Progress in Research for Development for Sweetpotato in Africa

SPHI

9th Annual Sweetpotato for Profit and Health Initiative (SPHI)

24 to 27 SEPTEMBER 2018

CONCORD HOTEL NAIROBI KENYA

TABLE OF CONTENTS

Acronyms 4
Executive Summary 7
1 SESSION 1 9
1.1 Introduction and Welcome Remarks 9
1.2 Official Opening 9
1.3 Keynote Address: Integrating Orange-fleshed Sweetpotato into Government Policy & Creating an Enabling Environment 10
1.4 Status of Sweetpotato in SSA Update 11
1.5 Returns to Vine Multiplication in Tanzania and Uganda and Implications for Scaling-out Quality Planting Material 13
1.6 Discussion 14
Session 2: Advances in seed systems and crop management Research 15
2.1 Sweetpotato Seed Production in a Low Virus Pressure Rice Scheme: Win-win Through Rotation 15
2.2 Determinants for traditional vine multiplication and supply under different farming systems in southern Ethiopia 16
2.3 Participatory evaluation of performance of OFSP varieties in Triple S 17
2.4 Scaling Sweetpotato Triple S Plus: What are we learning 18
2.5 Strategies for strengthening the institutionalization of the Early Generation Seed (EGS) business by public institutions in SSA 20
2.6 Progress on microbial Control of Sweetpotato Weevil in sub-Saharan Africa 20
2.7 Discussion 20
SESSION 3 Advances in Sweetpotato Breeding 21
3.1 The Genomic Tools for Sweetpotato Improvement (GT4SP): Project Update - Developing next generation breeding tools for SSA sweetpotato breeders 21
3.2 Understanding Drought Tolerance: Top Five Performers in Mozambique and their Characteristics 22
3.3 Genetic Gains using the Heterosis Exploiting Breeding Scheme 24
3.4 Sweetpotato breeding progress in the Sahel 24
3.5 Developing and Naming Low-sugar 25
3.6 Discussion 26
Session 4 Viruses and Assuring “Clean” Seed 26
4.1 Conventional Breeding for Resistance: Slow but Sure? 27
4.2 Challenge and Progress in Using Molecular Markers 28
4.3 Speeding up Virus Detection and Removal 28
4.4 Are Begomoviruses Important? 30
4.5 Can smallholders successfully manage viruses in their fields? 30
4.6 Are Seed Regulations the Answer for Virus Management? 31

4.7 Discussion 31
Session 5 Best Sweetpotato Scientific Paper of 2017 33
5.1 Awarding of the Best Sweetpotato Scientific Paper of 2017. 33
Session 6 Deep Dive Workshops 33
Session 7 Youth Engagement in Sweetpotato Value Chains 34
Moderator: Temesgen Bocher Rapporteur: Srini Rajendran 34
7.1 Angela Mwanri from Tanzania. The Challenges and Opportunities OFSP based Job Creation 34
7.2 Josephat Mangeni Kenya 35
7.3 Caroline Komujuni Uganda 35
7.4 Mishael Ennuson Ghana 35
7.5 Case study working with youth in Mozambique: Temesgen F. Bocher 36
Reaching the Next Generation: Getting OFSP Materials into Primary Schools 38
Session 8 Progress in Dissemination 40
8.1 Keynote: Lessons Learned from Scaling up Sweetpotato in Africa through Agriculture and Nutrition (SUSTAIN), a four country Effort to Scale OFSP 40
8.2 Achievements and lessons learned from the Building Nutritious Food Baskets Project (BNFB) 47
8.3 Discussion 49
Session 9 49
9.1 Scaling Strategies and Efforts, continued 49
9.2 Discussion 51
9.3 Panel Discussion 52
9.4 Discussion 55
9.5 Scaling in Tanzania under Feed the Future 56
9.6 Lessons Learned from Promoting Sweetpotato Commercialization in East Africa 58
9.9 Our experience on coordinated partnerships in Malawi 59
Session 10 Advances in Post-Harvest & Value Chain Research 59
10.1 Progress in Developing and Utilizing OFSP purée 59
10.2 Poster Session & Display of OFSP Products 61
10.3 Handling and Storage of Fresh Sweetpotato Roots 62
10.4 Communication for Change Award for 2017 66
10.5 Evaluation 67
1 Introduction 67
2 Participation by age, gender and organization 67
3 Technical meeting content 67
3.1 Presentations 67
3.2 Deep Dive Workshops 68

