Eastern Africa Agricultural Productivity Project (EAAPP)

Enhancing Adoption of Napier Grass Varieties Tolerant to Stunt Disease for Increased Feed Availability in Smallholder Dairy Systems in East and Central Africa



Healthy plants



Napier grass plants affected by stunt disease

Achievements (September 2011- February 2013) and Planned activities (2013-2014)

March 2013

Introduction

The Eastern Africa Agricultural Productivity Project (EAAPP) is a World Bank funded regional project contributing to enhanced agricultural production and productivity in Uganda, Kenya, Tanzania and Ethiopia for the project commodities of Cassava, Dairy, Rice and Wheat. The objectives of EAAPP are to: (i) enhance regional specialization in agricultural research; (ii) increase regional collaboration in agricultural training and dissemination and, (iii) facilitate increased sharing of agricultural information, knowledge and technology across national boundaries. EAAPP -Uganda Project IDA was launched in Uganda in March 2011.

The EAAPP implementing agencies and units in Uganda are: National Agricultural Research Organization (NARO), Uganda under which are the Cassava Regional Center of Excellence (CRCoE) located at the National Crops Resources Research Institute (NaCRRI), Namulonge. Dairy research component (coordinated by the National Livestock Resources Research Institute), Rice, Wheat, Value addition; the Departments of Animal Production and Marketing and Crop Protection under the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) for assurance of dairy cattle breeds and quality seeds respectively; and National Animal Genetic Resource Centre and Data Bank (NAGRC&DB) to support increased access to and use of Artificial Insemination (AI) and high yielding dairy breeding stock. National Agricultural Advisory Services (NAADS) is charged with training and dissemination of technologies and knowledge.

Importance of dairy production in ECA region

Dairy production is of strategic importance in addressing the Millennium Development Goals (MDG). Intensification of dairy sector contributes to sustainable land use in food production. The environmental benefits include enhanced nutrient recycling through crop residues feeding and manure utilization for crop production. Leguminous fodder augment nutrient benefits through biological nitrogen fixation. The increasing demand for dairy products provides a market driven incentive for investment in dairy sector for food and income security. The direct beneficiaries are often women who own the animals and earn proceeds from sale of their products.



Intensive smallholder dairy cattle production is a major source of employment particulary for rural women

These families derive nutritional benefits from consumption of milk especially in HIV/AIDS affected families. Indirect beneficiaries are poor households who get employment opportunities in the feed and/or milk processing and marketing sectors of the dairy value chain.

Dairy research component objectives

- Screen and promote promising Napier grass varieties tolerant to Napier stunt disease.
- Formulate nutritionally valuable supplemental feeds for the dairy cattle and its calf.
- Improve milk and meat production capacity of local cattle populations through selection and crossbreeding.
- Develop and promote technologies to improve detection of mastitis, milk-borne zoonoses and drug residues in milk.
- Improve East Coast Fever (ECF) control by contributing towards efficient vaccine development.
- Strengthen capacity of stakeholders and scientists.
- Package and disseminate research results.

Enhancing adoption of Napier grass varieties tolerant to stunt disease for increased feed availability in small holder systems in East and Central Africa

Constraint to Napier grass production

Intensive dairy industry in ECA countries is threatened by Napier stunt disease. It affects Napier grass (*Pennisetum purpureum*) which constitutes 40 to 80% of fodder base under cut-and-carry (zero-grazing) dairy production system in the region. In Kenya and Uganda, more than 1 million smallholder dairy producers rely on Napier grass as a major source of feed. Anecdotal evidence suggests that the disease has been spreading in the region and threatening the feed supply base in the smallholder dairy sector. The disease has been recorded in Kenya, Tanzania and Uganda and recently in Rwanda and Burundi.



