Erosion Control

CCARDESA
Centre for Coordination of Agricultural Research and Development for Southern Africa

Technical Brief 11

Erosion control measures are practices designed to reduce runoff water and wind erosion that wash away top soil and nutrients, degrading soil biodiversity and reducing agricultural productivity. Erosion is a natural, biophysical process resulting from rainfall, water flows, wind, or storm runoff. Erosion is integral to the formation of soils, however human and animal activity, including agriculture and clearing of land, can accelerate erosive processes, drastically impacting landscapes, soils (e.g. quality) and watercourses. In addition, erosion control measures can contribute to reducing rainfall runoff, increased water infiltration into the soil, and attenuates flooding. The intensity of rainfall is directly correlated with the severity of soil erosion; hence, this is a significant problem across the Southern African region as much of the rainfall in the region is episodic, and intense. To prevent or reduce erosive processes control measures can be incorporated into farming systems to reduce or reverse degradation and potentially restore or improve soil quality. Erosion control measures aim to mitigate soil erosion and improve soil fertility by reducing flow and speed of run-off to avoid soil being washed away. Erosion control can be initiated through a number of interventions, including, but not limited to, intercropping (e.g. planting cover crops), mulch, conservation tillage and reforestation, as well as terracing, soil bunds, etc.. Example: Stone Bunds. Lessons learned from West Africa show that stone bunds constructed along contour lines in fields and in key run-off locations can significantly reduce run-off, particularly in steeper agricultural fields. The stone lines reinforce the soil structure in the field following the contours of the land, reducing the speed and volume of run-off, thereby reducing the likelihood of erosion. This is an appropriate technology to implement on slopes up to 15 to 20 degrees. This is considered a climate smart practice as it maintains soil structure and nutrients, in turn retaining carbon in soil, enabling farmers to adapt to climate changes and sustain agricultural productivity.

MOST SUITABLE AGRO-ECOLOGICAL CONDITIONS

Value chain

- Maize
- Sorghum
- Rice
- Livestock
- Other

Soil texture

- Light
- Medium
- Heavy

Climatic zone

- Arid
- Semi-arid
- Sub-humid
- Humid

Water source

- Rainfed
- Partly irrigated
- Irrigated

Annual average rainfall (mm)

- < 250
- 250 - 500
- 500 - 750
- 750 - 1000
- 1000 - 1500
- > 1500

Topography

- Flat to gentle slope (0 – 5 %)
- Moderate to rolling slope (6 – 15 %)
- Hilly slope (16 – 30 %)
- Steep slope (> 30 %)

MOST APPROPRIATE CONDITIONS AND REQUIRED INPUTS

Farming system

Does it require collective action

- Yes
- No

Characteristics

- Subsistence
- Commercial Small
- Commercial Medium
- Commercial Large

Farm size (ha)

- < 2
- 2 to 5
- 5 to 10
- > 10

Mechanisation

- Manual
- Animal
- Mechanised

Human resources

Labour intensity – level of effort

- Low (household)
- Medium (seasonal)
- High (outside labour)

Gender/youth smart (low investment/low labour requirements)