3.3 Panel Discussions....69
4 Meeting organization (logistics and communication)....69
5 Other comments and suggestions for improvement....70
10.6 Cocktail Party & Photo Contest Awards....75
11 Annexes....76
11.1 Agenda....76
11.2 Best Scientific Paper....81
11.3 Communication for Change Award....82
11.4 Photo Contest....83
11.5 Deep Dive Workshops....84
11.5.1 Learning to be an Effective Biofortification Advocate....84
11.5. 2 Creating Orange-Fleshed Sweetpotato Products....90
11.5.3 Are you ready for Scaling? Use of the scaling readiness tool for Triple S....97
Introduction and Overview....98
Photo journey of the Triple S journey in Ethiopia – presented by Mihiretu Cherinet....98
Photo journey of the Triple S journey in Ghana – presented by Issahaq Suleman....99
Panel Discussion on burning questions on Triple S....101
Design your own Triple S innovation scaling package....102
Testing your readiness to scale Triple S....103
What have we learnt; what would we do differently? Ghana & Ethiopia....103
How do we improve our scaling readiness (technology and use); Is CIP ready for scaling?....105
11.5.4 Developing an Effective Consumer Panel for Evaluating Root Taste and Quality Traits....106
Participants List....112

Acronyms

AGRA	Alliance for a Green Revolution
AVCD	Accelerated Value Chain Development
BNFB	Building Nutritious Food Baskets
BMGF	Bill & Melinda Gates Foundation
CBO	Community Based Organizations
CHW	Community Health Worker
CIP	International Potato Center
CoPs	Communities of Practice
CRS	Catholic Relief Services
CSIR	Council for Scientific and Industrial Research
DVMs	Decentralized Vine Multipliers
FARA	Forum for Agricultural Research in Africa
FCI	Farm Concern International
FGDs	Focus Group Discussions
GAP	Good Agricultural Practices
GHS	Ghana Health Service
GMP	Good Manufacturing Practices
HCA	Hydroxycinnamic acid
HKI	Helen Keller International
INERA	Institut de l'Environnement et Recherches Agricoles
IYCF	Infant and Young Child Feeding
KEPHIS	Kenya Plant Health Inspectorate Service
MLE	Monitoring, Learning and Evaluation
MPU	Marketing, Processing and Utilization
MSU	Michigan State University
NCSU	North Carolina State University
NaCRRI	National Crops Resources Research Institute
NARI	National Agricultural Research Institute
NARS	National Agricultural Research Station
NCRI	National Crops Research Institute
NRCRI	National Root Crop Research Institute
NRI	National Resources Institute

ODK	Open Data Kit
OFSP	Orange-fleshed Sweetpotato
PAC	Project Advisory Committee
PPP	Public-Private Partnership
QDPM	Quality Declared Planting Material
QDS	Quality Declared Seed
RCT	Randomized controlled trials
RTB	Root and Tuber Crops
SBCC	Social and Behavior Change Communication
SARI	Southern Agricultural Research Institute
SASHA	Sweetpotato Action for Security and Health in Africa
SeFaMaCo	Seed-Farmer-Market-Consumer
SEM	Scanning Electron Microscopy
SETSAN	Secretariado Técnico de Segurança Alimentar e Nutricional
SHF	Small Holder Farmer
SNNPR	Southern Nations and Nationalities, and People's Region
SPHI	Sweetpotato for Profit and Health Initiative
SPVD	Sweetpotato virus disease
SSA	Sub-Saharan Africa
SSC	SPHI Steering Committee
SUSTAIN	Scaling Up Sweetpotato through Agriculture and Nutrition
SWOT	Strengths, Weaknesses, Opportunities and Threats
TARI	Tigray Agricultural Research Institute
TOR	Terms of Reference
UDS	University for Development Studies
USAID	United States Agency for International Development

Recommended citation: Njung'e, Faith and Low, Jan. 2018. Progress in Research for Development for Sweetpotato in Africa. Proceedings of the 9th Annual Sweetpotato for Profit and Health Initiative (SPHI), held 24-27 2018, Nairobi, Kenya, 116 p. International Potato Center, Nairobi.

