

Sand dams bring water and food security to Southeast Kenya



Above: Figure 1: Sand dams store up to 40 million litres of water and create the opportunity to invest in ecological agriculture.



Figure 2: Excellent Development has supported 126 self-help groups in rural Kenya to build 397 sand dams.

Each self-help group invests at least 40% of the cost of every project through labour and the provision of locally available materials.



Figure 3: Communities supported by Excellent Development have dug 1,500 km of terraces near their farms.

AF SA

Supported by:

Oxfam Novib

Hivos
people unlimited

Introduction

Eighty per cent of Kenya comprises arid or semi-arid lands. During the severe drought of 2011, 90% of water storage sources in the country dried up. About 57% of the population is without access to safe drinking water. Poor access to water in rural areas forces people, especially women and children, to walk for many hours to collect water and this seriously constrains their ability to grow enough food.

During the biannual rainy season, much of the rainwater is lost as run-off which also washes away fertile topsoil and seeds, severely impairing the ability of people to grow enough food. In Kenya, it is estimated that more than 10 million people suffer from chronic food insecurity and poor nutrition. At any one time, about 2 million people require assistance to access food.

Semi-arid Makueni County in Kenya suffers from severe water and food insecurity. It has a population of 884,527, of which 95% are rural subsistence farmers, and two-thirds are living below the national poverty line. There is a significant and urgent need for sustained investment in soil and water conservation and smallholder farming.

In 2002, Excellent Development UK and Excellent Development Kenya were established to address these problems by upscaling a model of soil and water conservation in Machakos County. In 2010, Excellent Development Kenya became an independent NGO (Utooni Development Organisation). In the same year, Excellent Development formed a strategic partnership with a new Kenyan NGO, Africa Sand Dam Foundation (ASDF), with the vision to upscale sand dams for the benefit of the rural poor in drylands around the world. The project was extended to Makueni County. Some 4,559 members of 126 registered self-help groups that partner with ASDF in both Machakos and Makueni counties are currently participants. 479,990 people in the region are benefiting.

The project involves rainwater harvesting, mainly through the construction of sand dams, as well as agro-ecological practices such as: agro-forestry, conservation farming, seed security, soil fertility, improved cropping practices, livestock improvement, terracing and irrigated horticulture, and tree nurseries. Sand dams have brought a clean, reliable supply of water for multiple uses within 30 minutes of people's homes in the project areas, enabling them to grow enough food for themselves.

Approach & Outcomes

Challenges

The project has sought to address three main challenges:

- *Lack of time to grow food*

The need to collect water from distant sources seriously hampers people, especially women, from growing food. For example, in rural Makueni County, women spend up to 12 hours collecting water each day, leaving little time to invest in agriculture. The FAO estimates that if women had access to the same resources as men, their farm productivity would increase by 20 – 30% and total national food production would increase by 2.5 – 4%. Thus freeing women from the drudgery of water collection so that they have more time to invest in farming to help boost food security.

- *Lack of water for livestock and irrigation*

The majority of people in Makueni County depend on rain-fed agriculture. Yet poor management of seasonal rainfall results in much of the rainwater being lost as run-off, leaving little or none for irrigation or livestock.

- *Lack of knowledge on sand dams and ecological farming*

Despite sand dams being the most cost-effective method of rainwater harvesting in drylands, they are relatively unknown and under-utilised as part of sustainable land management strategies, even within Kenya. In Makueni, most of the rain falls in a few intense and increasingly unpredictable seasons, making it difficult for farmers to plan when and what to plant and harvest. Moreover, the farmers have little or no access to external or governmental support and resources.

“Since we no longer travel long distances to collect water, we are using the time saved to work on our farms. For instance, we have changed to new farming techniques... We have been trained on how to intercrop to prevent certain pests and increase farm yields. My future and my children’s future is secure and will be pleasant and great because of these projects.”

