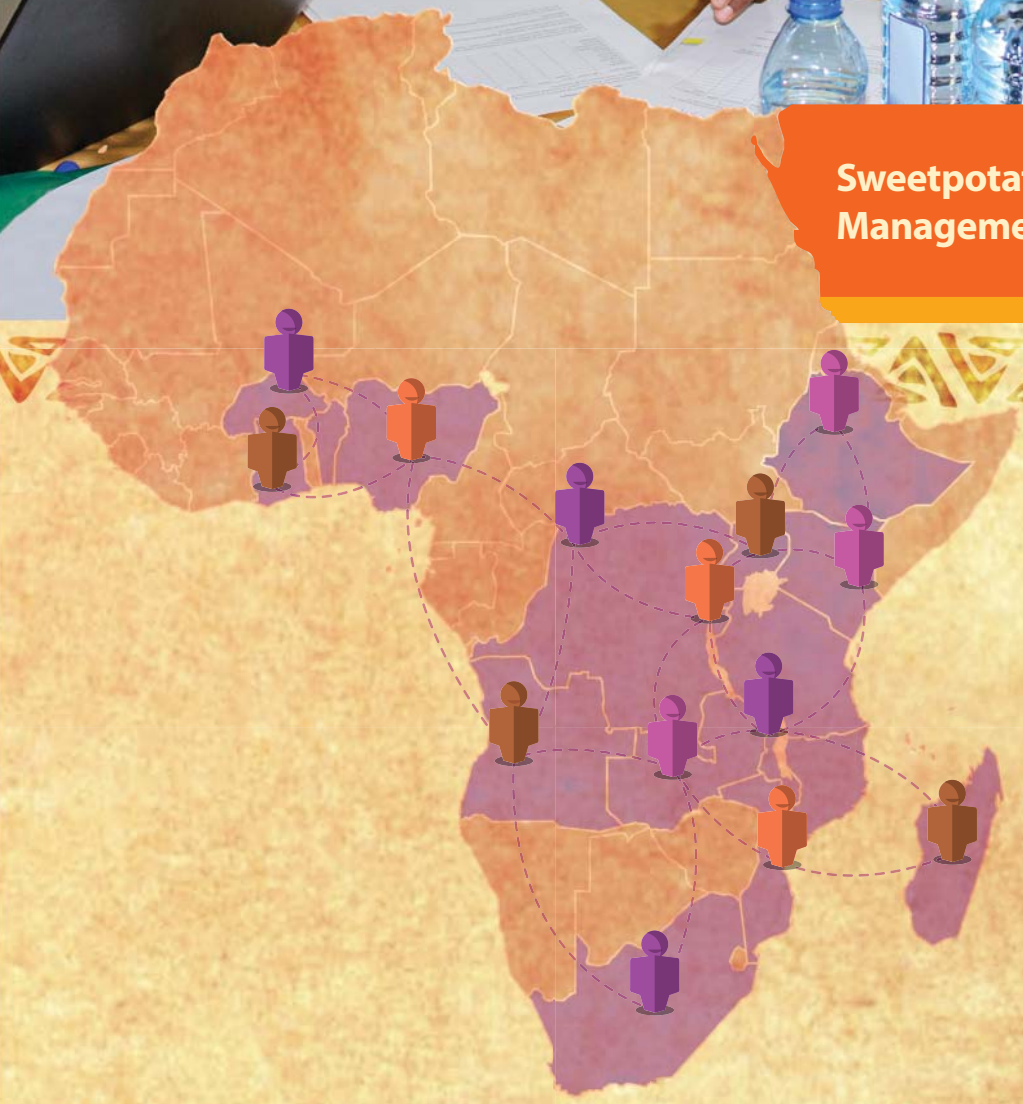
Sweetpotato Seed Systems and Crop Management Community of Practice



SPHI
Sweetpotato for Profit and Health Initiative

Regional Technical Support Platform for East, West, Central and Southern Africa

Sixth Consultation: Sustainable Pre-basic Seed Production – Progress Review

Pride Inn, Nairobi

December 6-8, 2016

Compiled by Christine Bukania and Margaret McEwan

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Cover photo: *Ivan Obare (right) and Maureen Mwangangi (left), both members of the Seed Systems and Crop Management CoP, use some of the tools that have been developed for determining prices of early generation seed (Credit: C. Bukania).*

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Acronyms

AGRA	Alliance for a Green Revolution in Africa
APMEP	Agriculture Productivity and Market Enhancement Project
BCR	Benefit-Cost Ratio
BecA	Biosciences eastern and central Africa
CIP	International Potato Center
COP	Community of Practice
DARS	Department of Agricultural Research Services
DVM	Decentralised Vine Multipliers
EGS	Early Generation Seed
FYM	Farm yard manure
INERA	Institut de l'Environnement et de Recherches Agricoles de Burkina Faso
IRR	Internal Rate of Return
KEPHIS	Kenya Plant Health Inspectorate Service
LAMP	Loop-mediated isothermal Amplification
LPG	Liquefied Petroleum Gas
LZARDI	Lake Zone Agricultural Development Institute
NAFASO	Neema Agricole du Faso
NPV	Net Present Value
NaCRRI	National Crops Resources Research Institute
NARI	National Agricultural Research Institute
NARO	National Agricultural Research Organisation
NRCRI	National Root Crops Research Institute
ODK	Open Data Kit
OFSP	Orange-fleshed sweetpotato
PBS	Pre-basic seed
PI	Principal Investigator
QDPM	Quality Declared Planting Material
QDS	Quality Declared Seed
RoI	Return on Investment
RTB	Roots, Tubers and Bananas
SARI	Southern Agricultural Research Institute
SASHA	Sweetpotato Action for Security and Health in Africa
SPHI	Sweetpotato for Profit and Health Initiative
SS-CoP	Sweetpotato Seed Systems and Crop Management Community of Practice
SUN	Scaling up Nutrition
TARI	Tigray Agricultural Research Institute
TC	Tissue culture
TOSCI	Tanzania Official Seed Certification Institute
ToT	Training of Trainers

Executive summary

The Sweetpotato Seed Systems and Crop Management Community of Practice (SS-CoP) Sixth Consultation was held from 6th to 8th December 2016 at Pride Inn, Nairobi, Kenya. The planning and review meeting was attended by the Sweetpotato Action for Security and Health in Africa (SASHA) project pre-basic seed (PBS) system sub-grantees. There were 45 participants from 11 countries - Ethiopia, Kenya, Uganda, Tanzania, Ghana, Nigeria, Burkina Faso, Malawi, Mozambique, Nigeria and Zambia. The participants were predominantly sweetpotato breeders, seed systems experts and agricultural economists working on the business plan cost data collection.

Each country made presentations of their activities for the period of June-November 2016, with a focus on production capacities, production targets vs. actual achievements and comments on how to improve multiplication rates and reduce production costs; quality management; estimated pre-basic seed requirements for the coming season; progress in implementing their business plans and revolving funds and capacity building initiatives undertaken. In discussion groups, they deliberated on their successes, lessons and the improvements they needed to make to improve the sustainability of their pre-basic seed production and marketing.

A presentation of the findings of a participatory formative assessment of the Seed Systems CoP was made by Lydia Kimenye. The study, commissioned by the CGIAR Research Programme on Roots, Tubers and Bananas (RTB) cross cutting seed systems cluster, took place between August and November 2016. The aim was to document the steps taken in establishing, running and maintaining the SS-CoP, and identify lessons, which stakeholders working on other RTB seed systems could draw on as they establish and grow their own CoPs.

The pre-basic seed system sub-grantees are at different stages of implementing business plans that will help their institutes run successful sweetpotato seed enterprises and ensure a consistent supply of quality seed. Srini Rajendran, the SASHA project's regional agricultural economist, conducted a session to increase participants' understanding of business plans and marketing strategies. Additionally, Jude Njoku shared the experiences of the National Root Crops Research Institute (NRCRI), where the business plan is gaining acceptance, and some tools are already in use. He explained that a revolving fund has been set up and NRCRI was working out modalities for opening a sub-account in the institute's revenue account. Elizabeth Ngundo from the Kenya Plant Health Inspectorate Service (KEPHIS) shared her organisation's experience with calculating break-even cost, selling price and stakeholder response to the new price structure. She highlighted their pricing structure with four price points, depending on whether advance payment was made when the seed was ordered; and the type of customer – where private multipliers would be charged a lower price compared to institutional customers such as NGOs.

In a three-minute "elevator pitch" each country elaborated their most successful marketing activity, the cost of implementing it; its impact on sales (based on evidence) and its added value/comparative advantage compared to other marketing activities.

Other highlights of the meeting were a practical demonstration of Loop-mediated isothermal Amplification (LAMP) a user-friendly, field-based detection tool for detection of sweetpotato viruses by Jan Kreuze (CIP Lima) and Bramwel Wanjala (CIP Nairobi), after which participants got a chance to practice independently. Erna Abidin (CIP-Ghana) presented a proposed model by the Jumpstarting

Orange-fleshed Sweetpotato in West Africa through Diversified Markets project, for dissemination of sweetpotato planting material. Jan Low (CIP-SSA) spoke of the highlights of the SPHI for 2016, which included the award of the World Food Prize to colleagues from CIP and HarvestPlus and the Al-Sumait Prize for African Food Security.

On the last day of the meeting, agricultural economists from the partner organisations worked with Rajendran to update their business plans. Lessons and experiences were shared through presentations and inter-country comparisons. The topics covered during this session included: financial tools used in existing business plans to assess profitability, their pros and cons; differences between margin and mark-up, and how to set prices; differences between cost effectiveness and cost benefit analysis; cost estimation methods using real-time data collection; linkages with revolving funds. Participants also practised how to use new cost templates based on their business plan data. At the end of the meeting, participants committed to follow-up actions to continue with cost data collection and the institutionalisation of their business plans.

1 Session 1: Mid-year 3: Successes, lessons and moving forward with pre-basic seed and Early Generation Seed production

The following two parallel sessions were held:

1. SARI, National Crops Resources Research Institute (NaCRRI), BioCrops, DARS, CRI, NRCRI

2. SRI, TARI, KEPHIS, RAB, IIAM, ZARI, Institut de l'Environnement et de Recherches Agricoles de Burkina Faso (INERA)

First, each country made 15-minute presentations using pre-defined templates. Their presentations covered the following information for the period of June-November 2016:

- Production capacities, production targets vs. achievements for the reporting period and comments on how to improve on the production targets
- Quality management i.e. virus testing, inspection standards and protocols
- Estimated PBS requirements, i.e. estimated demand for pre-basic cuttings for the next season, number of PBS cuttings required and proposed prices for each class or seed
- Stakeholder meetings held
- Progress in implementing the business plan
- Status of implementing the revolving fund
- In-country training and capacity building
- Areas that need strengthening
- Two photos that best capture the progress reported.

The two groups then discussed key successes, lessons to share, improvements needed, which were presented in a plenary session. In this section, highlights from each presentation and a synthesis of the discussion are provided. The full presentations are available to download at the links provided.

1.1 Country presentations

1.1.1 Southern Agricultural Research Institute – Ethiopia

View/download presentation

Varieties handled are Awassa, Kulfo and Beletech. Five new screen houses have been constructed by the regional government for production of sweetpotato, ginger, enset and pineapple plantlets. Actions to increase multiplication include using small inter and intra-row spacing (20cm x 20cm) in net tunnels, small cuttings of three nodes for planting and application of farm yard manure (FYM) in the net tunnels and urea in the open field. Use of small cuttings and irrigation systems established for other crops have helped to reduce costs. Instead of moving net tunnels, beans are being planted in the net tunnels as a rotation crop.

Virus testing is done using NCM ELISA directly on sweetpotato (with no grafting) and Quality Declared Seed (QDS) standards were approved and are being implemented. Inspectors were trained on QDS guidelines.

The estimated demand for pre-basic cuttings for next season (January-March, 2017) is 3,035,948 cuttings, of basic seed. Pre-basic will be produced in the mobile net tunnels and then cuttings transferred to open fields for basic seed production.

Sweetpotato basic seed production at Hawassa, showing creativity of a guard to protect against entrance of porcupines (3 November 2016). Photo Credit: Fekadu Gurmu

The business plan has been recognised by SARI senior management and there has been some progress in its implementation. However, a separate revolving fund has not been established as the institute has a seed production and sales unit for all crops, which brings in revenue. Prices are set by the institute management. They are not based on actual cost of production. There are ongoing discussions that the price should be based on the business plan and calculated costs.

The stakeholders meeting for 2016 is planned for the third week of December, 2016. Other areas identified for strengthening are training of newly recruited tissue culture laboratory staff; discussion with SARI management on how to make Areka TC lab more functional; and use of revenues from sweetpotato seed sales to strengthen sweetpotato PBS and basic seed production.

