

Box baling for cheaper animal feed

A cheap way to make straw bales helps small livestock farmers in the tropics cut costs and raise profits.



Above: Many small-scale farmers depend on the crop residues left after the cereal harvest to feed their animals in the dry season, when grazing is scarce. Developing countries produce enough crop residues each year to feed all their animals for 6 months. But straw is bulky and transport costs are high. Bales are a much cheaper and more efficient way of transporting feed.

Millions of small farmers in rural areas in the tropics keep goats, sheep and cattle, and the number of poor town and city dwellers keeping livestock is also rising. The main cost involved in keeping livestock is animal feed. And a large part of the cost of animal feed arises from having to

transport it from where it was grown to where it will be used. A simple method of baling straw and grass by hand brings down these costs by 10-20%.



Transporting feed straw: a big expense for livestock owners

The maize, sorghum and millet stover (dried stalks and leaves) left over after the harvest are important animal feeds, especially in the dry season. The same is true of grass and weeds—especially near urban areas. The best way to use crop residues is to let animals graze them in the field. However this is often not possible, which means that the stover has to be cut and carried to the animals. Unfortunately straw is bulky, and this makes it expensive to transport and store.

The cost of transporting animal feed has a big effect on the profitability of livestock keeping, particularly on small-scale farms which often rely on food produced elsewhere to feed their animals in the dry season. It also has a major impact on the many poor livestock keepers who keep their animals in stalls in or near towns and cities, because demand for meat and milk is growing. These urban livestock keepers can't put their animals out to graze and have to buy all the feed they need.

Handmade box bales: a cheap and easy solution

Making bales is an efficient way to pack loose feed that cuts transport and storage costs. However, small-scale farmers cannot afford baling machines. The answer is to make box bales by hand. This provides a quick, cheap and easy way of packing stover, straw and grass. Because the bales are less bulky than loose

stover or grass, they are much cheaper and easier to move and store. Box baling leads to gains of 10-20% for small-scale farmers.

The amount of space saved is huge. For example, a truck can carry up to twice the amount of straw when it's packed with bales as it can when it's loaded with loose straw.



Above: This truck carries 160 kg of loose straw



Above: Once the straw has been baled, the same truck can carry 260 kg (100 kg more)

Bales are also much easier to store and more resistant to rain and wind. Another advantage of bales is that farmers can easily count them, making it much easier for them to work out how much feed they have and how long it will last. Bales are also easy to handle, and can be carried by women and children, which is an important point because feeding animals is often their task.

Making stover into bales does not only cut transport and storage costs—it also improves the diets of livestock by making it easier to give them the large amounts of fodder they need. This is important because the stover and straw farmers rely on to feed their livestock in the dry season is not very nutritious. It's hard for animals to digest and contains little protein, and few vitamins or minerals. So, they need to eat a lot to get enough nourishment to produce milk, to put on weight, to draw ploughs or carts, or produce healthy offspring. If farmers have cheap ways of getting large amounts to their animals, they can offer them more.

Researchers found that the more stover animals are given, the more they eat. Plus, the animals will pick out the most nutritious parts, the leaves. This means that animals grow more quickly and produce more milk. What the animals don't eat isn't wasted, because what is left can be mixed with droppings and urine to make a good compost or mulch.

Farmers can also improve the quality of the feed they provide simply by stripping the leaves from the stalks when they are making their box bales. This doesn't mean that the stalks are wasted, because those stalks that are left behind add organic matter to the field.

The box baling technique is suitable for use with the straw and stover of many different types of crops. Farmers in Tanzania, Ethiopia and Bangladesh, for example, have been using it to bale maize, sorghum, millet, groundnut and barley stover, as well as rice and bean straw, hay and grass.

Box bales can be made from the straw and stover of **many different types** of crops

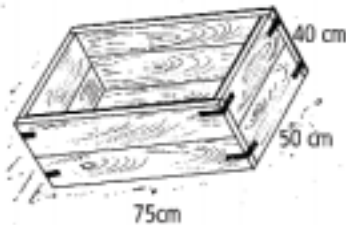
A step-by-step guide to making box bales

Box bales are quick and simple to make by hand. All producers need is a strong wooden box (which can easily be made locally) and some string. Farmers and researchers have worked together to develop the system and come up with the best size for the bales.

It's best to make the bales early in the morning before it gets hot. When it's hot the leaves get brittle and break. People selling grass by the roadside can make the bales while they wait for buyers.