Affected fields at Mahwa Research Station in Burundi (Feb 2013)

Previous (2007-2010) attempts to mitigate Napier stunt disease in ECA region

The project on "Napier stunt and smut resistance" funded by the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) focussed on quantifying the extent of and raising awareness on Napier stunt disease in Kenya, Uganda and Tanzania. The research resulted in identification of potentially stunt tolerant Napier grass varieties and options for management practices that can be used to control and mitigate the impact of stunt disease in other parts of the region. Kenya Agricultural Research Institute and more particularly its Regional Dairy Research Centre at Naivasha (RDCoE), developed and disseminated Napier grass varieties that are tolerant to Napier stunt disease.

	support for all expenditure. The project should confirm to the Bank the refund of the identified ineligible expenditure of US$ 20,000.			implementing agencies. Accountability requirements have been re-emphasized. Periodic Examination of Accounts are undertaken to ensure adequate support to all expenditures. Proper
13	The project should ensure the audited financial statements for FY ending June 30, 2012 are submitted by the December 31, 2012.	December 31, 2012 deadline		EAAPP Audited Financial statments for FY 2012-13 are in place.
Procurement management				
14	Delayed civil and construction works. The program, in coordination with the CRCoE should prepare a detailed and time bound action plan for the civil and construction works before to complete the civil works on time and share the same with the World Bank.	December 31, 2012	PCU	A time bound action plan for civil works at NaCRRI has been developed and shared. Completion of construction is slated in April 2014. Details in Appendix.
Safeguards				
15	All project (and relevant sub project) reports to include a section on environmental and social safeguards compliance. All sub projects with potential for adverse impacts should make the necessary budgetary provisions for mitigation measures. The overall project plan and budget should make the necessary provisions for implementation of envirnomental and social safeguards.	15 December (AWPB 2013)	PCU All implementing agencies	All projects have been submitted to ASARECA for feedback on safeguard issues. Training of staff on safeguards is underway. EAAPP Uganda has formally assigned the Program Officer under the CRCoE the role of reporting on ESS compliance
Inclusiveness innovation				
16	The project needs to develop and practical action plan to improve gender and youth mainstreaming in training support, research project and scaling-up activities. This should be shared with the World Bank.	January 31, 2013		A concept note on Gender mainstreaming had been developed.

Notes: Strengthening the ZONAL implementation strategy to help to scale up implementation of the NAADS EAAPP program.

- Under ATAAS/EAAPP framework, Zonal NAADS structures have been established to provide and strengthen the linkage between regional districts, ZARDI, NAADS/NARO Secretariat, private partners and other stakeholders.
- NARO/NAADS technical team in agro-ecological zone is composed of, Director, ZNC, Scientists, TLIO, SMSs, DNCs, SNCs, AASPs
- **At the zone**: Planning and review with stakeholders, Innovation Plat forms, Support to DARSTs, capacity building to stakeholders along value chains
- Zonal implementation strategy doing very well for ATAAS, fair for EAAPP

WB Aide Memoire & action areas on NaLIRRI

- Focal point persons (NaLIRRI, NAGRC & DAPM) met on 3rd Jan 2013 and agreed that there is no overlap of activities:
- NaLIRRI will undertake on-farm and on-station comparison of the Shorthorn Zebu, their crosses with dairy breeds and the pure exotic dairy breeds--they use the farmers' Zebu cattle in Katakwi, the recently purchased Zebu cattle and pure exotic heifers.
- NAGRC&DB will offer technical expertise in the synchronization of the selected herds.
- NaLIRRI undertakes research on feeds and disease control.
- NaLIRRI to provide technical expertise on pasture improvement at the LES and Njeru Stock Farm.
- The stock under NaLIRRI are for on-station work while those purchased under NAGRC&DB are for multiplication to give to farmers countrywide
- NAGRC&DB will offer technical expertise in the implementation of the synchronization program in Katakwi planned under breeding research by NaLIRRI.
- NaLIRRI will facilitate the team to offer this expertise, provide the hormones and other supportive structures.
- NAGRC&DB will train AI technician from the local government in Katakwi district
- Action has been taken to improve efficiency in dairy activities under EAAPP by ensuring joint planning and review meetings and progress reports.
- A MoU was developed and signed by the heads of NAGRC and NaLIRRI and NAGRC has accepted to provide Liquid Nitrogen to NaLIRRI after the Liquid Nitrogen Plant has been installed.