Executive Summary

Over 100 people from fourteen countries in Sub-Saharan Africa (SSA), as well as the USA, UK, Germany and Peru, convened in Nairobi, Kenya on 24 September to 27 September 2018, for the 9th Annual Sweetpotato for Profit and Health Initiative (SPHI) at the Concord Hotel in Parklands, Nairobi. The theme of this year's SPHI meeting was 'Progress in Research for Development for Sweetpotato in Africa'.

The meeting was officially opened by Dr. Oscar Magenya, representing Prof. Hamadi Iddi Boga, Permanent Secretary for Agriculture and Research, Kenya. He stated "The pressure the agricultural sector is facing is not only of climate change but also of population growth. The demand for food is projected to double by 2030. The role of early maturing, high-yielding sweet potato varieties in the food systems becomes critical and obvious."

Mr. Augustin Olala, Assistant Director Department of Coordination of Government Business, Office of Prime minister Tanzania delivered a keynote address on 24 October focusing on "Integrating Orange-fleshed Sweetpotato (OFSP) into Government Policy and Creating an Enabling Environment in Tanzania." The meeting featured presentations and discussions on the progress in sweetpotato science and delivery along the entire sweetpotato value chain from scientists, experts, government representatives, academics and donors from the agriculture, nutrition and development communities.

Over the three-day period, participants engaged in discussions on progress made across sweetpotato value chains such as seed systems, production, post-harvest technologies and marketing in sub Saharan Africa, in line with the meeting theme. Dr. Julius Okello from the International Potato Center (CIP)-Uganda gave an update on the status of sweetpotato in Sub-Saharan Africa which opened the floor to presentations and discussions on lessons learnt from the various aspects of sweetpotato delivery projects and the way forward for the SPHI.

On day two of the meeting, participants had the opportunity to participate in one of four deep dive workshops. The workshops covered the following topics:

- Learning to be an Effective Biofortification Advocate led by Tumaini Mikindo, Hilda Munyua and Joyce Maru
- Creating Orange-fleshed Sweetpotato Products with Chef Arnold Mawala, Daniel Mbogo & Vivian Atakos
- Are you ready for scaling? Learn about the new "scaling readiness" tool and how it's been used for scaling Triple S" led by Margaret McEwan
- Developing an Effective Consumer Panel for Evaluating Root Taste and Quality Traits with Tawanda Muzhingi & Eric Dery

One of meeting highlights was the awarding of two $500 prizes each under the Excellence in Sweetpotato Competition:

- Best Sweetpotato Scientific Paper in 2017 was awarded to Derick Malavi a Food Scientist at the International Potato Center (CIP).
- Communication of Change Award for 2017 to Prof. Ibok Oduro and Maame Ekua Manful (in absentia) both from Kwame Nkrumah University of Science and Technology (KNUST) in Ghana for their communication work related to the development of Sweetpot Yoghurt.

On the 26th of September, private sector players from Kenya, Tanzania, Rwanda, Uganda and Nigeria working with OFSP displayed value added and processed OFSP products and posters. This provided a platform for participants to learn about the progress made in the development of processing and value addition of OFSP.

1 SESSION 1

Moderator: Jonas Musabwa Mugabe, Forum for Agricultural Research in Africa (FARA)

1.1 Introduction and Welcome Remarks

Jan Low welcomed participants to the 9th Annual SPHI technical meeting.

She began by mentioning the late Kofi Annan who supported SPHI through being a champion for orange-fleshed sweetpotato. His wife Nane Annan through talks with CIP scientists, became an advocate of OFSP and has been active championing OFSP in Ghana. His foundation continues to work on peace initiatives in the continent. Participants observed a moment of silence in honor of his work and in his memory.

1.2 Official Opening

Dr. Oscar Magenya, Scientific/Technical Advisor to the Principal Secretary, State Department for Agricultural Research (Representing the principal secretary, Ministry of Agriculture, Livestock, Fisheries and Irrigation)

Dr. Magenya welcomed participants to the 9th SPHI meeting, as well as to the country of Kenya encouraging them to feel free to enjoy the hospitality of this city.

He highlighted that SPHI aims to reach 10million households with improved varieties of sweetpotato. 50% of this has been achieved; yet there is still a long way to go. He noted that the importance of breeding as one of the strategies of mitigating the effects of climate change cannot be overemphasized. The Government of Kenya is active and aware of the threats of climate change and has published a policy on climate change to guide interventions that will mitigate against drought and other negative consequences.

