Sweetpotato vines silage technology for livestock feeding

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A field of sweet potatoes at Sight Farm, Nakyesasa, Wakiso district

Introduction

Small-scale dairy cattle and pig production play a major role in Uganda’s economy considering their strong potential to provide employment and regular income opportunities along the entire commodity value chains. Women and the youth are the major contributors to and beneficiaries of small-scale dairy cattle and pig production systems, which, unfortunately, are gradually being less productive due to climate change and extreme weather conditions. Feeding is the most important constraint to production in smallholder pig and dairy cattle production systems. Feeding costs represent over 70 percent of the variable costs in smallholder farms in peri-urban and rural settings. This is due to seasonality, poor quality, high cost of feeds and limited knowledge on supplementation strategies. Feed shortages and fluctuations lead to poor production and productivity in cattle and pigs. As a result, smallholder farmers make extensive use of crop residues, grasses, weeds, kitchen leftovers and agricultural by-products which have very low in nutrients required for growth, production and reproduction on livestock.
Uganda is the third largest sweetpotato producing country in Africa. Sweetpotato contributes about 20% of total crop residues in form of vines, non-marketable roots and peels. One major negative attribute of sweetpotato residues is that although they are a good source of energy (roots) and protein (vines), they are highly perishable. To minimize the losses, farmers often feed large quantities of vines to pigs, goats and cattle during the two months of crop harvest when sweet potato is in plentiful supply. However, this practice is wasteful and farmers often have no feeds for their animals just 2-3 months later during the dry season.

Challenges in using sweetpotato residues as a feed resource

Sweetpotato residues are highly perishable. There are times after harvesting that farmers have a lot of sweetpotato residues which are wasted in the fields. Yet these same farmers have pigs and dairy cattle which would feed on these vines and roots. Research conducted in Kamuli and Masaka districts by the International Potato Center (CIP) and the International Livestock Research Institute (ILRI) showed that sweetpotato farmers waste on average 599 kgs of vines per acre per season. The study findings further indicated that majority of pig and dairy cattle farmers actively engage in sweet potato production and face feed scarcity between the months of February to July. In urban and peri-urban areas sweetpotato residues create a disposal problem as they are dumped within the markets after sale of roots. This causes an environmental hazard.

Sweetpotato silage production

In order to make good use of sweetpotato vines, peels and roots, a technology was developed by CIP and ILRI to conserve sweetpotato residues during time of abundance for use during periods of scarcity. Forage while still green and nutritious can be conserved through a natural ‘pickling’ process. Lactic acid is produced when the sugars in the forage plants are fermented by bacteria in a sealed container (‘silo’). Forage conserved this way is known as ‘silage’ and will keep for more than 2 years without deteriorating. Conserving sweetpotato vines as silage has potential to mitigate seasonal feed shortages and help cope with feed prices fluctuations that many smallholder pig and dairy cattle producers experience. It also provides opportunity to reduce waste in urban markets and at household level as well as opening up business opportunities for youth and women. Sweet potato silage technology has been piloted as one of the interventions to reduce feed costs in smallholder dairy and pig production systems in Wakiso, Kampala, Kamuli, Mpigi and Masaka districts. Some farmers are enthusiastic about the sweetpotato silage technology as they have taken it up as a business.
Ms. Martha Matovu of MADCO (0774112810) offers services to farmers to make sweetpotato vines silage

In this context it should also be noted that farmers who invest in silage production may not necessarily be cattle or pig owners. Silage is itself a valuable commodity for sale to other livestock owners. Youth and women groups without livestock can grow or buy sweet potato vines and make silage for sale within the community. This means that the potential of sweetpotato vines silage to contribute to the improvement of livelihoods goes beyond farmers who keep livestock or grow sweetpotatoes but can be extended far beyond to contribute extra source of income for other groups.

**Benefits from sweetpotato silage making technology**

- Helps to reduce wastage of valuable feed resources;
- Stable composition of the feed (silage) for a long period;
- Feeding sweetpotato silage is a convenient and inexpensive method of providing a range of nutrients required by the animal especially when lacking in existing diets.
- The protein content and digestibility of sweetpotato silage makes it an excellent complement to grass feeds.
- Ensiling reduces methane gas which contributes to global warming.
- Silage making provides a business opportunity for unemployed youth who loathe agriculture as a direct employment option.