Annex 1: Responses to the MTR Recommendations

	Activity Detail	Timeframe	Responsibility	Progress
PDO and indicators				
1	The EAAPP PDO outcome and intermediate outcome indicators and their targets need to be revisited and streamlined. Revised draft outcomes, outputs indicators and their targets should be prepeared and shared with the Bank for consideration.	January 30, 2013	PCU and ASARECA	ASERECA organized 2 meetings where outcomes, output indicators and tagets for EAAPP were revised.
Regionality				
2.	Regional Integration/collaboration: ASARECA would finalize the seed policy related issues among countries (IPR, standard, certification) and share with the program countries and the World Bank for consideration.	January 10, 2013	ASARECA + Country programmes	ASARECA has received Uganda's inputs on these policies
Livestock/Dairy R&D				
3.	The Program should facilitate the harmonization process between the three institutes working on Dairy R&D. The priority EAAPP dairy activities should be clearly defined and managed as per comparative advantage of involved partners. Progress in this regard will be reported to the PSC and the Bank.	January 10, 2013	Programme Coordination Unit	Meeting held with these DAPM, NAGRC&DB and NaLIRRI and agreed on one's area of comparative advantage. No duplication of effort was glaringly identified. A MoU was developed between NaLIRRI and NAGRC&DB for the purpose.
4.	The program should coordinate with NAGRC&DB and ensure that sufficient resource is allocated to avail quality feed and veterinary services to the heifers and report the progress to the World Bank.	December 15, 2012	Programme Coordination Unit with NAGRC&DB	Meetings have been held with WB, NARO and NAGRC&DB on the imported heifers. Resources have been duly allocated to the heifers for proper management. Other requirements have also been incorporated in the workplan 2013-14
5	Subsequently, alternative arrangements should be made to relocate some of these dairy foundation stocks to a second site where their management will be less expensive.	To be implemented end February 2013	Programme Coordination Unit with NAGRC&DB	Arrangements have been made to transfer these animals. 35 acres have been ploughed and sowed for pasture establishment at Njeru Stock farm to facilitate the transfer. The dip tank has also been rehabilitated. Water troughs worked on and fence repaired.
6	NAGRC&DB and NaLIRRI, should develop a MoU specifying the mechnanisms on how NaLIRRI, could get delivery of sufficient liquid Nitrogen for its research and development activities. The program will facilitate this activity and share the draft MoU to the Bank for review and approval.	January 15, 2013	Programme Coordination Unit with NAGRC&DB and NaLIRRI	MoU is n place
Seed Multiplication and Certification				
7	A detailed plan for quality seed production and distribution should be established in order to scale-up farmers' access to improved seeds, planting material and breeds. This plan should cover the entrie seed value chain, from breeder to certified commecial material, for the remaining progreamme implementation period and be integrated into the AWPB 2013.	December 15, 2012	Programme Coordination Unit with all R&D stakeholders	The plan has been developed based on decentralized seed system under Zonal NAADs arrangement (See appendix for details)
8	It is expected that the National Seed Testing Laboratory will be granted the ISTA accreditation within a period of about six (6) months.	May 2013	PCI/MAAIF/Crop Protection	Annual payment effected. Laboratory seed documenttion submitted to ISTA. Plans are underway to send officer to attend Annula Seed Conference
AWPB 2013				
9	The program should ensure a coordinated planning process between the research and extension units for realistic delivery of improved seeds, breeds and planting material. This should be reflected in the annual work plan and budget (AWPB) to be reviewed and endorsed by the Program Steering Committee.	Revised draft AWBP to be shared with the World Bank by December 31, 2012 (before submission to the Program Steering Committee)		Revised AWPB developed and shared among stakeholders. PSC approved the plans.
10	The 2013 AWPB should reflect the agricultural technology transfer and scaling-out plan.			Scaling–up of cassava and rice varieties, increase in AI uptake and rapid multiplication of napier grass clones have been prioritized.
Financial Management				
11	Low disbursement. The draft disbursement projection of the program for the remaining implementation period fo the program by category would be shared with the Bank by for review and agreement.	December 31, 2012	EAAPP Coordination Unit	Disbursement projection developed and shared with WB and other stakeholders.
12	All the implementing agencies could ensure proper management of project financial records and adequate			Proper management of of financial records and adequate support for all expenditure are complied to by all

