



Written by Julia Davies

The five-year ASSAR project (Adaptation at Scale in Semi-Arid Regions, 2014-2018) uses insights from multi-scale, interdisciplinary work to inform and transform climate adaptation policy and practice in ways that promote the long-term wellbeing of the most vulnerable and those with the least agency.

What is climate change?

The changes in temperature and rainfall that we see and feel outside every day is the weather. Today might be hot and sunny, and tomorrow might be cold and wet! The climate is something different – it is the type of weather that we normally experience in a place over a longer period of time, usually measured over ten years or more. Climate can also be the normal weather conditions in summer as compared to winter, or the difference in weather between last year and this year.

Climate change, then, is a shift in the normal weather patterns of a place. For example, where a few years ago the first rains of the year might have started falling in January, some regions might now only start to get rain in March. And where people are used to maximum temperatures of 30° in summer, they might now be experiencing more days where the temperature is hotter than usual.

Introduction

The north-central region of Namibia has a semi-arid climate, which means that it has high temperatures, low rainfall and a long dry season. In recent years, this region has started to have extreme weather events more often than in the past. This is due to climate change, which has caused very bad droughts and floods. Climate change is most worrying for local communities who depend on agriculture for food and income. This is because climate change can make crops (such as mahangu and maize) less productive, and cause more livestock (including goats, sheep and cattle) to die.

It is therefore important for people in north-central Namibia to understand *how* and *why* their climate is changing, so that they know how they can prepare for this change and make sure that there is enough food and water for the future.



Namibia and climate change

How is Namibia's climate changing?

People who study climate change have seen that Namibia's climate has become hotter and drier over the last 100 years. They have also shown that in the years to come, temperatures in Namibia will likely go up even more, while rainfall will probably become less. Wind patterns are also changing, but the change in wind is not yet clear. What is clear, however, is that the climate will become more unreliable. For example, although there may be less rainfall in total, the rain that does come might fall in a short period of time, causing a flood. Or when farmers have prepared their fields for rain, there might be no rain for many months, or even years. These changes mean that the farming practices that people have always used in the past might not work as well in the future. In fact, some methods are even becoming less useful now, as climate change is already happening.



What causes climate change?

There have always been natural changes in the Earth's climate. People who study the Earth have seen that in the past, there have been long periods where the Earth is cooler or hotter than it is now. However, over the last 100 years, humans have caused the Earth's climate to change more quickly than ever before.

This is because the world's population has grown very fast. All of these people need food, water, energy, land, houses, jobs, transport and basic services. To meet this need, more and more natural resources (such as trees, fresh water, fish, coal and metal) are being taken from the Earth, and more land is being used for farming and for the development of roads, towns and cities. These things all require energy, which people mostly get from burning wood, coal, oil or natural gas. While these are all useful sources of energy, they are bad for the environment and for human health. They release dirt and harmful gases into the air, which heats the air up and, over time, causes the climate to change.

What are the impacts of climate change in Namibia?

Slow increases in temperature and rainfall over time may cause crops to become less productive, as they might not be suited to the harsher conditions. This means there may not be enough food for the household to eat, or produce to sell at the market. Hotter temperatures could cause greater heat stress in livestock, and may bring more pests such as armyworm. Stronger winds may damage crops, while less wind than usual could make accessing water more difficult for people who depend on windmills. When a drought occurs, animals do not have enough water to drink and may die, while people do not have enough water to drink, cook or wash. Less water also means that the soil becomes less fertile as there is too little moisture in the ground. This causes crops to die, which results in shortages of food for people, and fodder for animals. Droughts are often followed by floods. This is because when the earth is hard and dry, rainwater cannot easily filter into the soil. When heavy rainfall occurs, the water quickly washes away the dry soil and causes damage to the land. Floods can also damage houses, buildings and roads, which may cost a lot of money to repair. Because there is not enough infrastructure (such as earth dams or water tanks) to catch and store rainwater, it collects in *lishana*. If this water sits still for a long time, it becomes dirty and can cause diseases and sickness to spread.

