

## Sustainable Farming Film Guide

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This case study film demonstrates how subsistence farmers terrace land, build sand dams and plant trees as a route to achieving water and food security. The 21' 36" long film is split into two parts. Each section ends with some questions – you will need to pause to keep them up longer than a few seconds.

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### Overview – part 1

**Part 1** explores why soil and water conservation are an essential first step to achieve sustainable farming in semi-arid Africa and how Excellent Development supports farmer to do this with terracing, sand dams and trees. (13' 34")

**Key vocabulary:** (See glossary)

*Subsistence farming, food security, semi-arid environment, climate change and global warming.*

**Currency conversion** – The 2,800 Kenya Shillings Muendo earns from his tomatoes is equivalent to about £20 sterling or US \$40 (2007).

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### Overview – part 2

**Part 2** looks at the potential created by soil and water conservation – with hours a day saved from collecting water and firewood farmers can develop their farms using techniques such as zero-grazing, inter-cropping, diversifying the crops and other food they grow, income generating activities and ensuring food security with seed banks. (8' 02")

**Key vocabulary:** (See glossary)

*zero-grazing, inter-cropping/ mixed cropping, crop yields, cash crops, seed bank.*

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### Answers to questions raised in the film – part 1

1. Name 4 obstacles to sustainable Development.

*Semi-arid climate,  
Climate change and global warming,  
Dependence on the land,  
Population growth*

2. What are the 2 main problems resulting from the semi-arid climate?

*Soil erosion and water loss.  
(there is heavy rainfall but most of the water runs-off dry farmland and along dry riverbeds so little is stored for use in the dry season)*

3. How will climate change make sustainable farming more difficult?

*Greater risk of drought and flooding are predicted. Drought will extend the dry season raising soil temperatures, shortening the growing season and exacerbating problems of soil erosion and water loss when it does rain. Flooding will wash away newly planted seeds and waterlog the land.*

4. What are the impacts of terracing, dams and trees?

- \* *Terracing keeps more fertile top soil and water in the farms.*
- \* *Sand dams create a reservoir of underground water, additional to the existing water supplies.*
- \* *Trees help with soil erosion and water retention in the farm, the coverage from leaves reduces soil temperatures, nitrogen-fixing trees fertilise the soil and wood is used for fuel, fruit and medicines.*

### Answers to questions raised in the film – part 2

1. Can you name the 5 ways farmers can improve food production?

*Zero-grazing livestock, inter-cropping, growing a wider range of crops that are suitable to dryer climates, growing vegetables and fruit, improving their goat breeds and learning to become beekeepers.*

2. Are these sustainable solutions?

*They are all simple affordable solutions that farmers can develop themselves after some initial training and support.*

3. Describe how a seed bank works.

*Seed banks store seeds for future planting – so that farmers don't need to find cash each time they plant. Ideally they will hold 3-5 seasons' worth of seed to protect against failed harvests. The community seed banks Excellent support are set up by an initial investment of seeds for farmers to plant – made on the condition that farmers return twice the amount of seed given to their community store, which of course builds up the bank.*

4. Would it be better to grow cash crops like coffee?

*Excellent believe that farmers in this area are better off growing food to feed themselves and their families **first** on the basis that what you don't spend is equivalent to earning it. After this, some farmers may choose to grow cash crops even though farmers in remote areas have little control over the price they get for cash crops. Farmers also have to invest money upfront in the form of pesticides and fertilisers to even have a chance of a harvest.*

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## Suggested Support Activities & Questions

### Activities to accompany the film

- 1. The world in an apple** - All you need is an apple and a knife and you can demonstrate just how little topsoil there is on the earth - great for a lesson opener! *Find details in teaching resources.*
- 2. Soil and water conservation** – *See worksheet* – Fill in the missing statistics while watching part 1 and calculate how many 1000s of years it takes to replace the soil lost by erosion.
- 3. How the savanna can get destroyed** – *See teaching resources* - Learn more about the problems facing farmers in the savanna with a diagram that visually tracks how the savanna has come under pressure and questions that encourage students to think about how farmers can adapt, manage and protect their ecosystem.
- 4. When you don't have water piped to your home...***See worksheet.* Calculate the average amount of time farmers spend collecting water during the busy planting and harvesting season and how much time is saved by the dam. Use the writing frame to consider the impact this has on lives and livelihoods.
- 5.** Jumble up some of the definitions from the **glossary** and create a **word matching** activity.
- 6. Sustainable Farming** – *See worksheet* – Free text boxes allow students to capture essential information while watching the film or as a follow-up activity with pictures that can be annotated.