Current (2011-2013) efforts to mitigate Napier stunt disease

The project on "*Enhancing adoption of Napier grass varieties tolerant to stunt disease for increased feed availability in smallholder systems in East and Central Africa*" funded under EAAPP is being implemented in Uganda, Kenya, Tanzania and Ethiopia. The expected project outputs/results are:

1. Enhanced generation of technologies and innovations for managing Napier stunt disease in ECA region.
2. Enhanced adoption of appropriate policies to facilitate transfer of forage genetic materials within the region.
3. Strengthened capacity for stakeholders to utilize technologies for managing stunt disease.
4. Enhanced availability of information on management of Napier stunt disease.

Results/Activities/Achievements (2011-2013)

Result 1: Enhanced generation of technologies and innovations for managing stunt in ECA region

Activity 1.1: Review literature on Napier stunt disease research in Uganda

Previous research on Napier stunt disease conducted in Uganda was reviewed and documented. A report "*A review of research on Napier stunt disease in Uganda*" was produced and shared with collaborators in Kenya, Uganda, Tanzania, Burundi, Rwanda and Ethiopia.

Activity 1.2: Country inception meeting

A project inception meeting was held in April 2011 at Mukono Zonal Agricultural Research and Development Centre (MUZARDI) to select study sites and discuss methodologies and share roles. The meeting was attended by 42 (13 women) participants .

Activity 1.3: Regional consultation meeting for RDCoE, 1st to 3rd December 2011

The meeting was held in Kenya and attended by 19 research team members from Uganda (4), Kenya (13), Tanzania (1) and Ethiopia (1). The objective of the meeting was to harmonize planned regional activities. During the meeting, direct commissioning of 5 regional projects was recommended:

1. Enhancing adoption of Napier grass varieties tolerant to stunt disease for increased feed availability in small holder systems in East and Central Africa.
2. Exploiting market opportunities for value added dairy products.
3. Preventing and controlling East Coast fever and zoonotic diseases.
4. Define and harmonize food safety and standards and organize users along value chain.
5. Improving indigenous cattle for dairy production through targeted selection and cross breeding.

Activity 1.4 Baseline survey

A baseline survey was conducted in Katakwi, Jinja and Kiruhura districts representing major Agro-ecological Zones (AEZ) of Uganda; the Eastern Semi-Arid Zone (ESAZ), Lake Victoria Basin (LVB) and Western Rangelands (WR), respectively. The objective of the survey was to assess extent of spread and incidence of Napier stunt disease in major agro-ecological zones in Uganda.

Highlights of survey results

(a) Majority of the respondents (76%, n=150) in the LVB reported the occurrence of Napier stunt disease on their farms. Thirty two (32%) of the respondents reported the disease in the WR while no respondent reported the occurrence of the disease in the ESAZ.
(b) The high prevalence of the disease in the LVB was attributed to the increased cultivation of improved Napier varieties that are highly susceptible to the disease. The reported absence of the disease in the ESAZ may not necessarily mean that the disease has not affected the region but because farmers devote no efforts on fodder cultivation making it difficult to notice such diseases.
(c) Farmers in the ESAZ mostly depend on local Napier grass varieties in the wilderness which are either tolerant to NSD or farmers have not taken time to diagnose the disease. Also, because only few farmers have taken the initiative to cultivate Napier in ESAZ, the farmers may be ignorant of the occurrence of the disease but yet in the actual sense, they have the disease. This was evidenced during the survey when the farmers mistook the disease for inadequate soil nitrogen implying that many could be ignorant about this disease.
(d) Fifty percent (50%) of the farmers faced with disease ranked it as high (>10 diseased plants in 20 plants) while 35% ranked it as moderate (between 5-10 diseased plants in 20 plants). Only 15% of the affected respondents ranked it as low (< 5 diseased plants in 20 plants).