- Yes
- No

Financial resources

Initial investment

- Low
- Medium
- High

Maintenance Costs

- Low
- Medium
- High

Access to finance capital or credit required

- Yes
- No

Enabling Environment

Extension support

- Yes
- No

Access to inputs

- Yes
- No

Market access

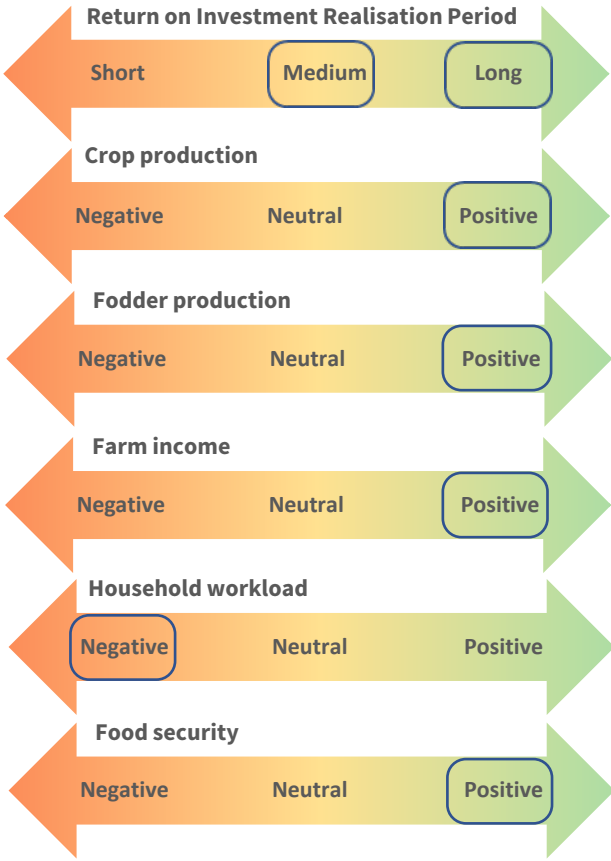
- Yes
- No

The purpose of this technical brief is to guide where this **practice, technology or strategy** could be applied. It may be applicable in other circumstances, but this brief focuses on where it is possibly **most suitable**. Content is general, and should be contextualised depending upon locality. The brief provides an overview, details of appropriate agroecological characteristics, appropriate conditions and inputs, possible outcomes and impacts, how the **practice, technology or strategy** should be applied, potential benefits and drawbacks, and provides suggestions for further reading in terms of CCARDESA materials and other sources, including those used to develop this technical brief.

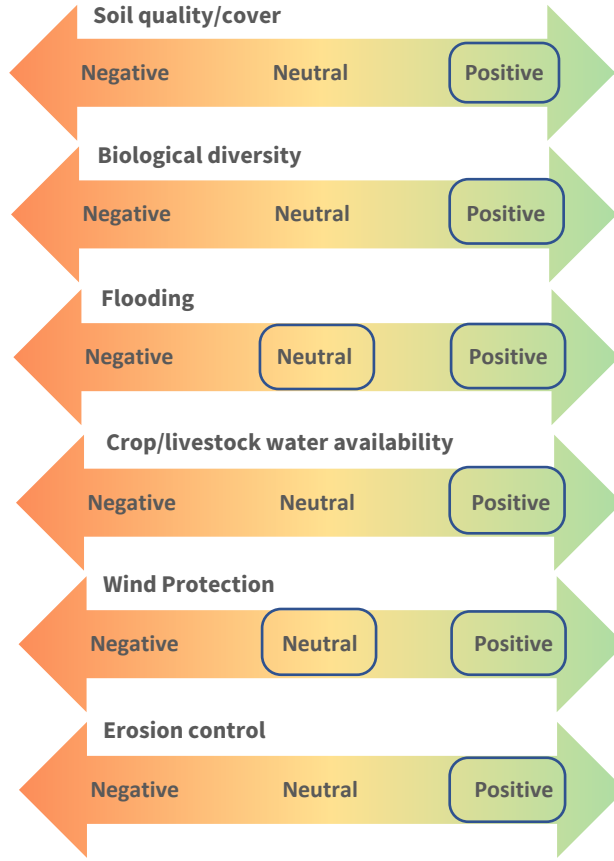
CCARDESA is a subsidiary of SADC, coordinating and harmonising agricultural research and development in Southern Africa.
*This **Technical Brief** is part of a series of materials designed to support **Knowledge Products on climate smart agriculture** available here: www.ccardesa.org/saaiks-knowledge-hub*

POSSIBLE IMPACT/OUTCOMES

Socio-Economic Impacts Positive or Negative



Ecological Impacts Positive or Negative



These descriptors indicate whether the practice, technology or strategy has a positive, neutral , or negative impact or outcome
Those with no box are deemed not-applicable