In his remarks he noted the country is frequently subjected to cycles of flooding (resulting in the loss of lives) and drought. Recently, Tegemeo Institute conducted a major study focusing on climate change effects on maize and tea specifically with the aim of designing interventions that reduce production loss. In the future climate change will affect food production and security more than limitations of rainfed agriculture. It is therefore important to diversify from Maize (current production is 3 million tons) and potato. Sweetpotato current production is about 700 mt per acre.

He also highlighted that KALRO is in the process of releasing five new sweetpotato varieties that are cold tolerant and can be grown in the highlands to support dairy production, another important cash source for farmers.

Beyond climate change, there is also exponential growth in population. There are now more people to feed. There is therefore need to increase current yield e.g. South Africa produces about 60 tons per hectare compared to 8 tons in Kenya. The Ministry of Agriculture appreciates collaboration between CIP and KEPHIS to ensure clean seed in the market.

The value of OFSP in combating VAD cannot be overemphasized. It is a win-win for Kenya if markets use OFSP puree for products, improving nutrition and providing business opportunities for the youth.

Dr. Magenya wished participants fruitful deliberations during the 9th SPHI technical meetings.

1.3 Keynote Address: Integrating Orange-fleshed Sweetpotato into Government Policy & Creating an Enabling Environment

Mr. Augustine Kungu Olal, Assistant Director, Department of Coordination of Government Business Office of the Prime Minister, Tanzania

My Olal began by stating that several areas in Tanzania have increased production of sweetpotato because it is resilient and is packed with nutrients. The government of Tanzania has also adopted a holistic policy that combines biofortification, dietary diversification, supplementation and industrial fortification to combat VAD. Sweetpotato is the second most important root crop in Tanzania with more than 760ha under the crop; an annual production of about 3.8 million tons on average and about 18 varieties officially released.

Tanzania recorded significant reduction in the rate of stunting from 42.5% in 2010 to 34.4% in 2016 (WHO), however 2.7 million children under five are still stunted. Highest prevalence rates are found in Pemba N. (51%), Kagera (47%), Pwani (45%), Manyara (44%), Kigoma (39%), Shinyanga (37%) and Mtwara (36%) TDHS 2010

Experience has proved that combating VAD with supplementation is expensive. A lot of households affected by VAD are poor so cannot diversify their diet. Biofortification of resilient crops that do not have high capital investment then becomes a very viable solution thus the value of orange fleshed sweetpotato.

Tanzanian's Government approach to combat VAD is the holistic approach that has four main components: Supplementation, fortification, dietary diversity and biofortification. The government has created an enabling environment for the above interventions by creating an enabling environment through:

Public Sector Engagement

- A national multisectoral policy platform that through coordination by the Prime Minister's office using a national multisectoral policy platform that ensures that government activities are implemented in a coherent manner by bringing together key actors with cross-sectoral complementarities. This platform also plays an advisory role to the government.
- Strengthening capacity of policy makers, leaders, advocates and champions at different levels to influence inclusion of biofortification and OFSP in policy documents.
- Annual events e.g. the Joint Multisectoral Review Meeting that brings together all key actors in nutrition.
- Policy formulation and implementation e.g. National Agricultural Policy 2013, Agricultural Sector Development II (ASDS-II) of 2014, Tanzania Food and Nutrition Policy (1992), The 5-year strategy for the Ministry of Livestock and Fisheries (2016-2020)
- The Agriculture Sector Development Programme II (ASDP-II of 2017), The National Multisectoral Nutrition Action Plan (NMNAP) July 2016-June 2021)

Private Sector Engagement

- Encouraging increased private sector investments in production, marketing and processing of OFSP. Government of Tanzania has provided tax exemption for the fortificants starting with those for wheat and flour
- Government of Tanzania is using four key steps in to implement policies on biofortification:
  - **Pre-implementation: policy, multisectoral and district level discussions to unpack and understand policy statements such as NMNAP**
  - **Implementation: rolling out essential actions by Government and development partners**
  - **Sustainability - institutionalization of programs with various actors playing their role**
  - **Monitoring, Learning and Evaluation (MLE) to measure progress of implementation**

Investment at local level - TzShs 1,000 per child for health and nutrition at local government level. There are discussions to legislate to ensure that this money cannot be reallocated.

Challenges revolve around resources needed to increase awareness and invest in OFSP in Tanzania. There is also need for regular supply of high quality vines to farmers especially during the dry period. Market supply of high quality roots to the market throughout the year is still a challenge. There are still significant postharvest losses. There is still need for standards, protocols and infrastructure for micronutrient analysis for large-scale processors.

