



# Making High Quality SWEETPOTATO SILAGE

An Improved Tube  
Silage Making Method



*transforming into*





## *Sweetpotato Silage*

**Sweetpotato** silage is a method for preserving vines and roots in a succulent condition in a silo. Well-made sweetpotato silage is a wholesome and nutritious feed for all classes of cattle and pigs. Sweetpotato silage is made by fermenting chopped vines and roots of non-commercial value in the absence of air and can be stored for up to a year. Its protein content and digestibility makes it an excellent complement to grass feeds (Table 1). Silage can be made with only chopped vines or combined chopped vines with roots (at a ratio of 70:30) or with a grass like napier. The use of a ferment starter, like molasses, improves the process of fermentation and nutrient content. Use of sweetpotato silage can significantly increase milk yield by 15-20% as well as meat production. However, sweetpotato silage is underutilized in Sub-Saharan Africa because it is largely unknown. The best use of sweetpotato silage is during the dry season as it helps to maintain good milk and meat production levels.

**Table 1:** Nutrient value of sweetpotato vines and silage compared to Napier grass\*

	Moisture Content %	Crude Protein %	Neutral Detergent Fiber %	Metabolizable Energy (MJ/Kg)	Digestibility %
Sweetpotato vines; fresh	87	16.0	46	8.3	60
Sweetpotato silage; vine & roots	72	16.2	20	13.3	69
Napier grass, fresh	82	10.0	60	8.5	57
Napier grass; silage	80	9.5	56	7.8	66

Values on dry matter basis;\* at 6-8 weeks old.

## ● Why an improved method for sweetpotato silage?

The greatest challenge that farmers face when making sweetpotato silage is how to control the high moisture content in the sweetpotato vines. Typically, vines are wilted prior to making silage to remove excess moisture. However, many farmers have found it difficult to wilt sufficiently large volumes of vines which often results in spoilage during the silage making process.

The spoilage is due to excess water accumulating at the bottom of the silage container. This leaflet explains an innovative way of enhancing compaction and draining excess effluent (liquid waste) from the tube silo method of producing silage.

## ● How to make an improved plastic tube silo?

A silo is an airtight place or receptacle for preserving green feed for future feeding on the farm. To make an improved plastic tube silo you will need:

1. One 95 cm length, 4 cm diameter plastic (PVC) pipe (your drainage pipe)
2. 2.5 meters of 1000 gauge silage tubing (made of polythene), sold in 1 m diameter rolls
3. 230 cm of flexible rubber tubing, 2.75 cm in diameter
4. One 4 cm plastic tap which should have the same diameter as the pipe or a piece of soft wood if a tap is unavailable
5. A metal rod 0.9 cm in diameter for making holes on the PVC pipe
6. 7 meters of sisal twine
7. 3 wooden poles (can be cut locally), at least 1.2 m in length and 5 cm in diameter
8. 2 used 200 liter empty drums
9. 10 kg of molasses
10. 30 liters of water
11. 2 nails (length, 6cm)
12. 375 kg of fresh vines and 175 kg of fresh storage roots to make 500 kg silage

## TO MAKE THE TUBE SILO:

### STEP 1

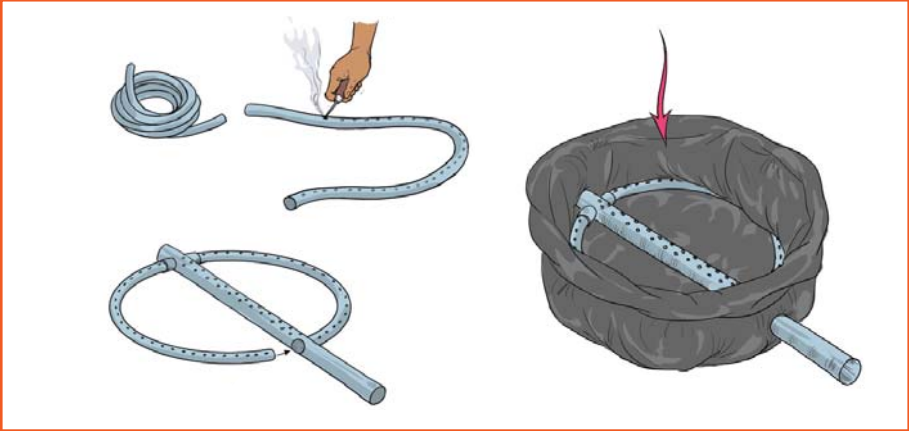


Figure 1. Making the internal drainage system for the silage tube

In the drainage pipe make 2 holes using a knife (4 cm from one end and 8 cm from the other end (this end will serve as the outlet)), each 2.75 cm in diameter (the same as the diameter of the flexible pipe), and one on each side of the pipe as shown in Figure 1.

### STEP 2

Heat the nails with a wood or charcoal fire. Drill small holes for drainage using the hot metal rod through the PVC pipe and in the flexible rubber tubing at intervals of 1 cm throughout their entire lengths as shown in Figure 1.

### STEP 3



Figure 2. Assembling the internal drainage system for the silage tube.

Pass the rubber tubing through the top holes in the drainage pipe, so that the open ends of the tubing align at the bottom of the pipe as shown in Figure 2.



## STEP 4



Figure 3. Sealing the bottom of the silage tube

To make a good seal at the bottom of the silage tubing, first open up the tubing. Then on one open end (that will be the bottom of the tube), make even pleats about 20 cm long starting from the end towards the centre on each side of the tubing. Then twist the pleats together and tie off with the rope making a strong knot. Then turn the tubing inside out, so that the tied knot is on the inside (Figure 3).

