THE NINETH SWEETPOTATO BREEDERS' ANNUAL MEETING

S. Tumwegamire, A. Naico, M. Andrade, R. Mwanga, and E. Carey

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Background

The 9th annual sweetpotato (SP) breeders meeting coincided with the 2nd implementation year of SASHA project. The theme of the meeting was *'Building an efficient and innovative sweetpotato breeders' community of practice'*. In the past the annual breeders' meeting has been helpful as a forum to share progress in SP breeding research and harmonize methods for breeding experimentation, data collection and analysis. The key objectives of the present meeting were: a) exchange information on progress in key research areas such as population breeding, molecular marker assisted breeding, and heterosis; b) share ideas on how best to engage farmers in the varietal selection and c) train on the latest version (2.0) of the CloneSelector. The list of participants and agenda are shown in annexes 1 and 2, respectively. The evaluation of the meeting is provided in annex 3.

Welcome remarks and introductions

Dr. Maria Andrade welcomed all the participants to Mozambique. The participants introduced themselves and were from 12 countries (i.e. Ethiopia, Ghana, Rwanda, Madagascar, Kenya, South Africa, Uganda, Tanzania, Burkina Faso, Malawi, Zambia, and Mozambique.) plus representatives from the Bill & Melinda Gates Foundation (BMGF), Alliance for Green Revolution for Africa (AGRA) and United States Aid for International Development (USAID). Unfortunately, the breeder from Nigeria couldn't make it due to not getting a transit visa for South Africa in time.

Opening Remarks

In his opening speech, Dr. Calisto Bias, the Director of Instituto de Investigação Agrária de Moçambique (IIAM), welcomed all the SP breeders plus representatives of BMGF, AGRA and USAID to the breeders' meeting in Mozambique. He recognized the relevance of the meeting's theme to Mozambique current situation. 'It is indeed necessary to be more efficient to speed up the process of getting SP varieties to farmers,' he said. He mentioned that agriculture was an important sector in Mozambique economy, and is therefore crucial to achieve the objectives of employment, food security and malnutrition, and poverty reduction. He informed the participants of the big potential contribution from orange-fleshed sweetpotato (OFSP) on improved livelihoods and this would be achieved with the new 15 released drought tolerant OFSP varieties in Mozambique. The varieties are a result of fruitful and longstanding collaboration between the International Potato Center (CIP) and IIAM. Dr. Calisto expressed gratitude for selecting Mozambique to host the Southern Africa Sweetpotato Support Platform (SSP-SA) which will breed drought tolerant populations for Africa and backstop SP germplasm management with IIAM's modern tissue culture lab facilities. He also appreciated other considerations for Mozambique by the Sweetpotato Action for Security and Health in Africa

(SASHA) project, like establishment of the quality lab. He declared the meeting officially opened and wished everybody fruitful deliberations.

Progress on sweetpotato breeding under SASHA project - Robert Mwanga

The main objective is to breed new populations with new methods for varietal development.
The specific objectives are:

i) Generate a radically expanded range of SP varieties that combine many traits with significant improvement in yielding ability.
ii) Generate by population improvement new populations for major needs. In Uganda, (for ECA) the focus is on virus resistance; In west Africa, the focus is on SP low in sugar content, close to cassava and yam since people like flat tastes in that sub-region; In Southern Africa, the focus is on drought tolerant populations. There are however, some traits that are cutting across the regions' needs e.g. β-carotene, and dual purpose varieties.
iii) Redesign SP breeding systems in the region to produce varieties in a short period, 3-4 years instead of 7-8 years.
iv) Adopt new breeding methods like heterosis and molecular markers for virus resistance breeding (markers help to screen seedlings compared to conventional breeding which takes long and is difficult to confirm).

Progress

i) Heterosis for storage root yield in SP has been demonstrated through experimentation
ii) The CloneSelector tool has been developed and is ready for use by the breeders. The tool will help to design trials, data collection and analysis, thus make the work easier for breeders.
iii) Accelerated breeding method for varietal development has been demonstrated in Mozambique. The method relies on using rapid multiplication of seedlings under screen house conditions to increase planting materials so that the breeder is able to evaluate the clones in different sites in the early stages evaluation/selection. Building on previous efforts funded by AGRA and HarvestPlus (HP), Mozambique has been able to release 15 OFSP drought tolerant varieties.
iv) Population development: This is long term and has been initiated in different regional platforms. In contrast, variety development takes a shorter amount of time. As the population development goes on NARS will access breeding clones or populations for variety development.
v) 142 parents for population breeding for the ECA region (based in Uganda) have been characterized using molecular markers. The parents will be replanted into two polycross nurseries as distinct populations.
vi) Near-infrared spectroscopy (NIRS) machines now exist for the three platforms to enable analysis of many breeding populations for e.g. content of protein, total carotenoids, Fe, Zn, Ca, and Mg. Two of these (Mozambique and Ghana) were sponsored by SASHA.
vii) Supported the development of AGRA funded projects for NARS in Rwanda, Malawi, Tanzania, Kenya, Nigeria and Zambia. Other countries (Ghana, Uganda, Kenya, Ethiopia, and

Mozambique) recently submitted their proposals for possible consideration under 2nd phase funding.

Comments and questions

a) More information on the 15 varieties released in Mozambique: Some have specific adaptation. Irene is the most interesting across agro-ecologies.

b) Have the released varieties been shared to other countries? - they have been cleaned in Kenya and will soon be shared with other countries.

c) Why make efforts to reduce sweetness in SP? Why not eat cassava then? - The potential of SP to yield is enormous and can effectively contribute to combating hunger. The efforts are aimed at improving food security. A lot of SP varieties with low sugar already exist and more can be bred as priority for SASHA in West Africa.

d) Is it really practical to cut short the breeding cycle under accelerated breeding - yes, this is possible through rapid multiplication of individual seedlings at early stages of clonal selection. In this way one can evaluate the materials in several sites as early as possible using un-replicated single plots of 3 plants.

e) How much of heterosis is obtained in SP? What is the future challenge of hybrid breeding in SP? Unlike cereals, there is no need for inbreeding (inbreeding is impossible in SP) to be able to realize heterosis. The breeder only needs different populations or individuals. When achieved, heterosis is fixed in SP since it is clonally propagated.

f) There is a challenge of seed (planting material) production through involvement of private sector.

Progress as of Year 2 -Non-Breeding (SASHA) Activities - Jan Low

SASHA project is part of the 10 year initiative which is a multi-donor initiative. The goal is to reduce child under nutrition and improve smallholder incomes in 10 million African families by 2020 through the effective production and expanded use of SP. SASHA is a 5 year foundation project of the wider initiative. Its purpose is to build the evidence base of what can be done with SP (i.e. proving the potential). The project will develop the essential capacities, products and methods to reposition SP in the food economies of Sub-Saharan Africa. The later phase will be aimed at delivery to scale (i.e. achieving the potential). However, there is some effort of delivery to scale that is already going on in Uganda and Mozambique. Other countries will be brought on board during the second phase.

Component activities

1. Seed systems Research Program: Overall, the research aims to establish demand-led cost-effective seed systems for the dissemination of new varieties and high quality planting material. The specific objectives are: i) develop and test strategies for the multiplication and

dissemination of SP varieties; ii) study the costs of disseminating SP vines using vouchers and trained farmer multipliers. The target is 150,000 households in Tanzania in 3 years (Marando Bora); iii) ensure that SP varieties can be maintained in a disease-free state over time at the sub-regional level and that safe and efficient germplasm exchange occurs between countries i.e. develop field level diagnostic kits for virus detection.

Marando Bora (Going to Scale with better vines) in Tanzania

The project within Seed Systems aims at testing feasibility of going to scale with better vines. It is building on an earlier cassava seed systems project by Catholic Relief Services (CRS). Up to 35,479 diseases free plantlets of 7 SP varieties have been multiplied by a private sector company in Kenya (GTIL) and hardened at Maruku Research station in Tanzania.