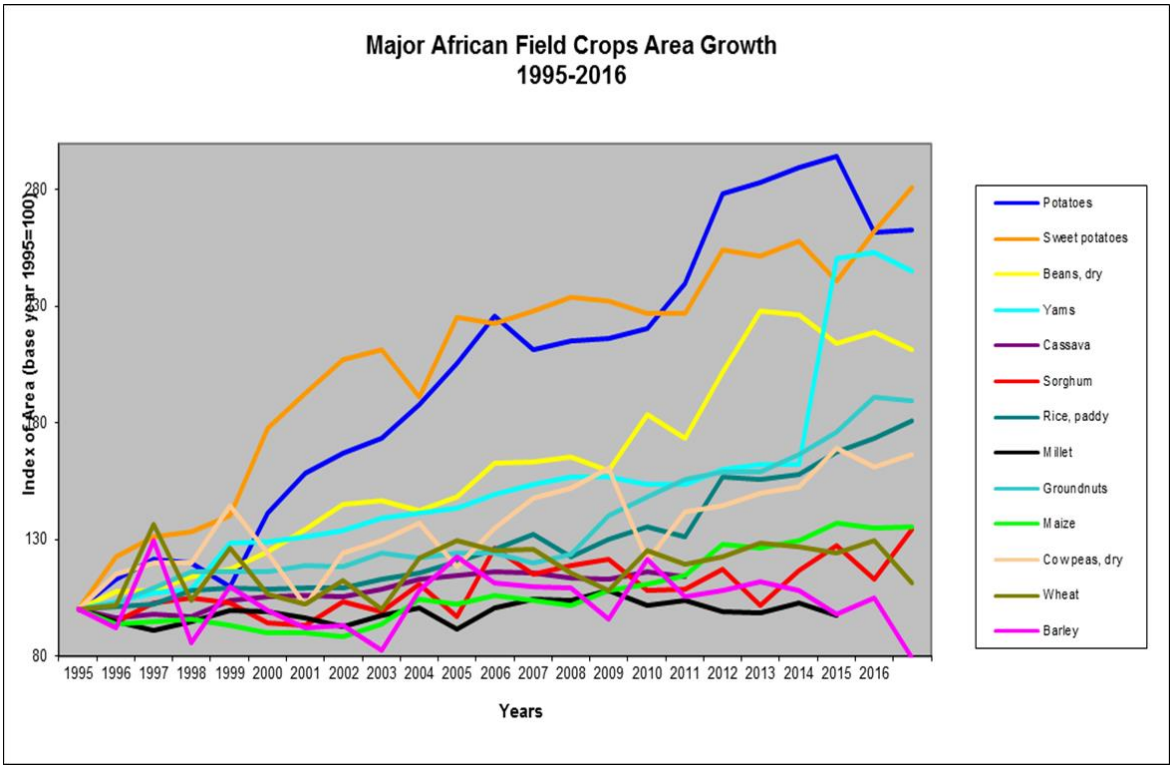
The enabling environment is substantially improved, it is now the time to turn policy into action.

1.4 Status of Sweetpotato in SSA Update

Julius Okello (CIP-Uganda)

Julius Okello of CIP, the co-leader of the SPHI Monitoring, Learning and Evaluation Community of Practice group, provided the update.

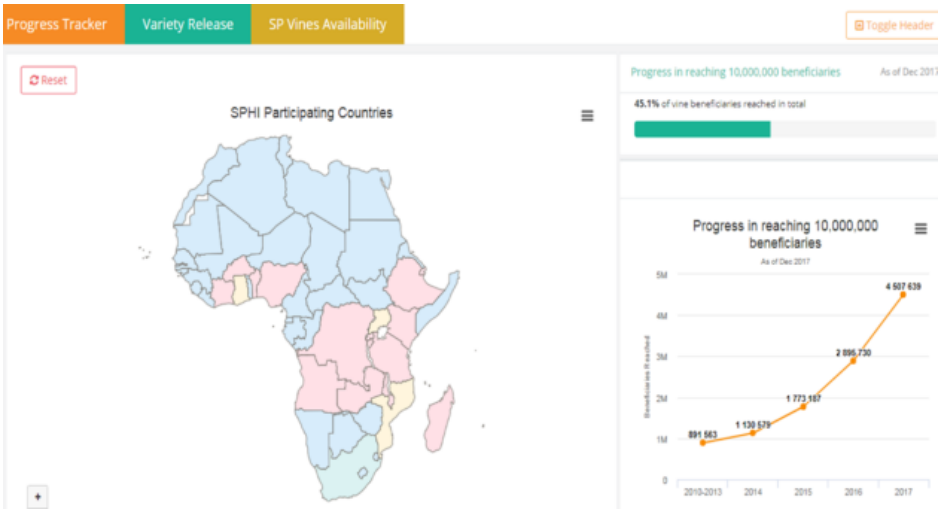
Trends in sweetpotato and staples in SSA: Sweetpotato leads all field crops in rate of acreage expansion; overtook potato in production levels. Production (tons) FAO: General upward trend in production, Nigeria leading in West Africa, Malawi leading in Southern Africa (area of production lower than other countries, but production is much higher, great potential)