1.1.2 National Crop Resources Research Institute - Uganda

View/download presentation

Sweetpotato Field day in AbiZARDI, Uganda (November 17, 2016)
Photo Credit: Paul Musana

Varieties on demand include: NASPOT 12 O, NASPOT 13 O, and Dimbuka-Bukululа. Dimbuka-Bukululа was however found to be a slow grower. Other varieties are maintained in the screen house in low numbers. Open fields are utilised to increase vine production (basic seed) in low virus pressure regions in Serere. Utilisation of wooden boxes produces more cuttings per unit area compared to pots. This could be attributed to high soil density. NaCRRI has also found that planting cuttings with fewer nodes lowers the survival rate. As a research question, NaCRRI feels that there is need to establish the optimal number of ratoon harvests from each plant, both under open field conditions and the screen house.

Quality of the material is assured by testing five plants of each variety on *I. setosa* for sweetpotato viruses. The sweetpotato seed standards and inspection protocol are finalised and ready to be published for use. It is estimated that for season 1, 2017 (March-September), 32,000 PBS cuttings will be required to plant two acres for basic seed production.

As part of the business orientation strategy, NaCRRI has a sweetpotato ledger for sales. AbiZARDI has been contracted to multiply basic seed for NaCRRI and the proceeds from the sales are deposited in this sub-ledger. Pricing for QDS depends on the quality and quantity of vines in the bag and estimates are based on the usual price charged in farmer to farmer sales. However, it was noted that this material was not clean. HarvestPlus is helping farmers to undertake demand projection. One of the marketing strategies employed by NaCRRI is field days, which are conducted in West Nile region to promote orange-fleshed sweetpotato (OFSP). Areas of training included: PBS production, comparative advantage of using clean seed instead of potentially infected material.

No stakeholders' meeting was held, due to technical and logistical issues. It is planned for December 2016. A sweetpotato field day on production technologies and seed systems was held at the basic seed production site at AbiZARDI. Areas identified for strengthening are: human capacity building for increased vine multiplication; decentralisation of the management of the revolving fund to the programme and the need for National Agricultural Research Organization (NARO) to start funding the PBS business through the Agricultural Technology and Agribusiness Advisory Services project.

1.1.3 BioCrops Ltd. Uganda

View/download presentation

Adopting low-cost propagation containers in Kimenyedde - Uganda; 29 October 2016. Photo Credit: Arnest Bongole

Seven varieties: Ejumula, Kakamega, Kabode, Vita, NASPOT 1, 8 and 12 are being handled, with priority being given to the most preferred, i.e. NASPOT 8 and 12.

Biocrops Ltd. utilises troughs, pots, flat beds and ridges for multiplication. To increase survival rates of cuttings, multiplication is done under a humidity chamber during the cooler season. Bamboo is used in screen house construction to reduce costs, because metal is too expensive and wood is not long lasting. Satellite screen houses have been set up under co-ownership with farmer multipliers who are being trained on management and production practices. For the next season (November-December 2016), 3,500 pre-basic cuttings are required to plant in five nurseries.

I. setosa is occasionally used to rule out viral symptoms in suspected plants. During the reporting period, all plants tested negative. National seed standards and inspection protocols are in place and await implementation.

Being a business entity, Biocrops Ltd. it does not have a revolving fund. However, the company links farmers to credit operators such as banks and savings and credit cooperatives to provide funds.

A stakeholder meeting held on 12 August 2016 had 16 participants, including potential multipliers and research scientists. They discussed selection criteria for hosting and co-operation of the screen houses and nursery management as a business, and estimated the required quantities of planting material. The main areas of improvement are quality assurance (a diagnostic lab has been set up and is being equipped); and the support to multipliers to access credit and market linkages to root producers.

1.1.4 Department of Agricultural Research Services (DARS)-Malawi

View/download presentation

Seven varieties are being multiplied. Actions taken to increase vine multiplication rates include sandponics, covering with polythene sheets to increase temperature and training (or staking) of vines. Sandponics has been found to be quite promising and areas of improvement are being explored. One of the lessons learnt is that varieties respond differently to *in vitro* sub-culturing.

Virus testing is not done. Therefore, for quality assurance, grafting on *I. setosa* and symptom observation is done to detect viruses. There have been challenges such as electricity failures, lack of water and breakdown of the irrigation pump.

While some actions have been taken to implement the business plan, and a sub-ledger set up, the revolving fund is not yet functioning. With regard to building the business, CIP will collaborate with DARS on demand promotion activities.

Kennedy Masamba monitoring vine growth and leaf morphological features (note yellowing of leaves) inside sweet potato screen house –Bvumbwe Research Station (24 September 2016)

A stakeholders' meeting held on 14-15 July 2016 had 53 participants, who discussed vine multiplication, quality assurance and market linkages. The second meeting will be organised in a weeks' time to estimate seed requirements. Training was held on measurements for and preparation of nutrient solutions for sweetpotato sandponics. The following areas have been identified for strengthening: Pre-basic vine multiplication in screen houses; quality control and disease monitoring through indexing; and revenue collection for revolving funds.

1.1.5 Crop Research Institute – Ghana

View/download presentation

Improved barrel and LPG for soil sterilisation. The fabricated system with the lid has a slot for a thermometer to monitor temperature. Photo Credit: Boadi K. Ahenkorah

Ten varieties are being multiplied. Production is only done in the screen house and not in the field. The TC conservation medium that is used in Lima was evaluated and not found to be optimal as it favours fast growth of *in vitro* plants. In response, ten conservation media are being optimised, to reduce growth rate. Measures to increase multiplication include evaluating PBS planting spacing in screen house (10, 15 & 20 cm), in buckets and in beds. To save costs, there is minimal *in vitro* micropropagation and cultures are kept under conservation of until they are needed.

Nine OFSP varieties have been virus cleaned while 11 will be sent to KEPHIS for cleaning. Twenty multipliers have been identified to link with Crop Research Institute (CRI) for PBS for further seed multiplication. Linkages are also being sought with registered seed companies. Through national and regional innovation platforms, they are reaching out to other value chain actors for seed and root production and utilisation. Two national service staff received on-the-job training. Soil sterilisation is done by Liquefied Petroleum Gas (LPG) in a modified container with a thermometer to monitor temperature. The participants questioned the cost effectiveness of this method of soil sterilisation and proposed alternatives such as firewood.

The business plan is being developed and has not yet been fully implemented. Srini Rajendran will provide support. The revolving fund has been established but it is not yet operational.

1.1.6 National Root Crops Research Institute – Nigeria

View/download presentation

Only two varieties are being promoted because of a limited number of released varieties. Plans are underway to increase the number of varieties (especially those with low dry matter) by working closely with breeders. However, the process of variety release is a challenge and the last varieties were released three years ago. Production areas include screen house, net tunnels and open field multiplication. Net tunnels were set up late, resulting in low percentage achievement. Furthermore, the operations at the TC lab have been adversely affected by regular and prolonged electricity blackouts.

The Quality Declared Planting Materials (QDPM) seed standard was tested in Osun state and will be rolled out in other states. Some of the experiences are that vine production in beds produced a higher number of cuttings per unit area compared to pots; and staking of vines vertically increased the multiplication ratio to 1:12-15 cuttings. KEPHIS will share their current study for comparison.

The government is keen on revenue collection and happy with the progress made on the revolving fund. A sub-account was created with a separate ledger to manage sweetpotato funds, but is not yet operational.

Fourteen participants attended the stakeholders' meeting held on 16th November 2016. Sixty-two farmers were trained on Triple S technology for planting material conservation and production; while two participants attended the training course on "Everything you ever wanted to know about sweetpotato". NRCRI has identified the following areas for strengthening: training of technical staff on management of production of PBS and basic seed; strengthening the breeding programme of the institute for release of OFSP farmer preferred varieties; and infrastructure development such as construction of more screen houses to be able to reach the targets.

Visit to screen house in NRCRI by stakeholders to learn the advantages of training vines (16 November 2016). Photo Credit: Marcel Ogbonna

1.1.7 Institut de l'Environnement et de Recherches Agricoles de Burkina Faso (INERA) - Burkina Faso

View/download presentation

PBS multiplication focuses on three varieties; although 12 others are also multiplied in smaller quantities. Production is done only in the screen house with simple irrigation facilities. 75m^2 of pre-basic seed are being produced in pots, and 4,536 plants were planted. Although the target was to produce 35,000 plantlets, 72,000 were produced. There have been challenges with white-fly in the screen house and competition for water use. The price per cutting is determined by the cost of production. The multiplication rate of eight was selected to produce enough seed within six months. Currently, three-node cuttings are advised in pre-basic, but in open field multiplication, using three-node will end up burying the whole vine in the ground, therefore a longer length is recommended.

For quality assurance, 15 plants were grafted onto *I. Setosa* and tested with NCM Elisa. Eight were found negative. Seed standards and inspection protocols are under development.

The estimated demand for the June – July 2017 season is 153,733 pre-basic cuttings. To estimate this demand, the team in Burkina Faso used a tool (Monaire's formula) introduced in the 2015 Sub-Grantee Agreement (SGA) meeting. A revolving fund is in place but not yet operational.

No stakeholders' meeting or training was held during the reporting period. INERA will require technical support to finalise and implement the business plan, and to get the revolving fund fully operational.

Mixed fertilizer (NPK/Urea: 2/1 improve PBS production in screen house at INERA station of Kamboinse (25 November 2016). Photo Credit: Koussao Some

1.1.8 Tigray Agricultural Research Institute - Ethiopia

View/download presentation

Tigray Agricultural Research Institute (TARI) achieved 26.6% of the targeted 30,000 greenhouse production and 18% of the targeted 600,000 net tunnel production. The greatest challenge was lack of electricity to maintain the laboratory, which adversely affected all production plans due to loss of the tissue culture plantlets. Due to these problems, the available material was maintained in the greenhouse and then transferred for open field multiplication.

Vine dissemination in Tigray. Photo Credit: Beyene Demtsu

A draft copy of seed standards and inspection protocols was submitted and is waiting feedback from the national committees. Three farms producing sweetpotato seed were inspected and all were approved.

Implementation of the business plan has commenced; it is noteworthy that those institutions now understand that TARI is producing planting materials for sale which has resulted in orders of 320,000 cuttings and revenue of 118,400 Birr (approximately $5,638).

TARI is planning to start producing basic seed. One hectare of basic seed has already been produced for distribution to other seed multipliers. The area under production will be increased with demand.

The seed system stakeholders' planning meeting is planned for December to review the seed requirements for next season. Virus indexing and DNA finger printing of varieties are being carried out at KEPHIS and Biosciences eastern and central Africa. In addition, water tanks are being purchased and installation should start in December to finalise the rehabilitation of the water supply system. One hectare of basic seed at Mekelle Research Centre will be produced using resources from the revolving fund and/or TARI budget.

1.1.9 Kenya Plant Health Inspectorate Service

View/download presentation

Ivan Obare and Stephen Khisa trailing vines in the KEPHIS PQBS propagation room on 21 November 2016. Photo Credit: Elizabeth Ngundo.

The focus is on pre-basic seed production in two screen houses; there are 5,600 plants of four varieties, Kabode, Vita, and farmer preferred Chebolol and Kenspot 1. From June to November 2016, KEPHIS sold 540 cuttings for Ksh. 27,000 (approximately $270). New developments include training of vines using wires on benches, and reduction of tissue culture multiplication while increasing screen house multiplication to cut down on costs.

Seventy-four samples were grafted on *I. Setosa* and are awaiting serology results. The Seed and Plant Variety Act has been reviewed and sweetpotato has been put under Schedule 2 (mandatory certification). The seed standards and inspection protocol are under review, and the virus testing lab was re-accredited for ISO 17025:2005

Real costing activity was carried out and PBS cost determined and reviewed with the help of the International Potato Center (CIP) agricultural economist. A sub-ledger account under KEPHIS has been opened and is operational for the revolving funds. The revolving fund committee approved the use of 20% of these funds to cover production inputs between August and December 2016.

KEPHIS successfully hosted the 2016 International Phytosanitary Conference. A stakeholders' meeting was held, and it helped to generate feedback about the seed certification standards, which have been taken into account in the review and finalisation of the standards.

1.1.10 Rwanda Agriculture Board

View/download presentation

Eng. Edward Mbugua in a new screen house he is constructing at RAB. Photo Credit: Jean Ndirigwe

Rwanda Agricultural Board (RAB) achieved TC initiation of 40 against a planned 200, and produced 140,000 cuttings of pre-basic seed, which were transferred to open field for further multiplication. The focus is on the most preferred and dual purpose varieties, including white–fleshed ones. Ratooning is limited to 3-4 times within the screen house and to only two times in open field.