This is building on the cassava multiplication groups with CRS, but has proved difficult due to heavy water demands by sweetpotato than cassava, meaning the same sites might not work; and the fact that cassava is a men's crop while SP is women's crop.

Progress

- Storage in sand and sprout (SSS) system has been demonstrated to farmers. This is the system of storing SP roots in sand and sprouting them later during prolonged drought
- Voucher dissemination guidelines prepared and 3 implementing partners (IPs) trained.
- 30 trained decentralized vine multipliers (DVMs) by April 2011 distributed vouchers, of which 9,984 (72% women beneficiaries) were redeemed. 57% had children < 5 years of age.
- An additional 1,474 purchased vines and 641 received vines as gifts
- A total of 83 DVMs now trained and multiplying for next season. An additional IP has been added for DVM approach to reach 66,400 households (hhs).
- Will compare to mass dissemination to 47,000 hhs with 3 new partners.
- Social marketing company T-MARC contracted to support preparation of communication strategy.

Tunnu Women Group - champion multipliers

- GLCI cassava multiplication group interested in SP.
- Trained and provided with 1,765 cuttings of Polista and Ukewere in August, and 5,400 cuttings of Ejumula in November.
- They use buckets for irrigation, hand hoes, and apply manure.
- Achieved multiplication rates of 18x and 11.5x for Polista and Ukewere, respectively, and had 589,600 cuttings to disseminate in March-April (i.e., supply 2,500 households with 200 cuttings each).

2. Effective delivery systems to improve vitamin A intake in Kenya: This is a proof-of-concept project (PoCP). The main question here is, can linking OFSP access and nutritional training to existing health services provide a) an incentive to pregnant women to increase health service utilization?; and b) lead to increases in consumption of OFSP and other vitamin A rich foods by the women and their young infants? The project is implemented in W. Kenya and is the first in SSA to link Agriculture to health. The partners include: PATH (international health

NGO), CREADIS and ARDAP (two local agricultural NGOs) and CIP. The pilot phase is complete.

- Linked OFSP intervention to health service delivery by: a) Improving nutrition counseling by ANC service providers; b) Issuing 4,906 vouchers to pregnant or lactating women for OFSP vines 3,700 of which have been redeemed; c) Conducting home visits by agriculture extensionists and community health workers (CHWs).
- Improved evidence base of the health impacts by: a) Conducting the 1st round of Operation Research on feasibility and acceptability of the pilot project; b) Revising education and communication materials; c) Linking demonstration plots to trained vine multipliers; and d) Improving selection criteria for vine multipliers and established 14 sites

3. Mama SASHA (Kenya PoCP) roll out in 1st Half of 2011
   a. Conducted baseline survey. Sampled 968 pregnant women and 1,918 mother-child (6-24 month old) pairs in intervention and control communities. Wide range of information was collected including: i) Nutrition and health knowledge and practices; ii) SP knowledge and practice; iii) Assets and demographic information; iv) Anthropometry; and Prevalence of Vitamin A deficiency among children.
   b. Full implementation began April 2011- As of June 16th, 1,296 vouchers issued, 798 of which were redeemed (62%). The challenge has been undependable rains for vine multiplication and crop production.

4. Rwanda's value chain subproject Getting LOUs finalized between CIP and SINA enterprises, CRS-Rwanda, and Institut des Sciences Agronomiques du Rwanda (ISAR).
   - Conducting 2nd recipes refinement of SP-based products at the new SINA bakery in collaboration with ISAR postharvest team
   - Forging strong research links with Kigali Institute for Science and Technology (KIST) food science dept. Four students did research in 2010 and 8 have been selected for 2011.
   - Conducting a successful consumer testing survey at the Diaspora-Agri show with four SP products (biscuits, bread, doughnuts, and queen cakes) with 694 panelists in total.
   - Selection of biscuit as the first SP-based product to be processed and marketed by SINA in 2011.
   - Selection of varieties of SP to be used in the project and their multiplication effort at Rubona (70,000 SP cuttings available).
   - Selection and starting of production of SP roots by 3 farmer groups by CRS and 15 contract farmers by SINA (with over 80% women in both systems).
   - Training of Trainers in SP vine multiplication and SP roots production.
   - Akarabo Golden Power Biscuits will be first product launched in September 2011.

5. Improving incomes through use of SP as animal feed: Naspot1 has been found to be the best for multipurpose.
   - Adapting the lessons learned from silage utilization in China for dairy and pig feeds in East Africa.

- Identify the best dual purpose varieties for use in East Africa, where *zero grazing* policies are spreading.
- Project in Kenya and Rwanda, 4 master's students
- Partners: Heifer International (International NGO), University of Nairobi, Farmer's Choice (private sector/pork products), ILRI, ISAR and KARI (national research programs)

First round of silage trials have been completed. This involved varietal trials to select best feed variety for silage in Kenya. Naspot1 was the best variety for dual purpose. Pig silage trials and dairy silage on-farm testing begun.

6. Weevil resistance using biotechnology: The objective is to develop weevil resistant SP varieties for SSA within 5 years. The focus is on using *Bacillus thuringiensis* (Bt) sources for weevil resistance. Twenty years of conventional breeding failed to identify suitable sources. Also heavy emphasis has been put on training African biotechnologists (2 PhDs, 4 technicians) for Kenya and Uganda utilizing new BeCA platform facilities.
7. Support platforms - with the purpose to: a) organize the work around research for development platforms that integrate and support the work of institutional partners in each sub-region; b) provide technical backstopping with a special emphasis on Alliance for a Green Revolution (AGRA) supported national breeding and PhD training programs; c) assure clean germplasm exchange; d) assure gender-sensitive design and implementation; e) assure comparable data collection between countries engaged in breeding f) Facilitate information exchange; g) Hold SSP meetings in each sub-region every 6 months; and h) Support advocacy work for promoting Vitamin A SP
8. Obtained funding for the advocacy work with BMGF. The project will be implemented in Mozambique, Nigeria and Tanzania.
9. Standardized modules developed and implemented
    - Working as a team at CIP, we finalized 21 modules for the baseline surveys under SPHI.
    - Mainstreaming gender component in the baseline survey modules. Qualitative research on women and seed systems conducted in June 2011.
    - Adapting the survey modules to Tanzania, Mama SASHA and Malawi baseline surveys.
    - Testing the survey modules in the three baseline surveys and improving the final modules.
    - Being adapted for animal feeds project and Rwanda PoCP.
    - Draft communication strategy for research outputs to be completed by July 2011.
10. The SP knowledge portal has been launched. A total of 87 persons have been trained on use during the 2nd round of SP support platform meetings. The portal can be accessed on: www.sweetpotatoknowledge.org
11. Updated the 'CloneSelector' software. Version 2.0 is now ready with updated user manual. Multi-environmental trials can now be accommodated; conducts relevant statistical analysis on any trait, including stability analysis.

Molecular Marker Assisted Breeding in Sweetpotato - Craig Yencho

The presentation reviewed the known ideas and facts on molecular breeding and gave the current status.

Under Collaborative Crop Research Program (CCRP) project with the McKnight Foundation, a SP linkage map was constructed based on segregating populations from Beauregard and Tanzania. The map is considered the road map for SP molecular breeding. What remains is to place/locate the traits on the map.

Questions and comments

- Is sweetness a quantitatively inherited trait?
- Negative correlation between β-carotene and dry matter - and what is the efficient method of breeding to improve the two traits. A combination of methods including recurrent selection and paired crosses.

'CloneSelector' training - Jens Riis-Jacobsen

The main objective of the **'CloneSelector'** is to ensure efficient capture, management, and utilization of SP breeding data, information, and knowledge.