Adapting to climate change

What can I do?

To 'adapt' to climate change means to change the way that we do things in order to manage climate conditions that we are not used to, and prepare for extreme events such as droughts and floods.

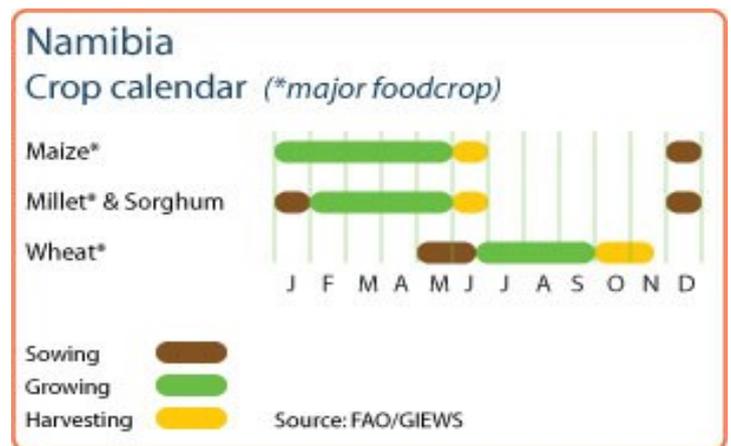
Use information from seasonal climate forecasts and early warnings

Forecasts give information on how the weather might look daily, weekly, monthly or seasonally. Short-term forecasts can help farmers to make day-to-day decisions. Seasonal forecasts are even more useful as they can help farmers to decide which crop varieties they should plant that year, and when they should plan to start their planting and harvesting seasons. Early warnings are important as they help farmers to prepare ahead of time for droughts, floods or very strong winds.



Change planting and harvesting times

When the timing of seasonal rains changes, farmers should either start planting their seeds later, or start preparing their land earlier than usual to be ready for early rains.



Diversify crops

If a farmer only plants one type of crop and it does not grow well, then there will be a shortage of food, fodder and produce to sell. A variety of different crops should therefore be planted in case one type fails. This should include crop varieties that are resistant to drought.



Adapting to climate change

What can I do?

Diversify livestock

If possible, farmers should keep a variety of different livestock (e.g. mixed goat, sheep and cattle rearing) and invest in breeds of livestock that are less sensitive to changes in climate.



Store grain and fodder

When there is a good harvest, extra grain and fodder should be stored to prepare for possible poor harvests in the future.



Use social networks for assistance

Strong support networks between neighbours, families, friends and community members are important in times of drought or flood when there is a need to share food, water and other resources.



Establish farmer's livelihood cooperatives and credit associations

Forming co-operatives among groups of men and women farmers, or among women only, can help in many ways. For example, by working together and pooling their resources, farmers can improve their access to markets, secure financial credit or loans and help to train one another in new farming techniques. Working together also means that the group will have a stronger voice than if everyone works on their own.



What works elsewhere?

Climate change means that many of the traditional farming methods used by people in north-central Namibia are not working as well as they used to. In other semi-arid areas, such as Mali, Burkina Faso, Ghana, Kenya and Ethiopia, people are starting to change their practices or even try completely new things. This has helped them to continue to grow crops and keep livestock, even though the climate is changing. Here are some examples of useful practices that farmers in Namibia could try.

What works elsewhere: PLANTING PITS

Planting pits (also called Zai pits) are used in crop farming to catch rainwater runoff, stop the soil from washing away, and prevent the wind from damaging small plants. Planting pits are dug in the dry season, so that they are ready when the rains come. Preparing the pits takes work, but does not cost much money as farmers only need simple tools. These are the steps that need to be taken to make the planting pits.