The seed inspection standards and protocol has been submitted to the Standards Board for approval.

Almost 2.5 million RWF (approximately $3,000) worth of cuttings have been sold, mainly to institutions, but some individuals also make orders. The demand is higher than RAB's supply capacity. This demand is driven by institutional buyers yet in the long run; these institutions are distorting the market as they reduce farmers' willingness to pay for vines. This is why the marketing

strategy will focus on the private sector. One idea that emerged from stakeholder meetings is the branding of seed with specific information e.g. name of variety, agronomic requirements and nutritional content. The sweetpotato market is growing and demand for sweetpotato roots is partly being driven by the increase in cassava diseases. 10kgs of roots are sold at $10.

Government officials do not understand why a government institution should sell them vines instead of distributing them for free. This is something that has to be addressed for RAB's commercialisation to succeed. Other areas that require strengthening are capacity of inspectors on vine tracking and the use of Open Data Kit (ODK), training of staff on virus indexing and grafting on *I. setosa* and branding/marketing of OFSP technologies and varieties.

1.1.11 Sugarcane Research Institute - Tanzania

View/download presentation

Casual labourers planting vines in Ukiriguru PBS screen house. Photo Credit: Everina Lukonge

At Ukiriguru, Kibaha and Uyole stations, cuttings are sourced from Crop BioScience tissue culture laboratory in Arusha, for further screen house and open field multiplication. Nine varieties are currently under multiplication. Multiplication rates range from 1: 3–8, depending on the site and variety. Multiplication rates are increased by applying FYM, nitrogen fertilisers and YaraMira fertiliser. Cost reduction measures include installation of a drip irrigation system in one screen house, mulching, and the use of black nets to reduce evapotranspiration.

Seven plants of four varieties (Kabode, Polista, UKG 05 and NASPOT 11) were taken from all three locations for virus testing by grafting on *I. setosa*, but the results are not yet ready.

The Tanzania Official Seed Certification Institute seed standards and inspection protocols are followed, and inspectors from Morogoro and Mwanza have inspected materials in Kibaha and Ukiriguru. To promote training on seed production, a manual was produced for use in all zones. Small amounts of vines are multiplied for sale to projects, while individuals are encouraged to buy from decentralised multipliers. 29,000 cuttings have been sold out of the targeted 50,000 cuttings. A WhatsApp platform links multipliers, root producers and consumers.

The business plan is being implemented, but it is affected by the fact that people were used to getting materials for free.

1.1.12 Zambia Agricultural Research Institute

View/download presentation

Mini display of the sweetpotato seed system at the National Agricultural Show. Photo Credit: Martin Chiona

Seven varieties are being multiplied in screen houses in Mansa and Msekera. An additional screen house been completed in Mansa to increase production capacity. Other ideas to increase multiplication and cut costs include staking of vines upwards, and using brick troughs instead of pots. Irrigation is now done using pipes instead of buckets and local fertiliser is used instead of imported chemicals.

Through a stakeholders meeting held in 25 August 2016, contact was made with the National Seed Traders Association. Furthermore, a seed standards meeting will be held as soon as vines are harvested. Multipliers linked to Msekera Research Station have been registered by the Zambia Seed Control and Certification Institute.

Current demand is over 1.5 million basic cuttings. This is mostly from institutional buyers Agriculture Productivity and Market Enhancement Project, Scaling up Nutrition, and Smallholder Productivity Promotion Programme (S3P). During the reporting period, 2% of this target was produced. The revolving fund was set up and the fund management committee held one meeting. However, no revenue has been deposited into the account, as cuttings were not sold.

Due to the departure of staff members for further studies and the need for better data collection and analysis, ZARI requires technical strengthening.

1.2 Plenary presentations

In plenary, the two groups presented and discussed the successes, lessons, challenges and suggested improvements that had emerged from the different countries. The topics included multiplication rate; production targets; demand (or seed requirement) projection; marketing; revolving funds and quality assurance.

1.2.1 Successes

- Technologies adopted by National Agricultural Research Institutes (NARIs) are contributing to an increase in multiplication rates.
- While pots are good at maintaining germplasm, boxes and beds have been found to be better for rapid multiplication as they enable higher production per unit – KEPHIS, NaCRRI.
- Use of staking vines to grow vertically increased multiplication rates in the screen house – ZARI, KEPHIS, DARS
- In some countries, multiplication rates were significantly higher in the net tunnel as compared to the screen house. At SRI, use of black net for screen houses, reduced evapotranspiration and contributed to increased vine multiplication.
- The following measures have been put in place to reduce PBS production costs
- Use of drip irrigation to improve water use efficiency and reduce labour costs.
- Reducing production in TC and increase production in screen house.
- Plug propagation and solar sterilisation using black plastic sheets.

- In Nigeria, there are synergies between projects in putting up screen houses while in DARS-Malawi, infrastructure has been provided.
- Revolving funds
- All the countries are institutionalising business plans. Marketing strategies have been put in place to promote sweetpotato production in some countries such as Ethiopia.
- All countries have started to set up revolving funds, and are in the process of obtaining official recognition to be fully operational. TARI and KEPHIS have received disbursements from the revolving fund to use for Early Generation Seed (EGS) production. SARI has also started using the funds, from seed sales although there is no separate sub-ledger for sweetpotato yet.
- Demand creation for EGS
- There is increasing demand for EGS. The known buyers are government and NGOs but there is actual and effective demand from the private sector. Demand for EGS among individual root producers is also steadily increasing.

1.2.2 Lessons

- The ideal conditions for PBS production are good Phytosanitary health status, knowing the generation of seed under production and optimum production conditions within the production facilities, e.g. screen house and TC lab. While there are qualitative observations/experiences/insights of some of the successes, these are not supported by figures. There is need to set up experiments to get quantitative evidence.
- Staking vines to grow vertically increases multiplication rates e.g. in Kenya.
- Branding is a good marketing strategy e.g. in Rwanda.
- Social media is an effective strategy of linking stakeholders in the seed system value chain e.g. WhatsApp in Tanzania.
- Gradual increase in proportion of revolving funds allocated to the production of PBS will help ensure sustainability.
- To accurately estimate and project seed requirements, there is need for coordination and proper planning between seed multipliers and root producers. All stakeholders need to be well aware of the seed multiplication cycle, so that orders can be placed in advance and not at the last minute.

1.2.3 Challenges

- Pricing: there are some pending questions. For example,
- Who determines the selling price? In Ethiopia, the price is fixed by government ($30 cents), but actual calculation shows the price should be $12 cents.
- When government departments set minimum prices, it affects businesses because in certain cases, these prices make it impossible to break even.
- One response to high demand for PBS could be to increase the unit price of seed (supply and demand). However, reducing the price can also attract more customers and so increase total revenue. The price elasticity of PBS and other price determination factors need further exploration.
- Free vine distribution is affecting PBS marketing because farmers are not used to buying seed. The conflict is exacerbated by different approaches by CIP projects.
-
- Dependence on institutional buyers may hinder the sustainability of business plans.

- Access to sustainable sources of water for irrigation is a common challenge across most of the partner institutions.
- Farmers do not have enough awareness about clean planting materials.

1.2.4 Areas for improvement

- Set a lower price for individual farmers and higher price for NGOs and institutional buyers (e.g. strategy being used by KEPHIS).
- Improve TC infrastructure/capacities; although the trade-offs in investing in TC or screen house production need to be considered – as screen house production is more cost effective
- Estimate and compare costs and margins along the value chain. If TC production volume is low, cost per unit will be high.
- Establish effective demand projection.
- Establish the production cost break-even point.
- Follow the following flow of seed: pre-basic –> basic –> QDS. In particular, encourage institutional buyers who will be distributing to root producers to purchase from QDS multipliers.
- Set up quality assurance management downstream in the seed production process e.g. satellite multipliers with whom profits are shared.
- Private and government models should work together with stakeholders through meetings.
- Carry out refresher training in screen house management and PBS production.

1.2.5 Discussion: How do we get orders into our books?

During this session, participants discussed how seed requirement projection is done, and brainstormed ideas that they could implement in their countries to increase the number of orders for EGS. The main points from this session were as follows:

- Strategy for effective demand determination: In Rwanda, there is very high demand and RAB could sell all the material produced; however, sometimes there are conflicts with CIP projects that want to distribute free vines. A compromise has been reached where CIP projects buy pre-basic seed from RAB, which is then used for further multiplication by project supported multipliers, and distribution to root producers.
- Demand is determined by the operational area. For example, in Ethiopia, all the demand is institutional. The strategy used for creating effective demand is to hold a stakeholders meeting. In Southern Ethiopia there is high demand, so the production area and multiplication rate have to be increased.
- By working backwards from the root grower's demand, it is possible to estimate how much EGS should be produced. Following the value chain could also increase demand by root producers. This is an idea that is being followed up in Zambia.
- Ghana is already working on innovation platforms; whose chairman is a root producer. E-Agriculture is a platform to help establish what the demand is.
- In Tanzania, SRI has been working with the same Decentralised Vine Multipliers (DVMs) and NGO projects since the Reaching Agents of Change project. Demand for EGS will be determined by orders placed by NGOs for cutting material to distribute to farmers.
- In Nigeria, the root producers should be motivated to buy material because they are guaranteed of a market from root consumers, therefore the strategy is to expand the root market.

- In Zambia, the idea is to follow the value chain so that the demand by root producers can increase.
- In Kenya, KEPHIS works with Farm Concern International, which facilitates grouping of farmers into production zones. From these zones, KEPHIS can determine how many cuttings are needed, usually through stakeholder meetings. In the last meeting, stakeholders were informed of the new price structure and the price was lower than last year. This resulted in an increase in clients. Price reduction will therefore be used to create more demand.
- In Uganda, the material will be provided at a subsidy to some basic seed multipliers and this should start the process through which to create a pull factor.
- In Uganda, weather patterns play a role; at the end of the long dry season, there is upsurge in demand. This can be taken advantage of. Where there are two seasons, it is important to think about whether the market can absorb two cycles of seed production.
- If market development is done, the roots will be bought, and this will also ensure uptake of vines.
- The seed system will work better if there are many varieties, both orange and white.

2 Session 2: Report back on assessment of the Seed Systems CoP

2.1 Findings of the participatory formative assessment of the Seed Systems CoP

View/download presentation

Kimenye presents findings of formative assessment. Photo Credit: C. Bukania

The participatory formative assessment was commissioned by the CGIAR Research Program on Roots, Tubers and Bananas. The aim was to document the steps taken in establishing, running and maintaining the SS-CoP, and identify lessons, which stakeholders working on other RTB seed systems could draw on as they establish and grow their own CoPs. The study took place between August and November 2016.

The conceptual framework of the study was informed by seven principles that guide the cultivation of a CoP. These are: (i) design for evolution; (ii) bring both insider and outsider perspectives; (iii) invite different levels participation; (iv) develop both public & private spaces; (v) focus on value; (vi) combine familiarity and excitement; and (vii) create a rhythm for the community.

Primary data was collected through email questionnaires (35% response rate) and key informant interviews with 25 CoP members. Secondary data was collected from the SS-CoP and related documents.

The assessment identified five components of the CoP i.e. online D-group, face-to-face meetings, learning journeys, SASHA SGA and knowledge portal. Each of the mechanisms was rated to determine which was the most useful for different types of learning by organisations and by different disciplines. In summary, the combination of the components provided members with means for the different types of learning. For example, detailed examples of the kind of learning

from the learning journeys can be downloaded **here**. The CoP enabled members to re-generate and share knowledge; to network more broadly; learn from each other and obtain solutions to some of the problems they face in their work.

2.1.1 Discussion

One of the lessons learnt during the assessment is that a functioning CoP must have a good coordinator, and a moderator that can push the online discussions forward. Furthermore, the roles of the coordinator and moderators should be clearly defined, and they should receive tips that enable them to carry out their tasks successfully.

During previous discussions during face-to-face meeting, there have been suggestions that the CoP fundraise to follow up on specific research questions. However, this issue is beyond the scope of the assessment report, as it was not included in the online questionnaire that was circulated during the assessment.

Overall, there is need for members to determine exactly how they can benefit from the existence of the CoP, and how it adds value to their sweetpotato seed systems activities.

