

Sweetpotato silage: Nutritious and affordable all year-round feed for pig farmers

In Uganda, researchers have finalized the supplementation strategy and the cost-benefit analysis for sweetpotato silage for pig production. This is expected to contribute to the transformation of the livestock industry whose major production constraint is expensive and poor quality feeds.



Fig 1. Chopping vines to prepare silage (credit G. Kyalo)

What is the problem?

In Uganda, high feed costs (especially commercial feeds) have steadily become a major constraint of pig production, representing 60 to 70% of the total production cost. The feed situation is exacerbated by feed scarcity, especially during dry season, and lack of good quality feeds. To mitigate these constraints, farmers often resort to using locally available feed resources, e.g., crop residues, plant leaves, swill and kitchen leftovers to feed their animals. Sweetpotato vines are among the most common crop residues utilized. They are only seasonally available and very perishable, deteriorating within 2 to 3 days after harvest.

Sweetpotato silage is feed made by preserving vines and roots in a succulent condition in a silo. Well-made sweetpotato silage is a wholesome and nutritious feed for cattle and pigs. Cost-effective sweetpotato silage recipes were developed and tested in Kenya during Sweetpotato Action for Security and Health (SASHA) Phase 1 project. Silage provides an opportunity to reduce waste in urban markets and can provide business opportunities for youth and women. However, the technology was not known amongst smallholder producers and had not been validated under Ugandan conditions.

What did we want to achieve?

Research on sweetpotato silage was one of the four projects under the umbrella of RTB-ENDURE project (2014-2016) implemented by the CGIAR

Research Program on Roots, Tubers and Bananas (RTB). The objectives of the project were to: (i) investigate options for silage making and supplementation; (ii) identify gender responsive models for organizing value chain actors to produce, conserve and market sweetpotato-based feeds; (iii) strengthen existing linkages between pig farmers and sweetpotato traders; and (iv) build business capacity for profitable silage making and pig raising. The challenge was how to integrate sweetpotato and pig production systems and demonstrate its benefits, in terms of increased productivity, affordable costs and savings in labor use, to smallholder and commercially-oriented Ugandan livestock farmers- especially women, who play a major role in pig production. Building upon the Kenyan experience, we have conducted adaptive participatory research with pilot farmers and youth entrepreneurs to test and validate the technological and economic feasibility of sweetpotato silage production and marketing.

Where we have been working?

We have been working in Kamuli and Masaka districts in Uganda.

How have we made it happen?

We have validated sweetpotato-based silage using various combinations of roots, cassava flour and legumes (Gliricidia and lablab) at Makerere University. We also evaluated best supplementation strategies on-station at Mukono Zonal Agricultural Research and Development Institute (MUZARDI) and on-farm using sweetpotato silage as a basal diet. For the on-farm studies, we conducted 24 on-farm trials with pilot farmers in Kamuli and Masaka districts (Fig. 1). Research was also conducted at Uganda Martyrs University (UMU) to determine the best dual purpose sweetpotato varieties and harvest times. We facilitated the development of gender responsive business plans for strengthening and promoting silage businesses. Studies were conducted to assess farmers' willingness-to-pay for silage as well as profitability of the silage enterprise.













Who are we working with?

Our partners are the:

- International Livestock Research Institute (ILRI)
- National Agricultural Research Organization (NARO),
- Makerere University,
- Uganda Martyrs University,
- Volunteer Efforts for Development Concerns (VEDCO),
- Coalition for Health, Agriculture and Income Networks (CHAIN)-Uganda,
- Pig Production and Marketing (PPM) and farmer organizations.

What have we achieved?

We determined the current pig feeding practices in Masaka and Kamuli districts, best bet sweetpotato silage diets on-station and validated them on-farm. Research on suitable dual-purpose sweetpotato varieties identified NASPOT 11 as a suitable dual purpose variety. We also determined levels of vine and root wastage at the smallholder farmer level, and established break-even prices for various silage preparation methods. We tested the willingness to pay for sweetpotato silage. Furthermore, a gender analysis enabled us to develop a gender strategy to guide interventions that benefit both men, female farmers and entrepreneurs.

Key findings:

• Sweetpotato vines and roots are the dominant ingredients in pig diets in Masaka and Kamuli during the wet season



Feed resources in the dry and wet season

- Daily weight gain of the pigs under conventional feeding is very low, 77-108 g per day.
- Sweetpotato farmers waste on average 599 kg and 125 kg of vines and harvested roots, respectively, per acre per season.
- All sweetpotato silage based diets had more than 17% crude protein which is more than the minimum recommended level for growing pigs.
- Feeding sweetpotato silage alone does not support optimum levels of weight gain and growth. The best level of supplementation was found to be 60% silage and 40%





Fig. 2 Demonstrating how to wilt chopped vines (credit G. Kyalo)

Fig 3. Content pigs enjoying their sweetpotato silage (credit G. Kyalo)

maize-soybean diet under farm conditions.

- It is 32% more expensive to produce a kilogram of pig carcass weight using farmer conventional feeding practices compared to the 60% silage--40% maize soybean meal (MSM) diet
- As the price of maize bran rises above Uganda shillings (UGX) 900, the 60% silage, 40% MSM diet becomes more economical with lower cost per kilogram of live-weight compared to the whole MSM diet.
- Smallholder pig farmers were willing to pay UGX 668 per kg of the sweetpotato silage based diet (60% silage, 40% MSM) compared to the current price of UGX 500 per kilogram of sweetpotato silage. This price was higher than the cost of preparing the diet (UGX 425), implying that the diets are potentially profitable for entrepreneurs involved in silage making and sale.
- NASPOT 11 had a root vine ratio of 1.25. NASPOT 11 is, therefore, a suitable dual-purpose variety.
- There were marked differences in access to and control of resources and benefits from sweetpotato and piggery enterprises among men and women.

During the period 2015-2016, the project produced two versions of the silage manual in English and the local language. We trained 585 (254 M, 331 F) farmers and extension workers in silage making (Fig. 2) and supplementation and pig management (Fig. 3). We also trained 129 farmers (92 M, 37 F) in entrepreneurial skills and marketing. We launched three silage business centers (2 in Masaka and 1 in Kamuli). The centers serve as one one-stop shops for silage production and marketing related information, provide training services to farmers and entrepreneurs, and offer silage making services as well as silage for sale. The project also supported the development of 14 gender responsive business plans: 11 for silage business entrepreneurs (either individuals or groups) and 3 for expanding the operations of the silage business centers established. The business plans are already being piloted.

What's next?

We are still finalizing publications from the project. We are also looking for funds for outscaling the sweetpotato silage technology in Uganda and the neighboring countries.

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