

Exploiting sweetpotato as an animal feed in East Africa

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Sweetpotato offers great potential as an animal feed in sub-Saharan Africa (SSA) but its potential use as a feed or dual purpose (food and feed) crop has not been fully exploited. Dry season feed shortage has long been a problem in many parts of SSA. Researchers have developed an improved silage tube and tested the resultant sweetpotato silage with pig farmers in Kenya.



■ Farmers admiring sweetpotato silage in improved tube (credit S. Agili)

✿ What is the problem?

East Africa has the highest per capita consumption of livestock products among all the regions in SSA. High population pressure has led to increasing competition between food grains and feed resources. East African smallholders engage in dairy, pig, and dual-purpose goat (meat and milk) production. However, high population pressures have increased the competition for grains for use as food or feed. The problem is compounded by a lack of quality feed year-round, with major feed shortages during the dry season that severely affect the lactation cycle.

Quality feed concentrates are too expensive for many farmers, so they use mixed crop and livestock systems that draw heavily on locally available feed ingredients. For example, pig farmers in Kenya currently use commercial feed as a protein source and supplement it with sweetpotato vines and low quality maize. Dairy farmers rely on Napier grass. However, Napier grass requires significant amounts of land and has been hit by a recent outbreak of disease, which has added to the urgency of finding

alternative, more productive feeds.

Increased use of sweetpotato as animal feed can be part of the solution. Sweetpotato vines provide more protein and dry matter per unit area than other staple feeds and require less land to produce. Kenyan researchers have found that 4 kgs of vines could replace 1 kg of dairy concentrate. However, in contrast to China, where 25-30% of sweetpotato is used as animal feed, the potential of dual purpose and forage varieties in SSA has not been fully exploited and little land is allocated to sweetpotato for feed.

✿ What do we want to achieve?

Our challenge is to integrate enhanced sweetpotato production with improved dairy cattle and pig productivity to the benefit of smallholders and, ultimately, consumers. To accomplish this we need the right kind of dual purpose (bred for food and feed) or forage sweetpotato varieties (vines only). We also need to know how to effectively integrate them into existing livestock systems to improve farmers' profits and product quality.

Building on its vast experience with partners in China, CIP will guide adaptive participatory research to test the economic feasibility of silage and leaf protein supplements, both produced from sweetpotato leaves, as part of feeding regimes. We want to build capacity and interest in conducting sweetpotato feed research in SSA, with researchers capable of using the LIFE-SIM computer simulation model to determine appropriate feeding regimes to test, based on the availability and cost of feed resources in different seasons.

✿ Where are we working?

By undertaking the dairy components of this research directly with farmers participating in the East African Dairy Development (EADD) Project and pig producers contracted by Farmer's Choice,



Science for a food secure future

Partners include:

East African Dairy Development project (EADD):

- Heifer International, International Livestock Research Institute (ILRI),
- World Agroforestry Centre (ICRAF)
- Technoserve (TNS)
- African Breeding Services (ABS)
- World Agroforestry Centre (ICRAF)

Farmers Choice Ltd, Kenya
University of Nairobi, Kenya
Egerton University, Njoro, Kenya

Kenya Agricultural Research Institute (KARI)
Ministry of Agriculture-Rwanda
Agricultural Board/Research (RAB)
Umutara Polytechnic University in Rwanda



■ Pigs enjoying sweetpotato silage in growth trial (credit S. Agili)

the largest pork product manufacturer in East Africa, results from this 3.5 year research effort will be immediately available to users. In Kenya, we are working in the Central, South, and North Rift Valley regions and at the University of Nairobi. In Rwanda, we are working in the Eastern Province where the EADD project is based (Nyagatare, Rwamagana, and Gatsibo districts).

✦ How are we making it happen?

Under this component, 4 Master's students are conducting the major research components, with supervision from their professors (University of Nairobi and Egerton University) and CIP and ILRI scientists. Two MSc students are evaluating pre-screened sweetpotato germplasm for biomass production under different cropping regimes and their potential as dual-purpose varieties in Kenya and Rwanda. A third student is adapting simple, low-cost, silage-making techniques using sweet potato roots and vines, other feed resources and legumes. A fourth student is modeling and testing new feed production and feeding strategies based on optimizing sweetpotato-legumes-other feed resources-pig interactions.

✦ What have we achieved so far?

The major achievements by the Animal Feed team are:

1. Identification of the improved variety from Uganda, NASPOT-1 as the best bet dual purpose variety for Kenya, based on screening 6 improved varieties against a local check in six sites.
2. Results from Rwanda varietal trials indicate that local varieties, especially Mugande, were superior to introduced varieties for dual purpose use.
3. Mini-silo experiments on-station demonstrated that the use of silage additives such as cassava meal, maize meal and molasses produces high quality

silage and ground poultry manure produces poor quality silage. Sweetpotato varietal differences exist in terms of the dry matter and protein content of the final silage.

4. An improved method for draining a silage tube containing chopped sweetpotato vines and roots was developed and tested in participatory way with several dairy farmers. A brochure describing how to make the improved silage tubing and the cost for producing silage was produced and is available on www.sweetpotatoknowledge.org.
5. A survey of 161 pig farmers in 7 districts of eastern Kenya was conducted in 2011. Among farmers producing forage, 48% grew sweetpotato for pig feed. However, use of sweetpotato silage was unknown.
6. On-farm pig feeding trials with nine farmers selected from Maragua, Kirinyaga, and Embu districts of Kenya were conducted in February and March of 2012, and analysis of data is on-going to determine the most profitable combination of sweetpotato silage and purchased concentrate.
7. Twenty-one scientists (13 males and 8 females) drawn from Kenya, Uganda, Rwanda and Mozambique were trained in the use of the LIFE-SIM model in August 2010 and it was employed in the design of the pig feeding trials and some additional mini-silo silage trials.
8. Experiments in protein extraction found that all protein could be extracted from sweetpotato leaves using the isoelectric point method, and 48.5% using the thermal method. The protein content in the stems is too low to have a significant extraction.
9. 2 students have submitted their theses for defense, and two are still in preparation, due for completion by November 2012.

✦ What's next?

Mini-silo trials exploring the best combinations of Napier grass and sweetpotato or maize stover and sweetpotato vines are under way, with results due in September 2012. Final results from the silage trial with pigs are expected by October 2012.

This SASHA component ends in December 2012. There is tremendous interest in continuing this work for dairy cows and pigs, expanding fresh vine and silage research, utilization and potential commercialization, in Uganda, Ethiopia, and Burundi in addition to Rwanda and Kenya. Including dairy goats should be considered as well as investing in the development of cold tolerant sweetpotato varieties.

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