2.1.2 Harvesting additional outcomes of the CoP

Participants worked in eight groups to reflect on further benefits derived from their participation in the CoP. The outputs of these discussions are synthesised and presented in the table below:

Table 1: Outcomes from learning journeys

Learning Journey context: (Place, date, Route & theme)	**Skill, idea, technology etc. picked/learnt**	**Skill, idea, technology etc. tested/experimented/ applied**	**Any changes (on practice) noticed**
Kigali April 2015 Route 1 Net tunnel	Net Tunnel	Reuse net tunnel, apply nutrient fertiliser and reuse the net tunnel (Nigeria)	Used PVC to construct the frame as the sticks were not durable. Tested in three countries
Kigali April 2015 Route 1 Net tunnel	Using alternatives to wires in constructing net tunnel.	Use of nylon ropes	Easy to open and close the net tunnel
Kigali April 2015 Route 2 Inspection of sweetpotato quality declared seed	Inspection protocol for sweetpotato (FAO)	Trying to domesticate the inspection protocol	Quality requirements determined (disease tolerances)
Kigali April 2015 Route 3 Tissue culture micropropagation and hardening	Reduction of cost in TC production	Increase screen house production	Increased number of screen house from 1 to 2 and net tunnels for more production
Nairobi December 2015 Route 1 Identifying good practice for tissue culture micropropagation and screen house production	Good practice to increase tissue culture multiplication rate and reduce costs	Preparing media from locally available materials	Use of table sugar instead of sucrose
Nairobi December 2015 Route 1 Identifying good practice for tissue culture micropropagation and screen house production	Identifying good practices for tissue culture micropropagation and screen house production of PBS	Experience on PBS production practices gained	Spraying the screen house with insecticides
Nairobi December 2015 Route 1 Identifying good practice for tissue culture micropropagation and screen house production	Use of bar code for labelling Grafting on sweetpotato on *I. Setosa*	Grafting and NCM ELISA being done	Improved quality assurance

Arusha May 2016 Route 1 Good agronomic practices for commercial root production	Disinfection of cuttings before transporting	Being used for shipping of materials to multipliers	Plant material loss during shipping significantly reduced in the SUSTAIN project, Kenya
Arusha May 2016 Route 1 Good agronomic practices for commercial root production	How the company controls the seed system,	Not yet	Not yet
Arusha May 2016 Route 1 Good agronomic practices for commercial root production	Packaging vine for transport	Disinfecting and waxing	Yet to apply
Arusha May 2016 Route 1 Good agronomic practices for commercial root production	The use of proper inter and intra – row spacing to manage root size and shape	Not yet	
Arusha May 2016 Route 1 Good agronomic practices for commercial root production	Use of vapour guard protecting vines from desiccation (increase shelf life of vine during transportation)	Failed to get the chemical/product (Why not consult CoP on where to get the chemical)	Not tried
Arusha May 2016 Route 1 Good agronomic practices for commercial root production	Use of maple trough for planting	Improvised/adapted maple trough with polythene sheet	Increased growth and MR Reduced risk of weevil
Arusha May 2016 Route 1 Good agronomic practices for commercial root production	TC micropropagation Different marketing strategies	Not applied yet	
Arusha 2016, Route 2 Business case for root production	Cooperative organising farmers for root production for export. Commercialisation need readily available clean seed	Help in commercialisation of clean seed and varieties	

Table 2: Outcomes from face-to-face/SGA meetings

F2F meetings OR SGA: (Place, date, & theme)	Skill, idea, technology etc. picked/learnt	Skill, idea, technology etc. tested/experimented/applied	Any changes (on practice) noticed
F2F, Nairobi 2015	Knowledge on seed classes	Differentiate between the different seed classes	In depth knowledge lead to increased participation in seed systems work in Zambia
F2F, Arusha, 2016	Measurement of vine yield per acre	Estimate vine yield and package vines for sale	Efficiency in vine quantity estimation for production and sale in Lake Zone Agricultural Research Institute (LZARDI), Tanzania
F2F, 2014	NET Tunnel	Implemented them in Burkina Faso, Ghana and Nigeria in 2016	
F2F, Arusha, 2016	Group discussion on Triple S	Implementing Triple S using different materials to substitute, using local material	
F2F, Arusha, 2016	Photo contest	Applied	Won a prize in photo contest
F2F, Kenya, 2013	Triple S method	Testing it under Tigray and SNNPR's conditions	Modifying to maintain planting materials from 3 months to 9 months
F2F, Nairobi, 2015	Demand projection	Demand for next 10 years have been projected	Able to set milestones and achieve most of them
F2F, Arusha, 2016	Sandponics for vine multiplication	Tried	Noticed increased vine growth rate
F2F, Kigali, 2015	Net tunnel	Come up with large mobile net tunnel idea	Modified screen houses into mobile; Shared with other programmes (6) and used for rotation with beans. Planning to have 12
F2F, Arusha, 2016	Data recording in screen house for use in business plan; Control of snail in screen house (salt, coffee, beer)	Implemented	Improved record keeping and cost and sale; Managed to control snails, attracted by beer then killed by salt
SGA, Nairobi, 2015	Staking of vines to increase production	Use of wires to trail vines	Increased production
F2F, Arusha, 2016	Use of coconut residues as screen house media	Not applied yet	
SGA, Nairobi, 2015	No of screen house ratooning in the screen house from KEPHIS	Applied	Increased production and maintain quality

Table 3: Outcomes from online D-G forum

Discussion Topic	Skill, idea, technology etc. picked/learnt	Skill, idea, technology etc. tested/experimented/applied	Any changes (on practice) noticed
Vine free distribution	Funding agencies distribute vine freely and distort markets	Formulate marketing strategies for NARIs; Different levels of price for different actors	Yes, increased revenue for NARIs
Vine degeneration	How long does it take for planting materials to degenerate?	Resistant varieties do not break within two years	Developed evidence based data; susceptible varieties susceptible break down in under one year
Vine packaging	Packaging vine for transport	Stripped and Un-stripped to affect bulkiness and storage	Experiments, un-stripped has ultimate better yield and this could be location dependent. When stripping keep one leaf
Effect of ratooning on vine and root production	Ratooning reduces the quality of vine	Increasing quality of vine by reducing ratooning	Reducing ratooning
Time of seed replenishing s/potato planting materials (ratooning)	Time of seed replenishing s/potato planting materials (ratooning)		
Net tunnel	Net tunnel	Come up with large mobile net tunnel idea	Modified screen houses into mobile; Shared with other programmes (6) and used for rotation with beans. Planning to have 12
Positive & negative selection; time of seed replenishment; how many ratoons	Positive & negative selection; time of seed replenishment; how many ratoons		Able to advise farmers on selection of planting material; Need for replenishment

Table 4: Outcomes from Sweetpotato Knowledge Portal

Discussion Topic	Skill, idea, technology etc. picked/learnt	Skill, idea, technology etc. tested/experimented/applied	Any changes (on practice) noticed
SPKP (Everything you ever wanted to know about sweetpotato)	Production of pre-basic seed	Application of terminologies in the seed chain (Ratooning, generations etc.)	Increased pre-basic seed production capacity at KEPHIS, Kenya
Upcoming conference	Applied for conference	Submitted conference abstract	
Everything you ever wanted to know about sweetpotato	Download everything you want to know about sweetpotato	Used as resource material for training	Extension staff and farmer's capacity enhanced
Triple S-technology	Triple S-technology	Used for advising farmers	Used to advise drought hit community on how to preserve seed
Developments and resources	To check on recent development and what resources		

2.1.3 Brainstorm: how to benefit from the CoP?

To conclude, participants brainstormed on how they could benefit more from the CoP. This is what they said:

- Borrow practices from other CoPs. For example, active members could get a prize in the next meeting.
- Discussion topics should result in an output, such as a publication that could be submitted to inter-disciplinary journals.
- One way to measure the benefit of the CoP is the level to which other members or the project help to address challenges raised in discussions.
- At the end of each topic, there should be some concrete recommendations. If the topic is researchable, action points should be assigned to specific people to follow up.
- Majority of the members are either from CIP or NARIs. There is need to reach out to other people e.g. universities, who may contribute directly or use the knowledge generated by the CoP to scale up or undertake further research.
- Package information generated in the CoPs in different ways so as to reach the beneficiaries.

2.2 How do we link breeder seed into a functional seed system?

View/download presentation

The presentation focused on a model for dissemination of sweetpotato planting material proposed by the Jumpstarting Orange-fleshed Sweetpotato in West Africa through Diversified Markets project. The project is working with 19 varieties released by the national breeding programmes in West Africa, and is implemented in Nigeria, Ghana and Burkina Faso. The flow of seed from the breeding level to the root producers passes through primary, secondary and tertiary multiplication, which is managed by different stakeholders. Primary multiplication takes place either on station and managed by a researcher; or through contracted private sector working with researchers/breeders. It is market-driven and aims to supply clean planting materials to multipliers. At secondary multiplication, the planting material is mainly used for vine production while at tertiary level; it is used for production of vines and roots.

Initial impacts (across the three countries) include earnings of US$104,581 from vine sales in the rainy seasons of 2015 and 2016, indicating that commercialisation can be achieved. There is need to think harder about strengthening the linkage between breeding and seed systems, and to take more time to discuss what happens after handling pre-basic seed.

The following clarifications were made during discussion:

- The primary, secondary and tertiary multiplication that was presented does not refer to seed classes, but to the movement of seed along the seed chain in Ghana.
- The seed classes in Ghana are pre-basic, basic, and QDPM. In Burkina Faso, they are pre-basic, basic, certified 1 and 2. As agreed in SASHA, the term QDS 1 and 2 can be substituted for certified 1 and 2. Ghana is streamlining the classes to make them similar to those in Burkina Faso. However, it must be stated that in Ghana, QDS is considered true seed, so any material being multiplied by DVMs should be referred to as QDPM.
- The breeding programme implements all the stages. After assessment of varieties by national assessors, farmers are involved with the on-farm trials. These identified farmers are considered as potential multipliers after release of those varieties. On-farm trials done

before release cannot involve multipliers. A variety can be released into the seed system after the evaluation is finished. It is at this point that the variety can go into the seed system, and multipliers can get involved.

- While multipliers and customers give feedback about the released varieties, there is still a large lapse between the final evaluation of a variety, its release and how it gets into the system.
- The protocols that the Jumpstarting project uses for QDPM borrow from others that have already been developed in the region. They also comply with the requirements of the ECOWAS.
- DVMs are trained on seed production; recognise varieties, types of pests and diseases and how to identify them. These DVMs are monitored to ensure that they follow recommended practices. Identification of viruses is difficult even for researchers, but they are taught enough to identify symptoms.

2.3 Financial reporting: why does it matter and what we must improve on

View/download presentation

For countries that started implementation in mid-2014, the spend rate should be at least 64% meaning that all the SGAs are under spent. The quality of partner financial reports continues to be poor, and in many cases CIP staff have to rewrite them. The problem could be with the template, but it is also founded on the fact that figures used for the reports are wrong. They made resolutions that were shared with PIs.

Accountants should always use the latest budget modification to do reports. In addition, communication and coordination between principal investigators (PIs) and accountants should be improved. CIP should also invest more time in on-site support. In every country with CIP country office presence, a CIP accountant will verify the receipts on-site as a means of reducing the time spent in submitting reports. Countries without a CIP office will be required to continue scanning and sending receipts to the CIP Nairobi office for verification. In Tigray, CIP could provide support, but the office would need to receive a copy of the modification, and to understand the partners' weakness. Accountants from partner institutions attended an accountants training in 2016.

During the discussion, participants highlighted some of the factors that affect financial reporting.

- The person appointed as a desk officer for a particular project is not selected based on specific criteria, e.g. the workload, skill level etc. which sometimes results in poor outputs.
- The dedication will be commensurate to the commitment (financial allowances) shown by the project.
- Accountants are managing many projects, some provide higher allowances and therefore they receive higher priority as compared to SASHA work. For example, in Uganda, NaCRRI has over 100 projects. The accountant working on the SASHA project is paid from the GT4SP project. In Ghana, the accountant has over 20 projects.
- In Tanzania, only one of the three accountants went for the training. The other two need to visit and learn from him. This notwithstanding, it is usually difficult for the PI to influence the pace of accountants from the other research stations. A printer and scanner were bought to facilitate SASHA project accounting.

3 Session 3: Finalising recommendations from CoP topics

3.1 Sweetpotato for Profit and Health Initiative (SPHI) update

Jan Low

View/download presentation

Four scientists (Jan Low, Maria Andrade, Robert Mwanga and Howarth Bouis) were awarded the World Food Prize for their work in biofortification in the state capital of Iowa. The prize was set up by Nobel Laureate Norman Borlaug to recognise people who make a contribution in food and nutrition. This was a joyful acknowledgement of the value of OFSP and a breakthrough for RTB crops. It is also a recognition that more work should be done to promote nutrition. The four have been added to the Hall of Laureates.

Another celebratory event was the 45th anniversary of CIP, which was the co-winner of the Al-Sumait prize for African Food Security on 22 November 2016. The new CIP logo has now incorporated sweetpotato. One of the SS-CoP members, Mihiretu Cherinet, was awarded a Borlaug fellowship with a placement at Louisiana State University in the USA.

