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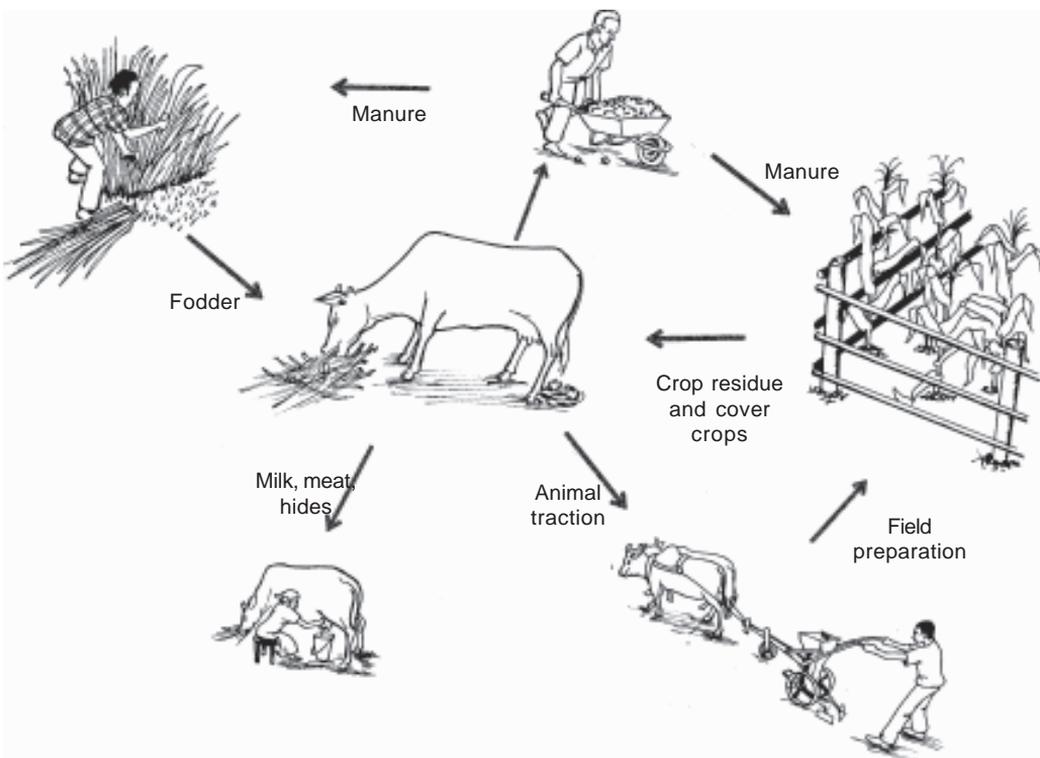
Livestock

LIVESTOCK ARE VERY important for many farmers. They provide meat, milk, hides, and manure, and they pull farm implements and carts. Farmers often allow their animals to graze on crop residues in fields after the harvest. But this is a problem in conservation agriculture because of the need to keep the soil covered. If the animals eat all the cover crops or stalks from the previous crop, the soil surface will be bare and exposed to heavy rain and to the wind. There will be little organic matter left to enrich and protect the soil. Heavy animals such as cattle also trample the soil and compact it, especially if the soil is wet.

So it is best to keep animals out of the fields even when there is no crop growing. You can fence your fields to keep livestock out, or you can reach agreements with neighbours who own animals about where to graze them.

But if the animals do not graze on the crop residues, what do they eat? You and your neighbours must find other ways to feed them. You can feed them with some of the residues from the main crop and part of the cover crop. If the animals do not trample the cover crop, you can use more of it as feed. You can also grow fodder in special plots.

It is quite possible to produce enough feed so that both crops and livestock benefit from conservation agriculture.



*Animals provide meat and milk to people and pull farm implements. They also produce manure that can be used to fertilize the crop field. They can be fed with crop residues and specially grown fodder.*

## Feeding animals

Here are some ways to feed livestock within conservation agriculture.

- **Cut-and-carry** Grow fodder in the conservation agriculture field, then cut it and carry it to the animals.
- **Controlled grazing** If you cannot keep animals out of the field, then at least limit the damage they do. Let them eat only part of the forage or residues. Leave the rest to cover the soil.