Julius gave a graphical overview of progress indicators by:

- Vine delivery: direct beneficiaries reached
- Individual beneficiaries reached 2017/2018
- Beneficiaries by partner/project
- Progress against target by country
- Vine multipliers improving vine access
- Number of female multipliers by country

Dr. Okello also shared a snapshot of the SPHI dashboard (on the sweetpotato knowledge portal) which has a wealth of information on tracking progress, variety release and distribution of DVMs.



Goals of SPHI

- Put in the hands of people vines, improved varieties. 6 newly bred varieties released- 2 OFSP, 1 PFSP and 3 other flesh
- Improve health and income from production and sales of roots
- 127 varieties in total released from 2010 to the present.
- 1,053,261 HHs reached in 2017/2018 25% less than the previous year.

In summary 2017/2018 was a challenging year for SPHI with major scaling up projects wound up and slower but steady progress in dissemination.

Dr. Okello concluded by stating that more than 4 million households are yet to be reached meaning there is still a lot of work to be done including more government engagement.

1.5 Returns to Vine Multiplication in Tanzania and Uganda and Implications for Scaling-out Quality Planting Material

Norman Kwikiriza

There is a lot of work to be done. Potential yield is 15tons, yet current yield stands at 5tons. There are agronomic challenges but also need to have an efficient process to put clean vines in the hands of root farmers.

This study investigated;

a. **The financial feasibility of different vine multiplication methods**
b. **Estimated the number of vine multipliers required to ensure access of clean vines by sweetpotato root farmers in sufficient quantities**

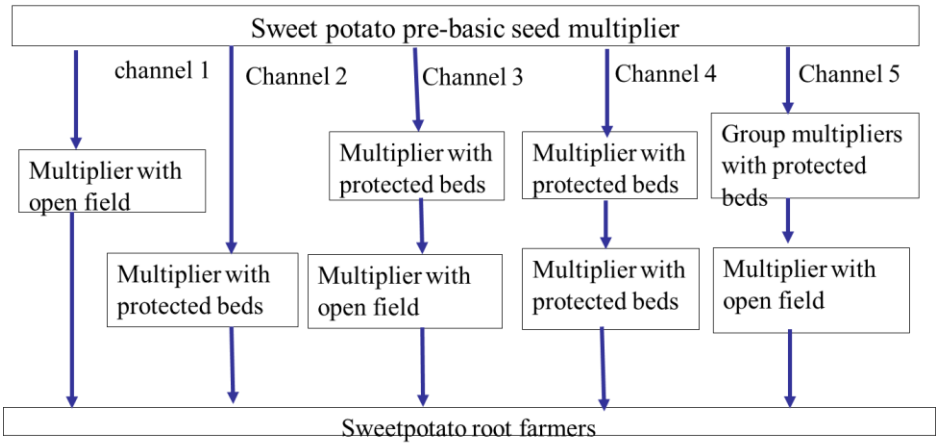


Fig 1: Vine Dissemination channels in UG and TZ

Summary of study

- Goals - financial feasibility of vine multiplication and no of multipliers needed for efficient production in Tanzania and Uganda
- Case study methods used; involved differences in SPVD pressure, drought and use of protected structures
- Tools used - Transaction cost theory, financial analysis tools, literature review