Activity 1.5: Inventory of feeds and feeding systems technologies for scaling up/out

An inventory of feeds and feeding systems technologies and innovations for scaling up/out was developed and shared with the collaborators. These included:

(a) Use of trellis for small-scale pasture seed production
(b) Cereal-forage legume intercrop for food and fodder production
(c) Napier grass-forage legume intercrop
(d) Calliandra leaf hay for increased milk yield
(e) Lablab hay as a dry season protein supplement
(f) Nutrient feed blocks.
(g) Homemade concentrates.
(h) Sweet potato vine-based partial milk substitute
(i) *Brachiaria* hybrid cv. Mulato 11 for intensive and semi-intensive dairy production systems

Activity 1.6: Screen and promote Napier grass varieties tolerant to Napier stunt disease

Twenty two (22) tolerant Napier grass varieties were obtained from Alupe Research Station in Kenya in September 2011 following phytosanitary procedures. The varieties were screened for disease tolerance, herbage biomass yield and nutritive quality.



Mass propagation of Napier grass clones in a screen house at the National Crops Resources Research Institute (NaCRRI)



Napier Stunt Disease screening trial at NACRRI

The varieties were established at the National Crops Resources Research Institute (NaCRRI), Namulonge located in Central Uganda. The plots were first harvested two months after planting to determine the herbage biomass yields, and the subsequent harvestings were done in two month's interval for seven times.





Measuring plant height and herbage biomass yield

Highlights of Research results (September 2011 to March 2013)

(a) Disease severity continued to build up in the field with increasing number of harvests and differed significantly between varieties.

(b) Varieties: 103, 117, 79, RBN, 79SN and 117 can be described as **susceptible**.

(c) Varieties: 105, 112, 16702, 16789, 16805, Kakamega 1, Kakamega 2, Kakamega 3 and 97 had not showed much disease symptoms by the 7th harvest and such can be described as **moderately resistant**.

(d) Varieties: 104 and 76 had the highest area under Disease Progress Curve (AUPDC) as such are described as **highly susceptible to NSD** (Figure 1).

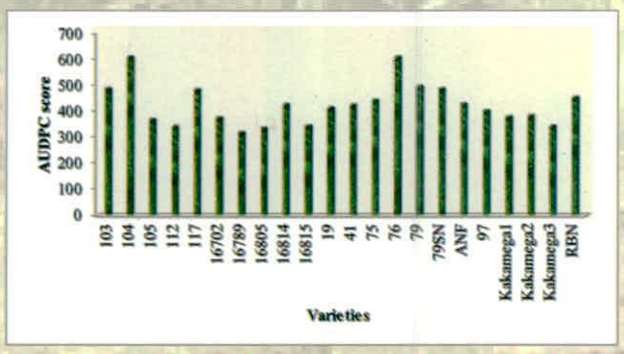


Figure 1: Area Under Disease Progress Curve (AUDPC) for the different Napier grass varieties

(e) Comparison of the disease onset and progress over time between the moderately resistant and susceptible indicated that in the susceptible varieties, the disease onset was as early as 4 months after planting while in moderately resistant, disease onset was after 6 months after planting. Generally the disease progressed faster in the susceptible varieties than in the moderately resistant (Figure 2).

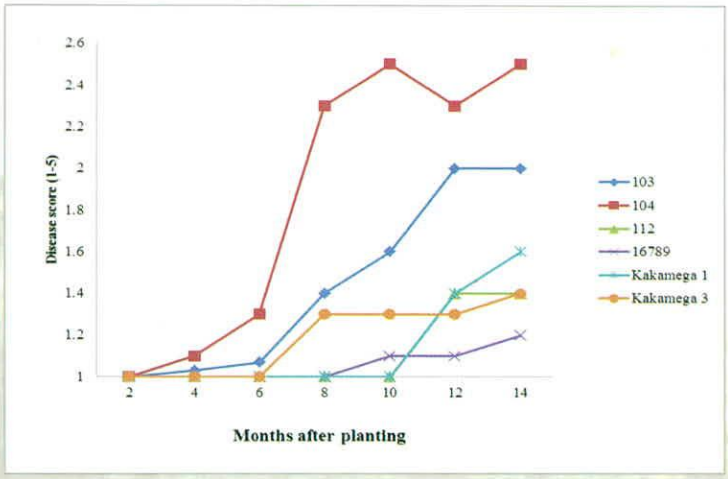


Figure 2: Napier stunt disease progress on different Napier varieties over time (1 = no symptoms, 2 = very mild symptoms, 3 = medium mild symptoms, 4 = severe symptoms and 5 = very severe symptoms)

(f) On the contrary, the varieties which had more disease build-up, on average had higher biomass (t/ha) yield (Figure 3).