### Extension questions

1. Describe the farm system you have seen.
2. Which factors affecting output are out of the farmers control?
3. Explain what subsistence farming is.
4. Define appropriate technology.
5. Describe the factors that cause soil erosion
6. How have droughts and population changes affected farming and farmers here?

### Extension Activities – Further challenges

- 1. Write a report** - You work for the Kenyan ministry of agriculture. Reports have arrived about the drastic improvements in the yield of farmers in the Machakos district. You have been sent to learn more and interview the farmers. Write a report about what the farmers have been doing, the successes and problems and whether you think it can be replicated elsewhere.
- 2. Before and after** - Look at the pictures of Manzaa valley taken from the same spot in 1984 and 2002. Describe the differences and give explanations for them.
- 3. Research the Machakos Miracle** – The Materials from the *Geog.2* textbook are based on a piece of research from Drylands Research: <http://www.drylandsresearch.org.uk> – Students can work through the questions with the aid of the diagrams or use enquiry to find out from the website how the Machakos story overturned the Malthusian scenario for drylands and showed that there can be positive links between population growth and environmental management under certain circumstances.
- 4. Design a poster** – Farmers who are not involved in our work can see how their neighbours progress and often wish to learn more. Produce a poster designed to spread knowledge of ways in which soil erosion can be prevented and illustrate other techniques to improve farming to farmers in the semi-arid savanna. Remember that many farmers in the area can't read English.
- 5. Appropriate technology?** Do you think that the technology Excellent Development use and promote are appropriate to this environment? How does a sand dam compare to a water pump? Think about the water table, maintenance & amounts of water supplied. Use the *appropriate technology worksheet* as a prompt.
- 6. Find out more about how Excellent Development work** – watch the third part of the Sustainable Development film or the short philosophy film or direct students to the Excellent Development website [www.excellentdevelopment.com](http://www.excellentdevelopment.com).
- 7. Dinner or market?** What do you think about Excellent Development's policy to encourage farmers to grow food to eat and sell locally before considering cash crops? Consider price fluctuations, how EU/US subsidies affect the farmers, investment costs and suitability of crops to the environment. State arguments for and against.
- 8. Case study write-up** - In 3 short paragraphs describe the farm system, the problems that have been addressed, the changes and results.
- 7. Compare the impacts of and response to climate change** in an MEDC (the UK) and an LEDC (Kenya). Incidents of drought & flooding are predicted to increase worldwide. In recent years water use has been restricted in the UK and some areas experienced flooding. Compare the impacts and response of farmers in the UK with what you have seen in the film or investigate further, for example, looking at United Nations World Food Programme articles about the 2005 drought in Kenya.
- 9. Could this model be replicated elsewhere?** Can you pick out the essential elements that make this model and approach work here – Would there be any difficulties? Think about physical landscape, culture (Kamba people have a tradition of working in community groups), climate etc. Use the *background document* for additional information.

### Other Support Materials:

#### See teaching resources for -

- Slides from the film.
- Soil and water factsheet.
- Excellent Development background & additional information.
- Website links for further climate information, maps and more fact about soil and water.

#### See image gallery for –

- Photos
- Maps
- Slides

## Sustainable Farming Film Script

Subsistence farmers in semi-arid Africa struggle to grow enough food to eat in a harsh environment. In this film we will explore the obstacles to sustainability and show how farmers can both create the potential for sustainable life and make it happen.

If they are to make farming sustainable farmers need to increase food production - growing enough food to eat and to sell to achieve food security. Of course they have to do this without damaging the environment so that the land will support them long term.