Findings

- Multiplication of vines is more profitable in low SPVD areas than high SPVD areas
- Rapid multiplication is more profitable than conventional multiplication but risky because of limited vine market
- Use of protected structures is not as profitable as using conventional methods i.e. directly replacing vines from pre-basic sources
- Quantity of vines harvested from conventional plots were higher than expected because of: higher density planting, more harvests than the recommended single harvest, cutting vines deep to the soil.
- Estimating the number of vine multipliers required in Uganda and Tanzania. This involved 5 steps based on estimates:
    i. Vine requirement by root farmers - estimates were based on national data on sweetpotato acreage
    ii. Target of sweetpotato land under clean vines - 40%
    iii. Capacity of vine multipliers to produce enough vines - Multiplying at least 4 varieties with basic and rapid multiplication on at least 0.4ha
    iv. SPVD vs drought considerations - vine replacement after 3 seasons in high SPVD and 4 seasons for low SPVD
    v. Vine demand: 10% in high SPVD and 20% in low SPVD

The number of vine multipliers needed per regions per the table below.

Country /Region	High SPVD	Low SPVD	Gender		Total
			Male	Female	
Uganda	64	51	76	39	115
Tanzania			118	66	184
Tabora			11	5	16
Shinyanga			41	18	59
Mwanza			10	5	15
Simuyu			20	8	22
Geita			22	9	31

1.6 Discussion

Kirimi Sindi: Question to Norman Q1: Presentation counterproductive to findings. We expect more market in areas with high SPVD, in low SPVD farmers can replant material or get vines from neighbours. **Response:** previous studies show there is more market in low SPVD areas because they tend to be prone to drought. Thus, more vine buying. High SPVD areas receive a lot of rain, farmers here buy vines can reuse.

Net tunnels do not seem not profitable from the calculations even for high disease pressure zones? **Response:** They are good, we need them, but mainly as a risk strategy. From our data, those who don't have them go to pre-basic multipliers to get material, and this can be far from the farms in some cases. They find the structure cheaper than travelling to get new material. Most of these structures are subsidized currently. Need to establish true viability to the farmer with subsidy.

Sylvia Magezi: Harvest plus Uganda: gender breakdown, is it based on numbers already there or those you think you should have? Response: Data from 2015 we find 30% are women. When we increase acreage, we find lesser women. In our estimations we are targeting multipliers to have 0.4 ha under multiplication which becomes another hurdle

Sylvia Magezi: Profitability: If all those vine multipliers were in that area, would they make that money? Response: Based on our findings and other previous studies, our estimations are based on demand from previous studies. Small HH are 15%, NGOs are still the biggest buyers, assumptions that multipliers will advertise their material increasing demand

Edward Carey: Julius do you think that monitoring number of vines distributed to HHs will be viable when OFSP becomes more commercial? Response: Similar question to whether monitoring will be more difficult when we go to scale. Depends on what we want to monitor, products? We work with partners, based on relationships and partnerships we emphasize that we can get data. All partners e.g. FCI reports data that they collect based on their strategies. The same goes to private sector e.g. Tuskys in Kenya on no of loaves produced. When developing the partnership this data will be part of discussion.

I don't see a big challenge in data collection.

Caution: Private sector is a business entity and will hesitate to share all and every aspect of their data.

Comment: Oscar Magenya. Looking at data, Kenya is doing well 70% achieved but target is relatively modest.

Comment: Jan Low. When setting initial targets, we relied on FAO data and looked at the countries where sweetpotato was important and there was prevalence of VAD. Based on the area and number of households in that area, within a 10-year period depending on the country we would replace 30-40% of the area with improved varieties. It does not mean we cannot replace those figures/targets.

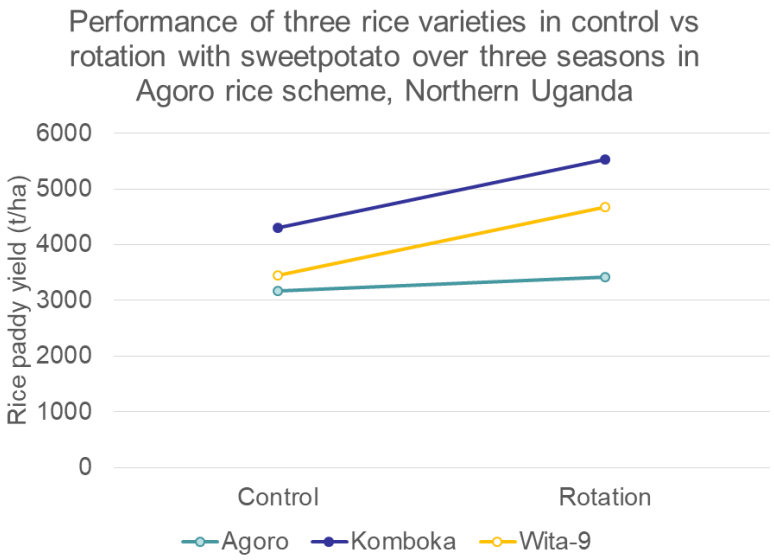
Session 2: Advances in seed systems and crop management Research

