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Harvesting,
marketing and
input supplies

ADOPTING CONSERVATION agriculture may mean making other changes in how you run your farm:

- Your production should increase, so you will need more labour to harvest and handle the crop, and more room to store the grain.
- The soil will hold more moisture, so you may be able to grow an extra crop in the dry season.
- You may need new types of inputs: cover crop seed, herbicides, special equipment, etc. You may need credit to buy these.

This chapter is aimed not just at farmers, but also at the people who provide them with inputs such as seeds, equipment and fertilizer.

Harvesting

When harvesting, make sure that the crop stalks and leaves are left on the ground as mulch. Use a machete to cut maize and other tall plants such as sunflower at about 20 cm high, leaving the roots in the ground. Old roots in the soil improve the soil texture and structure, and the standing stalks show clearly where to apply herbicide and plant the next crop. Lay the cut materials between the rows, parallel to them. Because the rows run across the slope, the mulch will help prevent erosion.

Alternatively, you can use a combine-harvester with a spreader attachment to distribute the stalks evenly over the ground.

When cleaning or processing the harvest, use the waste to make compost, or put it back on the soil as mulch.



Higher yields from conservation agriculture means you may need a bigger grain store!

Storage

Dry grain thoroughly before storing or processing it. It should have less than 12.5% moisture content. This helps prevent damage by pests and diseases during storage.

If you live in a humid area, you may have to use a drier. Consider having your grain dried by a commercial grain drier. Or it may be worthwhile buying or making a drier yourself, perhaps along with some neighbours.



A well-designed grain store made of bricks or cement

Make sure the grain is clean before storing it.

Grain stores on farm are best made of brick and cement, with few openings so that pests cannot get in. They must be weatherproof: the roof must protect the grain from rain and sun and keep the grain dry and cool. Channel rainwater away from the store to keep it dry.

Use an approved insecticide to protect the grain from insects. You can mix the insecticide into the grain by hand, with an auger or in a cement mixer. Or you can spray it onto the grain and then mix it in. If you use a spray, dry the grain before storing it for a long time.

If you store grain in jute or woven plastic bags, treat it first with an insecticide.

Rats and mice can be a big problem. They eat the grain and damage it with their urine. It is vital to keep them away from the store: put wire mesh over openings, and fix metal cones on the legs of grain cribs to keep them out. Use treated bait in the store. Cats and owls also help control rats and mice.

Processing and marketing

If you grow vegetables or other perishable crops, plan to get them to market quickly so they are fresh and fetch a good price.

Consider forming a marketing cooperative with your neighbours so you can sell a large amount of produce together. That should give you a better price, and will help cut transport costs. Also consider options such as contract growing to guarantee a market for your produce.



Inputs

The main inputs that farmers need for conservation agriculture are:

- **Information**
- **Equipment**
- **Seed**
- **Fertilizers, herbicides and pesticides**
- **Credit.**

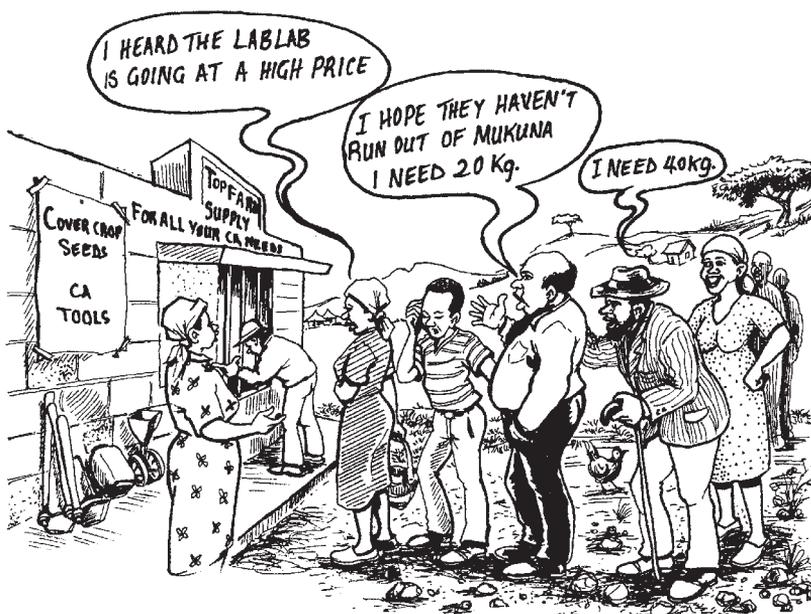
We will discuss each of these in turn.

Information

Farmers (and extension staff) need various types of information:

- **Services** Where to get services, who can provide what?
- **Marketing** Demand for produce, prices. This will influence what crops they grow.
- **Technology** How to grow a particular crop, how to overcome problems in the field.