Excellent Development was set up in semi-arid Kenya to spread successful initiatives developed by local farmers. The NGO works with communities to enable them to become sustainable farmers. We'll now explore their challenges and how they overcome the obstacles to make it happen.

*So what are the main obstacles to sustainable farming? Most importantly, the climate, which can be made harder by the impacts of climate change. Farmer's dependence on the land, exacerbated by population growth are further obstacles we will discuss.*

Surprisingly, the amount of rain in semi-arid areas is quite high - annual rainfall **can** be as much as Manchester at 1,200 mm, but it falls in only 15-20 days of the year - rather than what seems like every day in Manchester!

After the long dry season the earth is as hard as concrete. Consequently when the rains come, most of the water hits the land and, rather than sinking in, runs off the surface, taking the fertile topsoil with it.

The rain water soon disappears down the river beds and into the Indian Ocean meaning water can be scarce in as little as 4 weeks.

This means that in the dry season women and children can walk as far as 10 km to get water, taking anything from 4 to 8 hours. In periods of drought this becomes a walk of up to 20km, taking as much as 12 hours each day.

**Rhoda, Farmer** - *'thirty years back we used to live a very bad life because we used to go a long long way to collect water. We used only to have one meal per day because we used to go very early in the morning to fetch water and make lunch only and go for water in the evening'*

So how will climate change affect sustainable farming? In 2007 Sir Nicholas Stern investigated the economic effects of climate change and the resulting report predicts that the poor in developing countries will be hit the hardest by global climate change and those in semi-arid environments will be hit the most. It is already hard to grow enough food to eat in semi-arid Africa, climate change, will make it even harder.

More extreme weather is predicted for this region. Extended dry seasons or droughts would become more common, making water even more scarce and raising soil temperatures, exacerbating the problems of soil erosion and water running off farm land. Famine and starvation could be the result.

This is terrible news for farmers in this region - 50% of farmers Excellent Development work with are subsistence farmers so they depend entirely on their land to produce the food they eat; incomes are generated from selling any surplus. There are few other opportunities to earn incomes in rural areas.

Whilst the other 50% do have a family member employed in a local town or city sending money home once a month - this is only a supplementary income that is commonly used for basic necessities such as salt, sugar, soap and paraffin and, if it stretches that far, secondary school fees.

Food production also needs to keep pace with population growth which increases pressure on the land. Farms become smaller with each generation because they are divided up between children. More land is put into use for farming and land that was previously allowed to rest is farmed every season, risking its fertility.

Let's see how you can create the potential for sustainable farming:

The semi-arid climate poses a significant obstacle to feeding a growing population that is dependent on the land. Add climate change and the obstacle becomes even greater.

The initial challenge for farmers is to tackle the impacts of the semi-arid climate, by finding a way to conserve water through the dry season and reduce soil erosion.

ED supports farmers to conserve soil and water using three interrelated techniques; terracing, sand dams and trees.

The first of the three to be tackled is the terracing of land to create flat fields so that water and soil is conserved.

The terraces, dug along the contour of the land, can reduce water running-off the land from 45% to only 5% - a remarkable increase in the water conserved in the farms. Terracing also reduces soil losses by an amazing 97% - For a farm the size of a football pitch - this means 50 tonnes of soil is kept in the fields.

In drylands this is hard work! Farmers work together in a self-help group to help each other to terrace their land. It would take one person a full day to dig just 10 metres.

Working together, communities dig an average of **10km** of terracing on their farms, that's 25 times round an athletics track!

Terracing alone greatly increases the amount of food farmers can produce.

**Charles, Farmer** - *'Last season we learnt a lot because some few people who had terraces in their shambas (farm in brackets in subtitles) in the area - we saw them harvesting and that is why we are putting a lot of effort in every members shamba so that we can harvest. And we are sure that if we get same same rains that we get most of the seasons we shall harvest if we have terraces in every shamba'*

So, having increased the amount of soil and water retained in the farms, the second step is to conserve more water in the seasonal riverbeds. This is done with sand dams, ingenious structures with no visible water.