The 10th Triennial African Potato Association meeting was held in Ethiopia, with close to 300 attendees. This was preceded by the annual SPHI meeting with about 100 attendees. The SPHI target has now reached 29%, i.e. 2,895,382 households. Five CoP meetings were held in 2016. A few research highlights include:

- The presentation of results from the five-year integrated Agriculture-Nutrition-Health study in Western Kenya (Mama SASHA) at the Micronutrient Forum in Mexico.
- 70 OFSP and 39 non-OFSP varieties released since 2009 in SSA with the support of Alliance for a Green Revolution (AGRA).
- More proof that Accelerated Breeding works.
- Work with the SUSTAIN Kenya project to develop vacuum packed shelf-storable puree that can store for 4-6 months without refrigeration.

Together, different stakeholders are working to get all segments of the sweetpotato value chain working. Participants were urged to use the sweetpotato knowledge portal to share the latest developments, and to strive for breakthroughs in addressing bottlenecks in the seed systems.

3.2 Parallel working sessions: Key recommendations of CoP topics:

3.2.1 Sweetpotato seed class terminology and definitions

Mihiretu Cherinet

Efforts to harmonise the seed classes by country are listed in the table below:

Table 5: Harmonisation of seed classes by country

Seed class	Breeder	Pre-basic /nuclear	Basic	Ceritfied-1	Ceritfied-2	QDS	Foundation	Emergency seed
Uganda								
Kenya								
Tanzania								
Malawi		1 &2	1 &2					
Zambia								
Ghana								
Nigeria								
Burkina Faso								
Mozambique								
Rwanda								
Ethiopia								

1. Definition of the seed classes

Breeder seed: It is a seed that is handled by breeder after variety release. It is maintained in small plots with maximum possible quality. It should be true to type and may or may not be clean (TC cleaned).

Pre-basic: The generation directly derived from breeder seed multiplied under the control of research centres or private sector entity that is overseen by the breeder. The pre-basic sourced from pathogen tested TC plantlets is multiplied in protected screen houses/net tunnels in research centres. The level of protection from disease vectors is very high for PBS.

Basic: The generation derived from pre-basic and multiplied in net tunnels at the farmer-multiplier's level and in open field in isolated areas or areas with low pest and diseases pressure.

Certified: Certified 1 is the generation derived from basic seed and is multiplied in open field by legally registered and approved seed companies. **Certified 2** is the generation derived from Certified 1. It is multiplied in open field with legally registered and approved seed companies.

Foundation: The generation derived from certified (Ghana only).

QDS: The generation derived from basic/certified and produced in open field by registered farmer multipliers.

Emergency: Any seed that is distributed to farmers to mitigate disaster.

2. Definition of generation and ratooning

- **Ratooning**: implies cutting from the same plant, so within a generation. The number of ratoon crops within the same generation will depend on the vigour of the plant and cuttings.
- **Generation**: implies moving from one generation to another e.g. from pre-basic to basic then to certified etc.

The following points emerged from the discussion:

- QDS is for seed while QDPM is specific to RTB. However, to be in line with national Seed Acts and Regulations we should start to use the same terminology where possible.
- Emergency seed means any seed that is distributed when there is a disaster.
- In Ghana, foundation seed is derived from certified seed, but there is need think about this terminology a little more.
- The timing of production of each seed class should reflect the multiplication and root production calendar.
- A meeting with Nigeria's seed council clarified that seed refers to true seed, while planting material is what can go into multiplication.
- The group has made good progress to consolidate available information. The idea is not to harmonise seed class terms across countries – as this depends on what is specified in the national Seed Acts. Rather, that among ourselves we reach a joint definition of what this means for sweetpotato in each seed class, so that as we discuss "pre-basic" "basic" "foundation" we will then have a common language to discuss seed standards, and how quality can be maintained (e.g. the number of ratoons).

3.2.2 Sandponics

Bramwel Wanjala

Sandponics is a method of multiplication where sand media is used in place of soil. Based on recommendations from the last meeting, the following was done:

Table 6: Implementation of recommendations on sandponics from the last CoP meeting

Country	Status	Comments	Challenges
Kenya	New research protocol developed	Comparing sandponics vs. conventional	
Malawi	Sandponics set up	For vine production	Breakage of water system affecting drip irrigation
Ethiopia	Interested in setting up sandponics		
Mozambique	Sandponics set up	For vine production	
Zambia	Sandponics set up	For vine production	
Uganda			

The sandponics sub-group recommended that:

- A research protocol has been developed to compare conventional screen house production with sandponics production. It uses a nutrient formulation adapted from research on the use of sandponics for potato. The nitrogen levels have been adjusted to obtain an optimal formulation for sweetpotato.

- To do vine multiplication, nitrogen is important, but all macro-nutrients should also be optimised.
- Different countries have different environmental conditions, there is need to set up data loggers to determine the effect of temperature.
- There is need for a common check. Kabode and Tanzania varieties are being considered because they are widespread in most countries.
- Experiments should be set up to compare use of beds and pots, based on reports that higher multiplication rates are being achieved in beds.
- There is an intention to use locally available fertiliser formulations as a cost-cutting measure.
- Staking of vines will be done to maximise on vertical space and enhance branching to increase multiplication rate. Tip removal will also be tried as a means of enhancing growth.
- Because sandponics is being compared with soil, there is need to compare cost data e.g. labour, time spent for each activity; inputs/materials machinery (wheel barrow, sprayer), and harvests.
- To harmonise activities, monthly follow ups and information exchange will be encouraged.

3.2.3 Triple S

Triple S is being tested, adapted and scaled up in Ethiopia, Kenya, Uganda and the Jumpstarting countries i.e. Burkina Faso, Nigeria and Ghana.

Ethiopia: The agro-ecological zones differ; in the north, the dry season goes up to nine months, while in the south, it ranges between 3-5 months. Ethiopia compared Triple S against existing strategies for conservation of planting material i.e. volunteer sprouts and storing under the shade of enset. The trial was done in 2015 during the worst dry spell.

Highest survival rates were observed in Triple S (87.5%). Triple S also had the best results with regard to weevil infestation, which means it contributes to quality planting material. Up to 600% cuttings were produced, compared to the other techniques. Farmers' participatory groups were found to be very good for Triple S testing and adoption. In Tigray more than 58% of medium sized roots could successfully be stored for more than 7.5 months with limited decay. Larger roots started sprouting earlier, while small ones delayed to sprout. Therefore, the best roots for Triple S are medium sized ones.

Kenya: Triple S is being validated with farmer groups. The approach was to carry out a Training of Trainers (ToT) that then helps to cascade the technology to other farmers. However, there is a challenge in developing the Triple S calendar due to changing weather patterns.

Ghana: The use of Triple S was started with the demonstration on how to use roots. The demonstration includes selecting local storage containers options such as paper boxes, jute bags, and plastic bowls. The concept is used to develop Double S in Ghana, which is just storing storage roots.

Lessons learnt:

- Triple S has a good potential for climate resilience sweetpotato farming. The way to secure seed security for sweetpotato
- Weather change is affecting development of appropriate Triple S timing for the different steps and activities
- In Nigeria Farmers prefer using small roots than medium roots

- When working with farmer groups, the use of lead farmers to help upscaling the technology is very important
- In West Africa roots break dormancy earlier in the rainforest zone compared to the dry areas
- The use of participatory technology validation has shown very good results in the adoption of Triple S
- There is need to develop science-based standards by (a) consolidating findings from different ongoing researches and (b) developing science-based evidence on root physiology, the effect of physical environment and the interaction of the two
- During the discussion, participants made the following contributions:
- Between 200 and 300 30cm cuttings can be produced using about 20 roots. This means that a farmer does not have to keep many roots. The length of storage is determined by the weather patterns. Sometimes there is a delay of rains of over one month. If the schedule is made according to known weather patterns, there could be a problem. However, roots can be kept in a cool environment, where they will remain dormant, and then one will decide when to put water to stimulate sprouting, depending on expectation of rains for planting.

3.2.4 SWOT analysis and how to link to Marketing strategies

The discussion centred on how to use SWOT-TOWS matrix to reduce weaknesses and threats, and use strengths and opportunities to have a profitable business plan.

Strengths	**Opportunities**
• Monopoly in production of PBS • Network of institutions • Facilities to delivery • Ownership of varieties • Quality assured	• Huge untapped market • Processing industry • Promotional activities
Activities	**Targets**
• Mobile SMS with the assumption that about 70% of farmers use mobiles • Field demonstrations	• DVMs, farmers, NGOs, other value chain players
Impact on sales	**Why invest**
• Creation of awareness • Placement of orders • Increase demands	• NARIs have the monopoly of producing breeder seeds • Reaching out to many farmers in a short time • Learning by seeing • ToT • There is opportunity for more interactive learning

3.3 Marketing strategies: What have we done and what works?

Each country team, consisting of the PI and agricultural economist prepared an elevator pitch, i.e. a three-minute oral pitch, supported by PowerPoint slides, to make a case for investment in their PBS/EGS marketing activity. They were guided by the following questions:

- What is the activity (e.g. kiosk, labels, radio spot, demo plot, t-shirt etc.), and who is it targeted at?
- How much does it cost to implement?
- What is the impact on sales, and what is your evidence of this?
- Why should we invest in it – what is the added value/comparative advantage compared to other marketing activity?

3.3.1 SRI – Ambilikile Mwenisongole

Main target: Create farmers' awareness and willingness to pay for clean planting material.

Marketing strategies: Online marketing through social media; information about roots availability, achieved through stakeholder forum, which can be built up through established demonstration plots, where contacts of the attendees can be collected; national sweetpotato day; and radio promotion.

Expected impact: Farmers understand the importance of using clean planting material and their sources; stakeholder forum consisting of researchers, NGOs, traders and consumers is established; increased demand for high quality roots and clean planting material.

Why invest: There is a huge unexploited market for sweetpotato planting material and roots. The prevailing changing climate, especially in the Lake Zone and coastal areas has made sweetpotato a food and nutrition crop. There is a huge commitment by the government to make sure that farmers are food and nutrition secure.

3.3.2 NRCRI –Hellen Nkoli

Marketing strategies: Mobile phones can reach many farmers at the same time. Demonstration plots will be located in states where OFSP is produced. The target audience is NGOs, DVMs, school feeding programmes, and other farmers. With a cost of $250, these strategies are cost effective.

Expected impact: Create awareness about the technology and increase demand due to perceived advantage; increased sales revenue and improved livelihoods.

Why invest: Farmers can be reached in a short time to improve livelihoods and food security. Because demonstrations are practical, it will help farmers to internalise the practice. It offers exchange of ideas and opportunity for farmers to train others.

3.3.3 RAB – Jean Ndirigwe

Marketing strategies: OFSP kiosks have been set up to sell OFSP roots and planting material, the products are labelled. Other channels include brochures, TV, radio spots, and the target is passengers, passers-by, farmers, DVMs and farmer groups.

Impact: The evidence of impact is that OFSP demand has gone up and the sweetpotato value chain has been increased. As OFSP is one of the biofortified crops, demand is set to go higher. There are more processors now, so this is expected to increase demand for seed.

Why invest: There will be increased access about disease-free planting material, and the production and consumption of sweetpotato will increase.

3.3.4 DARS – Kennedy Masamba

Marketing strategies: A radio programme called 'a master farmer' is a 30-minute programme recorded in a rural set up with farmers who know the technology, extensionists, and scientists. At the end of the programme there is a feedback session. Listeners can answer questions and the lucky winners get t-shirts and farm implements. The target is rural farmers, DVMs, NGOs and extension workers. Ten programmes have been recorded at a cost of $2,400.

Expected impact: The broadcasters provide a list of respondents and the phone numbers of DVMs. This makes it possible to follow up and ensure they get farming material. We are now linking the DVMs to farmers looking for planting material. This will increase demand for planting material.

3.3.5 KEPHIS – Elizabeth Ngundo

Products: Farmer preferred virus indexed and virus cleaned sweetpotato pre-basic seed.

Marketing strategies: Brochures and posters radio spots and print media. The targeted audience is basic seed multipliers, NGOS and individuals with net tunnels. The cost implication is $500 per annum for the brochures and $400 for posters and $2,000 for media.

Expected impact: KEPHIS has been taking advantage of forums that have agricultural shows to talk to farmers, but this has limited impact. The proposed activities will take advantage of our offices that are located all over the country, and they can be accessed there. The brochures can target specific audiences and they can be passed on to others. The radio spots are interactive and can reach audiences in vernacular. They can also reach people who may have an interest to get into seed production. The print media targets Seeds of Gold, published every Saturday and known for agricultural information.