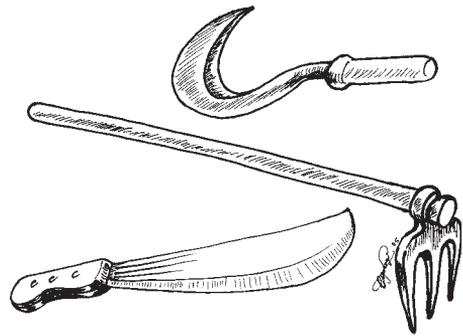
They can get this information from various sources: radio, extension agencies, leaflets, research institutes, successful commercial growers, farmer associations, local dealers, manufacturers and input suppliers. Events such as on-farm field days are crucial to bring together the various groups and enable them to share information. [See Chapter 13](#) for more information.



Equipment

Most small-scale farmers have (or can borrow) hoes, planting and weeding implements, and knapsack sprayers. It may be possible to borrow or hire other equipment rather than buying it yourself. An implement should last for several years, so it may be worth investing in it even though it looks expensive.

[The table on the next page](#) summarizes what equipment you may need when. See the other sections in this manual for details on the various types of equipment.



Hand tools used for harvesting

Seed

It is important to plant good-quality seed. This will ensure:

- A high germination rate (more than 90% of the seeds should sprout).
- There are no seeds of weeds or of other crop varieties mixed in.

You can make sure of this by buying only certified seed.

You can also grow your own seed. This is a specialized business, but it can be very profitable. In areas where a lot of farmers are adopting conservation agriculture, there may be a good market for seed of cover crops such as pigeon-pea, lablab and mucuna.

You may also be able to get seed from other farmers, seed suppliers, NGOs or research institutions.

Fertilizers, herbicides and pesticides

You can use the same fertilizers, herbicides and pesticides in conservation agriculture as in conventional farming.

Once your conservation agriculture fields are well established, you will probably need to use less inorganic fertilizer and herbicides. This is because the soil will be more fertile, and cover crops will suppress weeds.

Try to use integrated pest management to control pests and diseases. However, you may find you have to use pesticides to control pests in the cover crops and mulch.

Be careful when handling pesticides. Read the label carefully, and make sure you use them safely.

Equipment used in conservation agriculture

When needed	Hand equipment	Animal-drawn	Tractor-mounted
Field preparation	Hoe	Ripper	Ripper
	String	Subsoiler	Subsoiler
Planting	Hoe	Ripper- planter	Direct seeder
	Machete	Direct seeder	
	Planting stick		
	Jab-planter		
Weeding	Hoe	Knife-roller	Knife-roller
	Slasher		
	Machete		
	Push/pull weeder		
Herbicide application	Weed wiper	Sprayer	Sprayer
	Knapsack sprayer		
	Hand-pulled sprayer		
Harvesting	Machete		Combine harvester
	Slasher		
	Sickle		
	Billhook		
	Rake		

Credit

Small-scale farmers find it difficult to get credit for their farm operations. Few banks have branches in rural areas. And banks require collateral (usually in the form of land title deeds – which few farmers have) in order to extend credit. But there are ways around this.

Farmer associations Groups of farmers have stronger credibility than an individual, and can overcome the problem of collateral to get credit. Banks can extend a loan to the association, which then lends on to its individual members. The burden of recovering loans from individual members lies with the association, and not with the bank. If someone fails to repay a loan, the bank can disqualify the whole association. This puts pressure on other members to make sure the defaulting person pays up.

Village banks Village banks are where farmers group together and pool their savings into a common account. Individual members can then get loans from this account if they want to buy inputs. Group members agree on the conditions for borrowing. The money saved can be invested in small-scale businesses, deposited with a larger bank, or lent to non-members at a higher interest rate.

Collateral or loan security Prices for grain typically fall very low just after harvest time, when many farmers want to sell at the same time. Farmers can get around this problem by delivering their grain to a private warehouse, which issues a receipt. When the grain prices rise, the farmer can sell the grain, or can choose to keep it in storage in the hope of a better price. The farmer can also use this stored grain as collateral for a loan to buy inputs for the next crop.

Contract outgrower schemes Processors of farm produce often sign contracts with farmers to grow produce for them. The processor may provide some or all of the inputs needed, as well as extension advice and services such as spraying and harvesting. The farmer gets a guaranteed price for the produce. Small-scale farmers can join one of these schemes to finance their crop production. Such schemes are popular for commercial crops such as cotton and paprika.

Other sources of credit It may be possible to get credit from various other sources: through the manufacturer or dealer, a government loan scheme or a development project.

