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Converting to conservation agriculture

CONVERTING FULLY to conservation agriculture may take several years. You should plan carefully what to do. For example, it may be best to begin to grow a cover crop before reducing tillage. If you are lucky, you may see yield increases in the first year. Or improvements may be more gradual, and yields may even decline in the short term before your soil fertility has improved, you can control weeds properly, and other benefits can make themselves felt. It is important to be aware of the potential problems so you do not have false expectations and can plan what to do.

It can be difficult to switch to conservation agriculture. You have to accept new ideas and learn a new set of skills. You may have to overcome some preconceptions about what is “good farming”. In order to give the right advice, extension personnel need to know not only about conservation agriculture techniques, but also about how best to work with farmers to introduce them.

This chapter describes in brief the three stages you may go through when you first start using conservation agriculture. Remember: this is a simplified version! You may find yourself following a different set of steps, depending on your own situation. The chapter also lists some questions to ask, and shows where to find some of the answers in this book.

[See Chapter 11](#) for more detailed questions to ask when you are considering adopting conservation agriculture.

Three stages

Converting from conventional farming to conservation agriculture falls into three main stages:

- Before you start
- First season
- Second and following seasons.

Before you start

Choose a field to start conservation agriculture. Select part of a field where you feel able to take a risk, have good conditions for learning, and have a good chance of success. If you start with a field with good potential, you are likely to see results quickly. When you have converted this field to conservation agriculture, you can start on the others – for example, on badly eroded fields on slopes. However, if you have fertile fields on a hillside that are susceptible to erosion, make sure you protect them before starting to use conservation agriculture. [See Chapter 8](#) for how to do this.

Start small Try out what works on one field first. Observe closely and learn what works and what does not. You can then gradually extend what you have learned to other fields and crops.

Get support Get together with friends and neighbours who are also interested in conservation agriculture. Learn from one another, and visit each others' fields to check on the crops, soil, weeds, pests and diseases. It can be difficult to start conservation agriculture if you are alone: get advice from your extension worker or development agent, the local NGO, or other farmers who can advise you.

Before the first cropping season, you may have to do some work to prepare your field. Don't worry – you will have to do this extra work only once!

You may have to do the following ([see Chapter 3](#)):

- **If the soil is compacted or has a hardpan** Use an animal- or tractor-drawn subsoiler or a ripper.
- **If the soil has ridges and furrows** Plough once, preferably with a chisel plough with a long log or iron bar pulled behind to remove the ridges and make the surface more even. Remove rocks or stumps that get in the way. This is necessary because direct planters work better on a fairly smooth surface.
- **If the soil is acidic** (has a low pH) Add lime.

First season of conservation agriculture

Cover the soil Here are some ways to do this ([see Chapter 5](#)):

- **If there are crop residues nearby** Carry them to your field and spread them on the soil surface as mulch. This takes some work, but costs little. If you do not have any suitable residues yourself, perhaps you can get some from your neighbours.
- **Plant a cover crop during the first season** Choose a cover crop such as lablab with deep roots to improve the fertility and soil structure. Consider using fertilizer on the cover crop to help it grow well. It will produce enough mulch for you to grow food crops on the same field in the second season.

How a Kenyan farmer started doing conservation agriculture

A small-scale farmer in western Kenya had the opportunity to visit Nyanza, the neighbouring province. There he learned about lablab for the first time. He took a bag of lablab seeds home and planted it between the maize rows about 3 weeks after he had planted the maize.

After he harvested the maize, the lablab continued to grow and covered the soil completely during the dry season. The farmer and his family could eat lablab leaves as a vegetable, and mixed the beans with maize.

At the beginning of the next season, he slashed the lablab and left it on the soil surface. He made small holes with a hoe and planted the next crop of maize.

Lesson *This farmer started small, with cover crops: he began with intercropping, then gradually adopted other conservation agriculture practices.*

- **Grow a cover crop on a nearby field**, then cut it and spread it on the soil at the beginning of the second season. This cover crop can also produce seeds for you to sow or sell to neighbours.

Control weeds It is vital to control weeds, especially during the first few years of conservation agriculture. Pull them by hand, slash them, or kill them with herbicide ([see Chapter 7](#)). Then sow cover crops to prevent new weeds from growing.

Don't plough Instead of ploughing, direct-plant your crops through the mulch, or dig planting basins ([Chapter 3](#)) where you can sow seeds.

