



# Water security and Agroecology transform lives in the Drylands of Kenya

## Introduction

Drylands represent 40% of the Earth's surface, produce 44% of the world's food and are home to 80% of the world's poor. Eighty per cent of Kenya comprises arid or semi-arid lands. Rainfall occurs in just one or two short, intense seasons. Because the land is so dry, when rain does fall, up to 85% of the water is simply lost as run-off. The rain also washes away fertile topsoil and seeds, negatively affecting agricultural production.

About 57% of the population in Kenya 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. 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 live below the national poverty line.

### Sand Dams

Sand dams are a simple and cost-effective rainwater-harvesting technique which can provide a lifetime of clean water close to 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 such a seasonal sandy river. During the rainy season, a seasonal river forms that 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 can be completely filled with sand. However, up to 40 % of the volume behind the dam is actually water, held in the pores between the sand particles.



**Figure 1. Sand dams store up to 30 million litres of water and create the opportunity to invest in ecological agriculture. ©Excellent Development Ltd.**

Because water is stored within sand, it is protected from evaporation, contamination and disease vectors. Water can be abstracted by scoop holes, a pipe infiltration gallery or through a shallow well with a pump. A mature sand dam can store up to 30 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 the world's cheapest method of capturing rainwater and are widely suited to drylands. Despite this, they are relatively unknown and under-utilised in Kenya.



## Description of the Agroecology system

In 2002, Excellent Development UK and Excellent Development Kenya were established to upscale a model of soil and water conservation in Machakos County in Kenya in a bid to address the water and food insecurity problems. In 2010, Excellent Development Kenya became an independent NGO (Utooni Development Organisation). In the same year, it formed a strategic partnership with a new Kenyan NGO, the Africa Sand Dam Foundation (ASDF), with the vision to upscale sand dams for the benefit of the rural poor in drylands. The project was extended to include Makueni County.

The project involves revitalising an ancient method of rainwater harvesting through the introduction of sand dams and agroecological practices. Currently, some 5,161 members of 147 registered community self-help groups in both Machakos and Makueni Counties have participated in the project. The project seeks 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 Agroecology.
- *Lack of water for livestock and irrigation:* The majority of the 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.
- *Lack of knowledge on sand dams and Agroecology:* Despite sand dams being one of the most cost-effective methods of rainwater harvesting in drylands, they are relatively unknown and under-utilised within Kenya. In Makueni, most of the rain falls in a few intense and unpredictable storms. These storms are becoming harder to predict and more intense, making it more difficult for farmers to plan when and what to plant. Moreover, the farmers have little or no access to external or governmental support and resources.



Figure 2. In rural Kenya, women spend up to 12 hours collecting water each day, leaving little time to invest in agriculture. ©Excellent Development Ltd.



Figure 3. *Excellent Development* has supported 147 self-help groups in rural Kenya to build 533 sand dams (1). Each self-help group invests 40% of the cost of every project through labour and the provision of locally available materials (2). Communities supported by *Excellent Development* have dug 1,622 km of terraces near their farms (3). ©Excellent Development Ltd.

### Project Interventions

This project helps the communities to gain secure access to clean water close to their homes by building sand dams and using other simple rainwater harvesting technologies. Every self-help group initiates its own projects by contacting the local partner NGO, ASDF. Together, the self-help group and ASDF develop a five-year plan to address their specific problems. Each community invests 40%



of the cost of every project in the form of labour and provision of locally available materials. This way, the communities have ownership of the sand dams that they build together. Once communities have access to water, this frees up valuable time for them to invest in Agroecology. Several agroecological practices have been introduced by the project:

- *Terraces*: Terraces are dug into the slopes of riverbanks. This allows trees and crops to be grown near sand dams and can increase crop yields by 20%.
- *Intercropping*: Planting mutually beneficial crops together makes the most from limited water resources, balances soil nutrients, reduces weeds and pests, increases productivity and acts as an insurance against crop failure from extreme weather events, such as drought.
- *Crop diversification*: This increases resilience to drought, pests and disease. The use of locally adapted drought-resistant seeds is also promoted.
- *Seed banks*: Community seed banks are stocked with quality seeds that are adapted to local environments. On the condition that twice the number of seeds are deposited in the bank than are withdrawn, these seeds are freely available for use by the community.
- *Agroforestry*: Planting trees protects the soil as they reduce erosion and enable the land to absorb more rainwater. In addition, trees are also an essential source of fuel, food, fodder, compost, building materials and medicines.

The spread of agroecological techniques is achieved through farmer-to-farmer field schools. 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 risking a failed harvest. Successful techniques are transferred to family farms.

In Kenya, there is a local tradition of knowledge sharing and community working known as 'Mwethya', where people help their neighbours for the greater community good. In this way, the knowledge of sand dams, sustainable land management and Agroecology techniques is disseminated via farmer-to-farmer and community networks.

## Outcomes of the practices

The constructed sand dams bring a clean and constant water supply within three kilometres for 91% of the households involved in the project. Some 957,881 trees have been planted and 1,622 km of terraces have been dug in the project areas. The combination of soil conservation and agroecological practices, 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.



Figure 4. Goat projects increase milk and meat yields from goats for consumption and increased community income (1). With the opportunities the sand dams have created, communities are even initiating small-scale fish farms to supplement local diets and increase community income (2). ©Excellent Development Ltd.





The unique thing about a sand dam is that the water is filtered clean through the sand and stored below the surface, protecting it from contamination. When the water is then abstracted through a pipe, it comes out clean and protects those who drink it from disease. This reduces possible breeding sites for mosquitoes (therefore reducing the chance of malaria transmittance), and reducing the incidence of another of Africa's greatest killers of children under five, diarrhoea.

A secure water supply also enables a greater range of foods to be grown and addresses malnutrition problems. Diverse and nutritious diets are vital for improved health. More animal fodder can be grown too, and fatter livestock means more meat and more milk, which is especially valuable for children's health and at the same time helps to increase community income. Furthermore, with the opportunities the sand dams have created, communities are even initiating small-scale fish farms to supplement local diets and increase community income.

Time once spent collecting water from distant sources can now be invested in education, among other important benefits. Children no longer have to skip school to collect water. In addition, the crops that can be grown with increased water security have enabled parents to generate more income to invest in their children's education and other needs.



Figure 5. 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 (1). Through sand dams and ecological agriculture, rural dryland communities are growing enough food to sell at local markets (2). ©Excellent Development Ltd.

Due to the project's positive results, Agroecology techniques have now been adopted by high percentages of farmers as compared to the East African 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
<b>Agroforestry</b>	89%	50%
<b>Intercropping</b>	88%	50%
<b>Drought-resistant crops*</b>	94%	50%
<b>Terracing</b>	95%	16%
<b>Storing agricultural water</b>	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.

### Scaling up

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 and demonstrates the benefits that water security and Agroecology can bring.

There is enormous potential for sand dams to be scaled up for the benefit of smallholder farmers worldwide. The technology can be flexibly applied rather than rigidly replicated in new regions. The main challenge to upscaling and mainstreaming sand dams is the lack of awareness and difficulty in changing institutional practices. To overcome this, Excellent Development has developed a Sand Dam Manual, which is freely available, as a practical guide to the siting, design and construction of sand dams. With ASDF, Excellent also facilitates two to three sand dam learning visits to Kenya each year and provides practical assistance on the ground to other organisations to introduce sand dams into their food and water security programmes.

Excellent has already 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.

## Message from farmer to farmers

*"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

*"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."*

—Andrew Musila Silu, Development Director of ASDF