Few of the participants had never had prior training on the CloneSelector. Majority of the participants had been trained on the tool, some of whom are using it. However, to bring all the participants at the same starting level, a review of general information on **'CloneSelector'** was made before starting new sessions on the updated version of **CloneSelector** 2.0, data importation, and analysis. There is a manual on how to use CloneSelector.

The considerations for effective use of the CloneSelector are: a) User knowledge of plant breeding, statistical concepts and Excel; b) Limited institutional IT capacity (Internet, IT support, IT infrastructure, statistical expertise); c) Automate frequent and standardized processes (trials); d) Standardization of most traits measured (SP Protocol); e) Use existing (preferably free) software as basis for applications; f) Quick solution to start collecting data in standardized format

The **'CloneSelector'** covers: a) List of germplasm (clones to test); b) Design of trial; c) Generation of field books; d) Register metadata for trial; e) Data collection in field and post harvest; f) Enter collected data into field book; g) Calculation of derived variables (yield/ha etc); h) Statistical analysis of trial (only RCB trial covered); i) Elaboration of consolidated result table for each trial; j) Consolidation of data across a trial series; k) In-depth analysis of individual traits; l) Elaboration of summary result table across environments; m) Elaboration of selection indexes and evaluation of selection criteria; n) Elaboration of list of selected material, and start of new trial series with this; o) Incorporation of selected results in annual breeding report

In summary, the clone selector training covered the following:

a) Discussion of experiences with CloneSelector
b) Presentation of CloneSelector 2.0

c) Workshop on Trial analysis in CloneSelector
    - Import existing trial series in CloneSelector
    - Analysis of individual trials
    - Multi-Environment Trial analysis (MET)
        - Create MET sheet
        - Analysis of individual traits and interpretation of outputs
        - MET summary sheet and selection index
    - Other CloneSelector functions

Questions and comments

Citation of the tool as a reference in the publication - R statistical software can be referenced, but not the 'CloneSelector'.

Importation of data is very difficult and tedious, thus better to follow the workflow of clone selector i.e. listing germplasm (clones to test), creating design of trial, generating field books, registering metadata for trial, data collection in field and post harvest, entering collected data into field book(s), calculation of derived variables (yield/ha etc), statistical analysis of trial (only RCB trial covered), and elaboration of consolidated result table for each trial.

Addition of the trait in the field book is possible through use of hanging traits labeled trait 1, trait 2, etc. Identify the appropriate space in the field book. Go to the master sheet and introduce the formula in the corresponding trait no. by clicking = on top in the master sheet and clicking the top of the trait in the field book. You can also add the formula. Fix the formula if it is related to anything from the installation. 'CloneSelector' --→ Tools --→ Fix the formula.

The Sweetpotato Knowledge Portal (SKP)– Jens Riis-Jacobsen

This helps to put knowledge to use. There is also a discussion forum on the portal.

Like the 'CloneSelector', few of the participants had no prior training on the knowledge portal. Majority of the participants had had training on the portal and are currently using it.

Why the knowledge portal? a) Helps SP scientists and development professionals do their job better, b) helps people keep up to date, solve problems and make better decisions, c) strengthens the SP community of practice, d) facilitates networking and collaboration, e) to develop a common language, f) to diffuse best practices, g) cross-fertilize ideas and increase innovation, and h) enhances the 'memory' of the SP community.

The key elements of the portal include: a) All members to the portal are equal, b) Respectful tone of debate by members (no politics, no fights etc), c) SP knowledge structure is the organizational principle for the content, d) Portal work in English (default), French, Portuguese, and Spanish, and include translation tools, e) Easy to find information, f) Easy to add information

(but only members can add), g) Optimized for low bandwidth conditions (few clicks, few page updates, low resolution graphics etc.), h) User friendly, and little or no training needed.

Questions and comments

Linkages with other institutional or individual pages - this is possible to embed useful pages.

Registered members should be logged into add in more information

There is a guide on the top left, which can be helpful and specifies how to become members (register).

Program for Africa's seed systems (PASS) Jane Ininda

AGRA is funded by BMGF, Rockefeller, DFID, Howard Buffett and SIDA. AGRA targets 15 countries but has recently added Liberia and Sierra Leone. The crops supported include: maize, sorghum, rice, cassava, cowpea, beans, soybean, SP, wheat, millet and peanut.

The main components include: a) Seed systems, funded with USD 150 millions; b) Soil fertility / Fertilizer access, funded with USD 180 millions; c) Added value /output markets, funded with USD 25 millions; and d) Mand E (policy and advocacy); Water resource management and genomics/advanced science being started now.

Overall accomplishments include:

a) Training: M.Sc fellows in progress -150, graduated = 14; Ph.D fellows in progress = 118, graduated = 36
b) Crop improvement: 222 varieties have been released of which 178 are commercialized, and 3,000 MT of breeder/foundation seed produced.
c) Seed production: Have started up to 70 different seed enterprise/companies. Have also offered business development services and loans as starter capital. Up to 33,000 MT certified seeds have been produced. For cassava and SP about 14 Million cuttings have been disseminated.
d) Seed retail: established agro-dealers networks, trained = 10,000; seed sales = 373,000 MT; fertilizer sales = 780,000 MT; value of loans = $32 million

AGRA accomplishments on SP

a) SP breeding initiatives have been funded in E and SA up to the tune of USD 1.6 millions. Benefitting countries include Mozambique (closed), Tanzania, Malawi, Rwanda, Kenya, and Zambia.
b) PASS has also funded training of SP scientists at M.Sc and Ph.D levels. For SP breeders, Martin Chiona of Zambia has completed his Ph.D while Benjamin Musembi of Kenya, Ernest Baafi and Vivian Oduro of Ghana, and Koussao Some of Burkina Faso are in progress. Damien Shumbusha of Rwanda has completed his M.Sc training. In progress are Pearl Kpotor and Victor Amankwaah from Ghana, and Mustapha Danjumsah from Nigeria.

Applications of Heterosis - Results of hybrid population development last year – Raul Eyzaguirre for Wolfgang Gruneberg.

Hybrid cultivars play a critical role in several crops, more especially for the cross fertilizing and self fertilizing species. Examples of the crops include: maize where up to 65% of maize production area is due occupied by hybrid cultivars; sunflower with 60% of area occupied by hybrid cultivars.

Heterosis breeding is very important in clonally propagated crops. This is because they are highly heterozygous, and clone cultivars are always hybrids.

Heterosis has been demonstrated for sweetpotato storage root fresh yield, storage root dry matter (DM) yield, and DM biomass yield. Breeding materials (PJ and PZ populations) have been used for this purpose to show that there is exploitable heterosis in our breeding material and not among some clones in a careful selected experiment.

Characterization of OFSP varieties in South Africa for agronomic traits, consumer acceptability and nutrient content - Sunette Laurie

In South Africa, the formal markets require 50 000 – 60 000 MT of SP per annum. More or less the same quantities are required by the informal market. Most of these are cream-fleshed SP varieties (CFSP). However, there is a recent large increase in OFSP for frozen vegetable industry: Beauregard 425 ha, Purple Sunset (ARC), 225 ha.

Vitamin A deficiency (VAD) is reported at 64% among 1-9 year olds, and 27% among women of child-bearing age. In terms of food security, 30% of the households are at risk.

Rationale

- There is need for improved OFSP varieties to expand production
- Breeding aimed at high yield, β-carotene content and dry mass %.

The aim of the study was to characterize OFSP for a) agronomic performance, b) consumer acceptability, sensory traits and c) mineral and β-carotene content in order to recommend varieties for addressing VAD and for use in new markets.