3.3.6 CRI - Patricia Acheampong

Marketing strategies: T-shirts, labels, demonstration plots and radio spots will be used to target parliamentarians, ministries, hospitals, prisons and school feeding programmes. $38,300 will be used for these activities. Six demonstrations will be carried out at a cost of $9,000 and 12 radio spots in three months costing $1,000.

Expected impact: More demand for planting material will be created; evidence of Jumpstarting shows that 72 DVMs were established within 18 months and these groups accrued over $20,000.

Why invest: This is a way of changing mind sets; increasing food security and diversification and alleviation of poverty.

3.3.7 ZARI – Paul Mutondo

Marketing strategies: Establishing demonstration plots in two locations; make farmers visible through posters and caps; radio and TV adverts on local channels and stakeholder meetings. The

target audience is farmers growing sweetpotato, consumers, so that they buy OFSP; development partners. The cost of advertising and campaign will come to a total of $5,000.

Expected impact: Increased sale of pre-basic seed, QDS material and roots.

Why invest: Radio adverts, posters, caps, t-shirts and demonstrations are more effective than agricultural shows, where one meets many people who are not concerned. Stakeholders meetings held previously generated orders of 1.5 million cuttings, which will be sold this season.

3.3.8 INERA – Some Koussao

Marketing strategies: Radio spots and TV will be used in production areas to reach farmers and DVMs and in the big cities where institutional buyers are. The target is to reach at least 1 million people. Demonstration plots will be used to show farmers, DVMs and seed companies' evidence in using quality planting material for increased quality and yield of roots. T-shirts will be used with strong messages as well. The total cost will be $10,000.

Expected impact: Provision of information showing evidence of the benefits of using quality material will increase demand and sales.

Why invest: Farmers attitudes will change, increasing their willingness to pay for quality material. It will contribute to farmers' participation in promoting quality planting material and to a sustainable seed system.

3.3.9 NaCRRI - Stephen Angudubo

Marketing strategies: Field days, demonstrations, leaflets, brochures, print media, e.g. Seeds of Gold, radio adverts and decentralised multipliers. Farmer groups, individual farmers, NGOs and value addition actors. The implementation cost will be $12,750.

Expected impact: Increased orders and bookings

Why invest: It is cost effective, technically easy to implement, socially acceptable and it will increase participation. It will add value by increasing seed access points, farmer ownership, mass awareness, broader dissemination and it will allow NaCRRI to concentrate on EGS production.

3.3.10 SARI and TARI Ethiopia - Wogayehu Melesse

Marketing strategies: Platform and demonstrations: platforms will target DVMs, commercial multipliers, health institutions, government departments. They will meet twice a year. Promotion will be done using flyers, t-shirts and demonstration of sweetpotato recipes through buffets. Demonstration plots will be used to promote varieties during field days.

Why invest: it will create awareness and ownership of improved varieties for SARI and TARI. These are monopoly producers, and farmers are not mobile. Demonstrations will show them, in their own environment, the benefits of using clean planting material. It will also create awareness and get feedback from the customers.

The activities proposed were very country-specific and proposed the use of multiple approaches. In summary, people were urged to think about which marketing or promotion strategy is most effective to sell PBS.

4 Session 4: Updating the business plans

4.1 Using the business plan as a tool

Srini Rajendran

View/download presentation

To sustain PBS production, NARIs have to effectively execute business plans. The business plan helps to come up with a sustainable enterprise model. It is an important tool, particularly for agricultural economists, who must be innovative in developing appropriate marketing strategies for PBS. It takes into consideration the fact that sustainable seed business goes through the formal seed value chain.

The presentation set the foundation for participants to be able to update their cost structure and cost estimates with proper assumptions. This would help them improve their business strategies and link revenue to the operation of the revolving fund.

While the cross country synthesis of the business plans had been prepared and circulated; only one participant had read the document. Therefore, the first part of the presentation re-introduced the concept of the business plan, the different elements and how they can be used, and process for developing a business plan. The presentation, which involved Q&A exercises, sought to increase participants' understanding of business plans, marketing strategies and price determination.

The basic rules of pricing must be followed. All prices must cover costs and profits; the most effective way to lower prices is to lower costs and use resources efficiently; prices should be reviewed frequently to assure that they reflect the dynamics of cost, market demand, response to the competition, and profit objectives; and prices must be at a level that will ensure sales. To determine prices, three components must be updated. These are the seed multiplication calendar, production targets, and valid assumptions.

A revolving fund is a fund or account that remains available to finance an organisation's continuing operations without any fiscal year limitation, because the organisation replenishes the fund by repaying money used from the account. It may also be treated as a working capital fund. In the case of the SGAs, it is established to run a sustainable business after the project period. It is set up by, strategically assigning the existing (project grant) funds towards specific needs: e.g. strengthening initial investment, infrastructure facilities, marketing strategies, or technical innovations to meet the future demand or to create a future demand The revolving fund is based on price strategy and revenue target.

4.2 Country experiences: presentation on business plan for Nigeria PBS production

View/download presentation

Pre-basic seed production was started in July 2015 after NRCRI signed an SGA with the SASHA project. PBS production is currently going on in Umudike and Kano. The business plan aims to create a revolving fund that supports sustainable seed production. The implementation and institutionalisation of the business plan, and the revolving fund, was boosted when the PI and the agricultural economist were trained. Since the plan was developed, the Net Present Value (NPV) and Benefit-Cost Ratio (BCR) tools have been used. The NPV of the seed business at 24% discounting rate was found to be N153074.9 ($489.95) which in addition to BCR of 1.21:1.00(>1) show the feasibility/viability of the seed business. The plan was accepted by the institution and a revolving fund was formed. The institute is working out modalities for opening a sub-account in the institute revenue account. The business plan is not exhaustive, and cost categories will be used to determine what should be variations should be made to improve the margins.

As a public sector institution, there is need for behaviour change towards a business orientation if the business plan is to be implemented successfully. Furthermore, keeping records requires good data, which is sometimes difficult to get from the staff. Most have not taken time to understand what matters most in this business plan, which is collecting costing data. Most biologists focus on the production data. Where multiple projects use the same facilities, allocation of costs to different commodities still remains problematic.

In addition to efforts to release more OFSP varieties and facilitate seed standard protocols, NRCRI will fine tune the business plan, synchronise the PBS production with the vine multiplication calendar, and carry out a sensitisation and promotion programme. More stakeholders' meetings are planned in a bid to get buy in.

5 Session 5: Virus Diagnostic Tools: Supporting a functional seed

5.1 LAMP: a tool to support a functional seed system

View/download presentation

Bramwel Wanjala (R) and Jan Kreuze (L) demonstrate how to use LAMP for virus testing in the field. Photo Credit: C. Bukania

NCM ELISA kits are available for ten viruses, but these kits require labs. However, most viruses occur in very low titre when infecting sweetpotato by themselves, making test results made directly from sweetpotato unreliable. Sensitive methods include PCR, but even though several assays are available for most viruses, they require lab conditions and complex equipment, making them unsuitable for field application. There is a clear need for sensitive field diagnostic methods.

Isothermal amplification methods can overcome the cost and complexity of thermal cycling equipment. Loop-mediated isothermal Amplification (LAMP) functions at a single temperature and does not require complicated and expensive thermal cycling equipment. It uses enzymes, which are more robust to contaminants and can be lyophilised (robustness for field conditions). It has a 10-30 minute reaction time and is even more sensitive than PCR.

Two demonstrations were done, after which participants got a chance to practice independently. Afterwards, a discussion took place, in which the following details were provided:

- Sweetpotato virus disease is complex. Sweetpotato chlorotic stunt virus encodes a protein that eliminates the resistance that sweetpotato has to other viruses. This happens most severely with feathery mottle virus. Sweetpotato is typically resistant and has low titres but when sweetpotato chlorotic stunt virus is co-infected with others, the titres of the other viruses go very high.
- There are situations where LAMP tests positive and NCM ELISA negative and vice versa: what is negative for NCM ELISA could be positive with this test because it is more sensitive. Validation has not yet been done extensively. Another issue is how much the virus can be diluted while staying effective. Different assays have already been designed, but the one for sweetpotato feathery mottle virus is working better than the one for sweetpotato chlorotic stunt virus. If there is no clear cut difference it could cause confusion in the field.
- The decision was made to optimise with sweetpotato chlorotic stunt virus and feathery mottle virus because they are more common, but eventually optimisation will be done for begomoviruses as well.
- An internal control is put in place to show that it is working, i.e. if one is there, it is negative, if both amplifications are there, it is positive. Decisions have to be made with regard to the number of samples to be collected, bulking etc., as they have cost implications.
- The shelf life depends on the temperature under which the lyophiliser is stored. The current shelf life at room temperature is two weeks, but with refrigeration it could last much longer. The team is working on developing a more stable lyophiliser.

- The machine can be carried to the farm level, to test at the farmers' group level, instead of taking samples to the lab.
- In the degeneration study done by Kwame Ogero in Tanzania, viruses were detected by molecular methods and visual inspection. Differences in the findings prove that is difficult to identify viruses just by looking at the plant. This tool could help increase accuracy, but the costs and benefits of each method need to be assessed. Cost calculations done in Lima show that freight and customs for equipment coming into Africa from Europe could contribute about 30% of the cost. The first step was to make sure that the test is working, and the sensitivity and specificity are going to be developed further under a process of validation. After that, the process will be compared with other processes such as NCM ELISA and PCR.
- It is important to make decisions on where to test in the production cycle based on the cost implications. It is quite useful in foundation (pre-basic) material, where testing is done every six months and the volumes are small.

5.2 Financial tools and basic rules of pricing; How do we price EGS seed: KEPHIS experience with calculating break-even cost, selling price and stakeholder response

View/download presentation

KEPHIS held a stakeholders' meeting in Bungoma in 2015 with the pre-basic seed price set at the CIP standard of Ksh. 50 ($0.5) per 30 cm cutting. The feedback was that this figure was too high and there was need to reduce it. With the support of Srini Rajendran, a real costing activity was done. The real costing resulted in the establishment of a break-even cost and a selling price. The new price was presented at a subsequent stakeholder meeting in November 2016 where the price was of 0.1-$0.2 was considered affordable and sustainable. KEPHIS has also made a production plan for 30 cm 3-4 node cuttings of the Kabode and Vita varieties, spanning the period of November 2016 to May 2017. This activity only looked at costing to determine the price of materials; it did not look at the financial viability of the enterprise.

Costing is done at different stages. There are pricing structures for different buyers i.e. institutional and vine multipliers. Customers who make late orders and payment pay more than those who make early orders and advance payment.

The costing exercise was conducted until the end of December, when the material was supposed to be ready. However, the production process will now be completed in January, which will affect the costing. The costing exercise is flexible to allow for changes in the mark-up to reflect deviations from the planned production schedule.

The following issues were discussed:

- There is need to establish a standard to guide how many harvests should be done. According to KEPHIS experience, it was considered better to work with three harvests because after that, there is deterioration of material. SASHA will provide funds for further research on this. A conclusion should be available by the next meeting.
- There is a considerable difference in the proposed prices based on the type of buyers and affordability. Institutional buyers distribute directly to farmers, which breaks the chain. This

affects the price because the shorter the chain, the higher the price. If commercial multipliers get engaged, the economies of scale push unit prices down, hence making it more affordable for root producers. The pricing strategy is therefore set to encourage basic multipliers.

- There are no competitors for PBS, but starting from the basic seed level, there are competitors. At this point, it is important to compare and consider competitor prices.

5.3 2017 Participatory Evaluation of PBS/EGS business models and plans

View/download presentation

One of the donor requirements is a report that validates the business models for production of EGS by the 13 sub-grantees. There are two phases of countries, the first SGAs end in December 2017 and the second, in May 2018. During a recent AGRA meeting, it emerged that such information has not been documented before, so this is a cutting edge opportunity to influence practice. The idea is to develop articles for peer reviewed publications on the business models and an investment guide. The evaluation will be based on research hypotheses. These are currently drafted for discussion and proposed to address (a) how NARIs have strengthened capacities for EGS production; (b) how institutionalisation of EGS business plans are influenced by policy, administrative, financial, technical and socio-cultural factors; (c) profit margins and revenue and (d) revolving funds covering costs of EGS production. Key information areas will include technologies, facilities, financial analyses (especially of production costs, outputs, profitability and management of the revolving fund), staff and capacities, business orientation of institutions.

The project had an exit strategy at the beginning, i.e. business plans and revolving funds. Therefore, these have to be in place and functioning during the life of the project.

The proposed method is a peer to peer participatory evaluation, in which two NARIs pair up to carry out exchange review visits. This will help to stimulate learning among the NARIs, as opposed to contracting an external consultant.

