climate. Research showed that by moving away from the traditional maize production and introducing the intercropping of sorghum and cowpea could secure good harvests despite reduced water availability. This adaptation to a drier climate has been crucial for the region. To address the market limitations for sorghum, the project has successfully fostered collaborations between traders and producers, enhancing market access and securing better economic returns for farmers.



Figure 2: Fuduka cooperative sorghum crop during 2022–23 season. Photo: Sorghum-cowpea project file pictures

In the expansive parklands of Burkina Faso, the tradition of maintaining trees in agricultural fields was threatened by population growth, rising fertilizer prices, poverty, and conflict. The project responded by introducing agroecological practices designed to cut costs and enhance productivity. In two villages, innovative platforms were established and managed locally to facilitate the adoption of these practices. These platforms played a crucial role in disseminating knowledge and fostering collaboration among farmers. They enabled the community to develop and share effective agroecological techniques, such as improving tree health, increasing tree density, and implementing soil conservation and restoration methods. Through these platforms, farmers could engage in peer-to-peer learning, receive tailored advice, and access practical tools for integrating trees and crops to boost food production.



Figure 3. Millets and shea trees in the parklands.  
Photo: Madelene Ostwald

### Applying biobased circular economy

The rice straw project in Vietnam, aimed to shift farmers from burning straw residue to using it in a biobased circular economy. It promoted the application of straw in mushroom cultivation, cattle feed, mulching, and composting, which reduced

air pollution and added value to what was once considered waste. Over 100 farmers received training in these sustainable practices, learning to repurpose straw into valuable resources.

Awareness among rice farmers and straw users about the benefits of managing rice straw has grown. The adoption of rice straw for mushroom production and animal feed has increased, enhancing productivity, quality, and profitability. Producer groups have been formed to advocate for rice straw management and end straw burning. Additionally, training of trainers (ToT) for extension workers has improved their support for farmers. Government policy discussions are ongoing, focusing on the environmental and commercial benefits of advanced rice straw management technologies.



Figure 4: Collection of rice straw for further processing and value addition. Photo: Ng'endo Machua-Muniu

**Co-infusion of science and indigenous knowledge**  
In Samburu County, Kenya, the Transformative Rangeland Management Practices (TRAMAP) project, supported pastoralists and agro-pastoralists to increase agricultural productivity and enhance landscape ecosystem functions through the collective adoption of sustainable rangeland management practices and networking. Pastoralists in the region have been struggling with reduced fodder due to an invasive species *Acacia reficiens*.

Through collaboration with pastoralists, researchers, local authorities, and camel associations, new husbandry practices have been developed, and various control measures to reduce *Acacia reficiens*, reseed rangeland grasses and implement water harvesting structures have been discussed. ToT programmes were efficiently undertaken with 14 ToTs trained on camel husbandry, health and welfare, 40 ToTs trained on fodder value chain, and 50 ToTs trained

on *Acacia reficiens* control

The project team also produced a camel husbandry, health and welfare handbook tailored for Samburu County.



Figure 5. TRAMAP Kenya experimental learning for transforming Samburu rangelands through reseeding of degraded rangelands. Photo: Jane Mutune

# AgriFoSe2030

## Agriculture for Food Security 2030

Translating Science Into Policy & Practice

### Agriculture for Food Security 2030 (AgriFoSe2030)

The AgriFoSe2030 programme is dedicated to overcoming the hurdles to achieving the sustainable development goals (SDGs), with a primary focus on promoting sustainable agriculture and ensuring food security via research translation. Its framework comprises four cross-disciplinary 'challenges', each aimed at addressing different aspects of SDGs 1 (no poverty) and 2 (no hunger) and related goals.

The challenges are:

Challenge 1 - Improving access to safe and nutritious food

Challenge 2 - Agricultural productivity and ecosystem functions

Challenge 3 - Science-based innovation and extension

Challenge 4 - Smallholder agriculture within transforming food systems

Poverty alleviation, gender equality, climate resilience, and biodiversity conservation are integrated as overarching priorities.

### About Challenge 2: Agricultural productivity and ecosystem functions

Smallholder farming systems are often integrated in multifunctional ecosystems that need to be managed from the perspective of trade-offs and synergies between various desired environmental and socio-economic goals. The challenge focuses on supporting climate adaptation, soil management and diversity of plant and animal species to ensure sustainable farm productivity and improve smallholder resilience.

### Credits

This brief was prepared by the AgriFoSe2030 Communications and Engagement team, in collaboration with Challenge Leaders - **Madelene Ostwald** and **Veronica Brodén Gyberg**, and informed by reports from the Challenge 2 project leaders.

### Challenge 2 project team leaders

**Dr. Josias Sanou**, Institut de l'Environnement et Recherches Agricoles, INERA, Burkina Faso;

**Dr. Jane Mutune**, The Wangari Maathai Institute for Peace and Environmental Studies, University of Nairobi, Kenya;

**Dr. Jeninah Karungi-Tumutegyereze**, School of Agricultural Sciences, Makerere University Uganda;

**Dr. Nothando Dunjana**, School of Natural Resource Management, Nelson Mandela University, South Africa;

**Dr. Nguyen Ngoc Thuy**, Office of International Cooperation, Nong Lam University, Vietnam

## Contact us:

**Sofia Boqvist**  
Programme Director AgriFoSe2030  
E-mail: [agrifose@slu.se](mailto:agrifose@slu.se)

**Selorm Kugbega**  
Acting Communications Lead AgriFoSe2030  
E-mail: [selorm.kugbega@sei.org](mailto:selorm.kugbega@sei.org)

[www.slu.se/agrifose](http://www.slu.se/agrifose)

*This brief highlights lessons on promoting research impact for funders, commissioners and managers of science translation and research for development initiatives.*