## Sources of feed

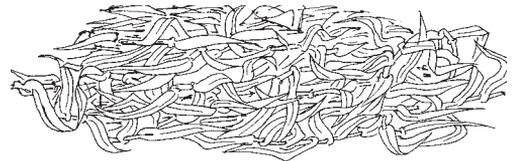
### Cover crops

Many cover crops produce excellent livestock forage. Legumes are rich in protein and help animals grow fast. [See Chapter 5](#) for a list of cover crops.



### Crop residues

The leaves, stalks and pods of legume crops such as beans, cowpeas, pigeon-peas and groundnuts are rich in protein. Oilseeds such as cotton, soybean and sunflower can be used to make feed meal. Maize and sorghum leaves provide roughage. It is best to leave the stalks on the field as mulch.



Check the crop and remove any barren plants, then feed them to livestock.

### Grasses and legumes

You can grow legumes (such as lucerne) and grasses in special fodder plots or along contour lines, the edges of bench terraces, and around fields. Suitable grasses include elephant grass, *Brachiaria*, Guinea grass, star grass, Rhodes grass and *Setaria*.

You can also cut natural grasses, weeds and other vegetation from field edges and roadsides and use it as feed.



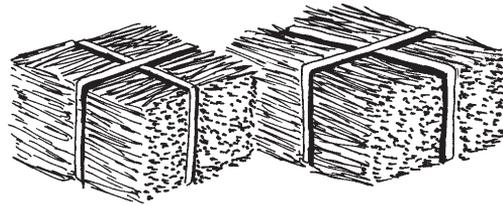
## Fodder trees

Leaves and pods of trees such as gliricidia and leucaena make good fodder. They are often planted around the fields or along contour lines to reinforce them. They are also often grown in rotation with maize or sorghum because they fix nitrogen.



## Hay

You can make hay to use as feed when fresh fodder is scarce ([see the box on the next page](#)). Store hay in a dry place.



## Silage

Silage is a good way of preserving fodder for use when other sources are scarce. [See the box on the next page](#) for how to make silage.



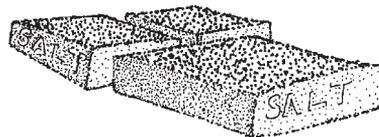
## Purchased feed

You may be able to buy hay from other farmers or feed from shops.



## Mineral blocks

Animals need vitamins and small amounts of minerals such as calcium, iron and phosphorus. Give them these in mineral blocks and licks. You can make mineral blocks yourself ([see the box on page 152](#)).

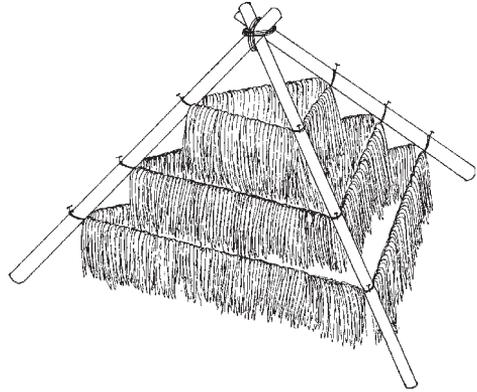


## Making hay with a tripod

- 1 Make a tripod from three stakes and some wire or string. Build it in the open, away from shade.
- 2 Cut grass or lucerne and hang it over the wires. Leave it to dry.

You can use a tripod even during the rainy season because raindrops simply roll off without wetting the inside.

Air circulates freely, so the hay dries without any mould forming.



## Silage

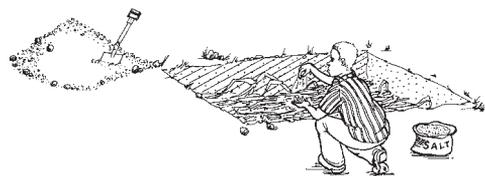
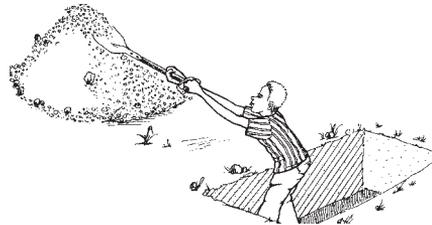
Silage is a good way to preserve livestock feed. You can make silage during the rainy season from **natural grasses**. Cut the grass when it is beginning to flower, about 10 cm above the ground.