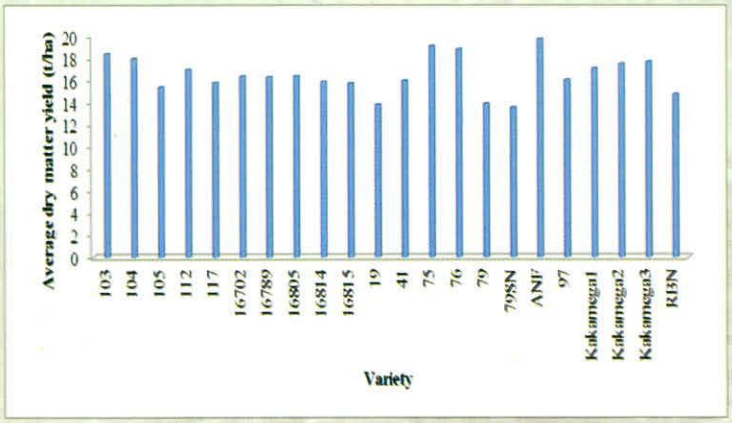


Figure 3: Average dry matter yield (t/ha) of the different Napier grass varieties

(g) Nutrient composition of different Napier grass varieties varied (Table 1). Variety SN79 which became susceptible to the disease 4 months after planting had higher protein content (9.2%) and lower fibre content (55%) than all other varieties (Table 1).

Table 1: Nutrient content of different Napier grass varieties being evaluated in Uganda

Variety	ADF (%)	ASH (%)	CP (%)	DM (%)	NDF (%)
103	34.1	13.42	6.78	90.4	62.5
104	33.41	13.8	6.8	90.1	60.2
105	31.68	14.38	8.32	90.4	59.2
112	33.52	15.48	7.65	90.5	58.2
117	31.91	13.75	7.55	90.1	58.9
16702	32.59	14.98	7.42	90.2	58.6
16789	31.52	13.21	7.65	90.3	60.4
16805	31.9	13.78	7.99	90.3	60.1
16814	30.58	13.84	8.5	90.2	58.4
16815	30.63	13.64	8.4	90.1	58.0
19	33.75	13.97	7.3	90.4	61.2
41	31.37	14.90	8.4	90.4	58.2
75	32.3	12.97	7.4	90.4	61.8
76	33.32	12.97	6.7	90.3	62.3
79	30.91	15.01	8.5	90.6	58.5
79SN	29.19	14.5	9.2	90.0	55.5
97	31.85	14.11	7.3	90.1	59.0
ANF	34.13	13.11	6.4	90.3	62.8
Kakamega1	32.10	13.81	7.3	89.9	58.8
Kakamega2	33.42	14.49	7.3	90.3	59.7
Kakamega3	33.2	13.64	7.1	90.3	61.2
RBN	30.47	15.11	8.9	90.3	56.0
LSD	1.7	1.3	1.1	0.4	2.1



79SN (Sugar cane x Napier grass) variety



Kakamega 1, a promising tolerant variety

Activity 1.7: Multiplication of promising tolerant Napier grass varieties

(i) Kakamega 1 and Kakamega 2 were multiplied on 8 household farms in Mafubira sub-county, Jinja district.

(ii) Kakamega 1, Kakamega 3 and 16789 will be multiplied in Rwanda and Burundi under a new "*Napier stunt disease project*" funded by ASARECA and launched in Kigali on 13th February 2013.





Multplication of promising Napier grass varieties in Jinja District

(i) Activity 1.8: Evaluate and promote alternative forages and feed resources

With additional funding from ASARECA, the project evaluated and promoted ***Brachiaria*** hybrid cv. Mulato ii and the use of maize stover as alternative feed resources to Napier grass fodder in Wakiso, Jinja, Kiruhura, Kampala and Masaka districts.