– Sammy Ngondo Kitonyo, a member of the Kyeni kya Mukononi self-help group



Figure 4: In rural Kenya, women and girls can spend up to 12 hours collecting water each day, leaving little time to invest in agriculture.

Ensuring Water Security

Sand dams are a simple and cost-effective rainwater-harvesting technique which can provide a lifetime supply of clean water within 30 minutes of people’s homes. They can save up to 11.5 hours each day (otherwise spent on collecting water) in periods of drought.

A sand dam is a reinforced stone masonry wall built across a seasonal river. During the rainy season, a seasonal river forms which carries soil (composed of sand and silt) downstream. The heavier sand accumulates behind the dam while the lighter silt is carried downstream. Within one to four rainy seasons, the dam completely fills with sand. However, up to 40% of the volume behind the dam is actually water, held in the pores between the sand particles. Because water is stored within sand, it is protected from evaporation, contamination and disease vectors.

A mature sand dam can store up to 40 million litres of water, recharging groundwater and providing a clean, reliable and local source of water all year round for up to 1,000 people. Sand dams have virtually zero operation and maintenance costs and last for over 50 years. They are widely suited to dryland regions of the world.

By working with local partners, this project has helped 479,990 people gain improved access to clean water close to their homes by building sand dams and using other simple rainwater harvesting technologies.

Practising Ecological Agriculture for Food Security

Once communities have access to water, the next step in the project is to invest in ecological agriculture. This includes introducing several practices as listed below:

- Terracing land – to reduce loss of topsoil and enable greater absorption of water
- Intercropping – to maximise the use of limited land and water by balancing soil nutrients and reducing evaporation
- Crop diversification – to increase resilience to drought, pests and disease
- Using locally adapted drought-resistant seeds
- Seed banks – to provide security in the event of crop failure
- Agroforestry – to enhance water retention and reduce soil erosion

A combination of conservation farming, terracing and sand dams as promoted by this project has increased soil moisture in the fields and enabled small-scale irrigation to be set up for growing food and trees all year round, thereby significantly improving agricultural productivity. Successful Outcomes

Excellent Development has supported 126 self-help groups to construct 397 sand dams, bringing clean water within three kilometres for 91% of the people involved in the project. Some 89,000 trees have been planted and 1,500 km of terraces have been dug. With the opportunities that the sand dams have created, ecological agricultural techniques have been adopted by a high percentage of farmers as compared to the East Africa averages, as shown in Table 1.

Table 1. Percentage of farmers supported by the project

Activity	Farmers supported by Excellent Development	East Africa regional averages
Agroforestry	89%	50%
Intercropping	88%	50%
Drought-resistant crops*	94%	50%
Terracing	95%	16%
Storing agricultural water	100%	10%

Note: *94% of the farmers supported by Excellent Development grow seven varieties of drought-resistant crops (cowpeas, sorghum, green grams, pigeon peas, pearl millet, finger millet and dolichos) compared to 50% of other farmers who are planting just one variety.



Figure 5: Excellent Development provides the support and resources needed for rural communities to grow enough food to eat, store and sell in the face of climate change.



Figure 6: With the opportunities the sand dams have created, communities are even initiating small-scale fish farms to supplement local diets and increase community income.

Video

A film on sand dams entitled “Rain Catchers” focuses on the work of the Africa Sand Dam Foundation and demonstrates some of the impacts of sand dams in rural Kenya.

This film was produced by Al Jazeera as part of their EarthRise series. EarthRise explores solutions to today's environmental challenges, taking an upbeat look at ecological, scientific, technological and design projects the world over.

The project approach is spread through learning exchanges and farmer-to-farmer networks. Neighbouring self-help groups come together to support each other, especially with labour-intensive activities such as building sand dams and terracing land. Demonstration farms are established to enable farmers to try out new ideas without the risk of failed harvests. Successful techniques are transferred to family farms while unsuccessful techniques are abandoned.