If it is possible to pay back the loan over several seasons, farmers or small groups can buy equipment without having to invest too much money at one time.

Microfinance eases access to inputs

After seeing demonstrations and trying out the new techniques, farmers in Kalama Division in Kenya were enthusiastic about conservation agriculture. But they couldn't afford to buy the equipment and inputs they needed. So the Kenya Network for Draught Animal Technology (KENDAT), the NGO promoting conservation agriculture, helped them organize themselves into credit groups and to operate their own village bank.

The credit groups were formed from the clubs which had been involved in trying out conservation agriculture techniques and running on-farm demonstrations. Each group set its own rules, decided on its own constitution and elected its own leaders. Seven such groups were formed. They registered with the government authorities and opened a bank account, with the group representatives as signatories.

The chair and treasurer or secretary of each group attended training in group dynamics and on establishing and managing a revolving fund. Group members deposit a small amount of savings into the account on a regular basis. KENDAT added funds to the account to help the funds grow. The NGO remains a cosignatory for the account.

The group processes applications for loans, and all loan repayments are deposited directly into the account. The members decided on vital details such as interest rates, fines, repayment periods and how to recover unpaid loans. Loan recovery rates are a remarkable 100%. Many farmers are anxious to repay their loans so they can borrow more for the following season.

The original intention was to help farmers borrow money to buy rippers, subsoilers and other conservation agriculture implements. But the farmers wanted to invest in things that would give them quicker returns. For example, they chose to buy fertilizer and hybrid seed rather than a ripper, to start with. Some also used their loans to invest in small businesses, and then to use their profits to buy equipment for conservation agriculture.

More information: Pascal Kaumbutho, KENDAT

The warehouse receipt system in Zambia

Zambian farmers are faced with the problem of marketing of their produce. Poor storage facilities mean they cannot keep their produce until prices are good. So they are forced to sell at very low prices.

Some privately owned warehouses implement a system called “warehouse receipt”. This system is controlled and promoted by the Zambia Agriculture Commodity Agency, which certifies the warehouses and ensures they are properly managed.

Farmers transport their crop to the warehouse, and they are given a receipt.

The warehouse gives the farmer an advance payment based on the total value of the crop at that time. This advance payment is usually about 50–70% of the current value of the crop.

When the market prices go up, the warehouse sells the produce. It deducts the advance and the cost of storage, and pays the balance to the farmer.

This system has several advantages:

- The farmer can choose when to sell the crop, or the warehouse will advise him or her when the price is right.
- The warehouse is responsible for storing the crop and maintaining its quality.
- The farmer can use the receipt as collateral to obtain a bank loan.

In 2003/4, farmers practising conservation agriculture in Choma District in southern Zambia stored about 300 tonnes of grain using this system. Their crop was sold after 7 months, when the prices were high, and in time for farmers to buy inputs for the coming season.

Farmers like this system because they can sell their crop when they want, and can get a loan so they can invest in other businesses. Some have even started earning money by buying produce from other farmers and putting it in the warehouse.

More information: Cholwe Chiposwa

Obtaining inputs

Farmers need to have easy access to seed, fertilizers and other inputs if they are to adopt conservation agriculture. It is a challenge to get the necessary inputs to remote areas. Businesspeople are reluctant to transport small amounts of inputs long distances over bad roads: it is too expensive and risky. Here are some ways to overcome this problem.

Linking suppliers and farmers

Extension officers should form links between farmers and suppliers. They can help farmers find out what is available, and suppliers know what farmers need. Field days and agricultural shows are good ways to bring farmers and suppliers together so they can learn from each other.

Local dealerships and agents

There are a number of advantages in establishing local dealerships. They reduce the distance farmers have to travel to obtain inputs. A well-stocked local dealer will save the farmer a lot of time and expense by providing a wide range of inputs. The dealer can also extend credit for inputs to farmers. He or she should have a good working knowledge of each product sold, so will be able to provide excellent customer service.

Dealers will have to stock new types of inputs, such as:

- Herbicides and other chemicals.
- Cover crop seeds.
- Hand tools such as jab-planters and weed wipers.
- Animal-drawn equipment such as rippers and subsoilers.
- Spare parts for equipment.

Farmer groups

Farmers groups can buy equipment for their members to share – and to hire out to non-members. As farmers' incomes rise and the area planted to conservation agriculture increases, the group can buy extra equipment. It can also buy seed and fertilizer in bulk, so cutting costs and saving on transport.

Equipment hire services

Individual smallholders cannot afford expensive, sophisticated equipment such as heavy-duty rippers or tractor-drawn spray rigs and planters. But they may be able to hire it – if there is a hire service nearby.