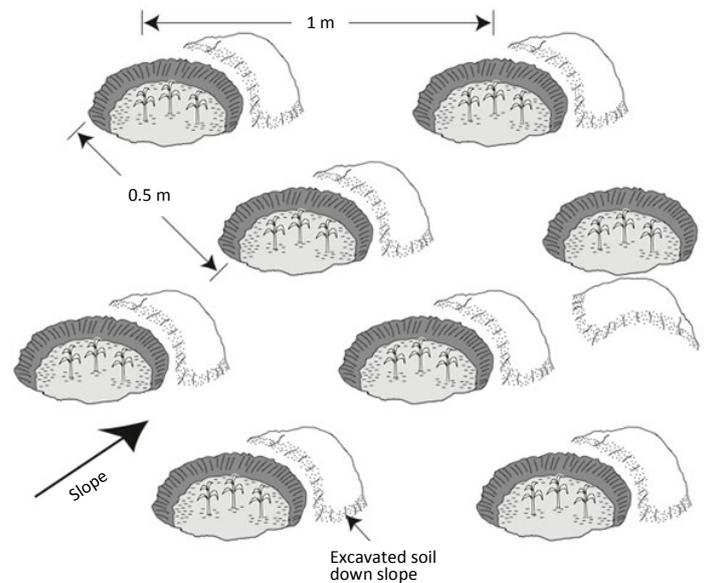
1. Lay out the positions of the pits

Choose a field that has a gentle slope (not too steep or too flat). Use pegs to mark where the pits will be dug. It is important that the pits are not directly behind one another, but spread out. The distance between each pit should be between 0.5m-1m, depending on how much space there is.



Millet growing in planting pits in Burkina Faso

Source: Motis, T., D'Aiuto, C. and Lingbeek, B. (2013) Zai Pit System. Technical Note #78. USA: ECHO.



Planting pits

Source: Malesu, M.M., Oduor, A.R., Odhiambo, O.J. (Eds.) (2007): *Green Water Management Handbook. Rainwater Harvesting for Agricultural Production and Ecological Sustainability*. Nairobi: The World Agroforestry Centre.

2. Prepare the pits for planting

The size of the planting pits are not always the same, but they are usually between 20cm-30cm wide and about 10cm-20 cm deep. When digging the pits, the soil that is taken out should be placed firmly around one edge of the hole, on the downhill side. This helps to prevent rainwater from running off down the slope. Depending on the crop type, 5-10 seeds should be planted in the pit. The seeds should be covered with soil, but enough space should be left for the rainwater to collect.

3. Look after the pits and plants

Once the plants are growing, the pits should be filled with the remains of old plants and manure. This encourages termites, worms and beetles to live in the pits, which helps water to run down to the roots of the plant because they make holes in the soil. The pits should be kept clear of weeds so that water can filter into the soil. If weeds start growing around the outside of the pit, these should be kept under control with a panga. It is best to not dig the weeds out as they can help to prevent the soil around the pits from being damaged or washed away. New pits will need to be prepared each year.

What works elsewhere: COMPOSTING

Composting is a very good way to add nutrients to the soil and to keep the soil moist, so that crops can grow better. Making compost is easy and costs little or no money. These are the steps that need to be taken to make a compost pit.

1. Prepare the compost pit

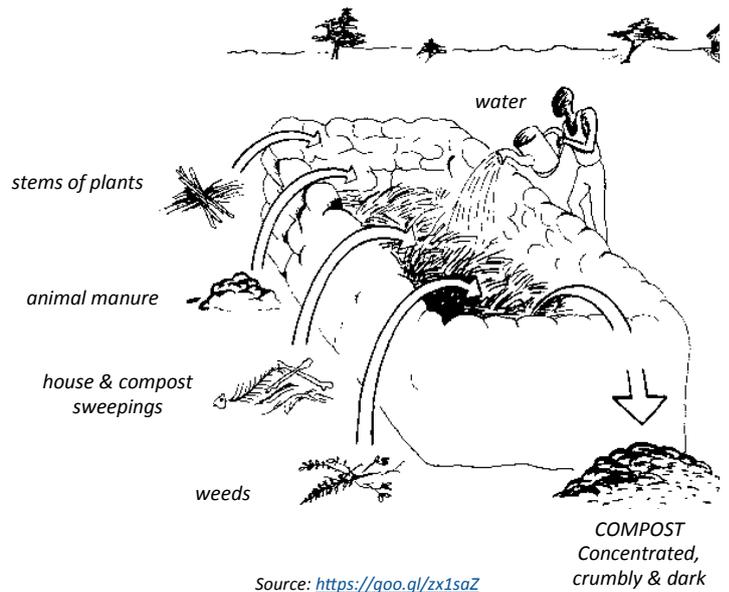
Select a patch of bare ground for your compost pit. Building it directly on the ground allows worms, termites and beetles to burrow in the compost. This is good because the holes that they make let air and water in, which helps the compost to rot and become full of nutrients. The compost can be left in a heap in the open, but it is better to make a pit with walls around the heap. To start, dig a shallow hole (25cm deep) that is about 3m wide and 6m long. Build the walls of the pit around this area. The walls can be made of natural materials such as wood or mud, or with strong plastic. The walls of the pit should be about 50cm high.



