GLSCRP
GIYANI LOCAL SCALE CLIMATE RESILIENCE PROGRAMME

WATER RESEARCH COMMISSION

SMALLHOLDER FARMING SYSTEMS

HOW TO DEAL WITH SALT IN SOIL AND WATER

Acknowledgements

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The Giyani Local Scale Climate Resilience Programme (GLSCRP) aims to develop and implement activities that will research, develop and demonstrate climate adaptive responses and solutions for optimising water utilisation in drought-stricken areas.

The programme will focus on the Greater Giyani Municipal area within the Mopani district and aims to impact an estimated 5000 beneficiaries over a three-year period in terms of water utilisation, improved water mix, and socio-economic opportunities as responses to climate adaptation.

A 2019 WRC study on droughts and adaptation strategies has highlighted risks to reduced productivity, livelihoods and food security, and an increase in vector and water-borne diseases in communities such as Giyani. Ultimately, climate change impacts on water resources in the Giyani area cannot be underestimated.

The programme has three key areas that will support improving local scale adaptation and resilience in Giyani.

They are:

1) a strengthened enabling environment whereby local authorities, institutions, communities, traditional authorities and market players are mobilised to improve climate resilience and water utilisation;

2) improved energy, ground and surface water solutions developed with communities to optimise and diversify water sources;

3) activities that support livelihoods and local economic development opportunities.

The programme will cover a spectrum of rural and rural residential areas in Giyani, working closely with the Mopani District Municipality and the Greater Giyani Local Municipality. Implementation partners include Tsogang Water and Sanitation as the lead on water projects and infrastructure; Association for Water and Rural Development (AWARD) in support of capacity development and stakeholder engagement, University of the Western Cape (UWC) as the water and energy technical partner and the WRC's TTO Enterprise Development arm on social enterprise development supporting local economic development projects.

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A guideline for small scale farmers in the rural villages of Greater Giyani Local Municipality

mahlathini development foundation

This Guideline was prepared in collaboration with Mahlathini Development Foundation

Promoting collaborative, pro-poor agricultural innovation

Erna Kruger and Betty Maimela contributed through community level explorations and dialogues around climate change impacts, adaptation and the agricultural and water management systems in selected communities in Giyani along with enthusiastic inputs from village residents at the various Giyani project sites

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ABOUT THIS GUIDELINE

The Managing Salt in Soil and Water guideline provides basic strategies for preventing and managing soil salinization, a process where salt accumulates in the soil, affecting land productivity and water quality.

The guideline outlines the natural and human-induced causes of salinization, such as mineral weathering, excessive groundwater use, removal of deep-rooted vegetation, and improper farming practices like over-ploughing and over-fertilization. The guideline emphasizes prevention as the key, through sustainable agricultural practices, careful water and fertilizer management, and maintaining soil health with organic matter. It also offers solutions for managing already salinized soils by improving drainage, enhancing soil structure, and avoiding further degradation. This guideline is vital for anyone involved in land management, farming, and environmental protection.

Who is the guideline for?

The guideline on managing salt in soil and water is aimed at individuals and groups involved in agriculture, land management, and environmental conservation. This includes farmers, landowners, and agricultural workers who need to prevent soil degradation and salinization to maintain productive land. It is also relevant to environmental managers, policymakers, and conservationists who work to protect ecosystems from the negative effects of salinity. Additionally, those involved in irrigation and water resource management can benefit from the guideline to ensure sustainable practices that prevent excessive salt accumulation in both soil and water systems.

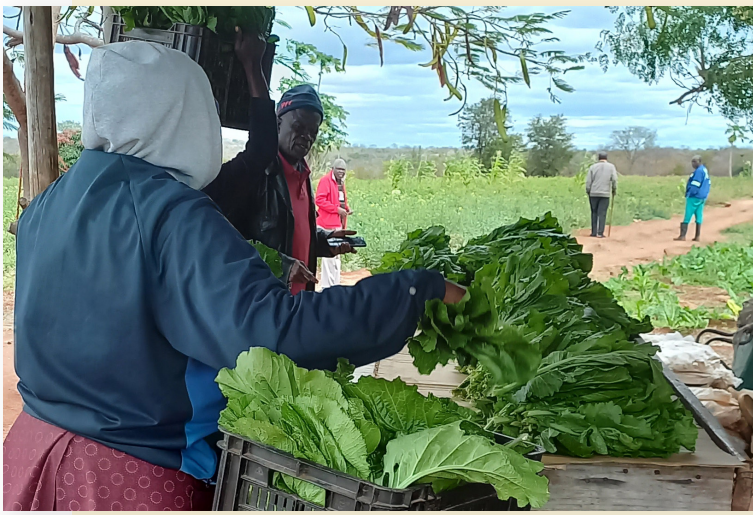
What does the guideline contain?