Methodology

The varieties included a) Nine OFSP varieties, namely Khano, Serolane and Impilo; lines 1999-1-7 and 2001-5-2; Excel, W-119 and Resisto from USA, Beauregard (USA variety) commercial use; and b) three (3) CFSP, namely Blesbok (Com), Ndou and Monate (dry, sweet)

Trials were planted for two seasons at four sites during 2005/6 to 2008/9. The sites are:

– EC1 and EC2: Communal garden (Eastern Cape); (temperate)
– E1 and E2: Elsenburg Agric. College (Western Cape); (dry, hot)

– OS1 and OS2: Owen Sithole College (KwaZulu-Natal);(sub-tropical)
– R1 and R2: Research center Roodeplaat (Gauteng); (temperate)

Plots of 30 plants were planted in 3 reps per site. Supplementary irrigation and fertilization were used and the plants were left to grow for 4.5 – 5.5 months.

3. Sensory evaluation: The root samples of the varieties were cooked and evaluated by a trained panel for appearance (yellow-green color, orange color, dark edges, discoloration), flavor (sweetness, SP flavor, pumpkin flavor) and texture (firmness, graininess, wateriness).

Content of free sugars (glucose, fructose, sucrose, maltose) and starch were also evaluated.

4. Consumer acceptability: Tested by a panel comprising 168 primary school children and 48 adults in Dassenhoek, KwaZulu-Natal, using a balanced incomplete block design.

5. Nutrient content was determined using randomly collected 8 medium intact roots from all the four geographical areas (ARC-Roodeplaat, Empangeni, Giyani and Hazyview) for lab analysis. The content of 6 minerals (by OES) and *trans*-β-carotene (by HPLC) was estimated.

6. Data processing and analyses: a) ANOVA, b) GXE: SREG model of GGE Biplot (G main effect plus G x E interaction), c) Correlation analysis between sensory and consumer data, PLS to indicate most distinctive attributes, group varieties and Elston Selection Index

Results

Unmarketable yield classes

- XXL (early maturing): Beauregard
- XXS: Serolane, Impilo, 1999-1-7 and Khano.
- Root cracks: Excel, Impilo and Khano.
- Insect damage: Beauregard, Ndou and Impilo
- Mechanical damage (long roots) W-119
- Long curved (slender): 1999-1-7
- Sprouting to some extent in Impilo
- Mean root weight:
  - Beauregard and W-119 (high), an indication of early maturity.
  - Serolane, Excel, Impilo and 2001-5-2 (intermediate).
  - 1999-1-7, Khano and Resisto (small).

GGE Biplot analysis for marketable yield

- Ideal varieties have high PC1 scores (high yield) and small absolute PC2 scores (high stability), e.g. Impilo and Beauregard).
- Stable, wide adaption, high yielding: Beauregard, Impilo
- Unstable, specific adaption, high yielding : 2001-5-2, 1999-1-7
  - responsive has the specific advantage that it may be able to respond to changes in environment

- Stable, wide adaption, average to below average yields: Khano
- Unstable, specific adaption, low yielding: Excel, Serolane
- Stable, wide adaption, low yielding: Resisto, W-119

Correlation analysis

- OFSP varieties were lower in sweetpotato-like flavor and higher in pumpkin-like flavor.
- Orange-fleshed varieties were generally higher in graininess and pumpkin-like flavor.
- And had higher sucrose content
- Consumer panel taste scores associated most with sweet flavor, dry matter and maltose content; consumer panel color scores negative association with discoloration.
- Adult consumer taste score negatively correlated to wateriness

Determination of dry matter and starch content, and sucrose equivalents in cooked roots can possibly be used in intermediate selection phases in breeding as indication of acceptable taste.

- OFSP mostly superior in mineral content
- In context of human nutrition in South Africa, all the orange-fleshed varieties, when boiling a raw portion of 100 g, have a potential contribution of ≥100% of the recommended intake for vitamin A, e.g. for 4 to 8 year old children, and 21% to magnesium, 12% to zinc and 9% to iron requirements

Discussion

- Improvements in yield coupled with good taste and dry matter content.

Table 1: Different varieties and their attributes

Group & variety	PLS ranking	Major attributes
Group 1		
Blesbok	-5.2	Watery texture, yellow-green color, sweet potato-like flavor, high fructose and sucrose content and contrasting dry matter %, dark edges and discoloration
Group 2		
Beauregard	-2.6	Watery texture and low dry matter %, not sweet, low maltose content
Khano	-0.4	Low dry matter, not sweet, high in discoloration, dark edges, instronforce, gumminess, color a*, orange color and sucrose content
1999-1-7	-0.1	Low dry matter %, low firmness, low fructose content, medium sweet
Ndou	0.3	Sweetpotato-like flavor, yellow-green color, high starch %, high color L* , low graininess
Group 3		
Impilo	-0.7	Sweet, medium dry matter %, high fructose and glucose content, slight yellow-green color, high discoloration, high pumpkin-like flavor, low starch %

Monate	-0.5	Sweet, medium dry matter %, sweetpotato-like flavor, yellow-green color, low instronforce, low discoloration, low graininess
2001-5-2	0.9	Sweet, medium dry matter % and pumpkin-like flavor, high fructose and glucose content, color a*, orange color; low starch %, dark edges, discoloration and starch %
Excel	1.5	Low wateriness, medium dry matter %, medium sweet, high pumpkin-like flavor, high dark edges, high graininess
Resisto	2.5	Low wateriness, high dry matter %, medium sweet and pumpkin-like flavor, low glucose content, color a* , orange color
Group 4		
W-119	1.5	High starch %, high instronforce and gumminess, high graininess, high pumpkin-like flavor, high firmness, orange color, high dry matter %
Serolane	2.9	High starch %, high instronforce and gumminess, high color L* and color b*, low fructose and sucrose content, high maltose content, slight sweet potato-like flavor

- Considerable root yield advantage over the USA introductions, Resisto, Excel and W-119 initially used in crop-based programs.
- Impilo and 2001-5-2 were found to be promising (all-round performance).
- Tolerance - virus
  - drought tolerance: both intermediate
  - stem blight: Impilo T; 2001-5-2 intermediate.
  - weevil and other insects:
  - vine persistence: Impilo medium thick
  - vine multiplication rate: 2001-5-2 higher

Progress of sweetpotato breeding in Rwanda - Damien Shumbusha

The overall breeding objective in Rwanda is to develop SP varieties with high root yields, quality traits (mainly DM, β-carotene), resistant to pests and diseases and suitable for specific or wide adaptation, farmer preferred).

Target areas: low altitude: Bugesera and Ngoma districts; mid-altitude: Huye, Muhanga districts; high altitude: Rulindo and Gakenke districts.

There are 3 methods we use to obtain improved sp cultivars for distribution to farmers: a) Collecting, evaluating and selecting from the local germplasm; b) Importing cultivars that have been bred in other countries and evaluating them under our conditions; and c) Breeding cultivars in our own research program.

Progress

- In situ conservation of 154 accessions of germplasm.

- A crossing block has been established at Rubona using 60 parents. The aim is to combine these parents and select WFSP and OFSP varieties needed through participatory breeding.
- An observational evaluation trial is in 3 locations (Rubona, Ngoma and Karama), with 5380 clones in each location.
- Nine entries (5-214, K51/3261, 4-160, 5-090, 8-1038, 9-466, 4-055, 8-1687, and 7-584) have entered advanced trials.

SASHA- Proof of concept project in Rwanda

Objective: To support technology development and dissemination for high value white and orange-fleshed sp products.

Selected OFSP varieties were cleaned and tissue culture multiplication done in the Lab. About 20,640 plantlets from varieties Cacearpedo, Ukerewe, and 97-062 were produced in tissue culture Lab. Demonstration plots were established in collaboration with NGO (CRS) and Farmers' Federation (Imbaraga). Training of trainers (TOT) on vine multiplication and sp processing were given to 22 farmer group leaders.

Way forward:

- Diversify varieties which are used for processing (through breeding)
- Tissue culture multiplication of Cacearpedo, Ukerewe, and 97-062 is on-going.
- New OFSP varieties Naspot 9 O and Naspot 10 O (cleaned from KEPHIS) are being multiplied in tissue culture lab in order to evaluate them on-farm and to be used later in processing.

