Homestead food production in a changing climate

1 Background

Smallholder farmers in Limpopo live in communal tenure villages with access to homestead gardens, including small livestock, field cropping (either dryland or irrigated) and communal grazing for livestock.

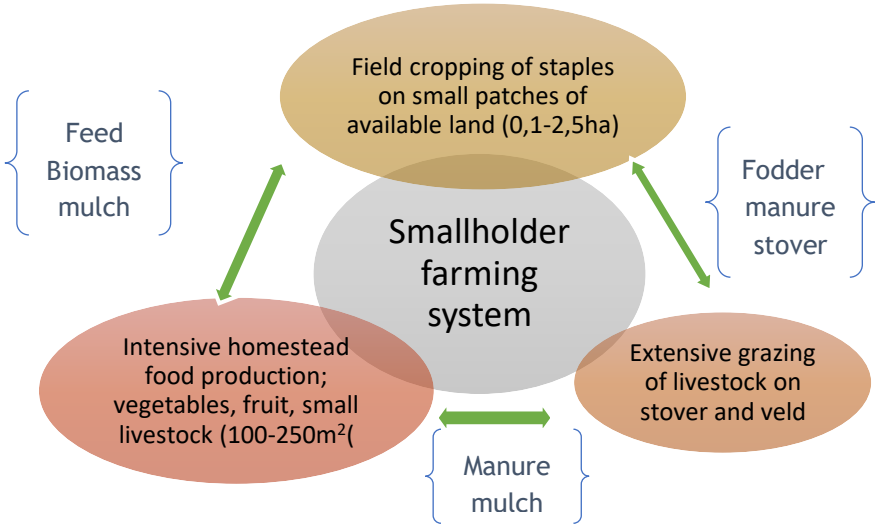


Figure 1: The smallholder farming system

Access to water (both quantity and quality) limits food production potential. Water for irrigation is not provided at household level and often households struggle just to get access to water for basic needs. The Giyani region has experienced significant impacts from climate change, including more frequent and severe droughts, erratic rainfall patterns, and increased water scarcity. These changes have adversely affected agriculture, livestock farming, and water availability for domestic use, posing substantial challenges to the livelihoods and well-being of local communities.

The GLSCRP (Giyani Local Scale Climate Resilience Programme) promotes innovative climate adaptation solutions in Giyani, including rainwater harvesting, small-scale irrigation, wastewater treatment and recycling, and climate-smart agriculture. The program aims to demonstrate the feasibility and effectiveness of these solutions, encouraging wider adoption throughout the region.

This document provides principles and practices for improved climate resilience in intensive homestead food production.

2 Introduction

Climate Resilient Agriculture can be defined as “agriculture that reduces poverty and hunger in the face of climate change, improving the resources it depends on for future generations” (Kruger, et al., 2021)

Climate resilient agriculture (CRA) aims to sustainability increase agricultural productivity and incomes while adapting our farming practices to the changing climate while making sure that our farming is friendly to nature. It is about making changes to how we farm that will improve both our ability and the ability of the environment to cope with these changes.

The emphasis is at farm/household level. CRA aims to improve aspects of crop production, livestock and pasture management, natural resource management, as well as soil and water management as shown in the figure below.

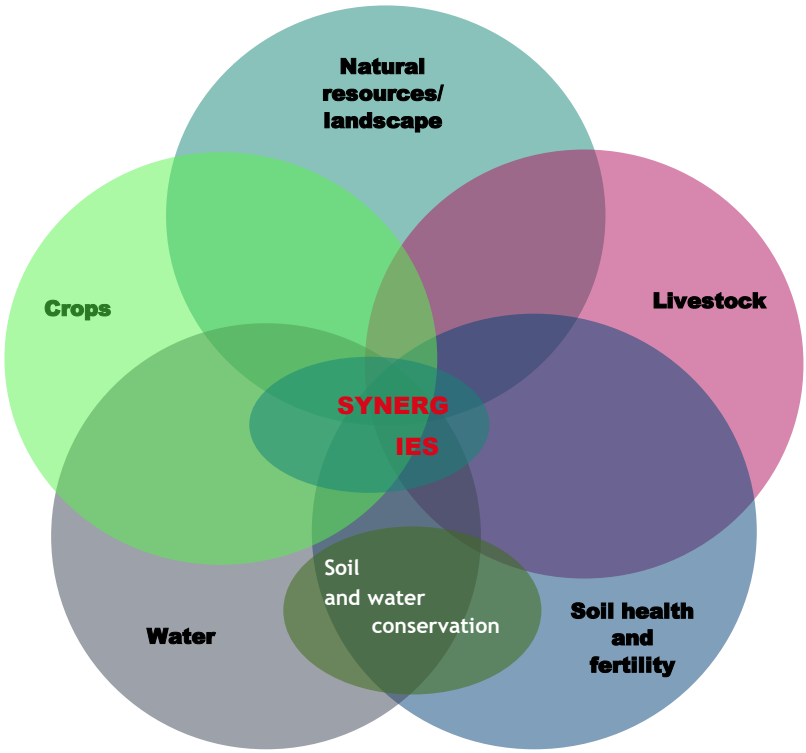


Figure 2: Household level implementation of CRA integrates across sectors. Adapted from (Arslan, 2014).

