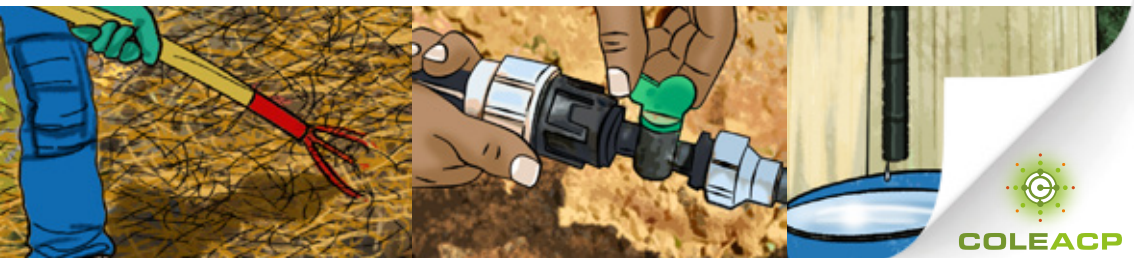


2 BROCHURE

SUSTAINABLE PRODUCTION PRACTICES

- ENVIRONMENTAL MANAGEMENT -

WATER-SAVING IRRIGATION



COLEACP makes this brochure available to ACP (African, Caribbean and Pacific) fruit and vegetable growers and exporters. The illustrated procedures on the following pages are intended for farmers wishing to comply with sustainable farming recommendations.

It sets out the key messages and procedures for economising on irrigation water, firstly by creating soil conditions for crops that save on water and secondly by adapting inputs to crop needs.

Brochures on other subject areas are also available from COLEACP (<http://coleacp.org/>).

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This collection is available online for COLEACP members.

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Introduction

Water is an essential resource. Without it, life cannot exist. Water is needed so that other soil elements can combine to create vegetable, animal and human matter. Water resources are a prerequisite for food safety, our means of subsistence, economic activities and the preservation of our environment.

In the coming years, population growth and improvements in the standard of living will require increased food production, the major part of which will come from irrigated agriculture. Irrigation makes it possible to increase agricultural yields and to stabilise food production and prices. However, because of water scarcity and environmental concerns (water pollution), crop irrigation must be limited and wastage must be avoided.

Today, there is an overall increase in demand that is unsustainable in many regions. Agriculture competes with domestic, industrial, tourist and environmental uses. Water resources are depleting or are being polluted; the quality of underground water is deteriorating. Drinking water is becoming increasingly expensive to produce.

Quite apart from ecological concerns, there are good reasons to economise on water for irrigation:

1. **Financial reasons:** irrigation can be costly since water is scarce and pumping and transport are costly; this calls for significant work and equipment.
2. **Social reasons:** wastage of water resources by one party is to the detriment of others.
3. **Agricultural reasons:** excess water can have an adverse effect on crops (development of disease), on soil fertility (salinisation) and on the quality of the product harvested.

List of key messages and procedures to economise on water for irrigation

IMPROVE THE WATER RETENTION OF SOIL

1. Increase the organic matter content and maintain the lumpy texture of the soil.
2. Reduce loss through evaporation by covering the soil with mulch.
3. Hoe the soil surface to break up the crust that contributes to water evaporation.

MANAGE LAND PARCELS TO REDUCE THE WATER REQUIREMENTS

1. Install wind breaks to reduce evaporation and produce a bedding.
2. On flat ground, arrange the surface to foster the infiltration of water.
3. On sloping ground, arrange the slope to slow run-off.

REDUCE WASTAGE OF IRRIGATION WATER

1. Roughly estimate the soil humidity (the soil water content).
2. Adapt input strictly to the needs of the plant, on the basis of its state of growth and the crop density.
3. Adapt the surface areas to be irrigated to the water resource available and use the most efficient technique to avoid over-exploiting this resource (sustainable water management).