Questions and comments

The main challenges of SP breeding experimentation in the highlands include: a) strong field variation, very low temperatures that affect crop growth duration as well as *Alternaria* blight disease infestations.

Progress of sweetpotato Research and Development (R&D) in Malawi --- Felistus Chipungu

Maize is an important staple food crop in Malawi with political support. However, SP is also important for crop diversification agenda (due to climate) as a source of carbohydrate.

The overall objective of SP research and development (R&D) is to improve rural livelihood through crop diversification for improved food and nutrition (vitamin A) security and raising incomes.

Table 2: Varieties in Malawi

Varieties	Yield (t/ha)	Origin	Remarks

Yoyera and Kamchiputu	3-7	Local	Eroded- recommended early 80's
Kenya (SPN/O, Kemb 10)	20-25	Tanzania	Released in 1988, widely grown.
Lunyangwa	20	Local bred	Released early 1990, low adoption
Kakoma (TIS 3017)	20-25	IITA	Released in 1994, low adoption
Semusa (Cemsa 74-288)	25-30	CIP	Released in 1999, Highest yielding among the released, being adopted
Mugamba (Mogamba)	20-25	CIP	Released in 1999, low adoption
Tainoni (Tainon 57)	20	AVRDC	Released in 1999, low adoption
Salera (CIP1941 121)	20-25	CIP	Released in 2002, low adoption
Zondeni	8-16	Local	Recommended 2008-increased uptake
Sakananthaka	20-25	Local bred	Released 2008- being adopted

To complement government efforts there are two projects: i) Breeding SP in Malawi for Malawi --- funded by AGRA. It aims at variety development (diversification in Africa); ii) Rooting out Hunger in Malawi with nutritious OFSP -funded by Irish Aid through CIP. It aims at improving seed systems for farmers to access disease free seed on time (OFSP) and value chains.

Progress in breeding activities

- Population development and screening: Over 6000 true seeds in a seedling nursery
- Clonal nursery in two sites (Makoka and Bvumbwe -under speed breeding). Over 1200 clones are being evaluated.
- PYT, AYT and UYT multisite genotype evaluation.
- Promising genotypes: For OFSP: LU06/0146, LU06/0428, LU06/0252, LU06/0527, BV07/008, BV07/019, and BV07/028; For WFSP: LU06/0056, LU06/0137, LU06/0196, LU06/0258, LU06/0299, and LU06/0432. All have root yield at least 20 t/ha.

LU06/0252: Has medium DM, 28%, medium resistance to weevil and white grab and very good vegetative retention for seed and vegetable.

LU06/0527: is orange-fleshed, resistance to weevil and white grab

LU06/0146: Pale orange, best under irrigation and residual moisture conditions in the very hot to hot areas of the Shire Valley, and edible leaf vegetable.

LU06/0428: Very early maturing- 3 moths and therefore good for piece harvesting, yields up to 30t/ha, edible roots

Progress seed systems

- Primary multiplication - 4 ha of Zondeni variety (1.5 ha of other varieties) have been established at at Bvumbwe.
- Started with 4,033 plantlets of disease free Zondeni to serve as foundation seed stock
- Capacity building for both human and infrastructure
- Demand creation through dances, poetry, songs, banners e.t.c

Progress SP value chains

- Small scale enterprises: utilise the excess produce for more money- nutritious scones/buns (OFSP)
- Large scale processors:
    - SP crisps using SP varieties, Cordiner, LU06/0527, Mugande, Kenya, LU06/0428, LU06/0252, Zondeni.
    - Biscuits from Zondeni flour have ranked high. However, there is need for a pro-vitamin A content retention study in the final product (biscuits). Also there is need to explore more other bakeries.

Future plans

- Release of new varieties, cleaning (in-vitro) and multiplication of the new varieties at least 0.1 ha each variety by November 2011.
- Vine beneficiary target (November 2011).
- 24,000 new households to receive subsidized vouchers.
- 6,000 households per district (4 districts- Chikhwawa, Zomba, Phalombe and Dedza). More work on value addition and marketing.

Questions and comments

Early maturity among the varieties and the sprouting problems of the early maturing varieties: have observed that they are susceptible to sweetpotato weevils. These varieties are recommended for piecemeal harvesting as well for dry areas that receive short rains.

CEMSA has high root yields but is not used as a check during the variety testing. Instead Mugande which is next to CEMSA in yielding is used as a check. This is because CEMSA's flesh root yield is too high to meet the variety release requirement of higher root yield performance than the check. In Malawi the problem is that the variety release committee considers yield performance and not other attributes. Despite lower root yield, Mugande is superior to CEMSA in other attributes such as flavor, resistance to weevils and tolerance to drought.

There is a need to present root yield in terms of dry matter yield of the two varieties. This gives a relevant comparison than the fresh weight yields.

This shows weaknesses of the existing policies in some countries that do not take into account of farmers' opinion. The regulatory agencies do not have capacity (no funds) to test themselves for what the scientist is presenting. There is a need to push for incorporation of farmers' opinion in those countries i.e. educate the variety release committee on the criteria for variety release.

In Kenya, the release body asks the scientist for any special attributes of the candidate variety. There is need to support the variety release submission with solid data of several attributes other than root yield.

Low adoption index of some varieties is probably due to poor performance of the target varieties in other attributes other than yields.

Integrated seed harmonization of policies across the countries is needed - this is currently only possible in West Africa. Released varieties in one country must be revaluated in the country of introduction. The variety is named by the breeder in the 1st country of release and this is respected in countries of introduction.

Is there systematic evaluation for leaf use and taste–test during experimentation? This is systematically done in Malawi. The leaves are prepared in the same way as farmers do i.e boil with tomato and sometimes add groundnut powder. In the field, farmers comment on leaf shapes --- they like narrow robbed leaves than broad and round leaves. This process is also well incorporated in Kenya. In Zambia all types of leaves are used as vegetable.

There is need to work on negative pre-conceived mentality on sweetpotato leaves through deliberate efforts to promote the leaves for vegetable use (moreover, they are nutritious).

Analysis of GxE Interactions -Raul Eyzaguirre

We have GxE interaction when the performance of a genotype depends on the environment.

There is a component for GxE interaction in any statistical model. For the RCBD it is
yijk = _ + _i + _j + _ij + k(j) + _ijk
If we have g genotypes and e environments, we have gxe interaction effects.

It uses simple linear regression to explain the interaction.

For each genotype, a simple linear regression of its individual mean value (y) is fitted on the mean of all genotypes for each environment (x).
In the previous example, you need 52 degrees of freedom to explain interaction, but just 13 to fit 14 simple linear regressions.

Interpretation

The slope of the regression line is used as a stability parameter.
Genotypes with a slope around 1 have average stability over all environments.
Genotypes with a slope greater than 1 have below average stability (they are very sensitive to changes in the environments), and hence are suitable for high-yielding environments.

Genotypes with slope less than 1 have above average stability (they are very insensitive to changes in the environments), and hence, they could be suitable for low-yielding environments.

Utility of AMMI

If the number of components to explain the interaction is two, you can get a nice plot.
You can explain the interaction with less degree of freedom (a more parsimonious model).

Farmer participatory Research -- Ted Carey and Silver Tumwegamire

This discussion was necessary because of the following: a) breeding procedures manual (Gruneberg et al. 2010) has a procedure for on-farm trial (OFT), but a bit unclear; b) analysis of OFT data not in CloneSelector --- would be nice, but we need to tell developers what we want; c) required for variety release in some countries?

There is also need to improve the section on on-farm trial in the manual for breeding protocols before it is loaded on the knowledge portal.

The on-farm trial (OFT) survey was done among the participants with the aim of understanding how on farm trials are currently being conducted in different countries. Details of the survey findings are shown in annex 4.