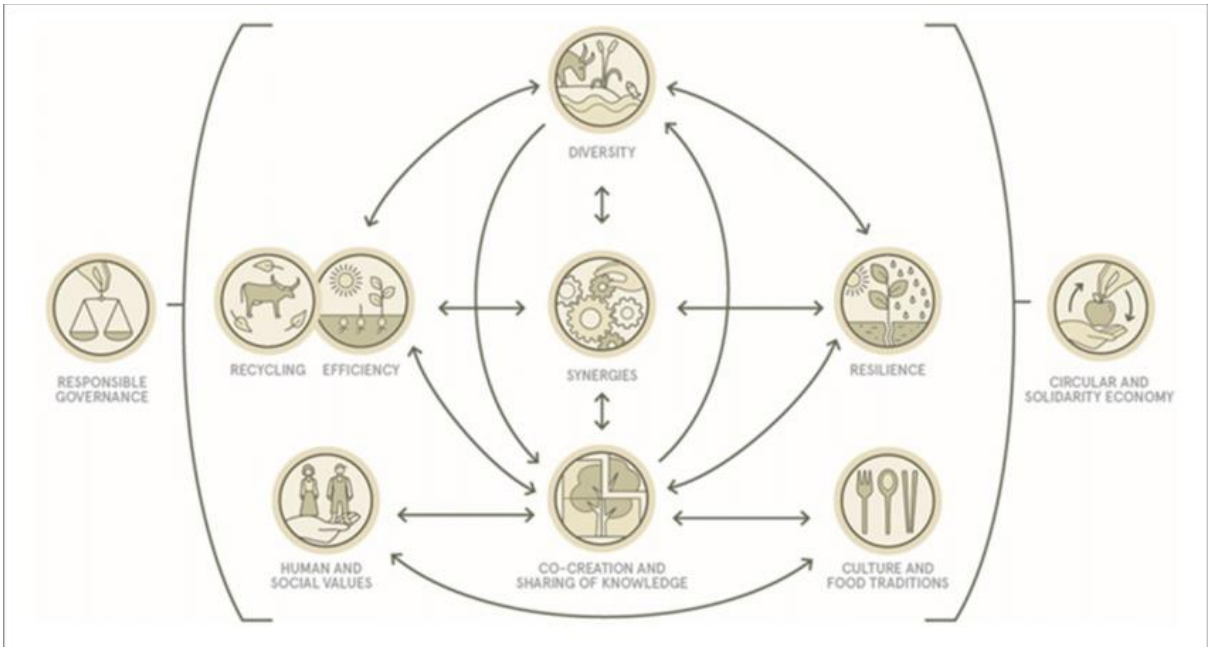
There are a range of farming practices that can be useful. The idea is that we try out the practices that are appropriate for us, where we live and compare them with what we are doing already, to observe the differences and to make decisions from there about changing our farming systems. Combining a number of different practices will increase their effect.

The challenge is thus to work with a combination of aspects; soil fertility, soil erosion control, water management, cropping, fruit tree production, livestock integration and natural resources management, to create a more productive and resilient, intensive homestead food production system, working within the confines of the local situation and resources.

3 Principles

Climate change adaptation (CCA) for smallholder farmers requires the transition to agricultural production systems that are more productive, use inputs more efficiently, have less variability and greater stability in their outputs, and are more resilient to risks, shocks and long-term climate variability. This requires a major shift in the way land, water, soil nutrients and genetic resources are managed.

The 10 elements of Agroecology, as outlined by the FAO are a very useful framework….



Diversity; synergies; efficiency; resilience; recycling; co-creation and sharing of knowledge (describing common characteristics of agroecological systems, foundational practices and innovation approaches)

Human and social values; culture and food traditions (context features)

Responsible governance; circular and solidarity economy (enabling environment)

Not sure whether should include the agroecology principles here? Or just stick to the five finger and synergies mentioned above – should I more coherently include five fingers in this document?