This is a potentially profitable business opportunity for entrepreneurs or groups of people. Projects or extension services might consider helping them set up such a business. In Ghana, for example, young men have formed contract spraying and planting teams. They hire themselves out to farmers to apply pesticide and fertilizer and to do planting. The farmers supply the inputs needed.

Benefit from better-off farmers

If you cannot afford to buy equipment yourself, perhaps a better-off neighbour would be interested in investing in it, then hiring it out?

If large-scale commercial farmers nearby adopt conservation agriculture, inputs may become available for small-scale farmers too. If a few large-scale farms demand certain types of inputs, suppliers may find it profitable to open a local depot. Small-scale farmers can then buy inputs and get information from the same depot.

Local manufacture and repair of implements

Africa must import most of its conservation agriculture equipment, mainly from Brazil. This is expensive, takes time, and restricts the amount and type of equipment that farmers can buy.

Equipment such as rippers, subsoilers and planters can be made more easily available if local artisans and blacksmiths are trained to make it. Farmers can then buy the equipment cheaply, instead of waiting for hard-to-find, expensive imports. Artisans can also repair equipment that is damaged or worn out.

Locally made equipment has to be good quality. It must use the right materials (such as quality steel) and be made with precision. If implements do not work properly, no one will buy them.

Learning how to make rippers and subsoilers

Many farmers would like to use conservation agriculture, but they can't. They don't have the right equipment, and they can't buy it anywhere.

The solution? Teach local artisans to make the equipment.

Farmers in Kalama Division, Machakos District, Kenya, and in Arumeru in Tanzania, learned how to use direct planting and cover crops. But they still had a problem with hardpans. And they couldn't buy or hire subsoilers to break the hardpans.

The Maendeleo Agricultural Technology Fund, a KENDAT project supported by FARM Africa, trained local artisans how to make the equipment. Before the training, artisans attended field days and demonstrations so they were familiar with the equipment, the principles of conservation agriculture and the needs of farmers.

They then attended two training courses. The first was held at Nandra Engineering in Moshi, Tanzania. It covered basic workshop procedures, safety measures, materials selection and costing, basic workshop skills (cutting, bending, measurements, etc.), and the use of jigs and fixtures for accurate, consistent reproduction of tools and parts. Each of the participants made a prototype subsoiler to take home.

The same artisans then attended another course, this time closer to home, at Ekima Engineering in Machakos. It reviewed the production process, and in particular the use of jigs and fixtures. Each participant was given a set of the jigs and fixtures needed to make rippers and subsoilers. The project then placed an order of five subsoilers and five rippers with each of the artisans to get them started. It also arranged for credit so they could buy materials for big orders.

Buying materials remains a problem: some can be found only in Nairobi, some 100 km away. The cost of transport adds to the sale price of the equipment, and makes small orders uneconomical.

Links with farmers are critical. If they are to buy conservation agriculture equipment, farmers have to know where to get it. The same is true if they need it repaired.

More information: Joseph Mutua, KENDAT

Appropriate packaging

Seeds, fertilizers and other agrochemicals often come in large packs, designed for commercial, large-scale growers. But these large packs are not ideal for smaller scale farmers. Retailers can re-bag these inputs into smaller packages better suited for smaller farms. For example, seeds packed in 1 kg, 2.5 kg and 5 kg bags could be sold in local dealer shops, supermarkets and garages in rural areas. The small packs are lighter, affordable, easier to carry and can be planted in a short period. Seed firms in Kenya and Zimbabwe have tried this approach and found it is very successful.

Equipment manufacture in Zimbabwe

A workshop in Zimbabwe highlighted the need for conservation agriculture equipment for smallholder farmers. A representative of a local equipment manufacturer attended the workshop, and the firm started producing ripper-planters soon afterwards.

The firm procured a prototype from South Africa and modified it to suit Zimbabwean conditions. It conducted on-farm trials with the help of NGOs and extension organizations. The planter is now available commercially.

Small packs for small farms

CropLife, an industry association, is encouraging firms to make things easy for small-scale farmers. Among its recommendations:

- Supply inputs in small packs.
- Make packs the right size for specific needs – for example, a 2.5 kg bag of maize seed is enough to plant 1000 m²; one sachet or bottle of insecticide for a 15 litre knapsack sprayer.
- Print labels in the local language.
- List problem pests, weeds and diseases on the labels, with the local names.
- Provide local-language brochures, pamphlets and video presentations.

Mixing a small pack is easy: no measuring equipment is needed, and some packs have markings on the container. Application is accurate, reducing the misuse of products. A farmer can mix and spray a small pack of herbicide quickly: a single knapsack of insecticide takes 15–20 minutes to spray out. Storing and disposing of small packs is easy.

More information: Jim Findlay