Why on-farm trials? a) to get farmer input; b) to get information needed for variety release; c) observe variety performance under farmer management; d) to get feedback on farmers' preferences on the varieties; to expose the varieties to farmers; d) train farmers on various aspects of experimentation as well as varieties.

Key steps for on farm trial

1. Farmer selection - through exploratory visits to the target areas. The visit helps the researcher to interact with community leaders and bridge the gap between the two. It also helps to schedule a formal meeting with the targeted community or group.
2. Second visit -Planning meetings are held with different target communities. This meeting or series of meetings should help to clarify the objectives. The farmers should be allowed to freely give their ideas so that you are able to understand the farmers' expectations. The other key issues considered during the meeting include
    - Adjust research agenda to allow farmers' input
    - Have a feel of readiness for activity uptake
    - Build consensus on the criteria for farmer selection
    - Process should be participatory
    - Develop a plan of action up to planting date

3. Planting trial and design: Together with farmers agree on the trial design - as you explain the design and trial objectives. Further explanation must be made of what is expected of the farmers and a schedule of when you will come back.

   Plot size: minimum of 24 sq meters- 4 rows, each measuring 6 meters…
   Spacing - traditional 3-5 varieties with local check. For the mounds, plant 3 vines on top of the mound; on ridges you can plant in line at 0.3 m between the vines.
   Guide but let the farmers plant the vines their own way and replicate with more farmers (4 – 10 farmers) depending on the number of groups.

4. Fourth visit: Monitoring - Encourage farmers to make their own observations. Observe the establishment rate, plant vigor, maturity time, susceptibility to disease, weed management

5. Final evaluations: Plots are harvested and farmers are asked to evaluate: a) planting material, disease resistance (e.g. SPVD), weevil resistance, drought tolerance, root yield, root shape, flesh and skin colour. For consumer acceptance evaluations, sample roots for each variety are cooked and farmers are asked to evaluate: appearance, taste, starchiness, fibrousness.

For each stage of the evaluation at least 20 farmers (men and women) must be involved Prepare many cards of 3 colours (green, yellow and red). Green = better than the local check; yellow = comparable to the local check; Red = poorer than the local check. The cards for men are labeled 'M'. For each attribute each farmer gives a card in a labeled bag. Data are tallied in a prepared sheet.

Questions and comments

a) The number of farmers for variety evaluation - At least 20 farmers as a starting point: Men as well as women.

b) Need to explain how important each farmer should give his or her own opinion irrespective of opinion of other farmers. Farmers do not to give the neighbour's opinion.

c) What about catching age effects? Children can be involved in the evaluation.

d) Mother field: managed by a group: with all of the varieties - Baby fields: 3-5 new varieties with local check.

Field visit

The field visit was held on the last day of the workshop with the objective to observe and share information on the seed systems based on the experiences of Mozambique. The participants visited the following activities:

a) On-farm variety evaluation of orange-fleshed varieties in Ambrosio village, Boane district. The village hosts 21 on-farm trials out of the 45 trials in the entire district. After a quick introduction between the farmers and the participants, the groups were formed to tour the trials established along the Umbeluzi River. Each farmer planted 4 varieties on which the

farmer adds his/her local variety. During the visit, farmers and visitors shared different experiences and lessons variety performance and particularly on-farm trials. During this exercise, farmers were introduced and explained to the new approach to evaluate the on-farm trials using three cards (green, yellow, and red) to decide whether or not the variety is good enough. At the end of the garden tours, the participants and farmers tasted and evaluated cooked roots of 15 new clones for palatability. In general, both visitors and farmers were satisfied with the taste of the new varieties. The last stage at Ambrosio was reserved to the ceremony to award the most prominent sweetpotato farmers participating in the on-farm trials. In total, 6 farmers were contemplated with the award that included watering cans, hoes, vegetable seeds and boots.

b) Breeding trials established at Umbeluzi Research Station. The focus here was on the explanation of Mozambique's experience on the accelerated breeding scheeme (ABS), used in the process to released the new 15 varieties, and the implementation of the vine survival trial.

c) Decentralized vine multiplication plot of Mrs. Julieta Antonio, located at Manguiza, 8 km away from Umbelúzi Research Station. The farmer explained the concept of de-centralized vine multiplier (DVM), particularly the criteria how farmers are identified and chosen for the DVM scheme. She also explained the main challenges up to date in establishing the DVMs in Mozambique. Critical aspects such how to deal with local authorities, gender issue, the process of cleaning the varieties, the process of allocating the varieties to DVM, the monitoring and evaluation, the sustainability of the system among other were discussed for about 1 hour. Experiences on how and the frequency of irrigation of the fields were shared by other DVMs present in the event. Mrs. Julieta, indicated that from last 2009/10 cropping season, she has been able to sell all the vines and part of the roots and managed to make 8,540 MT ($300) exploring an area of 1500 m^2, and she was able to buy a new TV with the money.

d) LOZANE farm, which is the commercial private farm testing 5 of the new pre-released varieties (Bela, Irene, Sumaia, Erica, and Amelia) at a commercial level. The participants were explained the objective of working with a commercial farmer to produce both vines and roots, and most important, this approach is different from the DVM, as the farmer will have to pay all inputs used to produce the roots and vines.

a) Annex 1: List of participants

Name	Institution	Telephone	Cellphone	E-mail
Martin Chiona	ZARI	+260977125692		martinchiona@yahoo.com
Maria Andrade	CIP Mozambique	+258823065460		mandrade@cgiar.org
Sammy Agili	CIP Nairobi	+254722365784		s.agili@cgiar.org
Jan Low	CIP Nairobi	+254733411010		j.low@cgiar.org
Laura Karanja	KARI	+254722685544		laurashali@yahoo.com
Adilia Viegas	CIP	+258828608770		adiliaviegas@yahoo.com.br
Engida Tsegaye	SARI	+251916828014		etaz2003@yahoo.com
Jose Ricardo	IIAM	+25821461610	+258823229880	j.madija@yahoo.com.br
Abdul Naico	IIAM	+258829849584		aanaico@yahoo.com.br
S. Heudricha	ILRI	+258820896645		sheudricha@cgiar.org
Tania Goossen-Alk	UKI	+258823119570		tgoossenalk@hsi.org
Jose Guerra	WFP	+258823634246		Jose.guerra@wfp.org
Chad MacArthur	HKI	+16466456438		cmacarthur@hki.org
Francisco Jr. Matua	World Vision	+25821350600	+258824966850	francisco_matua@wvi.org
Irene de Souza	USAID	+25821352059	+258827679381	isouza@usaid.gov
Joao Junior	CIP	+258828183250		j.jeque@cgiar.org
Ted Carey	CIP - Chana	+233546938599		e.carey@cgiar.org
Ernest Baafi	CSIR – CRI/ WACCI	+233244155180		nestobaafi1123@yahoo.co.uk
Ebenezer Obeng-Bio	CIP/SSA	+233244109533		eobeng-bio@cgiar.org
Benjamin Kivuva	KARI – Maguge	+254720824484		benmusem@yahoo.com
Philip Ndolo	KARI -	+254722227456		ndolophilip@yahoo.com
Koussao Some	INERA - Burkina	+22676615894		koussou@hotmail.com
Vivian Oduro	BNARI/WACCI	+233203848210		vivianoduno@hotmail.com
Damien Shumbusha	ISAR – Rwanda	+250788469957		shudam@yahoo.fr
Putri Erna Abidin	CIP – Malawi	+265993821221		p.abidin@cgiar.org