DIVERSIFY AND PROTECT WATER RESOURCES

1. To avoid water loss, carefully maintain equipment and irrigation systems (clean filters, channels and drippers, replace worn or defective items).
2. Diversify and exploit different water sources (including rain water and water used to wash fruit and vegetables); making sure that water contaminated with microbes (faecal contamination) or hazardous products is not used. Never use used domestic waste water: it contains bacteria that are dangerous to man.
3. Protect wells from all pollution (organic or chemical) and ensure that watering places and wet areas (ponds, pools and creeks) are kept clean.

Improve water retention in the soil

INCREASE THE ORGANIC MATTER CONTENT AND MAINTAIN THE LUMPY TEXTURE OF THE SOIL

- Enrich the soil with organic matter (manure, compost, green residues, etc.).
- Till the soil to obtain a structure with rounded aggregates, with lumps that clump together to a greater or lesser extent.

This improves water retention in the soil pores, reducing the quantity of irrigation water that is necessary.



REDUCE LOSS THROUGH EVAPORATION BY COVERING THE SOIL WITH MULCH

- Mulch reduces surface evaporation, protects the soil and provides an environment beneficial for plant development.
- Cover the plant bed with vegetable waste (straw, peanut shells, millet hulls, etc.).
- If there is insufficient organic matter, use black plastic film.

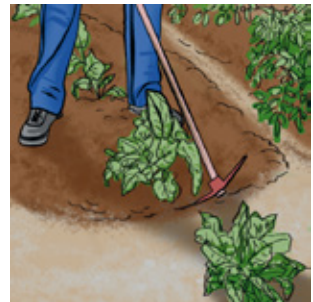
This also hampers the development of water absorbing weeds.



HOE THE SOIL SURFACE TO BREAK UP THE CRUST THAT CONTRIBUTES TO WATER EVAPORATION

- By hoeing, create a layer of loose soil a few centimetres thick.
- Facilitate the infiltration of water by hoeing (or in certain cases, by earthing up).

Based on the French adage “one earthing up is worth two waterings” hoeing to break up the surface crust of the soil reduces the upwelling of water by capillary action and limits evaporation.

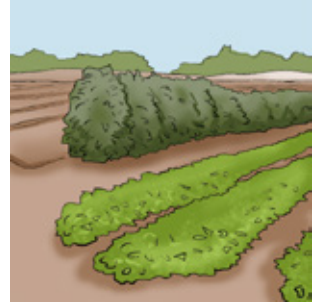


Manage land parcels to reduce the need for water

INSTALL WIND BREAKS TO REDUCE EVAPORATION AND PRODUCE A BEDDING

- Plant trees and useful plants that will slow the wind and provide shade.
- Allow the wind to partially penetrate the hedge (ensure that the hedge has a degree of wind porosity to avoid turbulence).
- Dig into the soil the litter produced by the hedge.

This reduces water evaporation on the soil surface, decreasing the quantity of irrigation water that is necessary.



ON FLAT GROUND, ARRANGE THE SURFACE TO HELP WATER TO INFILTRATE

- If the ground is flat, outline the areas to be irrigated with small dikes to retain the water or half-moon embankments.
- Level the surface to be irrigated to avoid any lack or excess water in certain areas of the land parcel.

This makes it easier to spread the water and facilitate its infiltration into the soil.



ON SLOPING GROUND, ARRANGE THE SLOPE SO THAT RUNOFF IS SLOWED

- Install buffer strips on the slope to slow down runoff.
- Dig bunds and small reservoirs to retain as much rain water as possible.

This slows down runoff and fosters the infiltration of water while reducing soil erosion.



Reduce wastage of irrigation water

ESTIMATE SOIL HUMIDITY (THE SOIL WATER CONTENT)

- Take a handful of soil from around the roots by digging under the surface.
- Knead the soil particles and look at whether they clump together or whether they form a powder (not enough water available in the soil).

This makes it possible to provide sufficient water during critical periods (strong evaporation during periods of rapid plant growth).



ADAPT THE INPUTS STRICTLY TO THE NEEDS

- Regularly measure the growth of the plant, the leaves and roots.
- Consider the vegetative stage of the crop (from germination to the death of the plants) to adjust the inputs.
- Reduce the inputs as the plant begins to age (after flowering and fruiting).