A sand dam isn't **made** of sand! It actually **retains** sand behind a concrete wall built across a seasonal river bed during the dry season.

**Simon, Co-founder, Excellent Development-** *'The beauty of sand dams is that you are creating springs, you're not utilising springs so the sand dam will add water to the community and in actual fact what's even more beautiful about them is that they're built from the river itself so the water is collected - the sand that's collected in the river is used to build the dam, the stones are broken off by the community so with your little bit of addition of some cement and steel actually they are creating water for themselves out of the river itself'*

Dams are built during the dry season and are designed with spillways and wings to keep the river flowing as before. The rains are heavy and fast so it needs to be strong.

The dam captures the water when it rains – going back up stream, up to 1 km.

However there is soil suspended in the water – the sand in the soil sinks and the lighter silt is taken downstream by the overflowing water.

The wet sand builds up behind the dam – filling it completely after 1-3 seasons.

The water is then collected traditionally, by scooping a hole in the sand – this water is cleaner too because it's protected under the sand from insects and animals.

**Muendo, Farmer** - *'Before Excellent we were walking 20km from here to Athi River. Once you go and fetch water from there you have to stay for the whole day or 2 days before you get water because you find jerry cans are put in a queue for fetching water. Now we can also dig water from the sand dam'*

The dams provide clean water for people and animals. They also enable the water supply and time needed to set up tree nurseries in the dry season.

Trees are the third step in the effort to conserve water and soil; the roots hold the soil together and enable more water penetration. The coverage from the leaves reduces soil temperatures and wind erosion, also keeping more water in the soil.

Nitrogen fixing trees also fertilise the soil with their roots and leaves. All in all the result is a strong contribution to the increased crop yields.

Wood accounts for 95% of total energy use in rural Kenya so trees also enable farmers to be self-sufficient in fuel, saving another 2 hours a day collecting from other areas.

**Charles, Farmer** - *'there are some of the trees that we plant or to be planted in the shamba (farm in brackets in the subtitles- already there) and those trees can help us to maintain the moisture in the soil because as the*

*tree grows the roots are growing and these roots of most of the trees they are roots that help to lighten the soil. The soil will breathe and these trees when they grow up the leaves fall down. these leaves are fertilisers and we can use them'*

**Prof. Mugambi, University of Nairobi** - *'The microclimate has changed a great deal because of the following reasons, first of all trees have been planted and normally this area would have acacia and grass but the community here over the last 25 years has planted lots of trees. This has meant there is more precipitation because of arresting the clouds, there is much more dew now and also the birds and insects and the wind are bringing more seeds here. So over the last the last 25 years this climatic zone has shifted from fairly semi-arid zone 5 geographically to zone 3. Rain water harvesting and planting trees if it were spread it would achieve a great deal in contributing to the reversal of global warming.'*

So, to recap - soil and water conservation is achieved by terraces maintaining water and soil in the farms, sand dams providing water for the tree nurseries and the trees retaining more soil and water in the terraces. All of which, help to address the climate issues by transforming the environment.

Just to check that you've been paying attention – here are a few questions for you on what we've seen so far. You may want to take a break here while you think about the answers.

#### Questions:

- Name the 4 obstacles to sustainable development.
- How will climate change make sustainable farming more difficult?
- What are the impacts of terracing, dams & trees?

#### - Part 2 -

#### Enabling sustainable farming

Together, terracing and trees already have a huge positive impact on food production and with all the spare time enabled by the sand dam and trees, farmers can do more to develop their farms in order to increase food production, generate an income and achieve food security.

Let's have a look at how communities improve their farming to create sustainability by implementing techniques such as zero-grazing, inter-cropping and diversifying crops such as fruit and vegetables. Producing milk and honey also helps sustainability along with a different sort of bank – for seeds!

Dams allow animals to be better watered and fed which improves milk yields and meat production and therefore incomes. By zero grazing livestock means that you feed and water them in a pen, you create manure to fertilise the soil.