The guideline contains key information on both the causes and solutions for salinization. It explains natural and human-induced causes of salt build-up in soil, such as mineral weathering, overuse of groundwater, removal of deep-rooted vegetation, and poor farming practices. The guideline emphasizes prevention through sustainable land management practices, including maintaining vegetation, proper irrigation, and careful fertilizer use. It also provides strategies for managing salinized soils by improving organic matter and drainage. Additionally, it addresses the environmental impacts of salinization, offering practical steps for farmers, land managers, and policymakers to protect soil health and ensure sustainable agricultural productivity.

How to use the guideline?

The guideline on managing salt in soil and water can be used as a practical resource for preventing and addressing salinization in agricultural and natural environments. It helps farmers and land managers adopt best practices such as maintaining vegetation cover, reducing excessive ploughing, and managing irrigation to prevent salt build-up.

The guideline also informs the appropriate use of fertilizers to avoid accelerating salinization. Additionally, it offers strategies for restoring affected soils by improving organic matter and ensuring proper drainage. Policymakers and environmental managers can use the guideline to develop sustainable land and water management policies, ensuring long-term soil health and productivity.



SMALLHOLDER FARMING SYSTEMS

HOW TO DEAL WITH SALT IN SOIL AND WATER

Soil salinity is the salt content in the soil; the process of increasing the salt content is known as salinization. Salts occur naturally within soils and water. Salination can be caused by natural processes such as mineral weathering (the breakdown of rocks into soil). It is also common in hot and drier areas, where the fast evaporation of water pulls salts up to the surface of the soil and concentrates them there. Growing plants use the water in the soil, leaving the salts behind to accumulate. The salts also dissolve into the groundwater in these areas.

Some farming and environmental practices can increase salinity and should be avoided.

These include for example:
-Removal of trees and deep-rooted plants from the environment
-Devegetation and erosion of soil
-Over- use of groundwater
-Inappropriate application of fertilizer- excess nitrogen speeds up salinization
-Excessive ploughing and bare soils – leading to compaction and lack of drainage
Inappropriate irrigation practices

This accumulation of water-soluble salts, mostly table salt (NaCl), but also others, affects plant growth. Plants cannot absorb the available water properly even when the soil is wet and wilt, are stunted, show signs of stress and eventually die.

Above: Salinization in a mustard spinach field
Opposite Top : An example of Short Furrow Irrigation
Opposite Bottom : A Drip Irrigation installation.

What can we do to avoid and manage salt build-up in our soils?

The best way to deal with soil salinization is not to let it happen. In case it did, it is important to eradicate the problem – the sooner, the better, before the consequences get too severe. So, soil salinization solutions deal with prevention and management.

Looking after the soil is the most central requirement. A living soil with high levels of organic matter can manage salinization a lot better than a hard, dry, infertile soil.

"The best way to deal with soil salinization is not to let it happen"

I. Optimize irrigation

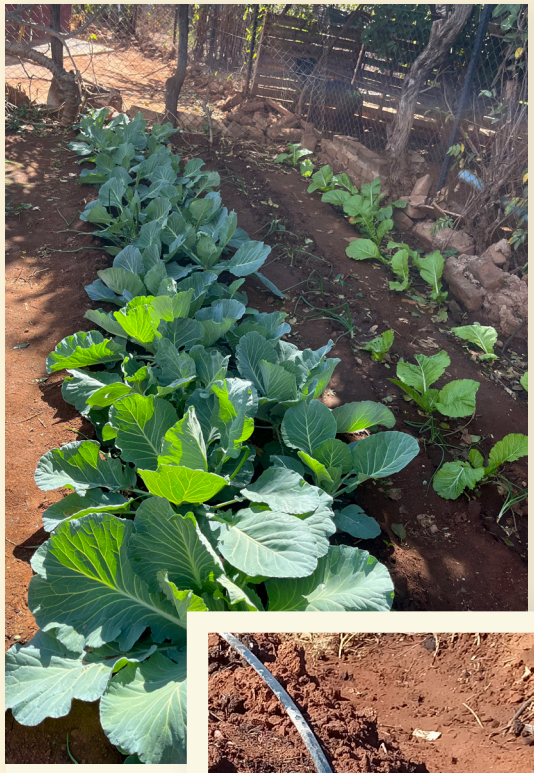
Alternate water sources
If your water source, such as borehole, is salty, alternate using this water, with another source, such as rainwater, greywater or water from a river to leach some of the salts in the soil out of the rootzone.