(i) Introducing 0.5 ha of a mixture of Brachiaria and forage legumes on farms previously dependent on 0.5 ha of a mixture of Napier grass and forage legumes, provided year round feed supply.

(ii) The research team formulated a complete feed ration based on maize stover (60%), fodder tree leaf hay (25%) and agro-industrial by-products (bentonite clay, maize bran and cotton seed cake) (15%). The protein content of the ration is 14.7%. The ration can substitute Napier grass fodder by 50%.

Activity 1.9: Impact assessment study

An impact assessment study was conducted in December 2012 in four districts of Uganda; Jinja, Mbarara, Mukono and Wakiso where EAAPP Napier stunt disease project activities had been implemented in the last 12 months. Respondents were assessed on level of farmers' satisfaction with the technology dissemination pathways used.

Highlights of study findings:

(a) Generally, Napier was the most adopted forage species with 75% (n=150) of respondents having adopted it between January to December 2012.

(b) Highest rates of Napier adoption were reported in Wakiso (93.3%), Mukono (76.7%), Jinja (73.3%) and least in Mbarara (56.7%).

(c) In Jinja, Mukono and Wakiso districts, Napier was the most adopted forage with establishments of 0.57, 1.45 and 0.73 acres respectively. Because of the limited land holdings in Jinja, Mukono and Wakiso districts, the predominant dairy farming system practiced is smallholder zero grazing system. As such, the greatest need is availability of high biomass yielding forages that suit the cut and carry system rather than large areas of low yielding pastures. This explains the increased adoption and availability of Napier in most households in Jinja, Mukono and Wakiso compared to Mbarara where extensive dairy production is practiced.

(d) Farmer's perceptions on gender responsiveness of technologies/innovations disseminated ranged from 9.4% to 39.8%. The highest level of gender responsiveness was reported on technologies on establishment and utilization of improved Napier varieties (39.8%) while the lowest (9.4%) was recorded for technologies concerning silage making.

(e) All technologies and innovations had very low responsiveness to the needs of youths and special groups.

(f) Establishment and utilization of improved Napier varieties (60.8%), establishment and utilization of alternative fodders (36.7%) and hay making (19.2) were highly ranked for gender responsiveness for women, while preparation and use of homemade rations (20.8%), and utilization of crop residues (28.3%) were towards the side of men.

(g) There were only eight dissemination pathways accessed by over 40% of the respondents; farmer to farmer (83.3%), extension officer (81.7%), radio (75%), research officer (60%), exchange visits (53.3%), agricultural shows (52.5%), family and friends (50.9), and print material (46.7).

Result 2: Strengthened capacity for stakeholders to utilize technologies for managing Napier stunt disease

(a) Three thousand three hundred and thirty nine thousand (3,339) stakeholders (2,049 female) were trained on NSD control/management strategies in Masaka, Mbarara, Kiruhura, Soroti, Kampala, Wakiso, Mukono, Gulu and Jinja districts.

(b) Three (2 female) project staff visited the Regional Dairy Research Centre of Excellence in Kenya

(c) Eighty nine (55 women) dairy farmers visited study sites at NaCRRI

(d) World Bank review mission wrap-up meetings in Kenya and Uganda

(e) The World Bank review mission visited project site at NaCRRI in November 2012

(f) The research team participated in agricultural shows in Jinja and Soroti districts.

(g) Research results were presented during a Napier stunt disease project inception meeting in Kigali, Rwanda, 13th to 16th February 2013.





Agricultural shows and field visits were used to disseminate project activities



Visit of Uganda research team to the Regional Dairy Centre Of Excellence (RDCoE), Kenya



Visit of RDCoE, Kenya research team to Uganda.

