



# CONSERVATION AGRICULTURE:

FOOD SECURITY IN LESOTHO FOR A CHANGING CLIMATE



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## Adapting our farming system to ensure a sustainable future

Sustainable agriculture implies producing our own food today without compromising our children's ability to produce even much more in the future. If we do not protect our natural resources, one day soon we may not be able to sustain our livelihoods and our children's future. If this happens, our children will never forgive us.

We must protect the environment that feeds us. We must protect our families.

While we have produced food crops through conventional tillage for many years, this has come at great cost to our environment and soil productivity with negative impact on our households' food security. Conservation Agriculture offers us the best opportunity for climate change adaptation.

## Climate Change Adaptation: why is it urgent?



- » Adapt to unpredictable and erratic rainfall.
- » Reduce incidents of crop failures.
- » Improve food security.
- » Reduce poverty.



Drought



Flooding



Soil erosion



Frost damage

## Climate Change Consequences

Weather has become more unpredictable, less regular



Extreme temperatures.



Intense drought.



Frequent flooding.



Delay of first rains.



Greater impact of frost.

## How do we adapt to Climate Change?



Conservation Agriculture  
(e.g. Likoti).



Homestead vegetable  
cultivation  
(e.g. Keyhole gardening).



Install water-harvesting  
tanks and drip  
irrigation systems.



Match planting times with the choice of  
your crops, to coincide with first rains.



Crop diversification.

## Conservation Agriculture & Climate Change Adaptation

Conservation Agriculture (CA) is one of the best adaptation techniques in Lesotho context and it is accessible to all. The principles of CA are:

**1** minimum soil disturbance.



**2** permanent soil cover: crop residue or live mulch.



**3** crop rotation and/or intercropping.



We need to change our current practices so we can produce more quantity and quality food while improving the soil in our fields.

## Conventional Tillage



Increased erosion of the fields and low yields with higher costs:



Food Insecurity



## Conservation Agriculture



Improves the soil condition and the production gets better and better, year after year, with lower costs:



Food Security



# THE 3 PRINCIPLES OF CONSERVATION AGRICULTURE

# 1



## 1st Principle: Minimum soil disturbance

Direct planting involves growing crops with minimum soil disturbance since the harvest of the previous crop. Direct planting can be used with all annual and perennial crops and vegetables.

Conservation agriculture can be done manually (e.g. likoti) or mechanically (e.g. animal or tractors drawn conservation agriculture planters).

### Advantages of minimum soil disturbance



Protects the soil against erosion by water and wind.



Cost savings: fuel, time and labour costs in the long term.



Improves soil organic matter.



Improves infiltration and conserves soil moisture.



Increases yield per unit of fertilizer or manure applied. Long-term decreases the amount of fertilizer per hectare.



Manual CA



Mechanical CA



## 2nd Principle: Permanent soil cover with crop residues & live mulches

Mulch is any organic material (such as decaying leaves, bark, or compost) spread over the soil and around a crop to enrich and insulate the soil. Live mulches are crops intercropped for purposes of providing soil cover. Crop residue or live cover protect the soil from direct impact of erosive raindrops; conserves the soil by reducing evaporation and suppresses weed growth.



### Advantages of permanent cover: residues and live mulches



Protects the soil from erosion by water or wind.



Suppresses weed germination and growth.



Improves recycling of nutrients.



Improves organic matter accumulation & carbon sequestration.



Crop residue



Live mulch: grazing vetch

# 3

## 3rd Principle: Crop rotation and intercropping

Crop rotation means that different crops are alternated in the same field, preferably cereals (maize and wheat) followed by legumes (beans).



Intercropping

### Advantages of crop rotations & intercropping



**Improvement of water use:** Crops with different rooting systems also utilize soil water at different soil depths.



**Reduction of pests and diseases:** different crops are susceptible to different disease and pest agents. Therefore, growing such crops in rotation will reduce the incidence of diseases and pests at no cost.



**Improve fertility and production:** Crops have different rooting patterns which take up nutrients at different soil depths. Rotations help to utilize soil nutrients more efficiently. In addition, legumes fix nitrogen in the soil for the benefit of successive cereal crops in a rotation.

