

11

Should you adopt
conservation
agriculture?

SO SHOULD YOU adopt conservation agriculture? Is it likely to be profitable? This chapter shows you how to work out whether conservation agriculture will be worthwhile for you.

Some questions to ask:

- How can conservation agriculture **benefit me**?
- How does conservation agriculture **benefit other people**?
- How much **yield** does conservation agriculture produce?
- How much does conservation agriculture **cost**?
- Is conservation agriculture **profitable**?
- Is conservation agriculture **worthwhile**?
- How much **work** is conservation agriculture?
- **When** is work needed for conservation agriculture?

This chapter deals with each of these questions in turn. For many of these questions, it gives a simple way of working out the answers using your own farming experience. [Check also Chapter 2, *Converting to conservation agriculture*](#), for more ideas to help you make the right choice.

How can conservation agriculture benefit me?

Conservation agriculture has many benefits. Here are some of them:

- Your soil will become more fertile. It will be richer in organic matter, and more earthworms and other soil life. That means healthy crops and **higher yields**.
- A more fertile soil also means **money saved on fertilizer**.
- The soil should hold **more water**, so is less likely to dry out quickly. That means better yields in dry years, more reliable springs, and wells that do not dry out.
- The soil cover **reduce erosion**, preserving the soil for the future. This may seem like a long-term benefit, but many farmers see the value of it in terms of higher yields in only a few years.
- A healthier crop should mean **less pesticide** use, meaning a cleaner environment and safer drinking water.
- **Fewer weeds** mean less weeding and money saved on herbicides.
- You should have more **free time** that you can use in other ways. Running a business, for example, trading, keeping animals, or making honey.
- Your fields may produce **new products** that you can use yourself or sell. Examples are cover crop seeds, firewood or forage.

Some of these benefits are reflected in higher yields and lower costs. Others are harder to measure in money terms: how much is clean drinking water worth, for example?

How does conservation agriculture benefit other people?

If you adopt conservation agriculture, you will gain in many ways. So will other people in your community and elsewhere. Everyone benefits from cleaner water and reduced erosion. If many farmers take up conservation agriculture, the benefits can be considerable for society as a whole.

- Less erosion means less soil carried away into rivers. **Cleaner rivers** mean better water quality for people living downstream. Less silt clogs irrigation canals and reservoirs. That means irrigation schemes work better and are cheaper to maintain, and reservoirs have a longer life.
- More organic matter holds carbon in the soil rather letting it disappear into the air as **carbon dioxide**. Large amounts of this gas change the climate – making drought more likely in some places, for example. So conservation agriculture will help make global weather patterns more reliable.
- Farmers buy things like planters, subsoilers and seeds to practise conservation agriculture. That stimulates artisans, seed growers and traders to provide these items. Higher yields also mean farmers have more produce to sell and more money to spend. This in turn stimulates **markets and growth** in the local and national economy.

How much yield does conservation agriculture produce?

The easy way to find out how much extra yield conservation agriculture will bring is to try it out.

- 1 Get together with a group of neighbours, and set aside a field for conservation agriculture.
- 2 Decide which conservation agriculture practices you want to use on this field. Decide who is going to do the work.
- 3 Meet regularly throughout the season to check on the crop and discuss any problems.
- 4 Keep careful records on the types and amounts of inputs you use, the amount of labour needed, and so on.
- 5 At harvest, measure the amount of grain or other yield produced. Compare this with your regular practices.

Here are some questions to ask:

- How much grain and other types of **yield** did the field produce?
- How much **work** did it take?
- How much did you have to **spend** for inputs?
- Check the soil. Is there more **organic matter**? How about the number of **earthworms**? Does it feel **hard or soft**? Is there a difference in the amount of **erosion** (rills in the ground, silt in water draining from the field, etc.)?

Remember, you may not begin to see the full benefits of conservation agriculture for several years. If your field produced no more grain in the first year, don't give up! Keep using conservation agriculture on the same field for another year or two, and you should see real differences.

How much does conservation agriculture cost?

If you have done the kind of test above, or if you have already started using conservation agriculture, you can draw on your own experience and records to calculate the costs and benefits. It is easy to do this if you keep records of what you have bought and the money you have spent on your farm ([see box on page 174](#)). If necessary, ask an extension worker to help you do this.

