



Photo by CRS Burkino Faso staff

Enhancing sustainable production — adaptations for recovery in a degraded environment

SYNOPSIS

Since the 1970s, Burkina Faso has experienced drought, which has intensified vegetation loss and erosion from wind, water, and lack of soil nutrients. Rain-fed agriculture is dominant throughout the Burkinabe Families Achieving Sustainable Outcomes (FASO) Program, and it is encountering increased risk as rainfall becomes more erratic.¹ The FASO Program contributes to climate-change adaptation by:

- Promoting water-harvesting techniques and crop diversification
- Promoting the use of early-maturing and drought-tolerant varieties of seed
- Improving soil management through integrated natural-resource management
- Training farmers on readily implemented, no-cost (or low-cost) adaptations

Water management helps communities become more drought-resilient by reducing runoff and erosion, improving water infiltration, increasing soil moisture, and increasing agricultural productivity even in dry years. FASO community members recognize that improving the management of natural resources, such as soil and water, is vital for food production and will strengthen the resilience of households and communities facing food insecurity. The FASO Program centers on the concepts of resilience and sustainability. It focuses on improving the absorptive and adaptive capacities of recover farmers to system shocks and strengthening their connections to long-term markets.

¹ Burkina Faso may experience a 0.8 degree Celsius rise in average temperature by 2025 and a 1.7 degree Celsius rise by 2050, with a potential drop in rainfall of -3.4% by 2015 and -7.3% by 2050. Source: Global Facility for Disaster Reduction and Recovery (GFDRR), www.gfdrr.org.

Limited availability and access to water. Burkina Faso receives most of its rain between June and September, and rainfall during this season typically provides water for crops and livestock. Millet, sorghum, maize, and rice are the principal crops grown for household use and surpluses to be sold in markets. FASO farmers' agriculture is mainly rain-fed, making it highly dependent upon rainfall amounts and distribution. The FASO area experiences higher rainfall variability, making it vulnerable to food insecurity; thus, the FASO Program focuses on promoting improved water availability to farmers.

Water infrastructure for productivity and resilience interventions. Rain-fed rice areas are characterized by lack of water control, flooding, and droughts. Yields are typically low due to adverse climate and poor soils, as well as a lack of suitable modern technologies and improved rice varieties. The FASO Program promotes a range of water infrastructure activities for production and resilience outcomes. One activity consists of bund (embankment) construction around fields to create dikes that channel and retain water. Water is added to banded fields by the natural flow of water from streams and rivers, and embanked to retain water for at least part of the year. In some areas, irrigation supplements natural rainfall during the wet season. Generally, FASO farmers with irrigated land reported using more purchased inputs than farmers of non-irrigated lands do.

OVERVIEW OF FASO SOIL AND WATER RECLAMATION RESULTS

Catholic Relief Services (CRS) has engaged over 6,600 farmers in the rehabilitation of more than 3,500 hectares of degraded private land through the use of zaï and other locally acceptable techniques.

Source: FASO Monitoring and Evaluation Indicator Tracking Table data for FY2015.

KEY PRINCIPLES FOR FASO'S WATER MANAGEMENT

- Capture rain where it falls.
- Make water stop and infiltrate soil.
- Make sure people and livestock do not disturb any measures put in place to achieve soil and water conservation.

The FASO Program has promoted irrigation schemes in program areas as another intervention to address both productivity and resilience. FASO-supported interventions to develop water infrastructure construction in marginal lands, including flood plains and *bas-fonds* (lowlands) show promise given the high potential of those systems to increase rice production. Within dryland areas, FASO disperses trees within fields and communities, and takes other agroforestry measures to help with soil reclamation. Micro-catchments or demi-lunes are used to harvest water in dryland areas. Even the smallest rainstorm results in runoff that is collected in the demi-lunes, and the water stored in the soil under them is enough to sustain the trees or plants during a dry spell. In FASO areas, communities and households plant trees in the demi-lunes if they can access seedlings.

Traditional techniques for conserving water and rehabilitating degraded land. The FASO Program's experience suggests that, wherever possible, community members should adopt no-cost climate-change adaptations. The zaï system is a traditional technique for conserving water and rehabilitating degraded land through the digging of a series of man-made pits on unused land. Because the land is typically less permeable to water, the man-made holes capture runoff precipitation. Farmers then fill the zaï pits with organic matter so that moisture can be more easily trapped and stored. Farmers then plant annual crops such as millet or sorghum in the pits. The zaï pits extend favorable soil conditions and are beneficial during storms, when too much



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water accumulates. The compost and organic matter in the pits absorb excess water and store it for the planted crops.

In the FASO Program, the zaï system is often practiced in combination with contour stone bunds and the planting of trees. Traditional methods and practices for conserving water and rehabilitating degraded land include contour stone bunds, compost pits, mulching, and re-generation of vegetation and zaï pits. When adopting the zaï technology, FASO mainly calculates the cost of implementation according to the farmer's laborer and access to tools. The economic return of the farmers' investment is 100 percent, because the land brought under production was previously abandoned or unused.

Adaptations needed for recovery in a degraded environment. The FASO resiliency strategy centers on improving the capacity of vulnerable communities and households to adapt to climate change. The poor, who are especially vulnerable, have limited adaptability and few incentives to invest in climate-change mitigation unless such investments also enhance current productivity. This situation is best illustrated by a man who, although not a direct beneficiary of the program, began to dig zaï in imitation of FASO participants. He observed, "When I started digging these small holes, people called me crazy because it's crazy to cultivate in the dry season. I dug half a hectare of zaï, and I harvested twice in this field. Those who called me crazy later renamed me the 'Wise Man' and started following my example."²

² RISE Newsletter, Tiabrimnani Nadinga.

