Exploiting sweetpotato as an animal feed in East Africa

SASHA Sweetpotato Action for Security and Health in Africa

AUG 2013

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 on growing pigs with small-scale farmers in Kenya.

Pig feeding on sweetpotato silage (credit Amos Kiragu).

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 for land between food grains and feed resources. East African smallholder farmers engage in dairy, pig and dual-purpose goat (meat and milk) production. However, high population pressures have increased the competition for grains between food and 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 in dairy animals.

Quality feed concentrates are too expensive for many farmers, thus they draw heavily on locally available feed ingredients. For example, pig farmers in Kenya currently use commercial concentrates as a protein source supplement it with sweetpotato vines. Dairy farmers rely heavily on Napier grass which requires a significant allocation of land and has of late been hit by an outbreak of disease, which has added to the urgency of finding alternative feeds.

Increased use and production of sweetpotato as animal feed can be a key part of the solution. Sweetpotato vines provide more protein and dry matter per unit area than other feeds. Researchers in Kenya have reported that 4 kgs of vines could replace 1 kg of commercial 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 production 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 there is need to identify the dual purpose (bred for both animal feed and human consumption) or forage sweetpotato varieties (vines only). Ways of effectively integrating them into existing livestock systems to improve farmers' profits and product quality need to be investigated.

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. There is need to build capacity and interest in conducting sweetpotato feed research in SSA, combined with the use of the LIFE-SIM computer simulation model to come up with appropriate feeding regimes based on the availability and cost of feed resources in different seasons.

Where are we working?

By undertaking this research directly with dairy farmers participating in the East African Dairy Development (EADD) Project and pig producers contracted by Farmer's Choice, the largest pork product manufacturer in East Africa, results from this 3.5 year research effort were immediately available to users. In Kenya, we worked in the Central, South, and North Rift Valley regions and at

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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

the University of Nairobi. In Rwanda, we worked 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 conducted the major research components, with supervision by the faculty from respective universities (University of Nairobi and Egerton University), CIP and ILRI scientists. Two MSc students evaluated 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 adapted simple, low-cost, silage-making techniques using sweet potato roots and vines, other feed resources and legumes. A fourth student did modeling and tested new feed production and feeding strategies based on optimizing sweetpotato-legumes-other feed resources-pig interactions.

What have we achieved so far?

1. 3 out of the 4 students participated in the poster contest during the 3rd Annual SPHI technical meeting held from 11th to 13th September 2012 in Nairobi, Kenya. This provided the students with an opportunity to learn how to prepare and publically present a poster.
2. A brochure on sweetpotato varieties screened for dual purpose in Kenya was developed. This brochure outlines the nutrient content and root vine ratios for these varieties. Morphological characteristics and performance of these varieties at different agro-ecologies were also included.
3. A preliminary report for a survey that involved 161 pig farmers in 7 districts of eastern Kenya has been completed. Intensive (total confinement) was the most preferred pig production system. Grazing or scavenging system was least preferred (1% of the respondents). There was lack of controlled breeding programs resulting inbreeding on many farms. The most popular breeds of pigs were Largewhite, Landrace and Saddleback. Most of the respondents (69%) kept sows, growers (10%), and boars (9%) as well as finishers and growers (6%). The pricing of pigs during sale was decided by husbands (39%), both man and wife (30%) and wife only (22%). Respondents reported lack of knowledge in basic management skills necessary to increase productivity, which explains in part the poor weight gains and low profits on average in the current pig system.
4. On-farm pig feeding trials with nine farmers selected from Maragua, Kirinyaga, and Embu districts of Kenya were concluded, a preliminary report prepared. Findings, using the Ugandan NASPOT 1 variety, show that silage of 15-30% with 3 parts vine and 1 part roots and molasses with combination of 70-85% concentrate resulted in good weight gain and greatly reduced feed costs and improved meat quality of pigs grown by contact farmers linked to commercial meat processors.
5. Two MSc. students have graduated and two are in final stages of thesis preparation and due for completion by November 2013.
6. Mini-silo trials exploring the best combinations of Napier grass and sweetpotato or maize stover and sweetpotato vines have been concluded and final results are expected by October 2013.
7. Testing of silage quality made from sweetpotato vines and roots plus other forages available on-farm using Mini silo plastic containers was concluded at Nairobi University, department of Animal Production; nutrient analysis of samples was done at the ILRI laboratory in Addis Ababa, Ethiopia. Data analysis is on-going and full report will be due by end of November 2013.
8. Nutrient analysis of 248 dried samples of sweetpotato storage roots for NIRS validation was concluded at the University of Nairobi and CIP, Lima. Full report will be due by end of November 2013.
9. A successful feedback workshop for partners was held during this period. The was to get feedback from stakeholders on the results obtained so far and capture lessons learnt by participating farmers through their experiences in the project. A total of 38 participants (32 males and 6 females) attended the workshop. During the workshop extension materials and lessons learnt were shared amongst implementing partners which included East African Dairy Development project, Farmer's Choice, Nairobi and Egerton Universities, the Ministry of Agriculture and Fisheries and participating farmers.

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 preliminary results due in November 2013. Final results from the silage trial with pigs are expected at the same time.

The field work for the animal feed component of the SASHA project ended in December 2012. There is tremendous interest in continuing this work, expanding fresh vine and silage research, utilization and potential commercialization, in Uganda, Ethiopia, and Burundi in addition to Rwanda and Kenya. Expanding the work to include dairy goats should be considered as well as investing in the development of cold tolerant sweetpotato varieties.

Silage made from modified silage tube (credit Sammy Agili).

CONTACTS

Ben Lukuyu (ILRI)
b.lukuyu@cgiar.org

Sammy Agili (CIP)
s.agili@cgiar.org