Exploiting sweetpotato as an animal feed in East Africa

SASHA Sweetpotato Action for Security and Health in Africa

AUG 2014

Sweetpotato offers great potential as an animal feed in sub-Saharan Africa (SSA). Research to identify appropriate dual-purpose varieties for Kenya & Rwanda, sweetpotato-based silage recipes and an improved silage tube was conducted by four students earning their Master's degrees and scientists at CIP, ILRI, and the University of Nairobi.

Animal feed Masters students Remy Niyireba, Amos Kiragu, James Kinyua, and Lonita Manoa (credit J. Low)

What is the problem?

East Africa has the highest per capita consumption of livestock products among all the regions in SSA. 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. Quality commercial concentrate feeds are too expensive for many farmers, thus they draw heavily on locally available feed ingredients.

Increased use and production of sweetpotato as animal feed can play a role to the solution of this feed scarcity. Sweetpotato vines provide more protein per unit area than other feeds. 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.

What did we want to achieve?

Our challenge was 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) and effectively integrating them into existing livestock systems.

Building on its vast experience with partners in China, CIP led the adaptive participatory research to test the economic feasibility of silage as part of feeding regimes. The team drew on the already developed LIFE-SIM computer simulation model to determine appropriate feeding regimes based on the availability and cost of local feed resources in different seasons.

Where did we work?

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 research effort were immediately available to users in Kenya. In Kenya, we worked in the Central, South, and North Rift Valley regions and at the University of Nairobi. In Rwanda, we conducted research 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.

What have we achieved?

1. A workshop on Simulation Models to Assess Year-round Feeding Strategies in

CENTRO INTERNACIONAL DE LA PAPA CIP

A member of the CGIAR Consortium

SPHI Sweetpotato for Profit and Health Initiative

Reaching 10 million African households by 2020

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

Smallholder Crop-Livestock Systems: Incorporation of Sweetpotatoes into Animal Feeds was held 24-26 August 2010 for 21 scientists (13 males and 8 females) from Kenya, Uganda, Rwanda and Mozambique.

2. An improved silage tube system was developed which involved installing a drainage pipe to remove excess moisture. We produced and distributed a step-by-step how brochure on how to construct the tube and make sweetpotato silage.
3. Six cultivars were evaluated at five highland sites in Kenya under rain fed conditions. The variety Gweri was most promising for forage production. Naspot 1, Kemb 23, Kemb 36, and Wagabolige were well performing dual purpose types. Note vines harvested on 75 days after planting had higher crude protein contents than those harvested on 150 days after planting.
4. In Rwanda, performance trials using 9 varieties were conducted at 9 sites selected on varying levels of intensification of livestock management. Mugande, a local variety, was identified as the best for dual purpose use among the 9 types. Results also showed that cutting the vines for feed at 80 days after planting nearly doubled vine yield without affecting root yields, except for one variety. An article has been published on this work.
5. A baseline study undertaken that involved 161 pig farmers in 7 districts of eastern and central Kenya showed that the intensive (total confinement) production system was the most popular production system used by most respondents. 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 men only in 39% of households, both man and woman in 30% and only by the woman in 22% of households. Respondents reported lack of knowledge in basic management skills necessary to increase productivity.
6. On-farm pig feeding trials with nine farmers selected from Maragua, Kirinyaga, and Embu districts of Kenya were concluded, and a report written. Findings, using the Ugandan NASPOT 1 variety, show that a combination of 15-30% sweetpotato silage (consisting of 3 parts vine and 1 part roots) with 70-85% concentrate and a small amount of molasses reduced feed costs and improved meat quality (leaner pigs).
7. Two MSc. students have graduated. Lonita Manoa thesis was entitled "Evaluation of dry matter yields and silage quality of six sweetpotato varieties". James Kinyua completed "Assessing the potential of sweetpotato cultivars and energy and protein supplement for dairy cows in highlands of Kenya". The third, Remy Niriyeba, has presented his thesis entitled "Evaluation of the screening of sweetpotato germplasm for biomass production of 8 cultivars and their potential as dual purpose varieties in eastern province, Rwanda" for external examination. The fourth student, Amos Kiragu, is still working on his final draft of "Use of sweetpotato vines and roots silage in pig nutrition".
8. Mini-silo trials exploring the best combinations of Napier grass and sweetpotato or maize stover and sweetpotato vines were concluded and data analysed. Combinations with Napier were used because it is the most popular grass used by farmers and maize stover is the dominant crop residue on-farm. The best combination of 75:25 for vines and roots gave an estimated protein content of 14.75% with 82% digestibility. The combination of 50:30 for vines and Napier grass with roots fixed at 20% gave the best estimate of crude protein -- 9.70% with 80% digestibility. Increments in vine percentage tend to increase crude protein content, but the addition of Napier decreases the protein and digestibility.
9. A successful feedback workshop was held 21st June 2013 in Eldoret, Kenya. A total of 38 participants (32 males and 6 females) attended the workshop to share extension materials and experiences.

What's next?

Articles will continue to be published based on research findings. 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. Cold tolerant varietal trials will be conducted by KARI from 2014 through 2016 under SASHA Phase 2. Funds must be sought to support the other desired activities.

Sweetpotato silage conserved for 3 months in improved tube (credit S. Agili)

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