The following guidelines are important

1. *Start with what people know and work from there*
2. *Develop adaptive strategies and prioritized practices at a local context (Come with ideas not 'solutions')*
3. *Compare new ideas to present practise and analyse advantages and disadvantages*
4. *Synergize across different activities (think cyclical not linear)*
5. *Use available water as efficiently as possible*
6. *Minimize external inputs*
7. *Pay attention to soil conservation and soil fertility*
8. *Focus on soil health and natural soil building techniques*
9. *Diversify*
10. *Take care of the environment*
11. *Work together learn together and plan together*

Include a succinct paragraphs for each principle – they presently feel a bit unwieldy – will try and consolidate more)

Note the move away from training led processes to self-motivated experimentation as a more effective strategy to engender change. Note also the move away from commodity focused interventions to knowledge brokering and co-creation across different elements of the smallholder farming system. New ideas and technologies need to build on existing practices and understanding, rather than being 'parachuted' into the system.

4 CRA practices

The following practices have already been tested and implemented by smallholder farmers in Limpopo and have shown to have a positive impact on climate resilience.

Practices will be divided into the following five categories and are also introduced at household level as a suite of CRA practices that can be tried out and used:

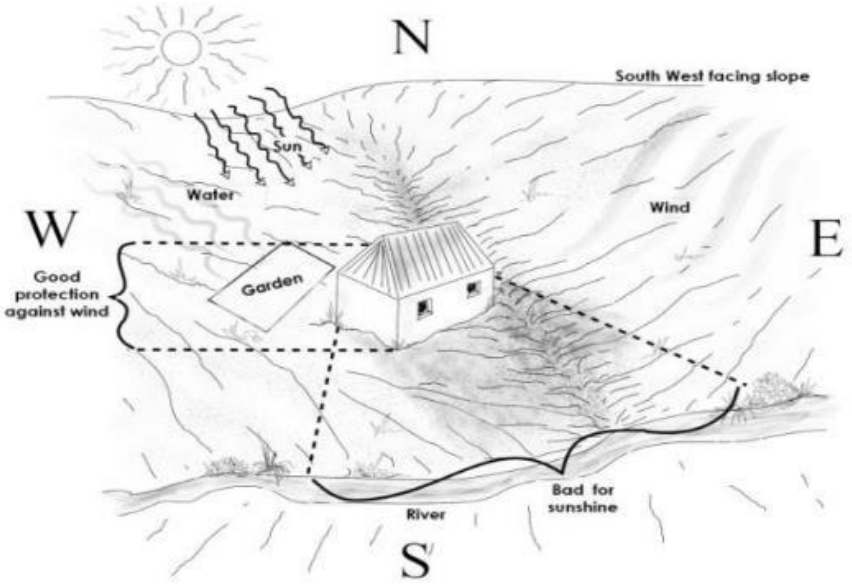
1. Water management
2. Soil management
3. Crop management
4. Livestock management
5. Natural resources management

Below short descriptions of practices are provided with local implementation examples.

4.1 Water management

This category includes aspects of water access and availability and water use efficiency. Many practices have both soil and water components. Here we focus on those practices that increase water in the soil in situ water harvesting, increase infiltration and increase water holding capacity. Practices are applicable in both garden and field cropping contexts.

The first step is always to do a joint assessment of the site and waterflow on the site, to find areas where run-off and run-on of water should be managed. And to introduce the concept of contours and how they can be measured.



Practices include: diversion ditches, swales, furrows and ridges, tied ridges, halfmoon basins, infiltration pits, shade cloth tunnels, rainwater harvesting storage and small dams. Not sure whether I should more clearly differentiate between access (RWH, springs boreholes),

evapotranspiration and infiltration, water holing capacity, … or whether that is complicating matters unnecessarily)

DIVERSION DITCHES

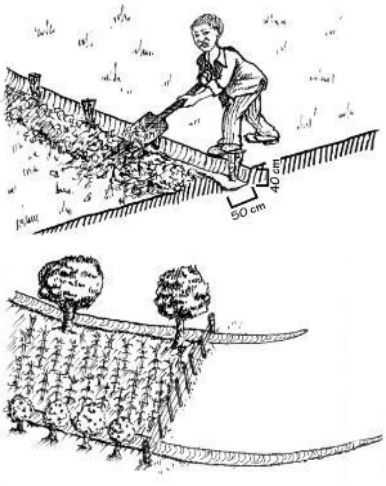
These ditches carry water from places where there is too much run-off to areas where you would like to use the water – through infiltration into the soil. You can for example divert water off a local road into fruit tree basins to both reduce erosion and improve water availability. Ditches 30cm deep and 30cm wide are dug at a shallow gradient -1,5-3% to channel water to beds in the garden or field. Planting can be done in the ridge, adding manure and compost and mulching of both ridges and ditches is a good idea.

