Conservation agriculture

At a glance

Conservation farming helps improve soil fertility and water retention. It also reduces costs.

- Start small
- Ensure minimal soil disturbance
- Cover and protect the soil
- Rotate and mix crops
- Remove weeds early
- Control soil and water erosion
- Experiment and innovate
- Persevere and get support

Why use this tool?

Conservation agriculture is a sustainable way of farming that improves the fertility of the soil and conserves water. It removes the need to plough land and introduces farmers to affordable, organic pesticides and fertilisers.

A brief description

This tool provides an introduction to conservation agriculture and its three main principles, which need to be carried out together for it to be successful.

Time taken

The benefits of conservation agriculture increase over successive seasons. It is therefore best to practice these techniques over a number of planting seasons.

Explaining the words we use

Contour – a line which represents the shape or level of the ground or a geographical feature
Cover crops – crops planted in the dry season or as an intercrop to protect the soil and improve soil fertility
Intercrop – the practice of growing two or more crops together in the same field
Mulch – a layer of plant material applied to the surface of the soil
Tillage – the preparation of land for growing crops

You will need

Conservation agriculture does not require specialised equipment. It can be started simply with:

- a hoe and a piece of string
- a farmer or group of farmers committed to experimenting with new agricultural techniques
- a piece of land for growing crops

Different crops remove and add different nutrients to soil. They are also susceptible to different soil-based diseases and should therefore be planted in different locations each season. Many crops also provide benefits to other crops such as shade, nutrients or protection from pests.

Keys to success

- **Plant at the right time**, according to the local seasonal calendar.
- **Disturb the soil as little as possible** (also known as minimum tillage). Instead of ploughing the land, plant crops directly through a layer of mulch or into small planting holes.
- **Keep the soil covered** using mulch or living plant material. This protects the soil from heavy rain, sun and wind, and reduces soil erosion. It also increases water infiltration into the soil, improves the soil fertility and suppresses weeds.
- **Rotate and mix crops.** Different crops remove and add different nutrients to soil. They are also susceptible to different soil-based diseases. They should be planted in different places each season.

What to do

Start out small

Start conservation agriculture on a small plot of land. This is a good way to see what works and what does not. Conservation agriculture can then be gradually extended over more land and with different crops.

Do not disturb the soil

When land is ploughed, it loses water, nutrients and carbon. With conservation agriculture, instead of ploughing, crops are planted through a layer of mulch which is put on the land. The mulch is cleared in small patches, and small planting holes are made. After seeds are planted, the mulch is reapplied over the hole.

Planting holes should be evenly spaced in rows at a set distance apart. A piece of string can be tied with regular knots to show the distance the planting holes need to be apart. This can then be laid on the ground to show where to dig the small holes. Hole-spacing depends on the rainfall in the area and the crop being grown. In locations with more rainfall, crops can be planted closer together. Guidelines for the spacing of planting holes, and the number of seeds per hole, is suggested below but it is important always to experiment with the spacing and number of seeds and adapt to the local context.

Rainfall (mm per year)	Spacing of planting holes	Number of planting holes per hectare (rounded up)
>1500	60 x 60 cm	27,500
1000–1500	70 x 70 cm	20,100
800–1000	75x 75 cm	17,500
700–800	80 x 80 cm	15,500
600–700	85 x 85 cm	13,500
500–600	90 x 90 cm	12,500
<500	100 x 100 cm	10,000

Crop	Number of seeds per planting hole	Planting depth
Maize	2-4 (then thin one)	2.5cm
Sunflower	2-3 at each end of the hole	2cm
Cotton	4-5 on each side	1cm
Soybeans	8-12	1cm
Groundnuts	6-10	3cm
Cowpeas	5-7	2.5cm
Green gram	6-8	2cm
Sorghum	8-12	1cm