Output 3: Enhanced availability of information on NSD control and management technologies

The research team packaged and disseminated information through:

(a) Baseline survey Report (2011)
(b) Impact assessment survey report (December 2012)
(c) Radio and television news
(d) Newspaper articles in The East African and New Vision papers
(e) Project progress reports
(f) Field reports
(g) Publications (Table 1):
(h) Video documentaries

Table 1: Publications

Authors	Title of paper	Conference where the paper was presented
1. Papers/posters presented during scientific conferences		
Kabirizi J., Mugerwa S., Ziwa E., Lukwago G. and Namazzi C.	Napier stunt disease incidence and management in Uganda	Animal Production Society of Kenya scientific conference held in Njeri, Kenya, April 2012
Mugerwa S., Kabirizi J., Zziwa E. and Lukwago G.	Utilization of crop residues and agro-industrial by-products in livestock feeds and feeding systems of Uganda	Animal Production Society of Kenya scientific conference held in Njeri, Kenya, April 2012
Kabirizi, J., Mulaa, M. Mugerwa, S. Kawube, G. Lukwago, G[4]., Olowo, R., Namazzi, C., Aleu, J., Namagembe, A. and Mukalazi, S.	Enhancing adoption of Napier grass resistant/ tolerant to stunt disease for increased feed availability in small holder systems in East and Central Africa: Achievements (2011-2012)-poster	NARO Scientific conference, 30th September to 2nd October 2012
2. Published papers/in press		
Mugerwa S., Kabirizi J., Zziwa E. and Lukwago G	Utilization of crop residues and agro-industrial by-products in livestock feeds and feeding systems of Uganda	International Journal of Biosciences (IJB) ISSN: 2220-6655 (Print) 2222-5234 (Online) Vol. 2, No. 4, p. 82-89, 2012 http://www.innspub.net
Kabirizi, J., Kawube, G., Namazzi, C., Mugerwa, S. and Mukalazi, S.	Enhancing adoption of Napier grass varieties tolerant to stunt disease for increased feed availability in smallholder dairy systems	Submitted to Uganda Journal of Agricultural Sciences
3. Farmer leaflets and brochures		
Kabirizi, J., Kirunda, H.; Oluka, J. and Mulindwa, H.	The Dairy research component	Brochure
Kabirizi, J., Kawube, G., Mugerwa, S.; Namazzi, C.,	Napier Stunt Disease management strategies for increased feed availability in smallholder farming systems in East and Central Africa	
Kabirizi, J., Kawube, G., Mugerwa, S.; Namazzi, C.,	Enhancing adoption of Napier grass varieties tolerant to stunt disease for increased feed availability in smallholder dairy systems in East and Central Africa: Achievements (September 2011- February 2013) and Planned activities (2013-2014)	

Planned activities (March 2013-2014)

Activity 1: Assess the effect of graded levels of cattle manure on the severity and incidence of Napier stunt disease

Justification

Information from Masaka district where Napier stunt disease (NSD) was first observed on farmers' fields in 2001 shows that amendment of Napier fields with cattle dung suppresses the effect of NSD on Napier grass production. Addition of cattle manure improves plant establishment, growth vigor and eventually biomass production from diseased Napier plants. The manure has also been noted to improve the leaf area index leading to high biomass production from diseased Napier grass plants. It seems that manure improves the growth vigor of the grass making it less susceptible to NSD. It is also possible that the manure modifies the micro and macro environments making the survival and proliferation of vectors hard. Despite the observed potential of manure in mitigating NSD on diseased grass plants, limited efforts have been devoted to evaluate the efficacy of the method on controlling NSD. This study will thus assess the effect of graded levels of cattle manure on the severity and incidence of NSD.

Study sites

The trials will be established at Kamyenyamiggo District Training and Information Centre in Masaka district, Buginyanya ZARDI, NaCRRI, Soroti and Mbarara ZARDI. The multilocation design of this trial will also cater for increased demonstration and popularization of the tolerant varieties and agronomic practices to farmers in all zones

Activity 2: Multiplication of tolerant Napier grass varieties

Promising varieties will be multiplied in selected sites representing major agro-ecological zones where smallholder dairy production is a major source of income. Promising varieties will be tested and multiplied in Rwanda and Burundi.

Activity 3: Capacity building of stakeholders

Stakeholders will be sensitized on: project activities, Napier stunt disease control strategies and use of alternative forages and feed management technologies and innovations through farmer workshops, scientific conferences, review and planning meetings and media (newspaper articles, radio and television programmes)

Activity 4: Package and disseminate research results

Research results will be published (scientific papers, farmer leaflets, manual and video documentaries)

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