Grow crops You can grow the crops you normally do, but add an intercrop or rotate crops if possible. For example, you might grow maize as normal, but add an intercrop of legumes ([Chapter 6](#)).

Leave the soil covered At harvest, leave the residue on the field to cover the soil during the dry season. Leave the cover crop growing, or plant another main crop if you can.

Second and following seasons

There should now be enough cover on your field. If not, carry in extra residues from nearby and spread them on your field. It is much simpler to prepare for planting in the second season.

- **Check for weeds** Hand-pull them, slash them, or kill them with herbicide.
- **Crop residues** Decide if it's possible to produce enough crop residues on the field for the third season. If not, grow some cover crops nearby, then cut them and spread them on the conservation agriculture field in the third season.

Questions to ask

Here are some questions to ask yourself when you are thinking about starting conservation agriculture.

Equipment Do you have the right equipment? You can practise conservation agriculture using a just a hoe. But you may want to use other equipment to save you work:

- Jab-planter
- Ripper or ripper/planter
- No-till planter
- Sprayer or weed wiper.

How a research institute introduced conservation agriculture

Farmers in northern Tanzania harvested low yields because their soils were infertile and eroded, and had hardpans caused by repeated ploughing. Extension staff advised them to plant on the contour, and introduced fertilizer and improved seeds. But yields stayed low.

A donor-supported project tried to help by providing subsoiling services. This helped for a few seasons, but as farmers continued to plough the field, the hardpan quickly came back.

Researchers at Selian Agricultural Research Institute learned through an international workshop about how Brazilian farmers use no-till and cover crops. The researchers introduced cover crops and reduced tillage using hoes, and the Tanzanian farmers tested them on their farms. The researchers later showed them how to plant directly through the soil cover – first using a hoe, and later with direct planting equipment.

Lessons *Subsoiling may be necessary to repair the damage caused by ploughing, but alone it is not sufficient. Support from development agencies may be crucial to promote conservation agriculture.*

If you do not own these implements, you may be able to hire them, or get together with a group of neighbours to buy them for the group to share.

Seed Can you get the right types of seed? Especially seeds of cover crops such as mucuna or lablab. You may be able to buy them from dealers or get them from neighbours.

Inputs Will you be able to buy herbicide to control weeds and fertilizer to improve yields? Can you make compost or use manure to help restore the soil fertility?

Labour Conservation agriculture generally saves work. But it may mean more work in the first year – for example for field preparation before the rains, or for weeding. Can you handle this work yourself, or can you get family members or hire labourers to help you when you need?

Storage and markets Conservation agriculture should help you grow more, and will produce a greater variety of crops. Will you be able to harvest these crops, dry them, and store them in your grain store? Will you be able to sell them?

Livestock You should try to keep livestock out of your fields, even after harvesting the crop. Can you find other ways to feed your animals if you do not allow them to graze the stubble? Some possibilities ([see Chapter 9](#)):

- Cut the cover crop and carry it to the animal pen.
- Make hay or silage to feed to the animals in the dry season.
- Plant an extra plot of forage to feed to the animals.
- Sell less-productive animals so you have fewer to feed.
- Arrange with your neighbours to graze animals somewhere else.

Information and support Do you have the skills you need to practise conservation agriculture? Where can you get advice if you need it? Consider joining a group of other farmers who are also trying out this new way of farming so you can compare ideas and experiences. If no group exists in your village, perhaps you could start one.

Where to find answers in this book

Conservation agriculture is made up of many different components. You choose those that suit your own situation. This book presents these components separately to make them easier to understand. But in reality, you will combine components into an integrated system. And you will introduce them in a sequence that suits your conditions best.

Field preparation and planting You can prepare the field and plant seed with a hoe, using a jab-planter or an animal-drawn implement, or with tractor power.

[See Chapter 3](#) for more on field preparation and planting.

Keeping the soil healthy Conservation agriculture improves the soil by increasing the amount of organic matter. You can plant legumes that fix nitrogen in the soil. You can improve the soil fertility further by adding manure, compost, green manure, or by applying artificial fertilizers. You may have to add lime or ash to lower the soil acidity.

[See Chapter 4](#) for more on how to improve the soil.

Maintaining soil cover It is important to keep the soil covered throughout the year. You can do this using cover crops or a mulch of residues from the previous crop.

[See Chapter 5](#) for guidance on how to use cover crops and mulch.

Crop rotations and combinations You can choose among many different combinations of main crops and cover crops. You can grow these as intercrops (sowing two crops in the field at the same time), relay crops (sowing one crop before the previous one is harvested), or rotations (sowing a different crop each season).