The timescale and responsibilities are: Study protocol – January 2017 by the core group. This will be followed by a test/pilot phase by May 2017 with a preliminary write up by June 2017. Pilot countries have yet to be selected. The second phase would start in July 2017 to May 2018 and would involve the remaining countries. The write up should be ready by December 2018.

Participants stated that:

- A lot has been learnt and achieved, but there is need to learn how to deal with the revolving fund. There is need to focus on how to best use the remaining one year of implementation.
- Volunteering should be systematic, well thought out and it should start where there is substantial data to present.
- KEPHIS should be in the pilot because they have made significant progress.

5.4 Evaluation and wrap up

In her closing remarks, Margaret McEwan explained that most countries only have one year left and they should strategise on how to use that time in the best way. The question on how to run a revolving fund is important, and training might be necessary.

As part of the SPHI, which targets 10 million households, seed is the starting block. There is even more attention on the seed systems group due to the World Food Prize. Therefore, it is more critical than ever that seed is produced and delivered in an efficient and sustainable way. The critical tools for delivery on project commitments are: the business plan (both narrative and financial); stakeholder meetings (for demand projection and planning); quality assurance mechanisms e.g. QDS and QDPM protocols; and internal mechanisms.

All institutions want to move towards a business orientation, and the heads of institutions are allies who should be made use. As part of a team, everybody has to work together. There is also the wider stakeholder group, which consists of different levels of the seed system and extends to the root producer.

At the 2016 Arusha meeting, eight potential topics were identified for the online D-group. Since then there have been only two discussions. One was a vibrant discussion on the free seed distribution: opportunity or illusion, led by Some Koussao; and a cross-CoP discussion that was led by Richard Gibson titled "Should we continue to consider sweet potato as a crop for food security and a mainstream staple or should we focus on it as a nutrition crop?"

The next topics will be:

- Strengthening public/private partnerships for enhancing vine marketing – Sammy Agili and Apollo Kasharu
- Fast tracking the seed certification process – Bramwel Wanjala and Ian Obare

With regard to the follow-up actions related to financial plans, participants should explain the most recent SGA modifications to their accountants.

The next meeting will be held in June 2017 in Uganda

The main meeting was officially closed by Jan Low, who praised the Seed Systems CoP for doing something new and innovative.

6 Session 6: Determinants of pricing for sustainable sweetpotato seed business

View/download presentation

The session was facilitated by Srini Rajendran, who started with a refresher of the concepts. In the first exercise, participants worked in groups to identify the financial tools used in existing business plans to assess profitability of EGS enterprise and their pros and cons. Next, they discussed the difference between margin and mark-up; and how to set mark-up, margins and prices.

The following tools are used by many of the countries: NPV, Internal Rate of Return (IRR), Return on Investment (RoI), cash flow analysis, gross margin and net margin analysis and BCR. Participants identified the pros and cons of these tools.

Overall, the tools show profitability, visibility and investment in the business; and they help to forecast the future values. They help to estimate the profit and loss, set prices accurately, determine the sustainability of the business and to know the payback period for any bank loans.

The tools are easy to use and can be adapted to different classes of the seed system. However, because data collection is based on recall method, this can result in errors. Not all consumables and fixed assets were valued properly, for example depreciation should have been done using declining balance method. The table below shows the pros and cons related to specific tools.

Table 7: financial tools used in existing business plans to assess profitability of EGS enterprise and their pros and cons

Tool	Pros	Cons
NPV	- Accounts for the time value of money - Helps to assess the profitability of the business helps to estimate the value of the enterprise	- difficult to use - does not give visibility to how much time it will take for a project to show profitability - assumes that capital is abundant
IRR	- Recognises the value of time, and uses an indicator of efficiency - Gives all cash flows equal weight by considering the time value of money - Simple to use - Can help to compare the worth of various projects under consideration	- Ignores the future costs of the project - Does not work unless there is a negative figure
BCR	- Simple to understand and use	- Uses common measurement
RoI	- Simple to help the management decide whether a project is worth approving	- Tells a company whether a specific project will earn a profit and not whole company - Requires well defined time period - It is not as fair as other tools that include other factors like environmental impact

It was evident that most NARIs are struggling to collect data either because staff do not understand what should be collected, or the data is being collected late. Estimation of fixed costs had also proved to be difficult.

The importance of financial analysis was emphasised. Financial analysis helps to show the benefits in investing in the project in terms of revenue. The bank interest rate is used as a discount rate. The benefit analysis looks at the micro-level, using the social interest rate from the World Bank.

From the angle of value chain, there are different actors, with different roles to play. For example, with time, private sector should take up the production of basic seed, while NARIs could focus on the breeder seed. Some public institutions do not have a mandate to produce for profit, but they should be able to sustain their business by covering some basic costs. Financial cost benefit analysis is being done to understand whether the PBS production enterprises can be viable and profitable for the NARIs. The foundation of the analysis is cost estimates.

7 Session 7: Using the updated cost templates

In this session, Srini Rajendran presented:

- Differences between cost effectiveness and cost benefit analysis; cost estimation method (variable and fixed cost) using real-time data collection; linkages with revolving fund.
- The new cost template (lighter version) and how to use it for recording real-time data; and the role of agric- economists.
- How to construct fixed and variable cost components using spread sheet.

In groups, participants used the new template to review and update the multiplication calendar; EGS seed production requirements and assumptions. They also identified components of fixed and variable costs based on group interaction and last business plans. They then presented to the plenary.

7.1 Group presentations

7.1.1 TARI (Ethiopia)

The process started from root producers, who start in July for four months. Therefore, the seed production would have to be available in June. Working “backwards” Stage 2 consists of hardening and planting in pots for further multiplication (August-September the previous year). A second harvest would be done in the next two months. Stage 3 consists of pre-basic multiplication in the net tunnels between October and December and the second harvest will continue after that. Basic seed multiplication in the open field extends from January to March. At the end of March, the seed will be sold to commercial multipliers who will multiply from April to June to then be able to sell to the root producers.

Production targets

About 350 plantlets will be taken from the breeder varieties. There may be wastage of about 15%. The remaining 298 plantlets will go to sub-culturing at a multiplication rate of 5, resulting in 1,264 plantlets after factoring the 15% wastage. These materials will be hardened and acclimatised, at a

multiplication rate of seven. These will be multiplied in the pot at a multiplication rate of 7. 7cuttings will be planted in the net tunnel, resulting in an output of about 82,000 cuttings to go to open field multiplication. When the second harvest is included, 1.3 million cuttings will be produced for sale to multipliers and root producers at different prices. Assumptions are that there will be 15% loss at different stages; that the second harvest will be sold as basic seed and that the second harvest from basic seed will be sold to root producers.

Challenges identified in current log sheets

- There was confusion about classification of items into fixed and variable costs. These issues arose where some items are paid on monthly e.g. casual labour or annual costs, and where some items, such as jars and coco peats, are used over a prolonged period e.g. a couple of years.
- Estimating the electricity and water was not easy.
- There should be an order for capturing data in the various sheets.
- Where there are several activities for different stages, it is not clear how to fill the forms because they only provide for one stage. Another challenge is the description of the specific activities.
- The formula for calculating depreciation did not refer to the right cell; and tax calculation is not always applicable, but the formula does not work without an entry.

Way forward

Additional explanatory notes should be added to make things clear and formulae should be fixed wherever there are errors.

7.1.2 KEPHIS (Kenya)

The seed multiplication calendar was based on the breeder material that is available. The group worked from Stage 0 to Stage 3. Production targets were done for Vita and Kabode varieties. The breeder material was already established in the screen houses. The workflow was as follows:

Stage 0

Establishment: 2-3 months -> Virus testing: grafting and virus indexing: 2 months -> In vitro initiation: 1 month (mid-October to mid-November) -> Multiplication to establish the cultures: 1.5 months -> Virus clean up (thermotherapy) – 1 month (January-February) -> Meristem excision and growth – 2 months. Final multiplication will take place, running concurrently with virus testing to ensure that the process of virus clean-up was successful

Production target: Both Vita and Kabode require about 38 3-node cuttings, with expected output being 175 one-node cutting. The unit of production will be 0.5 square metres in the lab. The focus crop is sweetpotato, and it will take 55% of the resources, while other crops will take the rest of the resources.

Stage 1

One-time multiplication to make them ready for hardening – 1.5 months

Production target: In Stage 1, the Stage 0 outputs will be sub-cultured to produce 4-node cuttings. The input will be 175 for each clone and the output will be 650. It will be one-time multiplication in the lab.

Stage 2

Hardening and acclimatisation: 4 weeks -> Growth period for the first harvest: 2 months -> Harvesting of cuttings from Stage 2

Production target: In Stage 2, 4-node cuttings from Stage 1 will go for hardening. The output will be 2,600 cuttings. The share of resources at this point is 100% for sweetpotato.

Stage 3

Growth period before harvesting to go to basic multipliers: 3 months i.e. second to third week of December –> Growth period for the second harvest: 2 months i.e. by mid-February -> Growth period for third and final harvest: 3 months, and this will signify the end of harvesting for these materials.

Production targets: Input will be new Stage 3 materials and those that come from Stage 2, a total of 3,250 cuttings per variety. The output will be 9,750 3-node cuttings from each variety.

The area of production in the screen houses is 33 metre square per variety, and they will both take 100% of the resources.

Assumptions

- At breeder stage, the materials introduced to TC will adapt well to the media and there will be no contamination.
- At screen house, there will be 100% survival of all plants and all factors of production will be provided on time, there will be no pests and diseases.

Challenges identified in current log sheets

- The log sheets are complex and there is large amount of data to be collected, there is need to orient all the people involved in data collection to ensure that it is done in good time.
- There could be time constraints because most staff have other duties, especially those in public institutions. There should be some motivation for the extra hours required for the activity.

Way forward

- We should share contacts so that we can interact with each other and help each other address any challenges.
- KEPHIS plans to continue practising to be able to show technicians how exactly to fill the logs, and to understand the cost categories and inputs for each category.

7.1.3 Tanzania

The multiplication calendar is targeting the planting season of 2018. Planting will be done in January, and screen house multiplication will take place for four months. Harvesting will take place in two phases. Basic production by multipliers will start from May to August. The planting materials will be available to DVMs by the end of August, for production up to December. Therefore, the planting material will be available to farmers by January 2018.

The production targets concentrated on Stage 3. There are four varieties and the activity will take place in the screen house. It was assumed that for every square metre, 50 cuttings are required. The

screen house will be equally divided between the four varieties. The output is 31,700 cuttings. It is assumed that all varieties will have equal share and that production period is four months.

Challenges identified in current log sheets

The challenges faced include estimating production targets, differentiating between variables and consumables, and how to fill the log sheets correctly.

Way forward

The way forward is to continue working with the templates and to improve capacity to collect the data.

7.1.4 INERA (Burkina Faso)

INERA starts with around 10 PBS cuttings received from Ghana, which they plan to plant in February. This material is first harvested at the end of March, and three harvests will be done per year. The material will be given to private seed company Neema Agricole du Faso (NAFASO) to multiply. When the company starts harvesting, INERA will also be harvesting for the second time. NAFASO will provide cuttings to DVMs to start multiplying vines for root production. If NAFASO cannot maintain the planting material until the next harvest, INERA would have to harvest a fourth time to provide the material to NAFASO. It was realised that the calendar goes with the planting season and materials should be availed on time.

Their production target is 4,500 cuttings and the multiplication rate is 1:8. These cuttings are given to NAFASO, who will produce 360,000 cuttings. A total of 3,600,000 cuttings will then be produced by the DVMs.

Challenges identified in current log sheets

- Fixed and variable costs revolve around the screen house used for production, and the variable costs and consumables would have to be distinguished.
- The group felt that the number of templates being used is very large, and it will require a lot of time and effort from the technicians.

Way forward

Burkina Faso is still lagging behind with regard to this task, and will therefore need more support to catch up.

7.2 Plenary discussion

- The timing of labour costs is captured in the log sheet. Casual labour is a variable cost. This will be included into the explanatory notes.
- Items such as jars, which are used for over three years, should be considered as fixed costs.
- Costing of electricity, water varies by institution. In some, it is provided by the institution e.g. in Ghana and Kenya. In Lake Zone Tanzania, they buy water, so it was entered as a variable cost. If a project hires a tractor to fetch the water, this cost should be accounted for. In such a case, one should consult with the accountant to confirm what is included under contingency costs.
- There is a sheet called activity sheet which is linked and automatically updates the cost template. It is for describing the activities, and what kind of input has been used. It is useful for reference to find out the details of each activity.