Tips for using planting holes

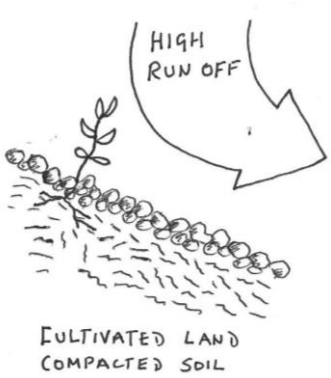
- Remember that the holes are permanent, and you will come back to plant the same place next season, and the season after that. So take care the first time.
  Train the whole family to make the holes. Everyone in the family should understand the ideas of conservation agriculture. If they understand why and how, they can help.
- Don't plant in a hole which is not nearly filled with soil – the crops will drown!
- Don't dig holes during the rainy season. Hardpans are best dealt with in the dry season

Source: IIRR and ACT (2005) Conservation agriculture: a manual for farmers and extension workers in Africa, p45

It can take a lot of time and work to make the planting holes for the first season, but they are then reused in future years. After the first year, soil in the planting hole is softer and easier to plant into, while the rest of the field remains compacted. This save a lot of time. However, as planting in exactly the same location significantly increases the risk of disease being spread from old plants to new ones, it is important to rotate crops each year (see below for more information on this) and also to allow land to lie fallow once every three years to recover.

Cover and protect the soil

Covering the soil protects it from damage from heavy rain, sun and wind, and reduces soil erosion. It also increases water infiltration into the soil, improves the soil fertility and suppresses weeds. A ploughed, compacted soil typically experiences much higher rain water run-off than an unploughed cultivated slope protected with mulch.



Soil cover can come from a number of sources including: ***mulch:*** which includes crop residues, dead plant material, leaves and branches from trees and shrubs, ***living plant material*****:** crops and cover crops

Mulch or crop residues have to be replaced regularly as they break down. It is also good to be aware of other important uses for crop residues, such as animal fodder and fuel for fires, and therefore to plan ahead how much is needed. It may be necessary to fence around the crops to ensure animals do not eat the crop residues or crops.

Rotate and mix crops

Different crops remove and add different nutrients to soil. They are also susceptible to different soil-based diseases and should therefore be planted in different locations each season. Many crops also provide benefits to other crops such as shade, nutrients or protection from pests.

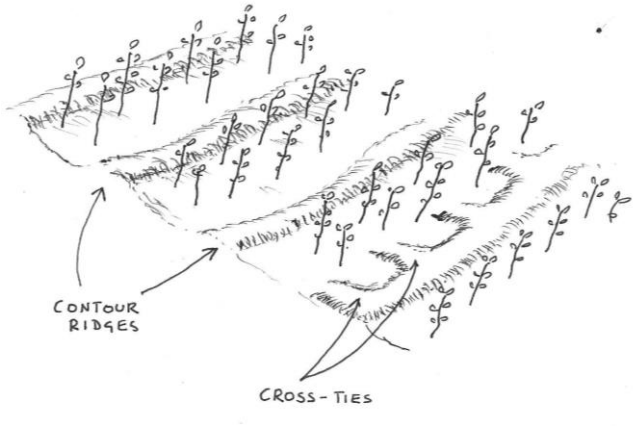
For more information on intercropping and crop rotation, see **Tool C2 - Developing rural home gardens**

When rotating crops, you can keep the same hole-spacing as for the previous crop. However, depending on the crop type, you might need an additional hole in between what is already there, or you may only need to use one in every two existing holes.

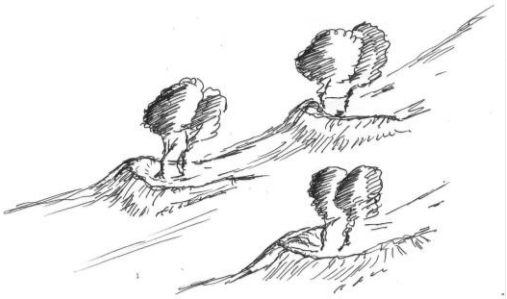
Remove weeds

Weeds compete with crops for sunlight, water and nutrients. Weeding is an important part of conservation agriculture and needs to be done regularly. It takes a lot less time and effort to remove smaller weeds than larger ones. Also, the use of mulch and successive seasons of permanent soil cover will reduce the number of weeds in the plot of land.