You can also make silage from **cover crops** or **purpose-grown forage** from your conservation agriculture fields.

You can even make silage from your **main crop** of rice, maize, sorghum and millet if it does not produce grain, or if it cannot grow on to maturity (e.g., if the rains stop). Cut the plants when the grain is at the dough stage. Cut them about 15 cm above the ground.

### How to make silage

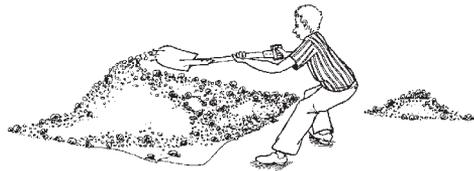
- 1 Pick a good site, preferably on a slight slope where water cannot collect.
- 2 Dig a pit about 3 m x 1 m, and 1.2 m deep.
- 3 Spread a layer of fine sand or kaolin clay, 20 cm thick, on the bottom of the pit.
- 4 Sprinkle 500 g of salt evenly over the bottom of the pit. Use the cheapest salt you can find.
- 5 The pit is now ready for filling. You will need about 3.5–4 tons of green grass and other vegetation, plus 500 kg of salt.
- 6 Cut the vegetation and let it wilt for about 20 minutes in the sun.
- 7 Put a layer of wilted vegetation in the pit, about 10 cm deep. Sprinkle some salt on this layer. Compact the vegetation by rolling it with a big drum filled with water.



*Continued...*

*Silage (continued)*

- 8 Add another layer of vegetation and salt, then another and another. Roll each layer as you add it. Sprinkle less salt on the lower layers but gradually add more salt on the upper layers.
- 9 Continue to add and compact the layers until the pit is completely filled, well above the ground surface and in the shape of a dome.
- 10 Cover the pile with a sheet of thick plastic 3.5 m x 1.5 m, then put a 10 cm layer of earth on top of the sheet. This earth keeps the pit watertight, airtight, and well compacted.



A group of 25 farmers can complete a silo like this in about 16 hours: 10 people to cut the forage, 5 to carry it, and 10 to fill and compact the forage in the pit.

Inspect the silo regularly. The pile will contract gradually as the vegetation inside ferments. Pile more earth on top to keep the dome shape and prevent rainwater from getting into the pit.

The silage is ready to be fed to animals after about 3 weeks. Take enough out of the pit to feed each day, then cover it with the plastic sheet again. The silage can be stored for 3–4 months.

### **Making salt licks**

When the silo is empty, you can make salt licks from the layer of clay or sand at the bottom.

- 1 Make a shallow, open box about 40 x 20 x 10 cm.
- 2 Fill the box with sand or clay from the bottom of the pit. Press it into the box so it is compact.
- 3 Turn it out onto a flat surface and allow it to dry in the sun.
- 4 The resulting salt licks will weigh about 2.5 kg. Each silage pit can produce about 20 blocks. Livestock love them!

## Protecting your fields

You need to protect your fields and cover crops from grazing animals throughout the year. That means managing animals in a different way.

This is usually a sensitive issue in semi-arid areas. After the harvest, herders often move their animals into the fields to graze on crop residues. The farmers are usually happy about this: the animals convert the stubble into valuable manure.

But conservation agriculture means keeping the soil covered with mulch or a cover crop, and preventing animals from trampling on and compacting the soil.

So herders and farmers who have set aside some of their fields for conservation agriculture may come into conflict.

It may be possible for the communities to agree for the herders to graze their animals on some fields freely, and to keep off the fields used for conservation agriculture.

If the land is communally owned, the whole community needs to be involved in controlling grazing.

## Fencing

Fences are one way of keeping animals out of fields. There are three types:

- **Metal fences** Wire netting or barbed wire fences are expensive but quick to erect.
- **Thorn bush fences** If there are dead thorn bushes nearby, you can drag them into place.
- **Living fences** Living fences take longer to establish than thorn bushes or metal fences, but they also produce firewood, act as windbreaks and provide shade. The best living fences are made of species that livestock do not browse on, such as *Balanites*, *Ziziphus* or *Euphorbia*, which are traditionally used for fencing. *Jatropha* seeds contain oil, which farmers can use as fuel or to make soap.

