Flooding Irrigation

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

Technical Brief 64

Flooding irrigation is a practice where water is pumped or allowed to flow into channels passing between crop rows in areas where farmers have level fields. This flooding system is an effective method of managing weeds and pests, preventing the completion of their lifecycles as they are either drowned or isolated from air and sunlight. This practice is applicable in areas where there are favourable climatic conditions with high rainfall amounts; and is not recommended in arid and semi-arid environments. Flooding is controlled using water pumps in order to reduce waterlogging problems, and fields should not be entirely flooded, with surges of periodic flooding used to distribute water and avoid wastage to run-off, evaporation and creation of anaerobic conditions in the soil. Flood waters can be filtered using a fine mesh to control pests and diseases from spreading to neighbouring fields. Sandy soil is not favourable for flood irrigation as it does not evenly distribute water across the field whereas loam and clay soils distribute water efficiently across the field.

It is considered a climate smart practice because it requires less energy, and can promote crop productivity, whilst controlling weeds and pests.

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

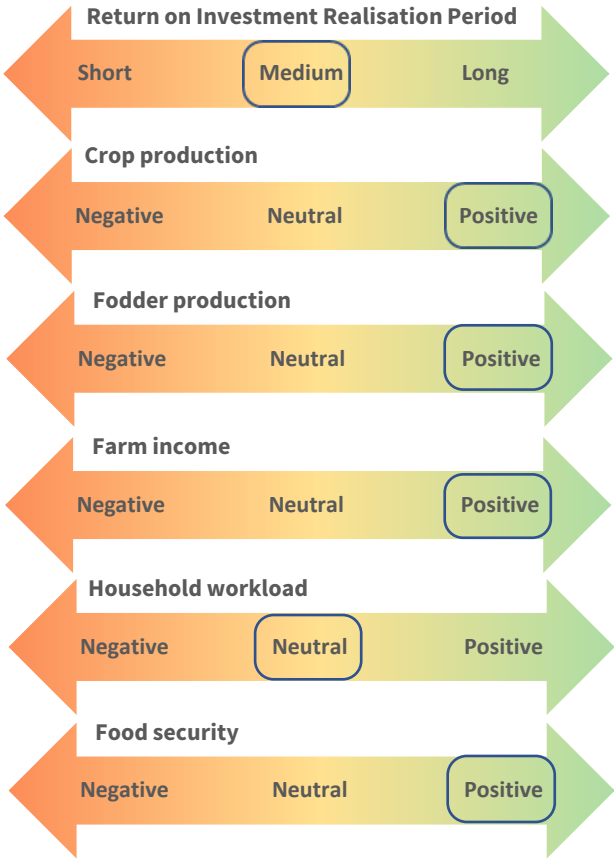
- ○ Yes
- ● No

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.

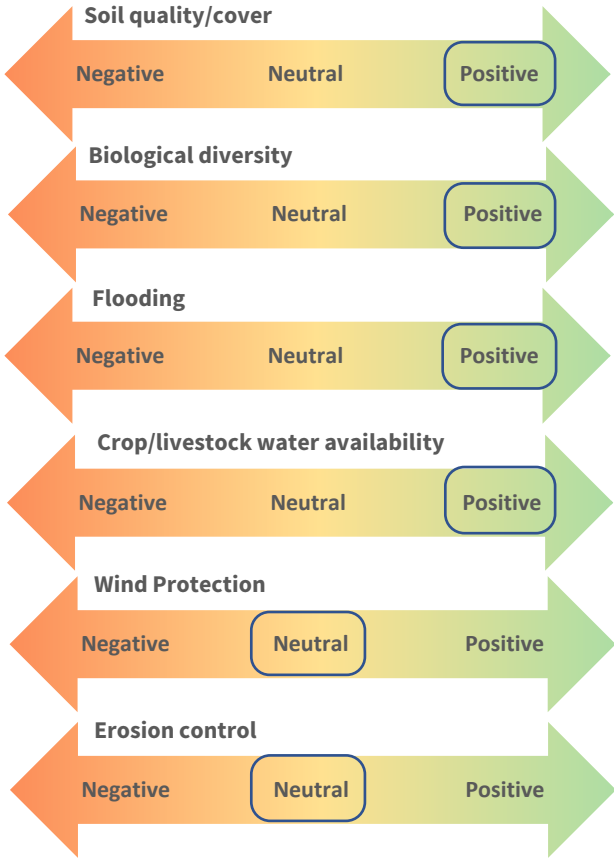
*CCARDESA is a subsidiary of SADC, coordinating and harmonising agricultural research and development in Southern Africa. This **Technical Brief** is part of a series of materials designed to support **Knowledge Products on climate smart agriculture** available here: www.ccardesa.org/saaiks-knowledge-hub*