**Rhoda, Farmer** - *'When I keep my animals in my cowshed, I just do a circle thing, all the manure comes*

*to my shamba stuffs go back to my animals so it's one way of rotating whatever I have'*

This is 'organic farming' but out of economic necessity. By using the manure from their animals, farmers avoid having to resort to spending cash on fertilisers – money they can ill afford.

Farmers here traditionally practised mixed cropping – effectively doubling the field space. Unfortunately intercropping has been discouraged by government extension officers who are in favour of 'western methods' of single cropping.

EXD Field Officers work with farmers to encourage the mixed cropping of staple crops which complement each other with their different ground coverage and root networks –

**Rhoda, Farmer** – *'So many people in the last few years or many years were told not to intercrop by the government people and I do this against the government will, and the funny thing is that when they come to see my shamba they always get surprised at what I am doing because my yield seems to be more better than the people who doesn't intercrop.'*

So, yields increase for a number of reasons – More moisture is retained in the soil and the greater coverage lowers soil temperatures.

Inter-cropping also means that you leave some land fallow and even get natural pest control! For example, onions plants protect tomatoes from green fly.

In addition Excellent Development encourage farmers to grow a wider range of traditional food crops like sorghum, millet, pigeon peas and cow peas, reducing the risk of failed harvests – particularly as they are species more suited to the dry areas.

Demonstration plots are set up and tended by each self-help group, enabling them to grow seeds to distribute to all their members.

The water from the dams also enables farmers to grow vegetables like tomatoes and greens – not only improving diets but providing income that can be used for school fees.

**Muendo, Farmer** - *'I had no any plan of planting anything like tomatoes, because thinking of planting tomatoes without a sand dam, it was a daydream. But when Excellent Development came and showed the sites and we constructed that sand dam is when my mind started waking up. First time I planted 140 plants, that one we ate around here. The community were coming to buy some more of them. Next time I planted 350 but last one that's when I got something, 2800 Kenyan Shillings- whereby I used to take the tomatoes to school, where my child is schooling, and there it is counted as money because that tomato is cooked at school'*

Communities in the dryer, less fertile areas can only afford goats. Farmers can participate in a programme to improve their goat breeds – breeding their goats with Toggenberg goats to eventually quadruple milk yields

More trees on the farm have enabled some farmers to become bee keepers providing honey to improve health and incomes. Other farmers plant fruit trees such as

papaya, mango or passion fruit, or trees with medicinal qualities, which again save them money.

By growing a wider range of crops, including fruit and vegetables, farmers can feed themselves and create a surplus – selling it when they want to, where they want to and at a price that they decide.

Excellent don't encourage the growing of traditional cash crops like coffee – they require high inputs of labour, fertilizers and pesticides. In Kenya farmers have no choice over whom to sell it to, or at what price and they often make no profit.

**Professor Mugambi** - *'Kola market. 25 years ago it was an open market with hardly anything to sell. Every Friday, like today there is a great deal of produce that is coming from here and this community has learnt to produce what they consume and consume what they produce.'*

Drought, flooding or variable rains can all cause crops to fail which can mean farmers have no seeds to plant or food to harvest. Following the drought of 2005/6 ED launched a Seed Bank programme whereby farmers agree to return more seeds than they are given, when they harvest. This enables farmers to create a secure source of seeds to protect themselves against crop failures or a lack of cash to buy seeds.

**Joshua, Farmer** - *'The seed bank programme that Excellent Development Kenya has, is to enable the groups in the marginal areas of Machakos and Makueni to bulk their own seeds to enable them to plant, and to return back to their stores. If you give them 2 kilos, we expect them to return 2 kilos, plus extra harvest from them so that in the future we can be able to help another community elsewhere.'*

So to retrace our steps - Creating potential through soil and water conservation enables farmers to improve production, incomes and food security – and **that's** sustainable farming!

#### Questions:

- Can you name the 5 ways farmers can improve food production?
- Are these sustainable solutions?
- Describe how a seed bank works.
- Would it be better to grow cash crops like coffee?