



Soil protection – a trigger for the transformation towards sustainable agricultural and food systems

BACKGROUND



What are agricultural and food systems?

Agricultural and food (in short here agrifood) systems encompass the entire value chain of food and agricultural production, from seed selection and crop cultivation to storage, transport, processing, marketing, consumption, and waste management. These systems are shaped by social, economic, and policy factors.

How does a sustainable agrifood system look like?

“A sustainable [agriculture and] food system [...] delivers food security and nutrition for all in such a way that the economic, social and environmental bases [...] for future generations are not compromised.” – FAO, 2018

Transforming agrifood systems is crucial to eradicating hunger. The German Federal Ministry for Economic Cooperation and Development (BMZ) aims to foster a global agrifood system that ensures food security, equality, climate resilience, biodiversity, and peace. Sustainable, climate-smart agriculture can create jobs in rural areas and support a “Just Transition” to a climate-neutral society.

Figure 1: Fair and sustainable food systems – Social-ecological transformation at the level of farms, landscapes and agrifood systems



Source: **GIZ 2023**

However, current agrifood systems face significant challenges, such as soil degradation, which affects 3.2 billion people and reduces land productivity, leading to hunger and economic loss. Approximately one-third of the world's soil is degraded, contributing to the fact

that in 2023, one in 11 people faced hunger. The growing global population will further strain the system. Agrifood systems are also responsible for about one-third of human-caused greenhouse gas (GHG) emissions and are a major driver of biodiversity loss.

THE GLOBAL PROGRAMMES ProSoil AND Soil Matters IN BRIEF

As part of Germany's Special Initiative "Transformation of Agricultural and Food Systems", the Global Programme "Soil Protection and Rehabilitation for Food Security" (ProSoil) supports and advises smallholder farmers in Ethiopia, Benin, Burkina Faso, India, Kenya, Madagascar and Tunisia on agroecological and climate-smart agricultural practices with a focus on sustainable land management. Stakeholders from the scientific community, civil society and the private sector are actively involved in the activities, in addition to the relevant government agencies in each country. Since the launch of ProSoil in 2014, soil degradation has been reversed on more than 981,000 hectares of land. This has resulted in an average yield increase of

44 percent, directly benefiting the livelihoods of more than 2.6 million people. More than 65 percent of the farmers reached are women. Through climate-smart soil management solutions, the carbon footprint has been reduced by around 1.74 million tonnes of carbon dioxide, as healthy soils are an important carbon sink. The Global Programme "Soil Matters – Innovations for Soil Health and Agroecology", launched in 2025, builds on the results of ProSoil and aims to develop and promote agroecological innovations in partnership with the private sector to scale up impact and support agricultural transformation processes. Soil Matters is active in Tunisia, India, Kenya, Ethiopia, Madagascar and Cameroon. Both Global Programmes, ProSoil and Soil Matters, are commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and co-funded by the European Union (EU) and the Gates Foundation.

The role of soil protection in the transformation of agrifood systems

Soil is the foundation for 95 per cent of food production, making it essential to our agrifood systems. Soil protection and rehabilitation (SPR) is a key strategy for creating sustainable agrifood systems and contributes to numerous SDGs, including 1, 2, 5, 6, 13, 15. SPR enhances soil health, enabling it to function as a vital ecosystem that supports plants, animals, and humans.

Benefits of soil protection in transforming agrifood systems:

- Enhanced or maintained soil health
- Improved resilience towards the effects of climate change
- Protection of ecosystems, their services, and biodiversity
- Increased income through higher and more stable yields
- Enhanced food security
- Greater independence and efficient use of external inputs like mineral fertilisers
- Contribution to Land Degradation Neutrality (LDN)
- Contribution to adaptation to and mitigation of climate change

Restoring soil health through SPR is fundamental for transforming global agrifood systems into sustainable, climate- and eco-friendly systems capable of feeding the world's population.

APPROACH AND METHOD

Current challenges for the transformation of agrifood systems

One of the primary obstacles to transforming our current agrifood systems is their prevailing narrow and short-term perspective. This limitation hinders the implementation of interdisciplinary approaches, such as integrated soil fertility management (ISFM) or agroecological farming. Additionally, the perceived lack of compelling scientific evidence supporting sustainable agricultural practices, combined with increasingly unsustainable human activities, is contributing to rising soil degradation and exacerbating climate change.

Consumer expectations for inexpensive and readily available food further reinforce the dominance of large-scale, globalised operations. Import and export regulations concerning food safety result in value-added processes being concentrated in industrialised nations, which impedes the socio-economic development of producing countries in the global South.

Moreover, the prevailing narrative of 'feeding the world' consolidates power among a few corporate entities, including large multinational agribusinesses and food processors, which benefit from preserving the current status quo.