**Sweetpotato silage making using plastic tube silo technology**

Tube silage making technology involves use of a tube (plastic polythene bag) as a silo. The technology is simple, cost effective and ideal for smallholder livestock farmers. Some innovative youths such as Bavubuka Twekembe group in Wakiso district have identified the technology as a business opportunity, and are not only making silage for sale but also offering training services at a fee.

The major advantages of tube silage making technology are:
• Ensures a regular supply of high quality sweetpotato silage, leading to good returns from the enterprise;
• Promotes conservation of excess residues ensuring high quality silage for the livestock at all times;
• It is easier to ration the silage at the time of feeding depending on the herd size;
• It is affordable for small scale farmers who make and use small quantities of silage at a time and;
• It is environmentally friendly since it does not release effluent, and the tube can be reused.

Materials required

Material requirements for the tube silage making technology includes:
- Sweetpotato residues
- Black polythene tubes, 2.5metres, gauge 600-800mm,
- Maize bran
- Forage chopper or a machete
- Tarpaulin
- 100- kg synthetic sac
- Weighing scale
- Sisal twine
- Labour to make silage

Silage preparation

1. Harvest or purchase the vines. If the vines are harvested from the field, spread the residues (vines) for at least one day to reduce the moisture content.

2. Spread a tarpaulin and chop the residues into to 2.5cm length pieces using a forage chopper or a panga (machete).
3. Weigh chopped sweet potato vines.

4. Sprinkle 10 kgs of maize bran to every 100 kg fresh chopped sweet potato vines and mix as evenly as possible. If non-marketable sweetpotato roots are available, a ratio of 75 kg of vines, 20 kgs of non-marketable roots and 5 kg of maize bran is used in making 100 kg of silage.

5. Pleat a black polythene tube (about 1.5 meters long, gauge of 600-800 mm for every 70 kg of residues) lengthwise. Tie firmly with a sisal twine at 30cm distance from the cut edge. Fold back the edge and tie once again to exclude the air. You can use plastic drums.

6. Turn the plastic tube bag inside out. Good reusable silo bags that can handle heat in silage are available in the Container shops, Kampala.
7. Roll down or fold back the top of the polythene tube. Place the tube into another synthetic sac used for packing sugar, salt, rice and maize flour. The synthetic sac protects the polythene tube from being damaged by rodents and hot weather.

A plastic silo bag being rolled into another synthetic sac

8. Place chopped sweetpotato vines into a "plastic bag" and compress the mixture firmly to drive out all the air. You can stand inside the bag and compress the mixture down thoroughly using the feet. Repeat the steps until the polythene tube is full.
9. Hold the top of the polythene bag firmly excluding the air. Tie the bag firmly with a sisal twine excluding the air in order to encourage the growth of fermentation bacteria.

10. Label the bags (Date and weight)

11. Store the silage under a shade, for example in a store. Rodents like rats that could tear the tube need to be controlled.
A simple store for silage

Trench silo method of making silage

1. A trench silo is built underground or semi-underground.

2. A tractor or heavy loads are used to compact the material within the silo.

3. The silo is covered with a plastic sheet, weighed down with soil. This helps maintain anaerobic conditions.
(a) Feeding sweetpotato silage to pigs

1. Remove enough silage to feed your pigs for a whole day.
2. Tie the bag again to ensure air or water does not get in.
3. A pig consumes 3-6 percent of its body weight per day. This means that a pig weighing 60 kgs requires 1.8 to 3.6 kg/day of sweet potato silage.
4. Weigh the pig weekly to know how much feed to provide.
5. Sweetpotato silage is best fed to pigs which are over 3 months and weigh more than 25 kgs.
6. Sweet potato silage (main feed) should be 60% of the total feed, the rest being supplement (See table 1 below).
7. Provide clean water.
8. Control diseases and pests
9. Maintain a clean environment
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<th>Ingredient</th>
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<tr>
<td>Salt</td>
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</table>

Source: Mutetikka et al. (2017)

(b) Feeding sweetpotato silage to lactating dairy cows

- Sweetpotato silage should be fed to lactating dairy cows as supplement (10% of its body weight). A-500 kgs liveweight will require about 5 kgs per day of sweetpotato silage.
- To prevent tainting the milk (off-flavor), do not feed silage to lactating dairy cows within 30 minutes of milking.
- Provide clean water and mineral supplements throughout the day.
- Provide adequate basal feed such as grass hay or fresh grass such as Napier.
- Supplement lactating dairy cows with about 4 kgs/cow/day of dairy concentrates to improve energy intake.
- Control diseases and pests.
- Maintain a clean environment for the animals.
- Provide clean water.

Acknowledgements

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