## STEP 5



Figure 4. Making the external drainage system of the silage tube

Make a 3.5 cm diameter hole using a knife at the side of the tube, about 43 cm from the tied knot. Then take the joined drainage pipe and rubber tubing and fit it into the inside of the silage tubing so that the bottom of the drainage pipe goes through the newly made hole, extending about 20 cm beyond the hole. Using the twine, tighten the plastic around the drainage pipe as shown in Figure 4.

## STEP 6

Fit a plastic tap or a piece of soft wood to the bottom of the exposed drainage pipe so that no effluent can flow out when the tap is turned off .

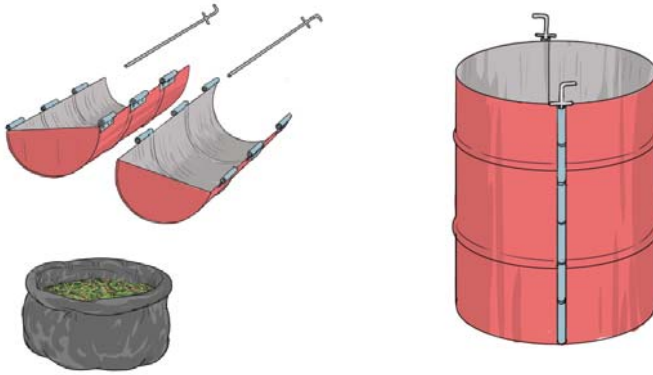


Figure 5. Making the compacting drum

To make a compacting drum measuring 86 cm in diameter and 120 cm in height first remove the top and bottom of each drum to make it hollow. Look for a shaded place to make and store the silage. Then cut each oil drum on one side, so that when joined the total diameter matches that of the silage tubing. To join the 2 drums together running lengthwise, have a welder make on each side 3 joints and one 75 cm long rod bent on one end to fit through the joints as shown in Figure 5.



## STEP 8

Figure 6. Placing the silage tube inside the compacting drum

Place the silage tubing inside the closed compacting drum, letting the excess tubing fold over the sides of the drum at the top. Ideally, the diameter of the tubing should be the same as or slightly larger than the drum for best results (Figure 6).



Figure 7. Preparing sweetpotato vines and roots for ensiling

To prepare the material for ensiling, chop the sweetpotato vines and roots to be ensiled into pieces not more than 2.5 cm long (Figure 7).



Figure 8. Preparing molasses

Prepare the molasses and water mixture by mixing 10 kg of molasses with 2 to 3 times as much water until the mixture can flow easily (Figure 8).



## STEP 11



Figure 9. Compacting the sweetpotato vines and roots in the tube

Fill the tubing with alternate layers of the chopped vines and roots and the molasses/water mixture. Each layer of vines and roots should be 20 to 30 cm high; then sprinkled with the molasses mixture until it is thoroughly wet on top. Each layer must be compacted before adding the next layer. One person can compact using feet as shown in Figure 9.

## STEP 12



Figure 10. Sealing the tube after ensiling

Bunch the excess tubing at the top together, remove all excess air so the plastic is in touch with the ensiled material and tie a tight knot, using the twine. Place heavy stones on top of the silo to ensure continued compaction during fermentation (Figure 10).





**Figure 11.** Anchoring the silage tube firmly on the ground

Remove the rods to remove the compacting drum. Anchor the filled tube silo with three poles to prevent the silo from collapse due to drainage of excess effluent from the silo (Figure 11).



**Figure 12.** Removing excess effluent from the silage tube

For the first five days, open the drainage tap daily and leave open until all the effluent comes out, then close (Figure 12). Then open the tap every 4 to 5 days thereafter and let any effluent come out. Fermentation is usually complete after 30 days.

## ● How do you know silage of good quality?

Well-prepared sweetpotato silage is bright or light yellow-green in color, has a strong smell similar to that of fermented milk and has a firm texture. Poor quality silage tends to smell similar to rancid butter or ammonia.

Sweetpotato tube silage should be stored under shade, for example in a store. Rodents like rats that could tear the tube need to be controlled. When feeding, open the tube and after removing the amount needed, remember to re-tie without trapping air inside.



## ● How much does it cost to make sweetpotato silage?

One tube holds about 500 kg chopped, well compacted silage. An example of the average cost of making one silage tube (prices for Central Kenya in March 2012, US\$ 1= 83 Kenya shillings [KSh]) is:

1. 2.5 m-length of 1000-gauge polythene tube cost Ksh 500 (US\$6.0).
2. 4 casual laborers can chop and compact 1 silage tube in 1 day. Each is paid KSh 300/day for a total of Ksh 1200 (US\$14.5).
3. To make 1 tube from sweetpotato vines and roots you need 20 liters of molasses costing KSh 650 (US\$ 7.8)
4. Cost of making the drum KSh 8,000 (US\$ 96.4). This is made only once and can be used many times.
5. Total variable cost of making one tube of silage from your own sweetpotato vines and roots will be KSh 2,350 (US \$28.3). We are assuming that the vines and roots are “free” to the grower.
6. It cost KSh 4.70 (US\$ 0.06) to make 1 kg of silage (full costing of the polythene tube included). However, if you are careful when ensiling you can use the polythene tube 4 times, thus reducing the cost of making silage.



# Everyone can make sweetpotato silage: men, women, young and old, rich and poor farmers!



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