Current global crises, such as wars or pandemics, place additional strain on agriculture and food systems, leading to:

- Disruptions in supply chains
- Limited access to and affordability of fertilisers
- Rising energy prices
- Restricted movement of workers

Despite these challenges, experiences from ProSoil have shown that SPR methods can positively contribute to farmers' resilience when soils lack nutrients, the access to fertilisers is limited etc. Scalable approaches should ideally come with a financing mechanism and these can be parts of a puzzle to deal with the challenges as mentioned in the following chapter.

How can these challenges be overcome?

ProSoil employs SPR methods to restore the fertility of degraded agricultural soils by providing context-specific and site-adapted solutions while contributing to climate adaptation and mitigation targets.

For instance, in Ethiopia, the Integrated Soil Fertility Management (ISFM) approach addresses low productivity caused by nutrient deficiencies in the soil. This method emphasises a balanced application of mineral and organic fertilisers to maximise agronomic benefits. Additionally, innovative management approaches, such as water spreading weirs and watershed management, are implemented in Ethiopia to restore the soil's essential functions such as water regulation, nutrient recycling and filtering of pollutants and enhance its productive capacity. Increasing the productivity is a strategy to prevent agricultural expansion, which is a major driver for greenhouse gas emissions. It is also a strategy to increase household incomes, which contributes to increased resilience towards climate risks.

The transformative potential of these practices is amplified through capacity development and knowledge sharing at the farmer, landscape and political levels, as collaboration among various stakeholders is crucial for the successful implementation of SPR methods. Research institutions involved in the process generate the necessary evidence to influence political decision



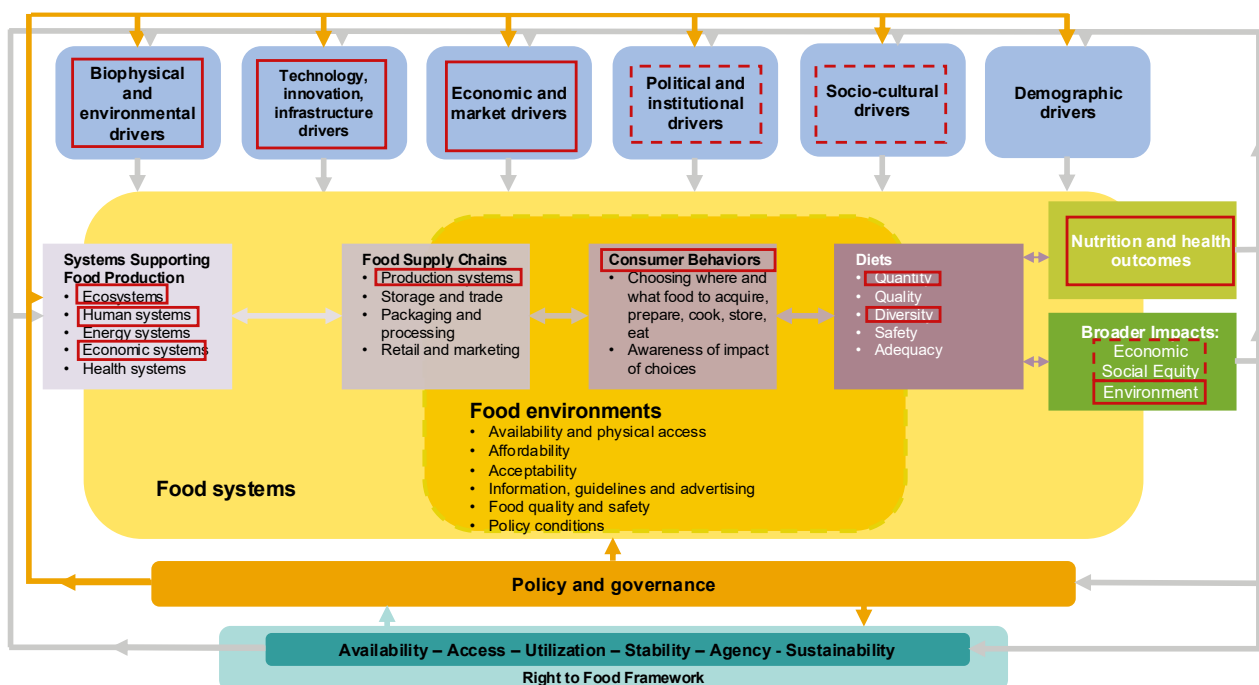
making, thereby promoting the adoption of soil fertility policies. For example, multiple studies conducted in India have demonstrated that natural farming not only improves food security for farmers but also benefits society as a whole by increasing agrobiodiversity. Healthy soils lead to healthy food, which ultimately contributes to a healthier environment.

Furthermore, the holistic perspective of viewing agrifood systems as interconnected promotes transformation and value-adding activities within our partner countries. A notable example also from India illustrates that compost produced from urban waste enhances soil texture,

improving nutrient retention and improving healthy root growth. This process simultaneously creates new jobs and income opportunities for youth and women. The application of compost increases the availability of nitrogen, phosphorus and potassium – the three primary nutrients – thereby enhancing disease resistance and boosting plants productivity.

By adopting a holistic approach centred on SPR, the Global Programmes contribute to a meaningful transformation in agrifood systems at all levels, from farm operations to research initiatives and the development of supportive political frameworks.