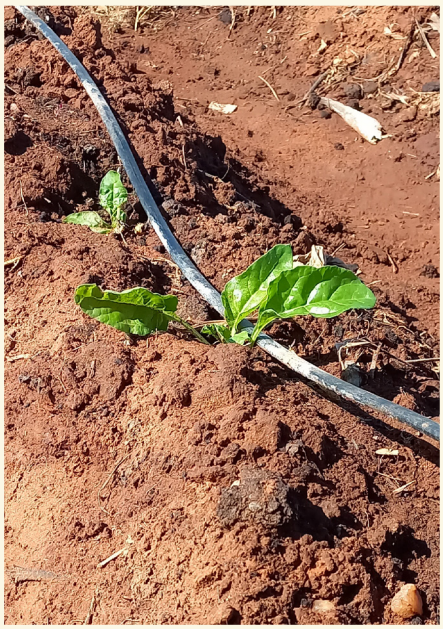
Implement good irrigation practices
There are two practices at both household and field level that work well – short furrow irrigation and drip irrigation.

Short furrow irrigation is a type of flood irrigation, which adds high volumes of water over a short time – allowing leaching of salt below root zones.

Drip irrigation, provides small quantities of water over a longer period, allowing soil to remain moist and also reduces evaporation and soil compaction, which is common for sprinkler irrigation systems.

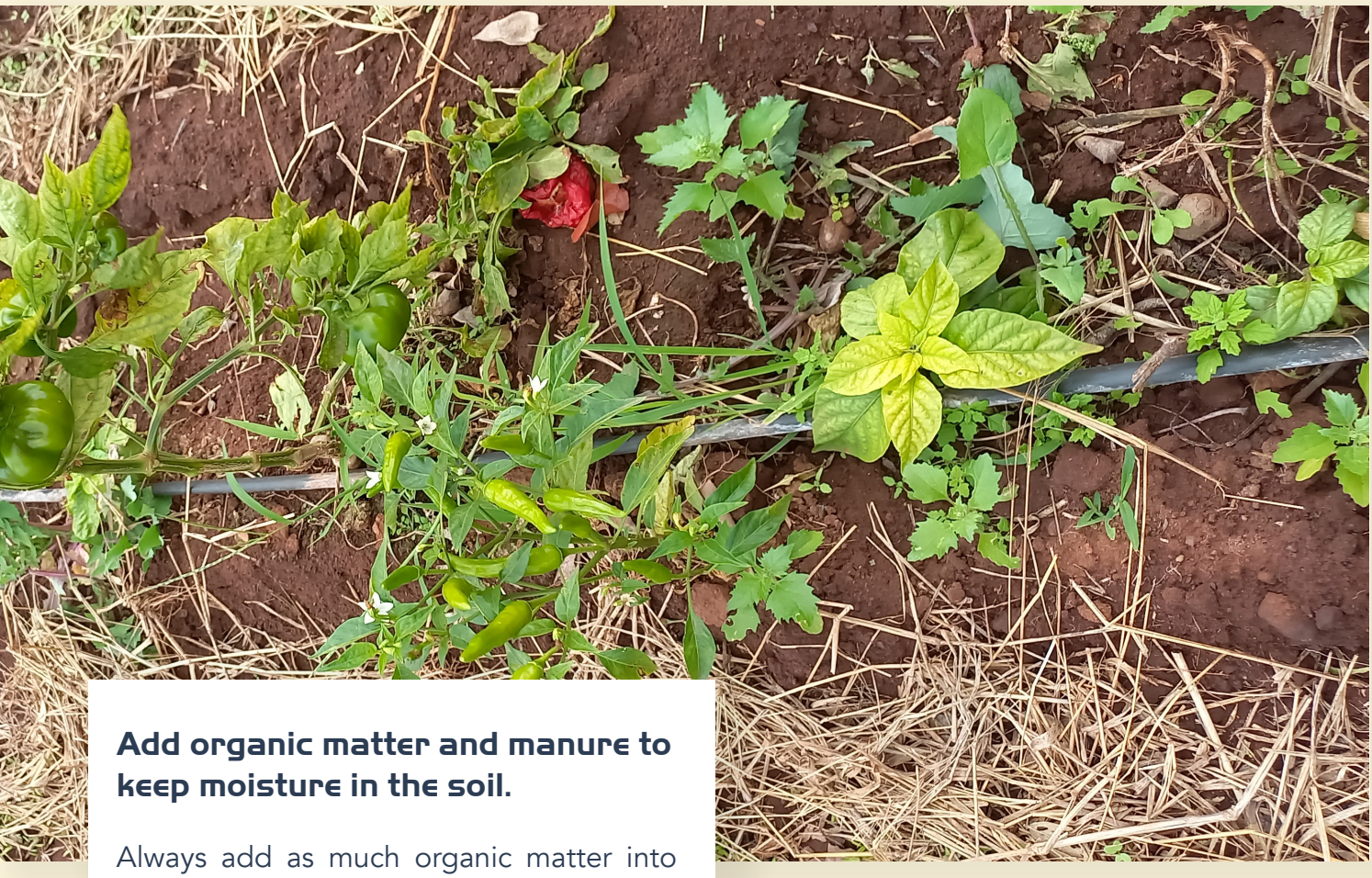
It is also important not to irrigate during the hottest part of the day, but preferably in the late afternoon. Do not over- irrigate.