<https://goo.gl/MvAMaU>



<https://goo.gl/iKQPL3>



2. Start composting

Wait until you have enough materials to fill the pit. Start by laying thin branches at the bottom of the pit. Then fill the pit up with waste such as weeds, stalks from harvested plants, kitchen waste (e.g. vegetable peels and egg shells) and household sweepings. If possible, old compost and manure from livestock should be added as this helps the new compost to start rotting. Water the compost heap and cover it with any material that you have – plastic sheeting, wood or old carpet scraps, for example. This will keep the moisture and heat in which helps the compost to 'cook'. When the compost is ready, it will be dark brown and crumbly. It should then be spread over the fields where seeds are being planted, added to planting pits or used as 'trash lines' around the edge of the field. Trash lines help to attract more worms, termites and beetles.

3. Look after the compost pit

Keep the compost moist (but not too wet) by watering it or allowing rain to fall on it. The compost heap should be turned regularly to make sure that it is well-mixed, so that water and air is spread evenly. Whenever there is waste, add it to the compost heap. The compost pit should be emptied and filled again once a year.

More information: <https://goo.gl/ENkqba>

What CAN I compost?

What can I NOT compost?

From home

- Fruit and vegetable scraps
- Eggshells
- Coffee grounds
- Tea leaves
- Household sweepings
- Shredded newspaper
- Cardboard
- Wood ash

- Waste that is not organic (e.g. plastic)
- Anything containing meat, oil, fat, or grease
- Dairy products (e.g. milk)

From the farm

- Manure from cows, goats, sheep or chickens
- Dry leaves
- Grass and plant clippings
- Finely chopped wood and bark chips
- Straw or hay
- Sawdust from untreated wood

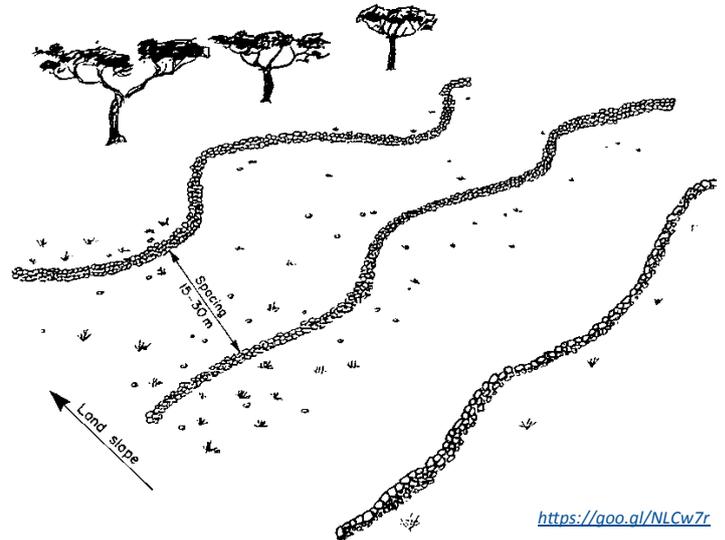
- Dog or cat faeces
- Weeds that go to seed
- Diseased plant materials
- Sawdust or chips from pressure-treated wood

What works elsewhere: STONE BUNDS

Stone bunds are another method than can be used to save water and prevent the soil from washing away when it rains. This method helps to slow down the flow of rainwater so that it has more time to filter into the soil. There should always be a few bunds next to each other, but if there is not enough labour to help then farmers can start with one bund at the bottom of their fields and build more up-slope in the seasons to come. These are the steps that need to be taken to construct the bunds.