Figure 2: Sustainable Agri-Food Systems: Drivers and Components (the red boxes emphasise, where SPR and other ProSoil activities are contributing)



Source: GIZ 2023

Outcomes

- ProSoil achieved impressive results globally by protecting or rehabilitating almost 982,000 hectares of agricultural land. On average, yields have increased by 44 per cent compared to reference areas. In total, more than 2.6 million farmers have directly benefitted from better soil health management.
- Improved resilience against climate risks: smallholder farmers have improved their adaptive capacity at the

household level. At the agroecosystem level, the development of biomass and vegetation cover promotes the ability of production systems to cope with climatic shocks such as droughts. In Kenya financing from international carbon markets enables 30.000 smallholders to implement climate smart agriculture for the next 20 years leading to yield and household income increase of ca. 30% if compared with a control group.

- Local markets: The local production of seeds or other agricultural inputs reduces seasonal underemployment in rural areas and provides households with additional income.

- **Focus on women:** In Benin, where 90 per cent of soils show a high degree of degradation, farm-level educational interventions have primarily targeted women as key changemakers in rural areas. Through ProSoil measures, almost 59,000 women reported improvements in their socio-economic situation.
- **Political awareness raising:** ProSoil enriches the political discourse on soil fertility and agricultural land use policies with evidence from its interventions. Bringing all stakeholders together and co-creating knowledge ensures the highest level of appropriation for the desired transformation of agrifood systems in partner countries. In Kenya, for example, a milestone was reached in spring 2023 with the adoption of the **Agricultural Soil Management Policy** after years of consultations and negotiations.

Example from the field: Ethiopia DVRPU

In Ethiopia, the Dry Valley Rehabilitation and Productive Use Approach (DVRPU) has made significant strides in the holistic rehabilitation of dry valleys. This initiative has successfully protected and rehabilitated over 50,000 hectares in the extremely arid Afar and Somali regions using integrated land management techniques. Key methods include the construction of water spreading weirs to regulate the flow velocity of periodic floods. Through the DVRPU approach and the resulting flood-plain-based agriculture, communities have been able

to build more productive, diverse and resilient agrifood systems. The success of this programme is attributed to the creation of dialogue and synergies among all stakeholders. GIZ facilitated a knowledge and exchange platform with 50 key stakeholders, ranging from farmers to political decision-makers, to strengthen cooperation and institutionalise the programme. This approach has proven effective, and expansion to other regions is currently ongoing.

Example from the field: Benin

The West African country of Benin is feeling the drastic effects of rising prices for food, gas and fertiliser due to the Russian war against Ukraine.

To mitigate the consequences, ProSoil has implemented two key measures: the production and application of biochar combined with organic fertiliser such as compost for better nutrient management and the increase in cassava cultivation. This is coupled with the establishment of a value chain that ends with cassava flour. The production of biochar helps alleviate the pressure of high fertiliser prices, while increased cassava production mitigates the impact of the lack of wheat imports from Ukraine by providing cassava flour as a substitute in the production of bread and other products.



TESTIMONIAL

Meseret Teshome, Small-scale-Farmer from Midakegn (Ethiopia)

“As a father of six, my livelihood depends on our four hectares of crop-livestock farming. In 2015, the ISFM+ project identified soil acidity as the main issue affecting our yields. Initially skeptical, I was convinced of lime’s benefits after seeing positive results. Since using lime, our productivity has nearly returned to previous levels, significantly improving our food security and income.”

Key Messages

- Multiple positive impacts: SPR is essential for transforming agrifood systems sustainably, addressing challenges like land degradation, food insecurity, carbon loss, and the fertilizer crisis.
- Circular economy promotion: SPR methods can foster a circular economy and mitigate the fertiliser crisis by boosting local production of organic fertilisers and reducing reliance on mineral fertilisers.
- Resilience through local production: New business models and local production enhance resilience against global agricultural value chain disruptions.
- Simple and scalable solutions: Easy starting points with quick wins for farmers help trigger locally adapted, scalable solutions, avoiding complexity and negative outcomes like misunderstanding and frustration.
- Evidence-based sustainability: Scientific evidence beyond pilot stages is crucial to convince policy makers of SPR’s effectiveness and long-term benefits.
- Long-term focus and cooperation: Effective SPR methods require long-term planning and cooperation, with visible positive changes in two to three years, encouraging partners to commit to broader transformations.
- Knowledge-intensive approach: SPR involves learning loops and long-term strategies, necessitating cost-effective capacity development methods like the “farmer to farmer” approach.

Further readings and sources

BMZ-Kernthemenstrategie: „Leben ohne Hunger – Transformation der Agrar- und Ernährungssysteme“

Sachstandsbericht 2023 – Globalvorhaben „Bodenschutz und Bodenrehabilitierung für Ernährungssicherung“

Sustainable food systems: Concept and framework

The IPBES assessment report on land degradation and restoration

Why is soil health important for food production? (eitfood.eu)

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