Sunette Laurie	ARC	+27833116029	slaurie@arc.agric.org
Everina Lukonge	ARI	+255754430675	elukonge@yahoo.com
Craig Yencho	NCSU/BMGF	+1 (919) 513-7417	craig_yencho@ncsu.edu
Silver Tumwegamire	CIP – Uganda	+256772911652	s.tumwegamire@cgiar.org
Jean Marc Randrianaivoarivony	FIFAMANOR – Madagascar	+260330835790	jrandrianaivoarivony@yahoo.fr
Robert Mwanga	CIP – Uganda	+256772825725	r.mwanga@cgiar.org
Luka Wanjohi	CIP – Nairobi	+254722302271	l.wanjohi@cgiar.org
Jens Riis	CIP – Nairobi	+254725718585	j.riis@cgiar.org
Raul Eyzaguirre	CIP – Lima	-	reyzaguirre@cgiar.org
Amelia Ruco	CIP – Mozambique	+258827060395	a.ruco@cgiar.org
Emalisa Carvalho	Admin Assistant for meeting	+258828679401	emalisa_carvalho@hotmail.com

Annex 2: Agenda

June	Activity	Responsible
26 Sun	Arrival	Amélia Ruco
27 Mon		
8:30-9:00 am	Registration	Amélia Ruco
9:00-9:15 am	Welcome remarks	Maria Andrade
9:15-9:45 am	Opening Address	Calisto Bias, Director of IIAM
9:45-10:15 am	Progress in Sweetpotato Breeding under SASHA	Robert Mwanga
10:15-11:00 am	Health Break and Group photo	Amélia Ruco/S. Tumwegamire
	Chair: Felistus Chipungu	
11:00-11:30 am	Progress on other SASHA Project Components	Jan Low
11:30-12:30 pm	Application of molecular methods in sweetpotato	Craig Yencho
12:30-1:30 pm	Lunch	
1:30-5:00 pm	CloneSelector	Raul Eyzaguirre (RE) Jens Riis Jacobsen
28 Tues	**Chair:** Martin Chiona	
8:00-8:15	AGRA support to breeding & seed systems	Jane Ininda
8:15-9:15 am	Application of heterosis in sweetpotato breeding	Raul Eyzaguirre
9:15-10:30 am	Discussion regarding On-farm trials	Ted Carey
10:30-11:00 am	Health Break	
11:00-11:30 am	Screening for drought tolerant sweetpotato	Laurie Sunette
11:30-11:50 am	Progress on sweetpotato breeding in Rwanda	Damien Shumbusha
11:50-12:10 am	Progress on sweetpotato breeding in Malawi	Felistus Chipungu
12:10-12:40 pm	General Discussion	Ted Carey
12:40-1:30 pm	Lunch break	
1:30-2:30 pm	Analysis of GXE Interactions	Raul Eyzaguirre
2:30-4:00 pm	Sweetpotato Knowledge Portal	Jens Riis Jacobsen (JRJ)
4:00-5:00 pm	CloneSelector	RE, JRJ
29 Wed	**Chair:** Everlina Lukonge	
	CloneSelector /whole day	RE, JRJ
30 Thurs	Field Trip	Amélia Ruco/Maria Andrade
7:15-12:30 pm	Depart from Hotel to attend on-farm evaluation	Maria Andrade & Bernardino Munhuaua
12:30-14:00 pm	Lunch at Umbeluzi station, followed by visits to fields	Amélia Ruco, José Ricardo, and & Maria Andrade
2:00-5:00 pm	Split into 2 groups:	
	Group 1: Visit 2 decentralized vine multipliers & one larger private sector & one larger private sector dual purpose producer (Lozano farms)	Abdul Naico, José Ricardo, and Bernardino Munhuau
	Group 2: At IIAM HQ, visit the quality lab, tissue culture lab, and the screen houses	Maria Andrade, João Junior, and Adelia Viegas
5:00-5:30 pm	General Discussion, Way forward	Robert Mwanga

Annex 3: Participants' Evaluation of the 9th Annual Sweetpotato Breeders Meeting

Maputo, June 27 - 30, 2011

The 9th annual sweetpotato breeders meeting was held at Turismo Hotel, in Maputo, Mozambique from the 27-30 of June. The meeting was basically divided between the activities conducted in the meeting room and in the field in Ambrosio, Boane District, and Maputo Province. A total of 35 people (14 from CIP and 21 partners) participated in the field day. From these 35 only 23 (17 male and 6 female) filled the evaluation forms. Thirteen questions were submitted to the participants to evaluate, of which 9 used a subjective ranking of 1 – 5, where 1 = very poor and 5 = very good, and 4 questions used listing points of opinion. The results of the evaluation are summarized below.

1. Is this the first time you have been to a Sweetpotato Breeders Meeting?

Most of the participants (73.9%) of the 9th sweetpotato breeders meeting have attended similar meetings in the past.

Is this the first time you have been to a Sweetpotato Breeders Meeting?			
Gender	Yes	No	Total
Male	4	13	17
Female	2	4	6
Total	6	17	23
%	26.1	73.9	100.0

2. Did the meeting meet your expectations?

In general, all of participants mentioned that the meeting completely (52.2%) and most (47.8%) met their expectations. As a reminder the participants were asked to rank the expectations using the scale: 1-Not at all, 2-Somewhat, 3-Most, and 4-Completely.

Did the meeting meet your expectations?			
Gender	Most	Completely	Total
Male	7	10	17
Female	4	2	6
Total	11	12	23
%	47.8	52.2	100.0

3. How would you rate the quality of the meeting in terms of content?

In general, the content of the presentation and the discussions in the meeting were of the interest of most of the participants. Overall, majority (60.9%) of the participants felt that the quality of the meeting in terms of content was very good while the rest (39.1%) agreed that it was good.

How would you rate the quality of the meeting in terms of content?			
Gender	Good	Very Good	Total
Male	9	8	17
Female	0	6	6
Total	9	14	23
%	39.1	60.9	100.0

4. Overall, how would you rate the quality of the different presentations?

Although two participants felt that the quality of the presentation was alright (8.7%), majority of the participants agreed that the quality of the presentations was very good (52.2%) while the rest mentioned that the presentations were overall good (39.1).

Overall, how would you rate the quality of the different presentations?				
Gender	Alright	Good	Very Good	Total
Male	2	8	7	17
Female	0	1	5	6
Total	2	9	12	23
%	8.7	39.1	52.2	100.0

5. At the end of the meeting, how would you rank your abilities to use CloneSelector?

A good number (56.5%) of the participants felt that they can do all the steps of CloneSelector by themselves. Among the 23 participants who filled the evaluation forms, 7 (30.4%) of them mentioned that they could train others in CloneSelector.

At the end of the meeting, how would you rank your abilities to use CloneSelector?					
Gender	Basic	Intermediate (can do all the steps with the manual by my side)	Good (can do all the steps by myself)	Excellent (could train others)	Total
Male	1	1	9	6	17
Female	0	1	4	1	6
Total	1	2	13	7	23
%	4.3	8.7	56.5	30.4	100.0

6. After you return to your station, do you see your breeding program adopting CloneSelector for its multi-location trials?

Overall, majority (65.2%) of the participants felt that their breeding program could adopt CloneSelector for the analysis of multi-location trials. However, some (30.4) of the participants mentioned that the use of CloneSelector will depend on local rules for data analysis. Only one participant felt that the tool will not succeed.

After you return to your station, do you see your breeding program adopting CloneSelector for its multi-location trials?				
Gender	Yes, completely	In some cases, have rules that we must follow using a different system	No	Total
Male	10	6	1	17
Female	5	1	0	6
Total	15	7	1	23
%	65.2	30.4	4.3	100.0

7. Do you need additional training for you and your staff on CloneSelector?

According to the majority (65.2%) of the participants, there still need for more training in CloneSelector. Only 35.8% of the participants felt comfortable to proceed themselves with the use of CloneSelector.

Do you need additional training for you and your staff on Clone Selector?			
Gender	Yes	No	Total
Male	10	7	17
Female	5	1	6
Total	15	8	23
%	65.2	34.8	100.0

8. Do you think the Sweetpotato Knowledge Portal will be useful in your work?

In general, majority (91.3%) of the participants mentioned that they will definitely use and contribute to the sweetpotato knowledge portal, while only 2 (8.7%) participants will use the portal according to the local conditions.