[See Chapter 6](#) for more on crop rotations and combinations.

Controlling weeds Cover crops and mulch help suppress weeds, but you must still control weeds in conservation agriculture. You can hand-pull weeds, remove them with a hoe or machete, or control them using herbicide. In time, there will be fewer weed seeds in the soil, so weeds will become less of a problem.

[See Chapter 7](#) for more on how to control weeds.

Controlling erosion and harvesting water Conservation agriculture reduces erosion by encouraging rainwater to soak into the soil, preventing runoff. On steep slopes and heavily degraded land, you may have to build terraces, bunds and drains to control erosion. In dry areas, you can use structures such as half-moon basins to harvest water and make it available to the crop. You can combine conservation agriculture techniques with these measures.

[See Chapter 8](#) for ideas on how to combine soil conservation measures and water harvesting techniques with conservation agriculture.

Managing livestock You should try to keep livestock away from your fields throughout the year. You may have to tether animals, fence land to keep them out, or make agreements with the community to limit or prohibit grazing on stubble or on fallow fields. Animals may need an alternative source of feed – such as plots of fodder grasses.

Farmers' choices

You can choose among many different conservation agriculture practices. Here are some things that may affect your choice.

- What is the **soil** type?
- What is the **rainfall**, and at what times of year does it fall?
- What is your **farm size**?
- How much **labour** do you have? Men, women, children, elderly, hired labour...? At what times of year? (Many people migrate in search of work at certain times of the year.)
- What types of **crops** do you want to grow?
- What **implements** do you have (or can you get)? Hoes, planters, rippers, sprayers...?
- What **draught power** is available? Donkeys, oxen, camels, tractors...? Or do you and your family have to rely on your own muscles and sweat? If you do not have access to draught power, you may have no alternative: you may have to turn to conservation agriculture in order to survive.
- What **inputs** are available? Seeds, manure, compost, artificial fertilizer, herbicides, pesticides...?
- How much **financing** is available? Credit for implements, field preparation, inputs, marketing...?
- What **information** is available? You may be able to get advice from extension workers, NGO staff, input suppliers, traders, other farmers, the mass media – and of course, manuals like this.

Because individual circumstances vary, it is not possible to prescribe a single best way to do conservation agriculture. You may decide to use an animal-drawn ripper, followed by direct seeding of maize and a mucuna cover crop. Your neighbour may prefer to make individual planting pits before sowing maize and lablab. Both approaches can produce good yields.

You must be able to choose the practices that suit your conditions. Extension workers and development agents must be ready to advise you so you can make your own decisions.

[See Chapter 9](#) for more on managing livestock in conservation agriculture.

Equipment Conservation agriculture requires different types of equipment from conventional agriculture. You no longer need mouldboard ploughs, disks and harrows. You can continue to use hoes and dibble sticks, but it might be worthwhile to invest in special equipment such as rippers, direct drills and jab-planters. Hand weeding is possible on a small scale, but conservation agriculture generally uses slashers, sprayers and wipers to control weeds.

[See Chapter 3](#) for more on field preparation and planting equipment, and [Chapter 7](#) for weed-control equipment.

Inputs, post-harvest storage and marketing Conservation agriculture uses some of the same types of inputs as conventional farming (such as fertilizers and crop seeds). But it also needs certain other types of inputs that may be new, such as cover crop seeds and herbicide. You may also plant new types of crop in a rotation, and you may have to harvest and sell unfamiliar types of produce. Better yields may lead to extra storage requirements.

[See Chapter 10](#) for more on input supplies and post-harvest activities.

Finance and economics You – and other farmers – have to be convinced that you will benefit from conservation agriculture before you will adopt it. It is a good idea to keep careful records of each farm operation, and work out how much labour and money you put in, and how much profit they earn. You can use simple methods to work this out. You should also see other benefits that are harder to measure in money terms: river water is cleaner, there is more water in wells, and erosion is checked.

[See Chapter 11](#) for details of these methods.

Hope for Tseoa

Tseoa Khoanyane almost gave up hope in 1998. His 1.5 hectare, steeply sloping field in Ha-Mosuoie in Qachas Nek District, Lesotho, was riven by gullies. His maize yield had fallen from 240 kg to just 60 kg. In despair, Tseoa gave up growing crops on the land.