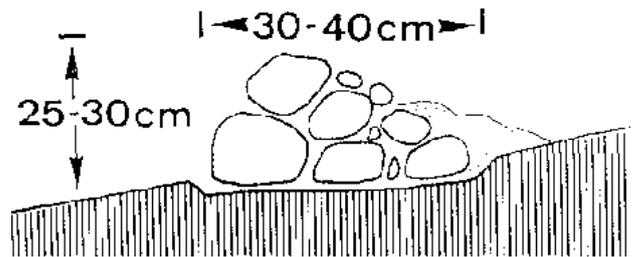
1. Lay out the position of the bunds

Bunds are useful for planting crops in areas where the ground is very uneven, or where there is a steep slope or hill. It is important for bunds to follow the contour and not go against the lay of the land. They can be spaced between 15m-30m apart, but where the ground is steeper the bunds should be made closer together. Pegs should be used to mark out the position of each bund along the contour lines.



2. Build the bunds

To prepare the ground for the bunds, a shallow trench must be dug along the contour line. The trench should only be 5cm-10cm deep and 35cm-45cm wide. The trench helps to make the bund more stable so that it doesn't get damaged or washed away by runoff. The soil that is taken out should be placed up-slope of the trench. Start building the bunds by laying large stones or rocks in the base of the trench and on the downslope side of the trench. Then lay smaller stones on top and in front of the bigger stones. Use the smallest of the stones to fill any spaces that are left. Grass can also be planted alongside the bund to help filter rainwater runoff.



3. Look after the bunds

After heavy rainfall, the bunds must be checked to see if any stones have come loose or washed away. These should be replaced and stones should be used to fill any new holes. After about three seasons the bunds may start to get filled with sand, which could prevent any water from getting downslope to the crops. If this happens then the bunds will need to be built up again, leaving more spaces between the rocks.

More information: <https://aoo.gl/mex7r3>
and <https://aoo.gl/JcPSMV>

Conclusion

Namibia's climate is slowly becoming hotter and drier, and extreme events such as droughts and floods are beginning to happen more and more often. These changes in climate can negatively affect people who depend on agriculture for food and income. It is therefore important for farming communities in north-central Namibia to understand how their climate is changing, and what they can do to adapt to this change. This brief has provided some ideas which have worked elsewhere in Africa, including: planting pits, composting and stone bunds. Using these techniques can help farmers to improve the growth of their crops and therefore make sure that they have enough food for their families and livestock in the future, even though the climate is changing.



ABOUT ASSAR

ASSAR uses insights from multiple-scale, interdisciplinary work to improve the understanding of the barriers, enablers and limits to effective, sustained and widespread climate change adaptation out to the 2030s. Working in seven countries in Africa and South Asia, ASSAR's regional teams research socio-ecological dynamics relating to livelihood transitions, and the access, use and management of land and water. One of four consortia under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA), ASSAR generates new knowledge of climate change hotspots to influence policy and practice and to change the way researchers and practitioners interact.

For more information: ASSAR - www.assar.uct.ac.za or contact Julia Davies - Julia.Davies@uct.ac.za



This work was carried out under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA), with financial support from the UK Government's Department for International Development (DfID) and the International Development Research Centre (IDRC), Canada. The views expressed in this work are those of the creators and do not necessarily represent those of DfID and IDRC or its Board of Governors.

Creative Commons License

This brief is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Articles appearing in this publication may be freely quoted and reproduced provided that i) the source is acknowledged, ii) the material is not used for commercial purposes and iii) any adaptations of the material are distributed under the same license. © 2017 International Development Research Centre Photos (unless otherwise indicated): Julia Davies, Sophie Lashford. © Photographers Editing and Layout: Tali Hoffman