Which species of tree or shrub to use? [Check the table on the next page](#), and consult the local forestry department if necessary. Choose one or more species, collect the seeds, dry them in the sun and treat them with insecticide so you can store them until you need them. Grow the seedlings in a nursery, then transplant them to where you want the fence.

## Work animals

Various animals are used to pull farm implements: oxen, donkeys, horses, mules, camels and water buffaloes.

- Pulling equipment is hard work. Animals need to be strong and healthy. Before using them for work, give them extra feed and treat them for worms to build up their strength.
- Prevent animals from eating crops and residues when they are working in the fields. If necessary, put muzzles on them.
- Feed them well the night before they work so they are easier to control.

## Shrubs for living fences

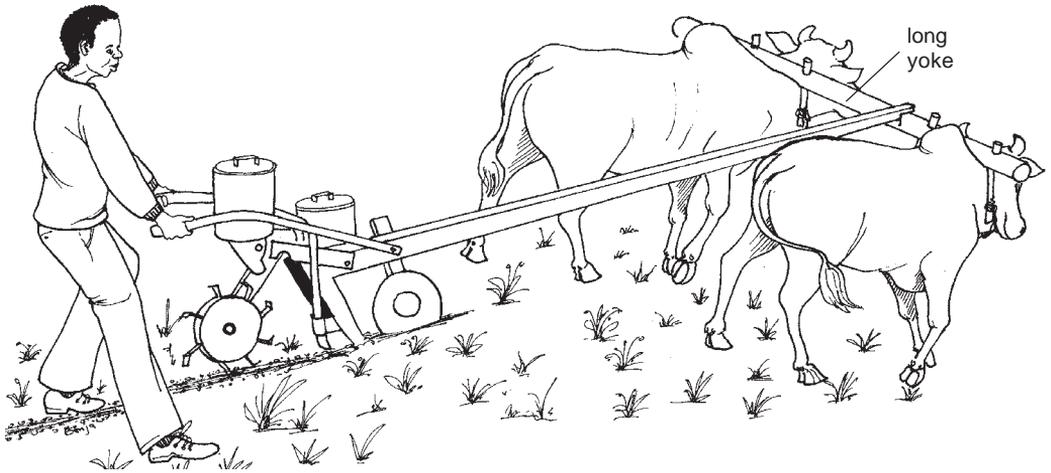
Common name	Scientific name	Fodder	Firewood	Fencing
<b>Humid areas</b>				
Sunn hemp	<i>Crotalaria grahamiana</i>			+
Sunn hemp	<i>Crotalaria paulina</i>			+
Tephrosia	<i>Tephrosia candida</i>		+	+
Tephrosia	<i>Tephrosia vogelli</i>			+
Sesbania	<i>Sesbania sesban</i>	+	+	+
Gliricidia	<i>Gliricidia sepium</i>	+	+	+
Grevillea	<i>Grevillea robusta</i>	+	+	+
Calliandra	<i>Calliandra</i>	+	+	+
Leucaena	<i>Leucaena trichandra</i>	+		+
<b>Dry areas</b>				
Acacia	<i>Acacia</i>	goats	+	+
Desert date	<i>Balanites aegyptiaca</i>		+	+
Euphorbia	<i>Euphorbia</i>			+
Jujube	<i>Ziziphus</i>	+	+	+
Kei Apple	<i>Dovyalis caffra</i>		+	+

## Training animals

- Train the animals so they get used to pulling conservation agriculture equipment (subsoilers, rippers, planters, sprayers and knife rollers). Animals are trained to follow the previous furrow line. Conservation agriculture equipment uses a long yoke: a little more than twice the width of the distance between the planting rows ([see page 58](#)).

A normal yoke used for ploughing is only about 75 cm long, so the animals are close together and in bodily contact as they work. Changing to a long yoke means that they no longer have this mutual support. Training them to work with a long yoke takes 2–3 days.

- Both the animals and operators need to get used to the new equipment. For example, subsoilers have no wheels, so are harder to turn at the end of the row.



*The long yoke is needed to get the right spacing between the rows in conservation agriculture. Animals take time to get used to being further apart when they work.*