If you have not yet started using conservation agriculture, it is hard to decide what your costs would be and how much profit you would make. Where can you find the information you need?

- Think of changes you would need to make, extra equipment you would need, and new types of seeds and agrochemicals you would have to buy.
- Perhaps you belong to a farmers' group that has tried conservation agriculture. Or maybe you can ask other farmers about their experience. Ask how much various items cost, and how much yield they harvested from their conservation agriculture fields compared to their conventional fields.
- If you buy equipment or animals, remember they will last more than one season. You may have to spend a lot of money this year, but none next year. You may be able to get a loan to help cover the cost.
- Remember, you do not have to buy all the equipment at once! If you farm using a hoe, you probably don't need any new equipment. But if you use an animal-drawn plough, you would need to buy (or hire) a subsoiler or ripper if you don't already have one.
- Also remember that labour and other costs may be high in the first year. For example, weeds may be a major problem before your cover crop is established, so you may have to hire labourers to weed for you. You may also need to buy cover crop seed. In the second year, you may be able to use seed you have grown yourself.



Inputs: seeds, fertilizer, herbicides, etc.



Land clearing



Spraying herbicide



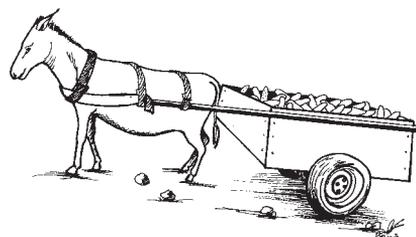
Planting using jab planter



Weeding



Harvesting



Carting

Some of the things to take into account when you are calculating costs

Keeping records

It's a good idea to keep records of your farm, even if you are not considering taking up conservation agriculture.

Why should you take the trouble to do this?

Because it helps you make the right decisions. For example, do you have enough money to invest in a ripper? Is it a good idea, or would you be better off investing in something else? Should you ask the bank for a loan, and if so, can you afford to repay it? Should you apply a herbicide this year, or is it cheaper to slash weeds by hand?

You can answer questions like these only if you have good records.

What type of records should you keep? Here's a summary:

Costs

- The cost and quantity of **equipment** (plough, draft animals, ripper, jab planter, sprayer, etc.).
- The cost and quantity of **inputs** (herbicides, seeds, fertilizer, etc.).
- The cost of **farm operations** (land clearing, planting, spraying, weeding, harvesting, drying, transport, etc.).

Income

- The **quantity** of crop you harvest and the **price** you received when you sell it (or the price you would get if you were to sell it).

Operations

- **For each crop:** the crop variety, seeding rate, dates planted and harvested, dates of key operations (fertilization, weeding, pest control), yield and price.
- **For fertilizers, herbicides and pesticides:** type of chemical used, dates of application, and application rates.

You can calculate the costs of practising conservation agriculture by adding up the costs of **equipment** and draught animals, **inputs** such as fertilizer and herbicides, and **operations** such as field preparation and weeding.

The following sections show how to do this. Fill in the tables on the following pages with your own figures so you can calculate your own costs.

Equipment and draught animal costs

- 1 List the different items of **equipment** and **draught animals** you bought last year for conservation agriculture (or would have to buy next year). Write down how much each one cost ([A, in Table 1 on the next page](#)).
- 2 Add the amount you spent to **run and maintain** the equipment (for example, the cost of repairing a sprayer) ([B](#)).
- 3 **Sum the amounts.** This is your total cost of equipment and animals ([E](#)).

Input costs

- 1 List the different types of **inputs** you have used (or plan to use next year): seeds, fertilizer, herbicides and pesticides. Write down how much you paid for each ([Table 2](#)).
- 2 **Sum the amounts.** This is your total cost of inputs (**I**).

Operation costs

- 1 List all the **field operations**, starting with field preparation and ending with transport and sale of the produce. It's easiest if you write down the dates as well to make sure you don't forget something. Also include any interest payments you have made for credit ([Table 3](#)).
- 2 For each operation, write down how much you paid for it (for example, to hire workers or to pay for transport).
- 3 **Sum the amounts.** This is your total costs of operations (**K**).