Sand dams have saved a significant amount of time for the communities, especially for women. In this way, they have created the opportunity for increased investment in agro-ecology, enabling families to lift themselves out of poverty. Because of their low operation and maintenance costs, they are particularly well-suited to community group ownership and management. Increasing the availability of water and the amount of time and skills of smallholders to farm effectively has transformed the lives of dryland farmers in the project areas.

Stakeholders & Resources

Stakeholders

There are three actors in this initiative:

- Excellent Development – international NGO overseeing capacity building, technical support and fundraising
- Africa Sand Dam Foundation (ASDF) – local NGO overseeing community engagement and technical support
- Self-help groups – government-registered community-based organisations which implement the project activities. Each and every self-help group initiates its own project in collaboration with ASDF. Together, they develop a five-year plan to address specific problems. Each community invests at least 40% of the cost of every project in the form of labour and provision of locally available materials.

Andrew Musila Silu, Development Director of ASDF, says, “In ASDF, we plan with the communities... We work with [them] for five years. Every community develops a plan of what they want to achieve... [After then] they will have water security and the knowledge of the best farming techniques and ways of getting income. That's when we can say this group stands on its own.”

Through connections with the self-help groups, local residents are engaged as skilled and unskilled laborers for the construction of sand dams. In addition, as small-scale farms expand with year-round irrigation, local people may be employed to provide farm support.

Resources

Excellent Development provides support to ASDF to develop their independent fundraising and communications capacity.

The cost of the materials and technical support needed to build a sand dam ranges from £6,448 – £25,489 depending on its size.

The cost of support to self-help groups to improve their food security through the adoption of agro-ecology and climate-resilient farming methods is £8,000 per year for each self-help group.

Upscaling

Sand dams have been built to scale and verified throughout southeast Kenya where they have had a significant impact on access to water and small-scale agricultural production. In Kenya, the scaling-up of the initiative draws upon a local tradition of knowledge sharing and community working known as ‘Mwethya’, where people help their neighbours for the greater good of the community. Knowledge of sand dams and sustainable land management is disseminated via farmer networks. The structured process of support practised by the project considers the local context, allowing the technology to be flexibly applied rather than rigidly replicated in new regions.

The main challenge for upscaling and mainstreaming sand dams is lack of awareness and difficulty in changing institutional practices. To overcome this, Excellent Development has developed a **Sand Dam Manual**, which is freely available, to demystify the technology. This is a practical guide to the siting, design and construction of sand dams. With ASDF, Excellent organises two to three sand dam learning visits to Kenya each year and provides practical assistance on the ground to other organisations in introducing sand dams into their food and water security programmes.



Figure 7: Seed banks provide security in the event of failed harvests.



Figure 8: Goat projects increase milk and meat yields from goats for consumption and increased community income.



Figure 9: Through sand dams and ecological agriculture, rural dryland communities are growing enough food to sell at local markets.



Figure 10: Crop diversification increases resilience to drought, pests and disease. 94% of the farmers supported by Excellent Development grow seven varieties of drought-resistant crops compared to 50% of other farmers in the region who are planting just one variety.

To date, Excellent has supported the application of sand dams in eight other African countries: Mozambique, Sudan, Uganda, Kenya, Zimbabwe, Swaziland, Tanzania and Ethiopia as well as in Rajasthan, India. Soon to be launched will be the website SandDams.com as an open access knowledge bank on sand dams and similar technologies to support the establishment of sand dams in the world's drylands.

If managed well, drylands can be fertile lands, capable of supporting essential animal and plant habitats, crops and livestock. What is needed is access to information, knowledge sharing, and collaboration and political will to ensure a focused and sustained investment in an agricultural system that protects the rights of smallholder farmers and supports the conservation of natural capital. This project provides a successful model to emulate in other dryland regions.

This case study is dated March 2014. The information was provided by Excellent Development. Questions may be sent to Jonny McKay, Communications Manager, Excellent Development, United Kingdom, at jonny@excellent.org.uk.