But 5 years later, in 2003, he was introduced to conservation agriculture. Instead of ploughing the land with a tractor or oxen, he dug contour furrows on his deserted field. He put a lot of plant residues into the gullies. The vegetation slowed down the rush of water, and silt started to build up. He built stone bunds on eroded parts of the field, and laid mulch on the ground. He dug basins to collect water in preparation for planting in November 2004.

Animals damaged some of his basins, but he did not give up. He now has a good crop on the land he had earlier deserted.

"I am expecting a very good harvest of maize and beans", he says. "Whenever I walk through the farm and see the crop, I get very excited. I am glad I embraced conservation agriculture."

More information: August Basson

Sociocultural issues Conservation agriculture may have different implications for men and for women. Women may prefer to grow more food crops, while men may want to sell crops for cash. Conservation agriculture requires less labour, so makes it easier for people affected by HIV to grow food. It is also attractive for young people who might otherwise have lost interest in farming. There may be benefits if neighbours also adopt conservation agriculture together, sharing costs of equipment and marketing produce together.

[See Chapter 12](#) for a discussion of these and other sociocultural issues.

Promoting and adapting conservation agriculture Conservation agriculture requires farmers and extension workers to be open to new ideas and to learn a new set of skills. It is ideal for participatory extension approaches such as farmer field schools and farmer-to-farmer extension. Because conservation agriculture is still relatively new to Africa, much research is still needed – both by research institutions and by farmers themselves – to adapt the systems to the specific situations.

[See Chapter 13](#) for more on promoting and adapting conservation agriculture.

What are the risks?

Conservation agriculture can prove very beneficial. But some things might not work right for you at the start – as often happens when trying something new.

Learning All farmers have to learn how to use conservation agriculture before they can reap its full benefits. For example:

- Farmers who are not used to leaving crop residues in the field sometimes make simple mistakes – such as leaving them in bunches instead of spreading them uniformly. That makes it hard to plant the crop correctly, reduces the crop stand, and cuts yields.

Why farmers may be cautious about conservation agriculture

Farmers are often cautious about giving up ploughing. This is what they have learned from their parents and grandparents. They know how to grow crops using conventional methods, and are sceptical about trying new ideas. Most do not have the money available to try out something new. They fear that the new approach will put their food supply and families at risk.

Farmers grow the crops the way they do for a reason. Generations of farmers have found by trial and error whether something works. This indigenous knowledge has enormous value as a basis for development.

Conservation agriculture will succeed best (a) where farmers recognize a problem with what they currently do, (b) they adopt conservation agriculture gradually, and (c) adapt it as they go, using their own skills – and the skills of extension agents.

[See Chapter 12](#) for more on beliefs.

- It can be difficult to learn how to cope with weeds. If you don't control them properly, your workload may actually increase, or weeds may invade your field and you risk losing part of the harvest.

The solution?

- Don't try to do too much too fast! So if you make a mistake, it won't matter too much.
- Look for advice. Some of your neighbours may have learned how to solve a problem already and can tell you about it! Share your experiences with others.
- Learn by doing. Eventually, you will become a seasoned conservation agriculture user, and you will know more than anyone else how to make it work for you, under your own conditions.

Getting support Another problem is finding the quality support and services you need. Many pioneers face this situation. For example:

- If no-till planters or rippers are not yet available commercially, you might have to rely on equipment that arrives too late.
- You cannot find the herbicides you need in local farm supply store.
- The extension agent may not know much about conservation agriculture, or about your specific conditions. His advice may actually be misleading.

There are no real solutions to this in the short term. As a pioneer, you will have to rely more on yourself than on the government services. You can help organize your neighbours to compensate for the lack of services. If you are well organized, it is easier to negotiate with development projects, the government and the private sector for the support you need.

[See Chapters 10](#) and [13 for more](#) on these and other questions.

Saving labour in northern Tanzania

Like many other places in Africa, Karatu District in Tanzania experiences labour shortages during parts of the year. Many people are ill from AIDS or malaria, so cannot work. And many young people go off to work in the cities. There are not enough people left to do the farm work.

Conservation agriculture can help. It eliminates the heavy work of ploughing. Using herbicides and cover crops means less time is needed for the backbreaking task of weeding.

Farmers in Karatu were able to cut their labour needs by as much as three-quarters by practising conservation agriculture. For sowing, they used jab planters or animal-drawn no-till planters. They slashed weeds by hand or crushed them with a knife-roller, as well as spraying herbicide.

Source: Bishop-Sambrook et al. (2004)