



C2 REVEALING GOOD PRACTICE

Protecting crops from flood damage

At a glance

Different ways of protecting crops include:

- Keeping ploughed soil covered by mulch or cover crops
- Planting trees and hedges around fields to reduce run-off
- Building dikes and irrigation channels/pipes to control the flow of water onto crops
- Improving drainage through raised beds, ridges or mounds
- Planting early-maturing crops to avoid the flooding season
- Planting flood-tolerant crops
- Promoting floating gardens in flood-prone areas
- Building flood-resistant storage facilities for grain
- Accessing information on risk and weather forecasting to work out the best planting times



Why use this tool?

Flooding happens when heavy rain falls and the ground is unable to drain the water fast enough. Most plants can withstand flooding which doesn't last for long (unless it is a severe torrential flood which washes away everything in its path), but prolonged flooding can cause great damage to crops. In many areas, floods are happening more often, or with greater severity. It is important that crops are protected from flooding, particularly in areas which are vulnerable to flooding.



A brief description

This tool explains the risks that flooding causes to crops, and describes how to protect crops from being damaged.



Explaining the words we use

Infiltration – water on the ground surface entering the soil

Mulch – a layer of plant material put on the surface of the soil

Grains – the seeds or fruit of cereal crops



Keys to success

- Promote community participation in all of the key stages to ensure ownership and sustainability. Ensure that women and men, older people, people with disabilities and people from different ethnic groups are all able to take part.
- Involve farmers using neighbouring fields so that the whole area is protected together.
- Develop structures such as dikes to prevent flood waters from entering the field. Seek appropriate technical expertise when constructing such structures.
- Develop early warning systems so that farmers know when the floods are likely to occur and what action should be taken.
- Help communities to access and understand information such as weather forecasts, flooding risks, and climate change impacts and adaptations.
- Collaborate with local government departments or national government ministries, such as the Department of Environment.

Understanding the damage flooding can cause to crops

- Flooding can wash away the crops and soil and can pollute the groundwater with chemicals and sewage etc, which in turn damages crops.
- Flooding causes increased crop disease because the air spaces in the soil are filled with water, substantially reducing the oxygen in the soil. Most healthy roots need air (aeration) for development.
- When crops sit in saturated ground for long periods of time, the leaves may turn yellow and roots may rot. Crops may even die, resulting in low yields.

Different types of crops respond differently to flooding:

- Rice is more tolerant to flooding compared to potatoes and beans.
- Small grains such as wheat can withstand at least one day of low-level flooding or two days of completely saturated soils.

The ability to survive flooding will depend on the growth stage of the crops:

- Crops at the later growth stages are more likely to survive damage than younger crops.
- Smaller plants are more likely to become submerged (be under water) and to remain submerged for longer periods than bigger plants.

Temperature also affects the damage caused:

- Crops are damaged faster during flooding at higher temperatures.
- The crop survival period may decrease by 50 per cent or more if temperatures are unusually high during the flooding period.

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Food & livelihoods
Gender & sexual violence
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Migration & trafficking
Water, sanitation & hygiene

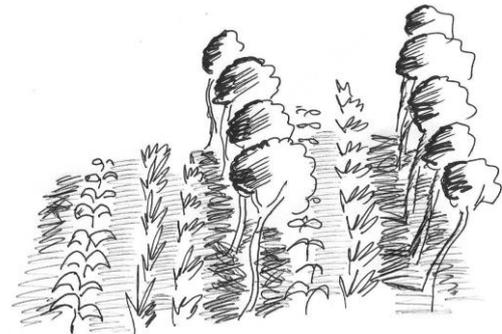
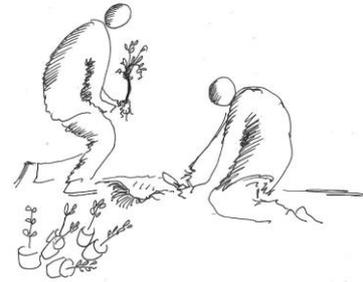


What to do

There are many things we can do to help water drain from the soil and to reduce damage to crops:

Planting trees in upland areas and keeping the soil covered

- Planting trees in upland areas reduces run-off times (rainfall on Mount Kenya used to take a year to flow from the top to the river then the ocean. It now takes a week because of deforestation).
- When the soil is not covered by vegetation, mulch or crop residues, it will be more exposed to the impact of rainfall.
- When the soil is protected by mulch, adjacent trees and shrubs, or cover crops (these are usually leguminous crops such as pigeon peas, lablab, velvet beans etc), the water flow is slowed down, so the water has more time to infiltrate into the ground rather than run off the land, washing away high nutrient soil with it. See **Tool C2: Conservation farming** and **Tool C2: Composting**.



Build dikes to protect crops from floods

- Dikes are barriers or walls built to protect the land from water damage. They can be built using soil, stones, rocks, sand bags or wood.
- Properly built, dikes can protect crops from flooding. A dike can slow water flow (for example, if made of stone) or divert water (in the case of clay or concrete dikes), or direct water flows to specific crops or other locations such as an irrigation channel. Dikes will also help to prevent the loss of topsoil when there is heavy rainfall.
- If using soil to make dikes, it needs to be high clay content sub-soil, preferably on top of a stone base.
- Clay soil should be compacted thoroughly to ensure that water does not break through.
- Sand bags, or wire netting could be used to reinforce the dike, giving it more strength.
- Grass could be planted on the dike to slow down erosion.
- Appropriate technical expertise is required before building a dike. Are there local experts you could ask to give you support and advice? Is there a local agricultural extension worker, or a local NGO who might be able to help you?

Plant flood-tolerant varieties of crops

Plant crops that are tolerant to flooding. Most root vegetables are naturally flood tolerant. And varieties of crops such as wheat and rice are being developed to be more resistant to floods.