TECHNICAL APPLICATION

Without a topographic survey, this technology may require trial and error to begin with, to see how rainfall and run-off responds to the contouring. To effectively implement erosion control measures the following should be carried out:

- **Step 1:** Perform a thorough local study of the landscape, soils, land use and erosive processes that most impact the area: steep slopes, flood plains, high winds etc.
- **Step 2:** Source a large number of stones, preferably five to ten centimetres square blocks (from a quarry) or five to ten-centimetre diameter cobbles (from a river-bed). You will need 30 to 50 tonnes of stone per hectare for contour bunds approximately 300 metres long.
- **Step 3:** Mark out contours, as discussed in Technical Brief 16 Contour Planting.
- **Step 4:** In larger fields with shallower slopes, place stones in rows of two along contour line, interlocking alternately, burying the lower half. The bunds can be between 25 and 40 metres apart. On steeper slopes, stack and bury stones against or in vertical/near vertical walls of contours much closer together (five to ten metres apart) to reinforce them.
- **Step 5:** Make sure that stone bunds follow the contours from one side of the field to the other, ensuring that no 'pour' points (larger gaps) exist along the way, lining the drainage channel or weir from one contour to the next with stones to avoid or reduce scouring in these locations.
- **Step 6:** Following, and if possible, during rainfall events, check the stability of the slope, adjusting stone bunds where necessary.
- **Step 7:** At the end of the rainy season and again following harvest, review the performance of the technology, and prepare for the next growing season.

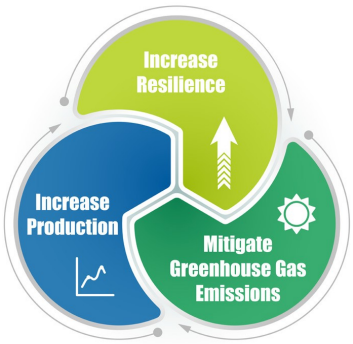
CLIMATE SMART AGRICULTURE OUTCOME(S)

Reflecting how this **practice, technology or strategy** contributes to Climate Smart Agriculture outcomes

Increased water infiltration can extend growing period and mitigates short dry spells. Can reduce flood risk downstream.

Increased production due to improved nutrient availability and higher nutrient use efficiency.

Depending on practices used, may lock more carbon into the soil.



SUMMARY/KEY ISSUES

Benefits

- Erosion control measures prevent the loss of top soils and nutrients.
- Can help farmers adapt to changes in climate that have include increased rainfall amounts and intensity.
- Can reduce the impact of wind erosion.

Drawbacks

- Erosion is a natural process that can be increased due to human and animal activity.
- Requires substantial labour inputs to construct bunds and other erosion control measures
- Maintenance is also needed.

REFERENCE MATERIAL

CCARDESA Related Content

- Centre for Coordination of Agricultural Research & Development for Southern Africa (CCARDESA), 2019. Knowledge Product 08, Decision Tool: Climate Smart Land Preparation Options.
- CCARDESA 2019. Technical Brief 16 Contour Planting. CCARDESA, Gaborone, Botswana
- CCARDESA 2019. Technical Brief 18 Terracing. CCARDESA, Gaborone, Botswana.

Additional Information

- The Food and Agriculture Organisation of the United Nations (FAO), 1990. Keeping the land alive. Rome, Italy
- FAO, 2019. Soil degradation definition. Rome, Italy
- FAO, 1996. Land Husbandry – Components and strategy. Rome, Italy
- CCAFS 2017. Contour Stone Bunds for soil erosion control in the Sahel of West Africa. CSA Guide, CCAFS, Wageningen University, The Netherlands.
- Rural 21, 2011. Stone Lines Against Desertification. Rural 21 Website.

Citation: CCARDESA and GIZ 2019. Technical Brief 11: Erosion Control. CCARDESA Secretariat, Gaborone, Botswana.