Total cost

Add the costs of equipment, inputs and operations together (Table 4). This is your total cost per year.

$$\text{Total cost} = \text{Equipment cost} + \text{Input cost} + \text{Operations cost}$$

$$T = E + I + K$$

Note that you will have to buy the equipment only once, so your expenses next year should be lower. If you do not need to buy any more equipment, your costs next year will be:

$$\text{Total cost} = \text{Input cost} + \text{Operations cost}$$

$$T = I + K$$

Table 1 Costs of equipment and draught animals for conservation agriculture

Equipment	Purchase cost	Cost of running and maintaining	Total cost
	A	B	C = A + B
Hoes			
Cutlasses, machetes			
Draught animals			
Subsoiler			
Ripper			
Planter			
Sprayer			
Others			
Total cost of equipment			E

Table 2 Costs of inputs for conservation agriculture

Input	Cost
Main crop seeds (e.g., maize)	
Intercrop seeds (e.g., beans)	
Cover crop seeds	
Herbicides	
Fertilizer	
Pesticides	
Others	
Total cost of inputs	I

Table 3 Costs of farm operations for conservation agriculture

Date	Operation	Cost
4 Feb	Land preparation	
11 Feb	Herbicide application	
17 Feb	Planting	
etc.	Weeding 1	
	Weeding 2	
	Harvesting	
	Transport to market	
	Payment of interest on credit	
	Others	
Total cost of operations		K

Table 4 Total cost

Type of expense	Cost
Cost of equipment	E
Cost of inputs	I
Cost of operations	K
Total cost	T = E + I + K

Buying expensive equipment

You don't have to buy a sprayer or subsoiler every year – it should last for several years. So if you want, you can spread the cost over that time (accountants call this “depreciation”).

Fill in the table below to take this into account in your calculations.

Extra equipment needed for conservation agriculture – taking depreciation into account

Equipment	Purchase cost	Lifespan (years)	Cost per year	Cost of running and maintaining per year	Total cost per year
	A	B	$Y = A / B$	R	$C = Y + R$
Hoes					
Cutlasses, machetes					
Draught animals					
Subsoilers					
... etc.					
Total cost					D

You can now use this figure to calculate your total cost per year:

$$\text{Total cost} = \text{Depreciated equipment cost} + \text{Input cost} + \text{Operations cost}$$

$$T = D + I + K$$

But you still have to pay for equipment all in one go. Or do you? Here are some ways to get around this:

- Get a loan from a bank or from your farmers' association to buy the equipment. You can repay the loan in several easy stages.
- Band together with a group of other farmers, and buy the equipment as a group. You will have to agree on who can use it when, and who is responsible for repairing and maintaining it.
- Ask the equipment supplier for credit. They may be willing to accept a down-payment now, and wait for the balance until the end of the season.

Using stones to calculate costs

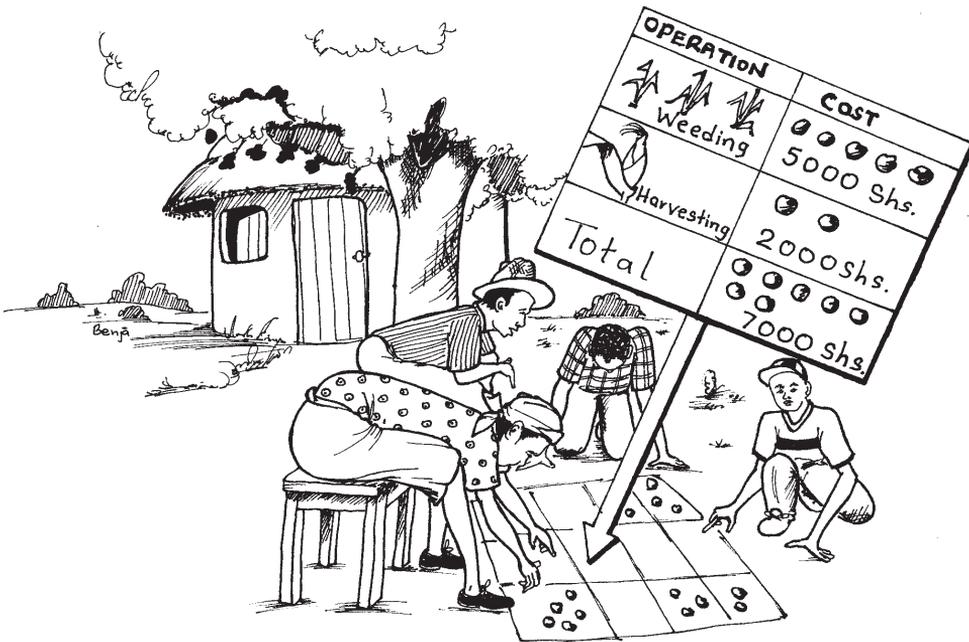
Instead of using a pencil and paper, you can use stones, twigs or grains to calculate your costs. You can also use this method if you are an extension agent working with a group of farmers.

