

Nutritious and affordable sweetpotato-based silage contributes to the feed bottleneck solution for small-scale pig farmers

The RTB-Endure project in Uganda is approaching its end. Researchers have developed an innovative business model to promote and commercialize sweetpotato silage to tackle the constraint of livestock feed shortages. The cost structures of silage at different stages and preferred silage recipes have been determined.



Fig. 1 Content, well-fed Ugandan piglets (credit S. Quinn).

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❖ What is the problem?

There are over 3.2 million pigs in Uganda (2011 survey figures) (Fig. 1). Uganda has the highest per capita consumption of pork in East Africa, 3.4 kgs per person per annum. However, in Uganda, quality commercial concentrate pig feeds are expensive, while other locally available feeds are seasonal in nature and often of poor quality. Feed accounts for about 62% of the total production costs in pig farming and the problem is further compounded by farmers' limited knowledge of supplementation strategies. To mitigate feeding costs, farmers often resort to using locally available feed resources, e.g., crop residues, plant leaves (*Ficus natalensis*), swill and kitchen leftovers to feed their animals. Sweetpotato makes up about 20% of total crop residues provided by roots and tuber crops and farmers in Uganda currently feed an estimated 1.9 - 2.7 kg per day of sweetpotato residues to pigs. However, sweetpotato vines, which are the most commonly used form of fodder, are highly perishable and seasonal in nature.

Silage (fermented, high moisture stored fodder) is a relatively easy and affordable technology that farmers can use to conserve roots and vines for feeding pigs in times of scarcity and helps cope with seasonal feed prices fluctuations that many smallholder pig producers experience. 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 at the household level can open up business opportunities for youth and women. However, the technology is not known amongst smallholder producers and has not been validated under Ugandan conditions.

❖ What do we want to achieve?

Research on sweetpotato silage is one of the four projects under the umbrella of RTB-ENDURE, a three year project (2014-2016) implemented by the CGIAR Research Program on Roots, Tubers and Bananas (RTB). This project aims 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 by December 2016. Our challenge is 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.

❖ Where are we working?

We are currently working in Kamuli and Masaka districts in Uganda. Our intention is to eventually be able to scale the technology up and out within East and Central Africa.

❖ How have we made it happen?

Building on experience generated with partners in Kenya, 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 as well as best-bet options for the organization of the value chain in Uganda (Fig 2). We have validated sweetpotato-based silage

recipes using various combinations of roots, cassava flour and legumes (*Gliricidia* and *lablab*) at Makerere University. These results formed the basis of on-station feeding trials at Mukono Zonal Agricultural Research and Development Institute (MUZARDI) to evaluate best supplementation strategies based on sweetpotato silage as a basal diet. This then paved way for 24 on-farm trials with selected farmers in Kamuli and Masaka. Research has also been conducted at Uganda Martyrs University (UMU) to determine the best dual purpose sweetpotato varieties and harvest times. Promotion and commercialization of silage is being guided by a business model that focuses on innovation and change in the way silage production is organized. To understand the economic viability and social acceptability of silage, studies have been conducted to assess farmers' willingness-to-pay for silage as well as profitability of the silage enterprise.

✦ Who are we working with?

We are working with the International Livestock Research Institute (ILRI), the 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 so far?

We have determined the current pig feeding practices; best bet sweetpotato silage diets on-station; and validated these diets on-farm. We have further identified one suitable dual purpose sweetpotato variety; and also established the amount of vine and root wastage currently occurring at smallholder farmer level. We also determined the break-even prices for various silage preparation methods. Furthermore, a



■ Fig. 2 Participants at a training of silage making in Masaka (credit P. Lule).

gender analysis enabled us to develop a gender strategy to guide interventions that will benefit farmers and entrepreneurs of both sexes.

Key findings;

- An analysis revealed a gendered division of labor in sweetpotato root and silage production, as well as pig rearing.
- There were also marked differences in access to and control of resources and benefits from sweetpotato and piggery enterprises among men and women.
- On average, sweetpotato farmers waste 599 kg of vines and 125 kg of harvested roots per acre per season.
- All sweetpotato silage based diets had more than 17% crude protein which is greater than the recommended level for growing pigs.
- Feeding sweetpotato silage alone does not support optimum levels of weight gain and growth.
- Under farm conditions, pig performance is improved by up to 50% when 40% of the sweetpotato vines silage is replaced with a concentrate. The best level of supplementation was found to be 60% silage and 40% maize-soybean diet.
- Use of sweetpotato vine silage for pigs can even out the supply of feeds on smallholder farms.
- NASPOT 11 that was de-topped yielded more than the crop that had not been de-topped by 12% and had a root vine ratio of 1.25. NASPOT 11 is therefore a suitable dual purpose variety.
- Preliminary results showed that silage made using the tube silo method and own vines had the lowest break-even price.

We have produced a number of training materials and scientific publications that can be accessed on the project website (www.rtb.cgiar.org/endure/). We also trained 350 farmers and extension workers in silage making and supplementation. We have also launched a silage business center in Masaka District (Fig 3). Aside from being a one-stop center for silage production and marketing related information, it also provides training services to farmers and entrepreneurs, silage making services and also offers silage for sale.

✦ What's next?

We are finalizing results from a willingness-to-pay for silage study as well as scientific publications and technical reports on the above research areas. Three silage centers are also being completed in Masaka and Kamuli districts while seven entrepreneurs are being supported to finalize their business plans which will guide their silage based businesses.



■ Fig. 3 Launch of the silage business center in Masaka district (credit CIP Uganda).

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