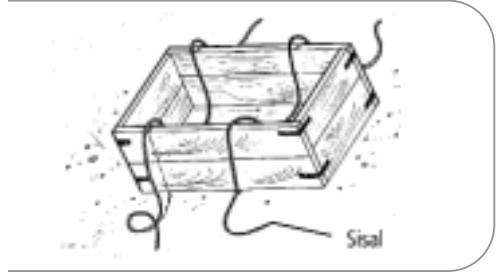
1. Make the box frame

Make a box 75 cm long, 50 cm wide and 40 cm deep from planks 2.5 cm thick. The box does not need a top or bottom. If you don't have wood or tools, ask a local carpenter to make a box. Bales made with boxes this size hold about 12 kilograms of stover.



2. Lay two pieces of sisal twine about 2 m long across the box so that they hang down inside it

The string must be long enough to be tied around the bale later.



3. Put the straw in the box and press down on it by standing on the stover to fill the box as much as possible

Gather the stover or straw. Strip the leaves from the stalks and chop them so that they fit in the box. Goats and sheep eat more stover when it's chopped. But cattle eat less. So, if the feed is for cattle, cut it to fit in the box but no more.

You may find that you can take the box to the field. Here you can pull the leaves from the stalks and put them straight in the box. This will save cutting and carrying the whole stover. Remember that the stalks make poor feed so leave them—they add organic matter to the soil and improve fertility.

Working in pairs is another good idea.

Push the leaves down as far as you can into the box with your feet.



4. Tie up the bale

Tie the sisal twine tightly around the bale.



5. Take the bale out of the box

Pull the bale out of the box or tip the box on its side and push the bale out. You now have a bale that is easy to move, stack and store.



Remember that the stalks make poor feed so leave them—they add organic matter to the soil and **improve fertility**



Bales cut transport costs

Bales stack neatly in a one-tonne pickup truck, so a lot more can be carried. If farmers don't have enough bales to fill a truck, they can share the cost with other farmers. Or, they could try to get the truck driver to agree a price per bale. This is a common way of paying to carry sacks of maize.

Bales will also fit into the trunk/boot of a car, or on its roof.

Bales take up less space in storage sheds

Bales should be kept out of the rain. But, they save space in the store shed because they can be stacked neatly. Farmers can store three times more stover if they make bales than if they store the stover loose.

Bales are easy to count, carry and use

This is important if livestock owners need to tell someone else to feed their animals, because they can tell them exactly how many bales to give. They can also very quickly check how much feed they have left and how long it will last.

Livestock owners must give the animals more than they can eat. This is because the more stover they get, the more they eat. This means they give more milk or gain weight more quickly.

Any feed left over makes good fuel, mulch or compost.

How have livestock owners benefited?

The benefits of using this simple technique can be very large. The experiences of small farmers keeping milking goats and cows in the highlands near Kilimanjaro in Tanzania are a good example. These farmers have to transport feed from the lowlands, and they found that they made 10% more money when they changed to box baling whole stover (the leaf *and* the stalk) and 20% more when they changed to box baling just the leaves.

Helping farmers learn the benefits

If they visit other farmers who are already using box bales, farmers can learn for themselves how to make the bales and use them. It will also give them a chance to ask 'is it worth it?' The other farmers may tell them that they earn more cash. But, they will probably also mention other benefits as well—for example their children may be healthier because they get more milk. Farmers can then decide for themselves whether or not they want to copy producers who are already using the technique.

Organising box baling competitions in a district is another good way of teaching people about box baling and spreading knowledge. The farmers who attend will learn from each other and pick up tips.



Above: In Bangladesh, competitions to make the best bales make learning fun. Photo: E. Owen

Bales cut transport costs

The idea for box bales came from researchers and farmers working together.

If you come across a problem, or come up with a way to improve on box bales, talk to researchers, farmers, NGOs, community groups and other extension workers. For example, in some areas money to buy boxes or build store sheds might be a problem. NGOs or community groups can help farmers to get together to help each other make the boxes or build the sheds. By putting your heads together, you can come up with simple solutions that can make a real difference.

For more information, please see the back page.



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How can I find out more?

For more information and leaflets on box baling in Swahili and English, please contact the Communications Group, RIU Programme, NR International, Park House, Bradbourne Lane, Aylesford, Kent, UK, ME20 6SN.
Email: w.richards@nrint.co.uk.

About this series

Research into Use *Pocket Guides* showcase new technologies that have been tried and tested, and have proven successful in the field. They were produced to demonstrate the importance of high-quality scientific communication.

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