This makes it possible to take into account plant development and the volume of soil used by the roots.



ADAPT THE SURFACE AREAS TO BE IRRIGATED TO THE WATER RESOURCE AVAILABLE AND USE THE MOST EFFICIENT TECHNIQUE

- Limit the surfaces under production if the quantity of water available is limited.
- Avoid waste by bringing water close to the roots (drip irrigation is preferable to sprinkling or border strip irrigation).

Drip irrigation makes it possible to provide water to the area in which the roots are active.

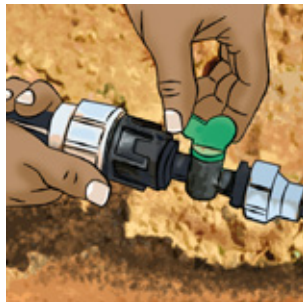


Diversify and protect water resources

CAREFULLY MAINTAIN THE IRRIGATION SYSTEM

- Do not let the irrigation system become obstructed (rinse and clean irrigation channels and drippers).
- Repair cracks and leaks.
- Check that pipes and irrigation channels are clean and watertight.
- Make sure that the equipment is sound.

Failing to maintain the irrigation system can lead to water loss that is sometimes higher than the parcel inputs. The cost of water lost can sometimes be higher than the cost of repairs.



DIVERSIFY AND EXPLOIT DIFFERENT WATER SOURCES

- Recover rainwater in barrels, tanks or pits.
- Reuse water from rinsing fruit and vegetables (if necessary, by filtering using the lagooning process), but never reuse water from washing roots or tubers.

Using alternative sources of supply lowers the cost of irrigation. Never use waste water.



PROTECT WELLS FROM POLLUTION AND KEEP WATERING PLACES AND WET AREAS (PONDS, POOLS AND CREEKS) CLEAN

- Distance animals from water sources to avoid microbial pollution from excrement.
- Store pesticides and fertilisers under cover and far from watering places.

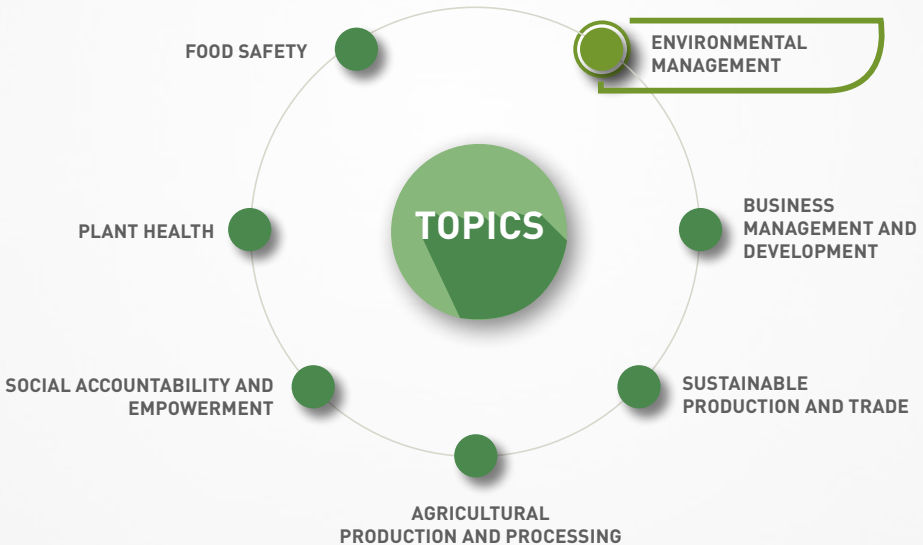
Polluted or degraded water cannot be used for irrigation or farming.



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2 **WATER-SAVING IRRIGATION**

3 **PROTECTING BIODIVERSITY**

4 **SOIL FERTILITY MANAGEMENT**

5 **RECYCLE ORGANIC WASTE**