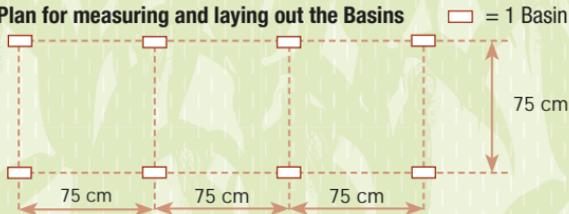
# CONSERVATION AGRICULTURE: STEP-BY-STEP

## STEP 1: Field layout

- Spacing between basins may differ among crops.
- For maize, basins need to be dug every 75 cm in each line/row.
- Different lines should be separated by 75 cm.
- In dry areas, spacing could go up to 90 cm between basins and rows.
- Tie knots at 75 cm apart on a line to mark basin intervals.
- Layout a line with clearly marked spacing points for basins within the row.
- The next row is laid out 75 cm away using a homemade meter stick.



### Plan for measuring and laying out the Basins



**When using mechanical Conservation Agriculture planters, the distance between rows is the same as conventional farming: Maize and Sorghum, 90 cm between rows; Beans, 60 cm between rows.**

## STEP 2: Preparing the planting basins [July – September]



The basins are 15 cm long x 8 cm wide x 10 cm deep (if using compost, basins can be 15 cm deep).

## STEP 3: Adding fertilizer and/or compost [September – November]



Fertilizer is banded by hand in the bottom of the basin and covered with soil.



x1 (2:3:2)

x1 (3:2:1)

x1 (6:2:1)

Measured in coca-cola caps (1 litre bottle caps), a minimum of 1 cap up to a maximum of 3 caps is needed per basin for fertilizers 3:2:1, 2:3:2, 6:2:1.



Compost application:  
Add 1 or 2 handfuls of compost in the basin and cover with soil.



## STEP 4: Planting [September – November]



### Maize/beans:

Plant 2 - 3 maize seeds and 6-9 bean seeds per basin (well spaced, not in a heap) and cover seeds with clod-free soil. Beans can be planted in rows between maize lines.



### Sorghum:

Plant 8 - 10 seeds of sorghum (pinch between fingers) per basin and cover with clod-free soil.



### Winter Wheat:

Wheat can be intercropped between maize lines from late April until the end of May.



## STEP 5: Manual weeding and thinning [October – February]



**Timely weeding is very important and must be done as frequently as necessary.**

Weeding requires extra work, but poor weeding can reduce your yield by 50%.



Thinning out to 2 plants per basin 2-3 weeks after germination.



First weeding: As soon as weeds start emerging.



Second weeding: 4-6 weeks after crop emergence.



Proper weeding of your land results in higher crop yields, which means more food for your family.



*(It is strongly recommended to keep fields free of weeds.)*

## STEP 6: Top dressing for maize & sorghum [January – February]



Top dress with Nitrogen (N) fertilizer when maize or sorghum crops have reached knee height (not for beans).



When top-dressing, use a minimum of one (maximum two) heaped coca-cola caps per planting basin.

## STEP 7: Planting cover crops [February – May]



### **Grazing vetch, Oat and Wheat:**

Spread Grazing vetch and Oat seeds (February-March) or Wheat (April-May) after tasseling, when plants have already formed cobs.

Grazing vetch is one of the best options to provide cover, suppress weeds and improve soil quality. It decreases need for nitrogen fertilizer and is sustainable because it is self-seeding. It can stand light cutting for fodder or grazing in the early spring, allowing for flowering and seed formation in summer (i.e once it is planted, there is no need to buy seeds again).

## STEP 8: Harvest [May – July]



Cut off the tassel for livestock feed.

Harvest the cobs and leave stalks standing in the field.

Cut and spread stalks in the field between rows.



## Livestock Integration:

Animals should not be allowed to eat the organic matter in the fields. The presence of cattle in the fields also contributes to compact the soil and this should be avoided. 30-50% of the crop residues can be used to stall feed the animals.





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