Figure 3: A diversion ditch mulched and planted to sweet potatoes, leading from the road towards fruit tree basins. And digging the ditch while placing soil upslope to create a ridge.

SWALES

Swales are ditches and ridges, constructed along a contour, where the ridge is made below the ditch rather than above and water is allowed to infiltrate through the ditch into the surrounding soil, rather than to run to a different location. Typically, permanent crops (e.g. fruit trees) are planted just below the ridge of the swale, while seasonal crops (e.g. vegetables) are planted between the swales.

Figure 4: A line drawing depicting how to construct a swale and an example of a swale dug at the top of a garden, above the deep organic garden beds in the process of being constructed.



And so on….

What do you think of this or is it too much info – I could stick to the principles with a few examples of each point instead?

5 Case study: Mayephu village-Giyani

Generally, there are 3 household types in these villages, determined by their access to water:

1 Those who can only access enough water for basic needs (20-40L/pppd)
2 Those who also undertake water harvesting and have storage containers and tanks for extra water (50-100l/pppd)
3 Those with all of the above and their own boreholes or water sources (>200L/pppd)

For the 2nd and 3rd groups, infrastructure is expected to be provided by the households themselves and access to water relies entirely on what each household can manage.

Water is used for household purposes, keeping of small livestock (chickens and goats), household gardens and small businesses, including for example hair dressing, catering and brick making.

In reality, it is only those households in the 3rd group, with their own boreholes/water sources who can maintain reasonably sized household gardens consistently (200-400m^2). For households in the 2nd group, much smaller gardens can be maintained (20-100m^2). The households in group 1 are not active in productive activities. Below, examples for each group are provided from a village level walk undertaken in Mayephu (Giyani) as examples.

Group 1 20-40L per person/day allocation

These households are extremely vulnerable and poor, consisting in the most part of woman headed households, pensioners, 'foreigners' or new entrants into the village. These households do not have access to their own yard taps and use the communal standpipes. Around 17% of households are in this category.

Group 2 <40L per person/day

These households seem somewhat more secure and a proportion of them do undertake productive use in the form of very small gardens in their homes. They do have yard taps. Around 25% of households are in this category. Households in this categroy can at best supplement their household food supply to a small extent, but do have enough water for general household use.



Figure 5: Right and far right: Households with yard connections, containers, and drums for water provision, of which a proportion have very small gardens (20-100m^2)

Group 3 < 90L per person/day

This group functionally is very similar to group 2, with either no productive activities or very small household gardens, which are generally slightly larger than the Group 2 participants

averaging around 200m^2. Around 24% of the community fall within this category. A few of the participants do have small livestock in the form of traditional poultry.

Group 4 >200l per person/day

Households in this category have small livestock (chickens, goats) as well as well established, thriving household gardens. In addition, participants in this group have small, but diverse fruit orchards.

Figure 6: Right to far right. Example of a household borehole with storage tanks, a goat enclosure and a chicken house at different households. Insert is of a traditional laying box, with eggs.

Figure 7: Above left to right: Household gardens with a wide range of crops (mustard, tomatoes, cabbage, onions, marrows, spinach etc) and examples of small orchards (citrus, bananas, paw-paws, macadamia nuts, sugar cane avocados, mangoes and litchis)

Irrigation practices in the gardens consist mainly of hosepipes and buckets irrigating into adaptations of short furrow irrigation, or drip irrigation. All householders interviewed are very aware of salinity issues in their water and management practices and have already

adapted their crop varieties, watering regimes and soil management to accommodate for this. The use of ridges and furrows is further considered a good practise in this regard. There is however potential for mulching, intercropping and methods of incorporating soil organic matter, to further assist.

There are some beautiful examples also of integration of traditional crops such as Cleome, pumpkins and gourds and Luffa for example into the gardening systems.

Figure 8: Left to right; traditional crops- pumpkins/gourds, cleome and Luffa.

There is a clear progression from no productive activities to household gardens, to further inclusion of small livestock to inclusion also of fruit trees, depending on the amount of water consistently available to households. It indicates that these communities are intrinsically aware of water demand for productive activities and would undertake a much larger range of activities if water wasn't limiting. In addition, dryland field cropping, which was a common practise in the past, has become unviable under the present climatic conditions. It has become too dry and hot to produce dryland maize and is now risky even for traditional crops such as sorghum, cowpeas, jugo beans, ground nuts and pumpkins. For the latter people will still take a chance and plant these crops when reasonable amounts of early summer rainfall is in evidence.

6 References