FASO promotes improved land, water, soil, and crop management practices through organized capacity training, model farmers, and farmer field schools demonstration. The improved techniques and practices FASO promotes include:

- Agroforestry in which Baobab trees and moringa are planted together with sorghum and millet crops on farms. The trees enhance soil fertility, provide shade, and reduce runoff and erosion.
- Stone bunds placed along contours to slow the runoff of water and enhance its absorption
- Water-harvesting structures and systems including water ditches to collect water from a surface area for irrigation or improved filtration
- Small-scale irrigation and improved water management from ground and water sources
- Zaï pits for planting and water conservation
- Crop residue mulching – leaving crop material on the field after the harvest to improve soil texture, prevent erosion, and encourage water filtration
- Livestock manure collection and storage for future use on farmers' fields
- Composting by allowing crop residue and manure to decompose and then adding them back to the soil to improve fertility and texture, and allow for improved water filtration
- Improved, stress-tolerant grain, legume, and vegetable varieties, bred specifically by the National Institute for Agricultural Research (INERA) to be adapted to climate challenges in FASO Program area

IN THEIR OWN WORDS

During a field visit in July 2016, participants in focus-group discussions and key interviews frequently mentioned that water access was a fundamental problem, noting the strong relationship between water availability (through either rainfall or irrigation) and land productivity.

Weighing the costs and benefits of adopting technologies.

The pump technology utilized in lowland rice paddies or at market gardening sites enabled producers to support large-scale irrigation during periods of erratic rainfall or during the dry season. The pump technology is a labor-saving technology for women who otherwise would be tasked with collecting water for farm, household, and production purposes. The primary disadvantage of the pump technology, which limits its scalability, is the lack of training in pump maintenance and the ongoing need for capital to pay for equipment and inputs, including spare parts and fuel. Market gardening groups and lowland rice groups often cited high pump-maintenance costs as an economic constraint, although well-organized groups were able to forecast these costs in their annual budgets and collect fees from members to meet annual operational costs.

Although producers appreciated soil and water management techniques for the resulting increase in yield, income, and soil- and water-retention, some beneficiaries – especially women – struggled to adopt or scale up the techniques. Some producers lacked the capital for needed equipment (producers needed a donkey, cart, wheelbarrow, shovel, manure, and compost to successfully complete each technique). In addition to the shortage of capital for equipment, women often found the zaï, mulch, and demi-lune techniques very labor-intensive. In some cases, they had to hire laborers to complete them, which added to their capital investment.

Recognizing these challenges and constraints, FASO capitalized tool committees with the necessary equipment, lowering barriers to the adoption of soil and water technologies that mitigated desertification and contributed to land reclamation. The tool committees appear to be a sustainable and cost-effective way for vulnerable, cash-strapped producers to access needed tools.

To a lesser extent, FASO promoted forestry management techniques for forage and shading

FASO SOIL AND WATER MANAGEMENT TECHNIQUES					
Crop and soil management techniques	Increased yield	Increased revenue	Improved soil fertility	Increased water retention/soil moisture	Short cycle crops adapted to climate change
Zaï	X	X	X	X	
Demi-lune	X	X	X	X	
Stone bunds	X	X	X	X	
Compost	X	X	X	X	
Mulch	X	X	X	X	
Adapted seeds (drought-tolerant and early-maturing varieties)	X	X			X
Market gardening	X	X			
Pump technology	X	X		X	

for animals, as well as crop protection on individual farms. When coupled with managed water access, agroforestry supports soil and water management by improving soil fertility and reducing soil erosion. The table above demonstrates how FASO interventions contribute to improved outcomes for producers.

Scaling up. The FASO Program is critical to USAID’s resilience and climate vulnerability work, and can be brought into the planning and design of future USAID programming to ensure that it responds to current climate trends, anticipates likely climate shocks, and provides workable solutions to food security challenges. Looking ahead, the FASO Program has identified potential areas to influence systems and structures, including: by locating entry points, it can help national policies and institutions better integrate disaster risk reduction, climate smart agricultural practices and adaptations, and development approaches.

Learning to-date: FASO smallholder farmers are dependent on natural resources for their livelihoods and food production. However, their resilience depends on their future ability to protect and enrich those resources, and to adapt to the impacts of climate change at the farm level. Adaptation approaches such as land reclamation are vital to protecting farmers from drought, flooding, and loss of production and income.

FASO farmers started to recognize positive changes in their landscapes after investing in zaï, demi-lune, mulching, and inter-cropping, as well as using adapted, stress-tolerant seed varieties. FASO community members observed that soil and water management helped reduce soil erosion, increase rainwater infiltration, increase stream flows, raise the water table, raise pond levels, and increase crop yields even in dry years. This realization was the tipping point for greater change. Non-



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program farmers and communities have now started adopting similar production techniques and reclaiming marginal lands.

However, agricultural techniques and technology on their own do not necessarily lead to adoption and productivity increases among smallholder farmers.

Effective capacity-building interventions require long-term commitment, especially in FASO areas where the initial natural resource base is weak. Programs must sustain support over a long period to institutionalize new approaches, systems, and practices; ensure sustainable production efforts; and prevent the erosion of emerging gains.