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C2 PROTECTING CROPS FROM FLOODING

Improve the drainage of land before planting crops that do not grow well with too much water

- Crops can be grown in raised beds, on ridges, or on mounds to improve drainage.
- Ridges help to drain excess water, keeping it away from the plants.
- Excess water can be drained if there is somewhere for it to go, or a storage pond could be dug at the lowest part of the garden/farm to store surplus water and allow it to soak into the subsoil slowly. The pond should be filled with stones or gravel to prevent mosquitoes breeding.
- Ridges can be made using oxen- or donkey-drawn ridgers or using hand hoes.
- The distance between ridges varies from crop to crop, and is also affected by the soil type. As an example, ridges can be made 60cm apart for planting maize.
- The depth can be up 30cm, but again will depend on the soil type and slope.
- Where could you go to seek advice on this? Are there people you could ask for information and support?

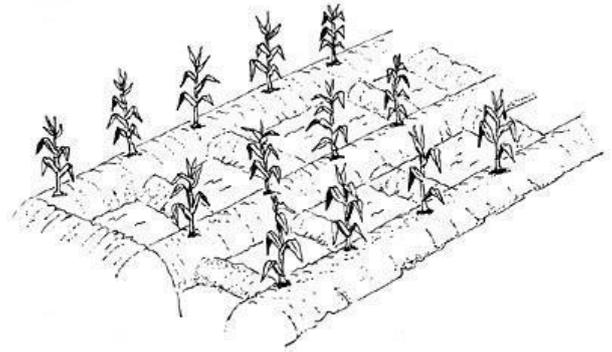


Image source: FAO, Information Sheet 9, Water Management (see below)

Building raised beds: getting started

- Raised beds are suitable for almost any vegetables and soft fruits like eggplants and tomatoes.
- They can be built at any time, but ideally before the soil becomes too wet.
- Decide the size of your raised bed, and its location.
- A width of less than 1.5 metres allows access to all of the growing area from the sides, removing the need to walk or step on the raised bed, which can damage the plants.
- The beds can be made from mounds of earth (although these can wash away in floods), or made stronger by constructing walls around them from stone, brick, wood or other materials.
- Once the sides are in place, cultivate and enrich the underlying soil with organic matter (see **Tool C2 – Composting**).
- Plants in raised beds can suffer more quickly and more severely from drought-induced water stress, because they drain so well. They will need watering in dry periods.
- Beds should have drainage channels to prevent excess water remaining between them and stagnating.

Plant early-maturing varieties of crops

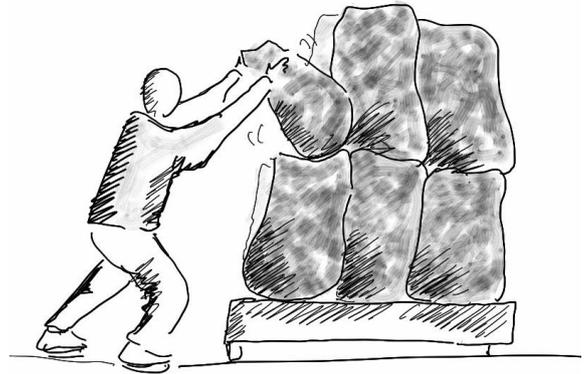
- Early-maturing varieties of crops are useful because they take less time to mature. It is therefore easier to avoid the flooding season.
- They are likely to be ready before, or can be planted after, the flooding season.

Promote floating gardens

- People who live in areas regularly covered by water (for example large areas of Bangladesh), and who are unable to grow crops because there is very little available land, or land that regularly floods, can build floating gardens.
- Floating gardens are built using aquatic weeds as a base on which vegetables can be grown. Please see **Practical Action's web pages on floating gardens** (see **Finding out more**, below).

Build flood-proof grain storage facilities

- Storage facilities should be built on level ground that is well-drained and not prone to flooding.
- They should be raised above the flooding level and should be insect- and rodent-proof. See **Tool C2 – Community grain banks**.



Try to access information on risk and weather forecasting so that you can work out the best planting times



Find out where such information can be found. Is it available on the local radio? Are there local agricultural extension officers who are able to access weather forecast information through sources such as famine early warning systems?



Finding out more

- Practical Action website pages on Floating gardens: <http://practicalaction.org/floating-gardens>
- Royal Horticultural Society website pages on Raised beds: <https://www.rhs.org.uk/advice/profile?PID=428>
- The Food and Agriculture Organisation of the United Nations (FAO) (2001) *Developing farming systems and best practices for flood-prone areas*, Annex to the Report of the FAO Asia Pacific Conference on Early Warning, Prevention: <http://www.fao.org/docrep/005/ac120e/AC120e16.htm>
- The Food and Agriculture Organisation of the United Nations (FAO) (2001) INFORMATION SHEET 9, WATER MANAGEMENT: <http://www.fao.org/docrep/003/x3996e/x3996e21.htm>

Related tools:

- A1 – Revealing environmental degradation: information for facilitators [A1: Environment-2]
- A2 – Different ways of adapting to climate change [A2: Environment-1]
- B – Caring for God's world (Bible study) [B: Environment-2]
- B – Caring for our environment (Bible study) [B: Environment-3]
- B – Stewardship of the land (Bible study) [B: Environment-4]
- C2 – Composting [C2: Environment-1]
- C2 – Conservation agriculture [C2: Food & livelihoods-5]
- C2 – Community grainbanks [C2: Food & livelihoods-7]
- C2 – Developing rural home gardens [C2: Food & livelihoods-8]
- C2 – Reducing losses after harvest [C2: Food & livelihoods-10]