- Many countries already have ongoing work in the screen house, so they are not starting from Stage 1. The calendar is a tool for planning, as it will enable the PIs to know exactly when they have to start multiplication in the TC lab.
- In response to the presentation, participants discussed the need to (a) work out how to use the calendar in bimodal systems and (b) include wastage factor into the assumptions.
- Varieties should be divided into erect and spreading, because they have different multiplication rates and outputs.
- Currently, there are two sets of calendars, the ongoing multiplication and the ideal planning. All NARIs should eventually get to the point where their activities are guided by a plan that takes into consideration the planting seasons and demand.
- The calendar can be used as a sensitisation tool with farmers, DVMs, and district officials to show the lifetime that is required to order. Realistically, DVMs and farmers will not make orders in advance, and especially if it is dry. There should be a formula to come up with a minimum of how much pre-basic has to be produced every year, and a strategy for rapidly multiplying these to meet demand.
- The multiplication rate differs per variety and at each stage. The template should include a column for that.

8 Session 8: Identifying challenges, way forward and wrap up

During the final session, participants stated the most useful and most difficult aspects of the sessions on using the new cost template:

Most useful	Most difficult
• Multiplication calendar is now clear. • The cost templates. • Calculation of the mark-ups. • How to make production targets.	• Estimation of fixed costs • Confusing between inputs, variables, equipment • The difference between the stages, and when there are many activities in one stage, how to adjust template • Differentiation of inputs and consumables

They committed to some actions which will enable them implement the use of the templates within their organisation. Here are some of the actions proposed:

- Form a WhatsApp group, led by Helen Nkoli, to share ideas and comments.
- Revise what has been done and get proper understanding of the tools before inviting other colleagues. This will make it easier to train the others.
- Get commitment from technicians and people working in these stages because they are the data collectors.
- Srini has simplified this into one sheet, what is needed here is commitment and assigning time to work on it and informing the heads of institutions.
- Get actual demand in good time through stakeholder meetings before multiplication begins.
- Translate the cost templates into French so that the technicians in Burkina Faso can understand. (If resources are available).

- Ensure that stakeholders understand what we are doing.
- Advise management to scale out seed business orientation to other crops as well.

Business plans: Next steps

- Participants were urged to send their practice log sheets to Srini to check them and see what needs to be supported. Srini will set up a Dropbox in mid-January for this purpose.
- One group said there is a need to orientate the technicians. The PIs and heads of the institutions should be briefed, and they should be informed that a small budget would be required for this exercise. Margaret will write to PIs and copy the agricultural economists with this information. The plan is to carry out the exercise mid to end January 2017.
- In January, Srini and Margaret will find a way to deal with two seasons and how to have the 2018 planning multiplication calendar and the 2017 current production calendar.
- The business plans have a narrative and financial sections, the narrative sections need to be written or updated, particularly using the SWOT matrix.
- Updating of cost estimates will still be going on for six months because some countries have not yet started. These countries can complete at least one season by the next CoP meeting in June 2017. By then, everyone will be expected to have a revised business plan.
- Time constraints and the need for motivation for working extra hours were considered in the budget, to recognise the agricultural economists for the work they are doing. The cost of monitoring should be included in the business plan budget, because it is an annual activity. The idea is that the revolving fund will pay some of these costs.
- Agricultural economists should consider how to keep networking going beyond the meeting. Two people should take responsibility for keeping people together. The Nigerian team has been communicating with Srini over WhatsApp. Another option is to have a Google group for the SGA. Helen and Leonidas will link people up via WhatsApp.
- It is critically important to keep the heads of the institutions updated, so Margaret will write to them to share action points.

9 Meeting Evaluation

The Sweetpotato Seed Systems CoP Sixth Consultation was held in the Pride Inn hotel, Nairobi during 6-8 December 2016. The agenda of the meeting was to review the progress of sustainable pre-basic seed production and business plans. The meeting was attended by 37 participants, of which 62.2% were males and 37.8% were females.

Participants pose for a group photograph at Pride Inn Hotel, Nairobi

Overall, 64.9% participants were satisfied with the meeting outcome. Majority of respondents (83.8%) felt that the meeting met their expectations. An overwhelming majority found the quality of the content of presentations (91.9%) and logistics arrangement (97.3%) at least good.

Session 1 “Successes, Lessons and Moving Forward with PBS/EGS production” was found to be most useful (32.4%), followed by Session 4 “Updating the business plans” (29.7%) and Session 5 “Virus Diagnostic Tools: Supporting a functional seed system” (21.6%). The least useful sessions were Session 2 “Report back on assessment of SS CoP” and Session 3 “Finalizing Recommendations from CoP topics” as reported by 24.3% and 10.8% respectively.

Three areas of improvement suggested by the participants were allocation of more time for discussion and presentation (40.5%), followed by more days for CoP (10.8%), finally linkage between business plans and revolving fund. In addition, seed classification terminology (10.8%).

Participants suggested the topics for future meeting: utilization of revolving funds effectively and linking them with business plan; focus on marketing strategies; ICT linkage between business plan and revolving fund; seed certification; and sandponics.

Annexes

Annex 1. Agenda

Sweetpotato for Profit and Health Initiative-
Regional Technical Support Platform for East, Central and Southern Africa
Sweetpotato Seed Systems Community of Practice: Sixth Consultation- Sustainable Pre-basic Seed Production – Progress Review. Pride Inn, Rhapta Rd Nairobi
6th- 8 th December 2016 AGENDA

TIME	SESSION	Responsible
	ARRIVALS: Monday 5th December	Tassy Kariuki and Chris Kioko
DAY 1: Tuesday 6th December 2016		
8.00 – 8.15	Registration	Tassy Kariuki and Lilies Gachanja
8.15 – 8.30	Introductions and objectives of meeting	Margaret McEwan (CIP-SSA)
Session 1: Mid-year 3: Successes, Lessons and Moving Forward with PBS/EGS production: 2 parallel sessions		
8.30 – 10.30	Parallel session: Country presentations group 1: SARI, NaCRRI, BioCrops, SRI, DARS, CRI, NRCRI Country presentations group 2: TARI, KEPHIS, RAB, IIAM, ZARI, INERA	15-minute presentation of Year 3 mid-year progress: June-Nov 2016. See template Group 1 Moderator: Kwame Ogero; Rapporteur: Bramwel Wanjala Group 2 Mihiretu Cherinet: Rapporteur: Christine Bukania
10.30 – 11.00 Group photo and tea/coffee break		
11.00 – 12.00	Parallel country group discussions: key successes, lessons to share, improvements needed	Summarize key findings across countries, with examples from each country
12.00 – 13.00	Plenary feedback: 20 minutes per group Plenary discussion: 20 minutes	Moderator: Jan Low; Rapporteur: Christine Bukania
13.00 – 14.00 Lunch		
Session 2: Report back on assessment of SS CoP Moderator: Marian Quain. Rapporteur: Christine Bukania		
	Presentation of results from formative assessment	Presenter: Lydia Kimenye
14.20 – 14.50	Plenary: Q&A	
14.50 – 15.30	Group work: harvesting additional outcomes of the CoP	8 groups of 5 at tables
15.30 – 16.10	Feedback on group work	5 minutes per group (ppt)
16.10 – 16.30 Tea/Coffee break		
30 – 17.00	How do we link Breeder Seed into a functional seed system?	Erna Abidin and Some Koussao
00 – 17.30	Financial reporting: why does it matter and what we must improve on!	Emily Ndoho (20 minutes presentation; 10 minutes Q&A
DAY 2: Wednesday 7th December 2016. **Session 3: Finalizing Recommendations from CoP topics.** Moderator: Jude Njoku. Rapporteur: Christine Bukania		
8.00 – 8.15	Recap and housekeeping announcements	Participant and Tassy Kariuki
8.15 – 8.30	Sweetpotato for Profit and Health Initiative (SPHI) update	Jan Low

8.30 – 9.30	Parallel working sessions: Key recommendations of CoP topics: i. SP seed class terminology and definitions (B. Yada) ii. Sandponics (B. Wanjala) iii. Triple S (S. Agili) iv. Re-visit SWOT analysis and how to link to Marketing strategies (Ag economists…) (2 groups)	Introduction to working groups: Margaret McEwan
9.30 – 10.15	Plenary feedback: 3 groups	3 groups x 10 minutes
10.15 – 10.30 ***Tea/coffee break***		
10.30 - 11.30	Marketing strategies – what have we done – what works?	3-minute" elevator pitch" from each country Ag. Economist: key marketing activity, impact on sales with evidence, what next.
Session 4: Updating the business plans. Moderator: David Talengera. Rapporteur: Christine Bukania		
11.30 – 12.15	Using the business plan as a tool: a. the multiplication calendar; SWOT, EGS seed production requirements; assumptions; b. linking the business plan to the revolving fund	Presenter: Srini Rajendran
12.15 – 12.30	Country experiences: presentation on business plan for Nigeria PBS production	Jude Njoku
12.30 – 13.00	Q and A: what are the challenges for implementing the business plans & revolving fund & how do we address them?	Plenary
13.00 – 14.00 Lunch Break		
Session 5: Virus Diagnostic Tools: Supporting a functional seed system Moderator: Benard Yada. Rapporteur: Christine Bukania		
14.00 – 16.00	LAMP: a tool to support a functional seed system	Jan Kreuze and Bramwel Wanjala
16.00 – 16.15: Tea/coffee break		
16.15 – 16.30	Financial tools and basic rules of pricing; How do we price EGS seed: KEPHIS experience with calculating break even cost, selling price and stakeholder response	Presenters: Elizabeth Ngundo & Srini Rajendran
16.30 – 16.45	Q and A: pricing seed – what are the challenges	Plenary
16.45 - 17.15	2017 Participatory Evaluation of PBS/EGS business models and plans	Presenter: Margaret McEwan
17.15 – 17.30	Evaluation and wrap up	Jan Low and Margaret McEwan
18.30 – 21.00	Evening dinner	WestEnd Hotel, Westlands
DAY 3: Thursday 8th December 2016. Updating the Business Plans (Agricultural Economists)		
8.00 – 8.15	Housekeeping announcements	Tassy Kariuki
Session 6: Determinants of pricing for sustainable sweetpotato seed business Moderator: Jan Low. Rapporteur: Christine Bukania		
8:00 – 8:30	Group work: identify the financial tools used in existing bizplans to assess profitability of EGS enterprise – what are the pros/cons	Introduction: Srini Rajendran. 3 groups
8:30 – 9:00	Plenary: group feedback and discussion	Plenary
9:00 – 9:30	Difference between margin and markup; how to set markup and margin: how to play the pricing game	Srini Rajendran
9:30 – 10:15	Plenary: Q&A	

10.15 – 10. 30 Tea/coffee break		
Session 7: Using the updated cost templates Moderator: Margaret McEwan Rapporteur: Christine Bukania		
10.30 – 11:00	Differences between cost effectiveness and cost benefit analysis; cost estimation method (variable and fixed cost) using real-time data collection; linkages with revolving fund.	Srini Rajendran
11:00 – 11:30	Q&A	Plenary
11:30 – 12:00	Introduction of new cost template (lighter version) and how to use this new template for recording real-time data and role of agri- economists.	Srini Rajendran
12.00 – 12.30	How to construct fixed and variable cost components using spread sheet.	Srini Rajendran
12:30– 13.00	Group work: 5 groups (3-4 per group). **1.** Review and update the multiplication calendar; EGS seed production requirements; assumptions. **2.** Identify components of fixed and variable costs based on group interaction and last business plans. **3.** Practice using new cost template based on last business plan data	i. Rwanda, Burkina Faso (3) ii. Ethiopia (3) iii. Kenya, Ghana, Nigeria (4) iv. Tanzania, Malawi, Zambia (4) v. Uganda, Mozambique (3) Each group uses 1 country as their working example
13.00 – 14.00 Lunch		
14.00 – 15:45	**Continued group work**	
15.45 - 16.00 Tea/Coffee		
Session 8: Identifying challenges, way forward and wrap up Moderator: Srini Rajendran. Rapporteur: Christine Bukania		
16.00 – 16:50	Plenary: groups present on challenges and way forward	Highlight key concerns with completion of cost templates & what is needed to implement this.
16.50 – 17.00	Plenary Q&A	
17.00 – 17.15	Business plans: next steps	Margaret McEwan
17.15 – 17.30	Evaluation and wrap – up	Jan Low and Margaret McEwan
Friday 9th December - departures		

Annex 2 Participants List

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The **Sweetpotato for Profit and Health Initiative (SPHI)** is a 10-year, multi-donor initiative that seeks to reduce child malnutrition and improve smallholder incomes through the effective production and expanded use of sweetpotato. It aims to build consumer awareness of sweetpotato's nutritional benefits, diversify its use, and increase market opportunities, especially in expanding urban markets of Sub-Saharan Africa. The SPHI is expected to improve the lives of 10 million households by 2020 in 17 target countries.

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