You will need a pile of small stones (or grains or pieces of twig). One stone can represent 100 shillings, or 10 rand, or whatever your currency is.

You can draw a table on the ground, or use a big sheet of paper so everyone can see and participate in the discussion.

- 1 **Equipment costs** List the various types of equipment you have bought. For each piece of equipment, put the right number of stones next to it to show how much it cost.
- 2 **Input costs** List the various types of inputs used. Next to each input, put the right number of stones to represent how much it cost.
- 3 **Operation costs** List the various operations done. For each operation, put down the right number of stones to show its cost.

Add up all the stones to get the **total cost**.



Is conservation agriculture profitable?

Profit is your **income** minus your **costs**. Here is how to calculate it.

Income

- 1 List the **crops** you have produced using conservation agriculture: maize, beans, cover crops, etc. (Table 5).
- 2 For each crop, write down how **many kilograms or bags** you harvested. (Make sure you count all the various types of yield. For example, your cover crops might produce firewood, fodder you can feed to your animals, as well as seed you can sell to your neighbours.)
- 3 Write down the **price** you got per kilogram or bag for each crop. (It doesn't matter if you sold only part of the crop and your family ate the rest: treat it as if you had sold all of it. For fodder, work out how much you would have to pay for the same amount of fodder if you had to buy it.)
- 4 **Multiply** the number of bags or kilograms harvested by the price per bag or kilogram to get your income from each crop.
- 5 **Sum the amounts** for each crop. This is your **total income (N)**.

Table 5 Total income

Crop	Amount harvested (kg or bags)	Price per kg or bag	Income
	H	J	M = H x J
Maize			
Beans			
Cover crops			
Total income			N

Profit

Subtract your total costs (**T**) from your income (**N**). This is your profit (**P**).

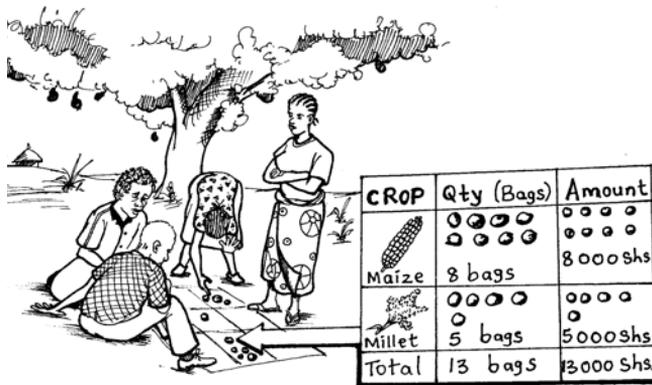
$$P = N - T$$

If the answer is greater than zero, you made a profit. If it's less than zero, you made a loss!

Using stones to calculate profits

You can use stones to calculate profits in a similar way to costs ([see previous box](#)).

- 1 **Income** List the various types of yield from your crops. You can use leaves or seeds of each type of crop so you remember which one is which.
- 2 For each crop you sold, work out how much money you got when you sold it. Put the equivalent number of stones next to that crop.
- 3 If you did not sell all of a crop (for example, if you and your family ate some of it), work out how much money you would have got if you had sold it. Put the equivalent number of stones next to that crop.
- 4 Add up all the stones. This represents your income.
- 5 **Profit** Take total costs you calculated earlier ([see previous box](#)) away from the income. This is your profit.