Control soil and water erosion



Combining conservation agriculture techniques with other methods that conserve soil and water can further improve crop yields. For example, on steep slopes, contour ridges (ridges of soil along the contour lines) help to slow down rain water run-off. This will reduce soil erosion and slow the water flow to increase infiltration into the soil. In drier areas conservation agriculture can be combined with water-harvesting methods to provide irrigation water. For example, crops can be planted using conservation agriculture techniques in half-moon pits.



Be creative and experiment with new techniques

Different plots of land have different amounts of rain, sun and shade, and different soil quality, and therefore crops have different yields. It is important that farmers experiment with these techniques, to see what works best for their context. They can then share this learning with others.

Persevere over time

It can be hard work to prepare a field and manage weeds according to conservation agriculture principles – but it does get easier over time! Also, as the soil fertility and structure is improved over the planting seasons, so the benefits of conservation agriculture are seen by the amount of crop that is harvested.

Get support

It can be difficult to start conservation agriculture alone. See if you can work with other farmers to help each other with ground preparation, planting, weeding and harvesting. Could you get advice or support from local extension workers, NGOs or other farmers on techniques and good practice? If there are other farmers in the area also implementing conservation agriculture then exchange visits can be a good way of learning from friends and neighbours.

Follow the 'Foundations for Farming' principles for effective implementation

In some places, particularly southern Africa, conservation agriculture is known by the name of Foundations for Farming. Foundations for Farming uses conservation agriculture methods, working through the local church to teach communities about these techniques. Foundations for Farming follows these principles:

- **On time:** There is a correct time to prepare land, plant crops, weed and harvest depending on the local seasonal calendar. Being aware of these key times of year and making efforts to keep to them will result in improved crop production.
- **No wastage:** Take care to not waste time, seeds, soil, water, sunlight, etc.
- **To high standards:** Pay attention to detail, even in the small things.
- **With joy:** This encourages an attitude of gratitude and joy for the land and harvest.
- **Helping the most vulnerable:** Identify people in the community who are more vulnerable than others. These may be people who are elderly, disabled or unwell. They could be child headed households. Women are usually more vulnerable than men as they have less access to and control over land and money, yet typically do the majority of agricultural labour work.

Finding out more

- Catholic Relief Services (2008) *Homestead gardening:* http://www.crsprogramquality.org/storage/pubs/agenv/Lesotho_homestead_gardening_manual_low.pdf
- Foundations for Farming (2009) *Trainers' manual* http://www.foundationsforfarming.org/
- IIRR and ACT (2005) *Conservation agriculture: a manual for farmers and extension workers in Africa*. International Institute of Rural Reconstruction, Nairobi; African Conservation Tillage Network, Harare
- Tearfund (2001) *Footsteps 85 – Trees* http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_81-90/footsteps_85/
- Tearfund (2007) *Footsteps 70 – Agriculture and climate change* http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_61-70/footsteps_70/
- Tearfund (2003) *Footsteps 54 – Household agriculture* http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_51-60/footsteps_54/
- Tearfund (1999) *Footsteps 41 – Looking after our land* http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_41-50/footsteps_41/
- Tearfund (1993) *Footsteps 15 – Soil erosion* http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_11-20/footsteps_15/
- Tearfund (1991) *Footsteps 7 – Home gardens* http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_1-10/footsteps_7/

Related tools:

- A1 – Revealing environmental degradation: information for facilitators *[A1: Climate & environment-2]*
- A2 – Different ways of adapting to climate change *[A2: Climate & environment-1]*
- B – Caring for God's world (Bible study) *[B: Climate & environment-2]*
- B – Caring for our environment (Bible study) *[B: Climate & environment-3]*
- B – Stewardship of the land (Bible study) *[B: Climate & environment-4]*
- C2 – Composting *[C2: Climate & environment-1]*
- C2 – Reducing losses after harvest *[C2: Food & livelihoods-10]*