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

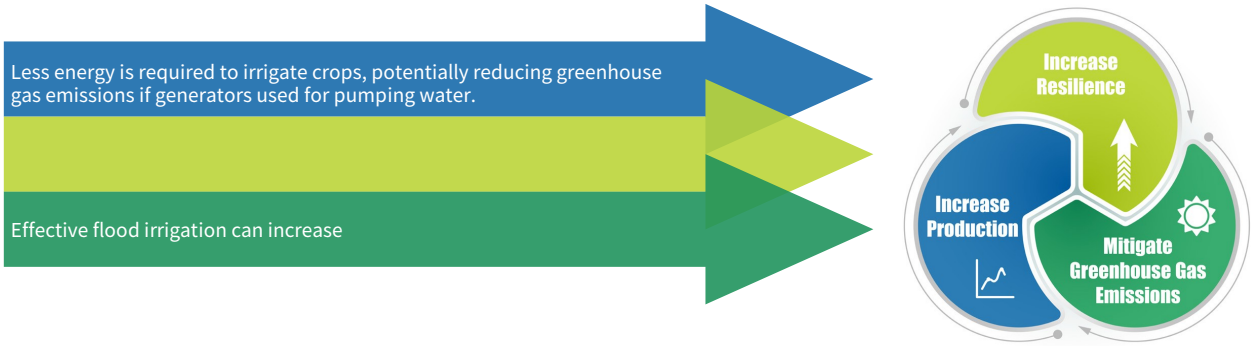
TECHNICAL APPLICATION

To effectively leverage flooding irrigation:

- **Step 1:** prepare the field, digging parallel furrows and raising beds with the excess soil. Crops are planted in beds, and the irrigation water will flow in the furrows.
- **Step 2:** Using a pump or gravity fed water storage, allow water to flow into the field, flooding furrows.
- **Step 3:** Insert a fine mesh or introduce a hessian sack at the in-flow point to trap weeds and pests.
- **Step 4:** Water release should be moderated so as not to flow too fast and erode beds, and too slow such that it remains trapped at the in-flow point.
- **Step 5:** Water release can be more effective if released in surges, taking advantage of infiltration rates and capillary action in soil.
- **Step 6:** Observe progress. Avoid leaving soil crusts, which will make water rush over.
  - A sustainable water source must be identified and a pumping/irrigation system should be used.

CLIMATE SMART AGRICULTURE OUTCOME(S)

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



SUMMARY/KEY ISSUES

Benefits

- A flood irrigation system reduces weed growth and acts as preventive measure against spread of pests and diseases.
- Requires less energy, so reduces costs. Gravity does the work, so less need for pumping
- Flood irrigation can work with lower-quality water because the water doesn't contact with crop leaves, which is usually a concern with waste water.

Drawbacks

- Requires larger amounts of water than other types of irrigation – only suitable in wetter climates.
- Is considered more labour intensive as land must be closely managed, and prepared.
- Land must be level, or manually/mechanically levelled.
- Cannot effectively operate in sandy soils.
- Very clay-heavy soil can easily become water-logged.
- If not managed properly, can be very wasteful with respect to water.

REFERENCE MATERIAL

CCARDESA Related Content

- CCARDESA, 2019. KP10 Climate Smart Water Management for Maize and Sorghum. CCARDESA, Gaborone, Botswana

Additional Information

- The Food and Agriculture Organisation (FAO), 1989. Guidelines for designing and evaluating surface irrigation systems. Rome, Italy.
- The Food and Agriculture Organisation (FAO), 1985. Irrigation Water Management: Irrigation Methods. Rome, Italy.
- FAO 2014. Irrigation Techniques for Small-scale Farmers: Key Practices for DRR Implementers. Rome, Italy.
- Kerr B. 2016. Getting flood irrigation right. Farmer's Weekly.
- African Farming 2018. Saving water: flood irrigation explained. African Farming.com

Citation: CCARDESA and GIZ 2019. Technical Brief 64. Flooding Irrigation. CCARDESA Secretariat, Gaborone, Botswana.