Determining sales value of harvested crops

Is conservation agriculture worthwhile?

To decide whether it is worthwhile to start practising conservation agriculture, you need to know which is more profitable: conservation agriculture or your current practice?

To work this out, simply make **two sets of calculations**:

- One for **conservation agriculture** (outlined in the previous sections)
- Another for your **normal practice**.

You can now compare the results. Which one gives you the best yields? Which one gives you the highest profit?

[See the box on the next page](#) for an example of this type of calculation.

Profit from conservation agriculture in Ghana

An experiment in Ghana over six years found that ripping produced more than twice as much maize as slash-and-burn farming: 1200 kg per hectare instead of just 500 kg.

Not only that: the farmers saved labour too. Slashing fallow vegetation is hard work: it took 83 person-days to clear and weed a hectare of land using the conventional approach. Using herbicide, it took only 48 person-days to do the same job.

The result: a profit of 940,000 cedis from conservation agriculture, compared to a loss of 495,000 cedis from slash-and-burn.

The farmers did not get the full benefits in the first year because it took several years to control weeds and they learn how to use the new equipment.

Comparison of conservation agriculture and slash-and-burn in Ghana

	Units	Unit price (cedis/ unit)	Ripping (conservation agriculture)		Slash-and-burn (conventional practice)	
			Quantity	Total value (cedis)	Quantity	Total value (cedis)
			a	b	c	d = b x c
Income						
Maize sales	100 kg	150,000	12	1,800,000	5	750,000
Total income (N)						750,000
Costs						
Labour	Person-days	15,000	48	720,000	83	1,245,000
1st herbicide spraying	Litres	60,000	1	60,000	0	0
2nd herbicide spraying	Litres	60,000	1	60,000	0	0
Knapsack sprayer hire	Days	10,000	2	20,000	0	0
Total costs (T)				860,000	1,245,000	
Profit (P = N - T)				940,000	-495,000	

More information: Philip Boahen

How much work is conservation agriculture?

It's easy to account for hired labour: you just add up the money you pay the labourers. But how about the work you and your family do – that you don't get paid for? How to keep track of this? How to tell whether conservation agriculture is more or less work?

- 1 List all the **activities** you and your family have done for conservation agriculture throughout the year. It's easiest if you write down the dates as well, so you don't forget something ([Table 6](#)).
- 2 For each activity, work out how many **person-days** it took. Count each person separately. So if weeding took two people 3 days, count that as $2 \times 3 = 6$ person-days.
- 3 **Sum the number of person-days.** This is your total family labour input (**L**).

You can now compare the amount of work you and your family put in to conservation agriculture with the amount you do for your normal farming practice. Which takes more work? Is the extra work worth it?

When is the work needed?

Conservation agriculture may need work at different times of year from usual. For example, you may need to do less work for land preparation (because you don't have to plough), but more work to control weeds later in the season.

How to account for your family's labour

If you want to include family labour in your calculations of costs and profit ([like in the box on the previous page](#)), you have to convert the number of days spent into money terms – even though nobody from the family actually got paid for their work. Doing so gives you a clearer picture of whether it's better to adopt conservation agriculture, stick with your normal farming practices, or look for other work.

You can work out the money value of your family labour like this: think of how much it would have cost to hire someone to do the same amount of work.

For example, maybe it took 6 person-days (2 persons for 3 days) to plant your conservation agriculture field. If it costs \$2 to hire a worker for one day in your village, then the equivalent cost of your family labour was: $6 \text{ person-days} \times \$2 \text{ dollars} = \$12$.

Beware: the costs of hiring workers can vary a lot: they go up if there is a lot of work to be done, if there are few labourers available for hire, or if other costs go up. So try to use the actual wage you would have to pay.

The result will only be an estimate. For example, it will not necessarily reflect things such as the quality of work (family members usually take more care than hired workers), or the fact that you really might not be able to hire anyone. But think about it: giving an approximate value to your family labour may be better than not counting it at all.

Here's how to check this so you can plan your calendar.