Do you think the Sweetpotato Knowledge Portal will be useful in your work?			
Gender	Yes, and I will definitely contribute	Yes, but I may not contribute (time constraints, connectivity problems)	Total
Male	15	2	17
Female	6	0	6
Total	21	2	23
%	91.3	8.7	100.0

9. Was the field day useful, in terms of helping you to better implement your breeding and seed system programs?

Overall, majority (52.2%) felt that the field day was useful while 34.8% of them mentioned that the activities in the field day were extremely useful.

Was the field day useful, in terms of helping you to better implement your breeding and seed system programs?				
Gender	Alright	Useful	Extremely useful	Total
Male	3	10	4	17
Female	0	2	4	6
Total	3	12	8	23
%	13.0	52.2	34.8	100.0

10. How would you rate the meeting in terms of organization (Logistics, communication)?

In general, the participants considered the meeting as good (65.2%) and very good (34.8%).

How would you rate the meeting in terms of organization (logistics, communication)?			
Gender	Good	Very Good	Total
Male	13	4	17
Female	2	4	6
Total	15	8	23
%	65.2	34.8	100.0

11. Please list the 3 things in the meeting that were most useful to you?

The thing that was the most useful

Three most useful things in the meeting	Frequency of mention
CloneSelector	20
Application of heterosis in sweetpotato breeding	8
Sweetpotato Knowledge Portal	8
Visit to decentralized vine multipliers & one larger private sector dual purpose producer (Lozano farms)	7
AGRA support to breeding & seed systems	7
Progress on other SASHA Project Components	6
Application of molecular methods in sweetpotato	5
Progress on sweetpotato breeding in Rwanda	4
Analysis of GXE Interactions	3
Screening for drought tolerant sweetpotato	2
Progress on sweetpotato breeding in Malawi	2

12. Please list 2 areas in which you would like to see improvement, either in content or organization.

Areas to improve	Frequency of mention
Add more time in future meetings	11
Interpreting statistical data analysis	10
Accommodation in hotel with good service and good Internet	5
Internet in meeting rooms	4
Punctuality at the beginning of the meetings	3
Punctuality in delivering the copies with theme of the meeting to the participants	3

13. Please list any topics you would like to see covered in next year's meeting that were not missing in this year's meeting

Topics proposed to be covered in next year's meeting	Frequency of mention
Analysis using R and other statistical packages	7
More on interpretation and data analysis	6
More of Index selection	4
More of other designs in CloneSelector	4
Progress of breeding activities in Countries	3
Heterosis breeding in Sweetpotato	3
Seed production Issues	3
Use of NIRS	1
Choices in selection at different stages	1
Standardized interesting traits	1

14. Any other comments on how to strengthen the sweepotato breeding community of practice

Additional comments on how to strengthen the sweepotato breeding community of practice	Frequency of mention
More use and Communication through Sweetpotato Knowlodge Portal	4
Need more work on CloneSelector as will simply help breeder work	3
Hold regular meetings	2
The location of the meetings should be circulated to countries	2
The food served at meetings should be primarily of sweetpotato	1
Include special discussion topics based on our experience	1

Annex 4: On-farm trial (OFT) methodology survey -Ted Carey

The survey was conducted among the workshop participants comprising mainly the sweetpotato breeders and students from different countries, namely, Burkina Faso, South Africa, Mozambique, Ghana, Uganda, Zambia, Tanzania, Kenya, Madagascar, and Ethiopia. The survey was aimed at understanding the current status of on-farm trial methods in different countries. To generate responses, a structured questionnaire was administered to the participants.

Outcomes of the survey

1. Stage(s) of farmer participation during sweetpotato breeding: Majority of the breeding programs in different countries involve farmers at advanced yield trials, multi-location trials and on-farm trials. Only Ghana, Burkina Faso and Uganda have involved farmers in the early stages of the sweetpotato evaluations.

2. On-farm trial methodology

a) Current year (2011) target regions for OFT: Multiple regions are targeted for on-farm trials in different countries, namely: a) Burkina faso = central, western and Eastern regions; b) South Africa = Manguzi and Gauteng regions; c) Mozambique = Maputo, Gaza and Zambezia regions; d) Ghana = Forest coastal savannah, Guinea savanna, Sahel savanna and forest transition partly; e) Uganda = Eastern, Central and Western regions; f) Zambia = 2 regions; g) Tanzania = Lake zone, coastal zone, and Zanzibar; h) Kenya = western Kenya; i) Madagascar = Berfo, Mimosa and Mandoto; and j) Ethiopia = Southern region.
b) Who is responsible? Majority of participants were responsible for the OFTs in their countries and a few were not. All the breeders have other staff (scientists, technicians) they are implementing on farm trials with. They also involve other partners that include NGOs, CBOs, sister research stations, universities, CIP, and farmer associations.
c) Who analyzes OFT data? OFT data is analyzed by the lead scientists and breeders in respective countries. CIP scientists also analyze their data where they have CIP led OFTs.
d) The major attributes assessed during the OFTs include: In the field farmers data is collected for root yield, vine yield and health, diseases (SPVD), pests (weevil), drought tolerance, root shape, skin and flesh colour. Other attributes assessed leaves as vegetables, and vine persistence for drought prone areas. Farmers also assess the taste test attributes that include: taste, appearance, texture, flavor, and fibre.
e) Methods of data collection - vary with countries and the type of data to be collected. For quantitative traits (like root yield) are measured or counted. For qualitative from farmers cards of different colours (Yellow, green and red) are used. To separate men's data from women's, the cards are labeled M for men and W for women. For both scenarios a special data sheet (from CIP's protocol for some countries) is used.

f) Number of varieties for OFTs: Majority of the countries evaluate 5-8 entries in OFTs. However, some countries evaluate larger entries of varieties for on-farm trials.
g) Management of the trials: On-station trials are managed by the researchers and farmers are invited during harvesting for evaluation. OFTs are managed by farmers or both the farmers and researchers depending on the planning.
h) Who takes the data and how? Data is mostly taken by the researcher/technicians, though, there are instances where farmers are also involved in data collection. Farmers can help in e.g. weighing and counting of roots.
i) Are all varieties at each farm? Majority of the countries, all the varieties are tested at each farm. For some countries, this depends on availability of planting materials while a few of the countries do not test all the varieties at each farm.
    i. The check varieties: Most countries use farmers' best variety as the check while others include the best improved variety as the standard check. In South Africa, Blesbok is used a check in one region, Gauteng, while no check is used in eManguzi.
    ii. Planting materials of the check varieties are provided by the farmers. A few countries obtain the planting materials of the check varieties from the central multiplication field at their stations.
    iii. Are replications at each farm or across the farms? Majority of the countries do not replicate at each farm but across the farms (at least 4 farms, but can use even 15 farms per agro-ecological zone). However, there are some cases where a replicated trial is established with a group of farmers.
    iv. The plot size: The survey findings show great variability of plot size across the countries. For example, in Mozambique a plot of 5 rows each planted with 15 vines is used. In Uganda, plots of 30 mounds (30 m^2) 12 mounds for harvesting or 4 ridges with 18 plants per ridge are used. Kenya also uses 4 row plots but each row is planted with 20 vines.
    v. Are all plants harvested? Only Burkina Faso (BF) and South Africa, all the plots are harvested. Other countries, middle bordered net plots (2 or 3 ridges/rows) are harvested.

3. CIP protocol use: BF has not completely adopted CIP protocol; South Africa is not using CIP protocol at all. All other countries except Ethiopia (where sweetpotato activities were suspended due to SPVD) are using the protocol.

4. Topics for further discussion: standard method of data collection, best method of data collection. Analysis of PPB trials with more than 50 entries using augmented designs; intercropping, integration into livestock systems; Farmer assessment tools; How to account for variation in trial management by different farmers; Reducing the amount of data collected.