Right: Short furrow irrigation in a household garden in Mayephu.

Far right: Drip irrigation of mustard spinach at the Duvadzi cooperative in Loloka

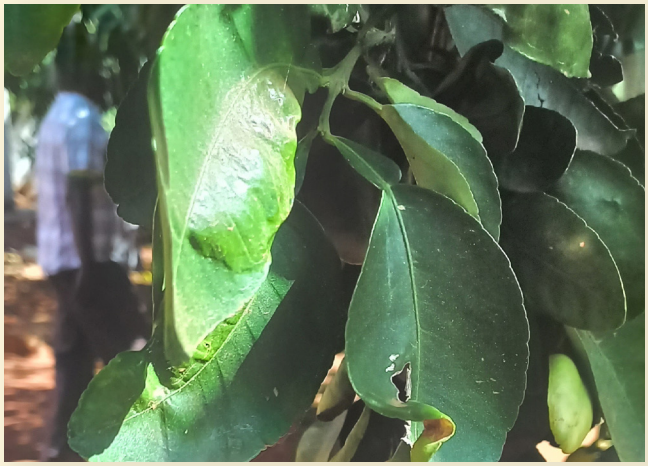


Add organic matter and manure to keep moisture in the soil.

Always add as much organic matter into the soil as possible, including manure, compost, or compostable materials such as green and dry plant material.

Use cover crops or mulch to protect the ground surface.

Always ensure that the soil is covered, whether by mulch or a diverse range of crops. Large areas of bare soil increase evaporation and salinization.



Top right: Example of kale intercropped with an indigenous leafy vegetable (Cleome), in a homestead garden in Mayephu.

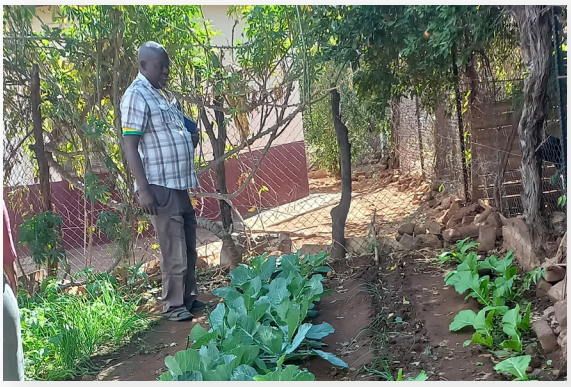
Bottom right: Citrus trees with irrigation basins filled with mulch. The shade of the trees further help to reduce evaporation

Plant a diverse range of crops, plants and trees

Used mixed cropping in household garden beds as well as fields. Plant trees in and around the cropping area and plant a range of multipurpose plants of different sizes and rooting depths. This allows access to water in the soil at different rooting depths, different levels of nutrient usage and reduction of upward movement of salts in the soil.

Above: An example of a multi-cropped garden in Mayephu, showing mixed vegetable beds, interspersed with larger herb plants and fruit trees, and

Below: Bananas planted along the edge of a vegetable garden in deep trenches will with organic matter and mulched.



Choose salt tolerant crops

Some crops are naturally more tolerant to higher levels of salinity than others.

Below is a list of common crops in the Giyani area.

High tolerance	Medium tolerance	Low tolerance
Lucerne	Jugo beans	Maize
Sorghum	Cowpeas	Peanuts
Oats, wheat and barley	Potatoes	Pumpkins and marrows
Kale	Sunflower	Chinese cabbage
Beetroot	Cabbage	Lettuce
Peppers	Swiss chard	Carrots
Okra	Tomatoes	Green beans
Brinjal	Onions	Peas

Plough as little as possible

Introduce systems of minimum tillage and conservation agriculture in larger fields and refrain from using heavy machinery. One way to do this is to construct semi-permanent furrows and ridges in the field.

Right: The Matsambo Ngamba project in Dzumeri where Delina uses drip irrigation, permanent furrows and ridges, and mulching to manage her soils and water. She does not i ntercrop, but practices crop rotation.

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