- 1 List all the **activities** you and your family have done for conservation agriculture throughout the year (Table 7).
- 2 On a calendar, fill in the number of **person-days** for each activity in each month. To make things clearer, you can mark who did each activity (e.g., husband did the land preparation, wife and children did the weeding).
- 3 Sum the number of **person-days** for each month to get the total family labour input for that month.
- 4 **Sum the number of person-days** for each activity to get the total for that activity.

Table 6 Calculating how much work your family has done

Date	Operation	Person-days
	Land preparation	
	Herbicide application	
	Planting	
	Weeding 1	
	Weeding 2	
	Harvesting	
	Transport to market	
	Others	
Total input of family labour		L

Table 7 Labour use in each month

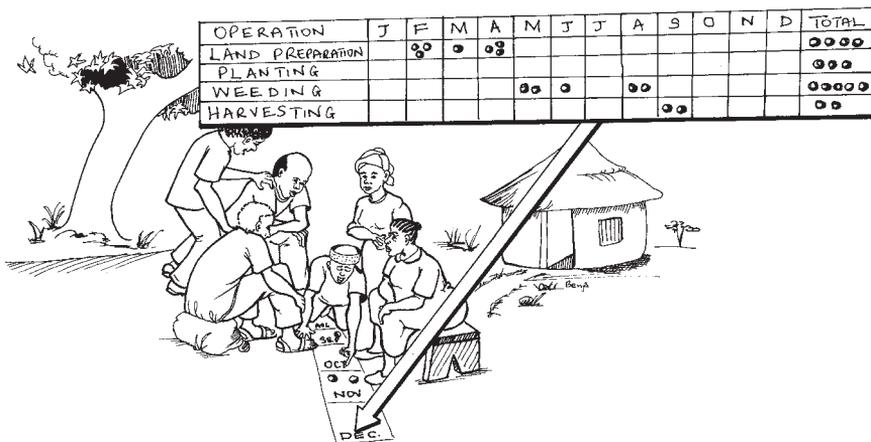
Activity	Number of person-days												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Land preparation													
Planting													
Weeding													
Harvesting													
Total													

Using stones to calculate labour needs

You can use stones to calculate the labour needs for conservation agriculture. You can do this at the same time as you are working out the costs of each operation.

- Total amount of work** List all the activities you and your family have done for conservation agriculture throughout the year.
- Put stones next to each activity: one stone for each week a person worked.
- Add up the number of stones to get the total family labour input.
- Timing of work** Draw 12 columns next to your list of activities. Put the name of a month on each column: January, February, and so on.
- Using the same stones as above, divide the pile for each activity among the months. So if it took you 2 weeks to weed in January, put 2 stones in the January column.
- Sum the stones** for each month to get the total family labour input for that month.

If you want to see who did what, you can use different coloured stones or different types of grain or leaves to represent each person.



Determining labour distribution for various farming operations

More time for beekeeping

Conservation agriculture has freed up so much of Rose Masai's time that she has been able to start a new business – honey production.

Rose farms in Teso, Busia District, in western Kenya. Honey Care, a Kenyan firm, introduced local farmers to honey production. The firm provided hives for a quarterly fee, and would collect honey every 3 months. Akrukranut, a local community-based organization in Busia bought a centrifuge, so now Rose and other farmers produce honey themselves.

Business is good. Rose makes a profit of KSh 20,000 a year from her honey, and she now has seven hives.

More maize for less work in Ghana

Farmers in Brong Ahafo in Ghana have found they can get higher yields with less work. They have started using minimum tillage and to plant leguminous cover crops. The cover crops include mucuna, lablab, *Canavalia* and *Pueraria*. These crops suppress weeds and raise the soil fertility.

Before these new techniques were introduced, farmers would use slash-and-burn to clear land. They had few tools – only hoes, machetes and dibble sticks, so could not farm large areas. The result was declining soil fertility and falling yields.

In 1996, the Sedentary Farming Systems Project (SFSP) introduced conservation agriculture to the region. The project was a joint initiative of the Ministry of Food and Agriculture, GTZ and the German Development Service.

The new methods enable farmers to do 20–40% less work, but get 50% higher yields. Women farmers are especially happy: they now have time to do trading or other outside work, which brings in as much as one-third of their income.