2.1 Sweetpotato Seed Production in a Low Virus Pressure Rice Scheme: Win-win Through Rotation

Jimmy Lamo and Gerald Kyalo

In Northern Uganda rice is grown only in the first season, and the land left to naturally fallow until the next planting since the rains in the second season are not sufficient for a good crop. During this fallow period hardpans develop which makes land preparation for the next rice planting tedious and costly. Also, the volunteer rice plants that grow during the fallow period can be a source of contaminants, pests and disease for the next rice crop.

On the other hand, continuous monocrop growing of sweetpotato preparation results in yield reduction due to the declining soil fertility and the build-up of nematode and weevil populations. This study aimed at assessing the technical, economic and social viability of rice-sweetpotato rotation system to produce sweetpotato vines and rice seed. The study used two sweetpotato varieties (NASPOT 11 and Ejumula) and three rice varieties (WITA9, Komboka and Agoro for three rotations.



There was a significant increase in the number of sweetpotato cuttings, vine vigor and storage root yield for rotation as compared to the control. Also, the paddy yield increased significantly and cost of weed management was significantly reduces. The Komboka-NASPOT 11 rotation had the highest yield gain increase was recommended to the community. The sweetpotato-rice rotation has demonstrated benefits for both crops and can be scaled out to other irrigation schemes in Uganda.

2.2 Determinants for traditional vine multiplication and supply under different farming systems in southern Ethiopia

Birhanu Biazin

Sweetpotato production in Ethiopia is constrained by lack of access and availability to quality planting materials and most producers rely on local traditional vine multipliers (TVMs) who operate under different farming systems. This study aimed at understanding the existing traditional vine multiplication and supply methods in the different farming systems and the biophysical, socio-economic, and institutional determinants for participation in seed multiplication and supply. Different tools like Focus group discussions (FGDs), Household survey and multi-stakeholders Framework Analyses were used across four farming systems (sites).

Attributes	Study district and Kebele			
	Dilla	Chuko	Hawassa	Sodo
Farming system	Multi-storey agroforestry	Perennial and annual crops	Annual and perennial crops	Annual crops (roots and cereals)
Dominant crops (in priority)	Coffee, enset, fruits, maize, SP, vegetables	Khat, enset, maize, haricot bean, SP	Maize, enset, haricot bean, SP	SP, maize, teff, haricot bean, taro, enset, cassava, yam
Altitude (m)	1500-2500	1250-2000	1500-1700	1800-2000
Rainfall (mm)	1200	980	950	1200
Main SP seasons	May/June-Oct/Nov	May/June-Oct/Nov	May/June-Oct/Nov	**Oct/Nov-May/June**

There is an increase in acreage of sweetpotato by households which is associated with better climate adaptation, high-yielding characteristics, better income as compared to maize, and increased acceptance as food and feed. As such a vibrant traditional vine multiplication and supply system exists across the different farming systems; but with low volumes and low quality of planting materials. Four vine multiplication and supply methods were observed in southern Ethiopia namely intercropping with Enset/coffee, intercropping with maize (overlay), and intercropping with khat and sole cropping. Implying that the farming systems dictate the primary vine multiplication and supply systems.

Study area	Perceived trends in area coverage	Proportion of households (%)		Chi-Sq test	Perception of the user FGD	Perception of the supplier FGD
		Users (n=36)	Suppliers (n=36)			
Dilla Zuria	**Increasing**	14	14	NS	Decreasing	Decreasing
	Decreasing	50	58			
	No change	36	28			
Aleta Chuko	**Increasing**	67	36	**	Decreasing	Increasing
	Decreasing	17	56			
	No change	17	8			
Hawassa	**Increasing**	62	84	*	Increasing	Increasing
	Decreasing	26	16			
	No change	12	0			
Sodo Zuria	**Increasing**	88	88	NS	Increasing	Increasing
	Decreasing	12	10			
	No change	0	2			

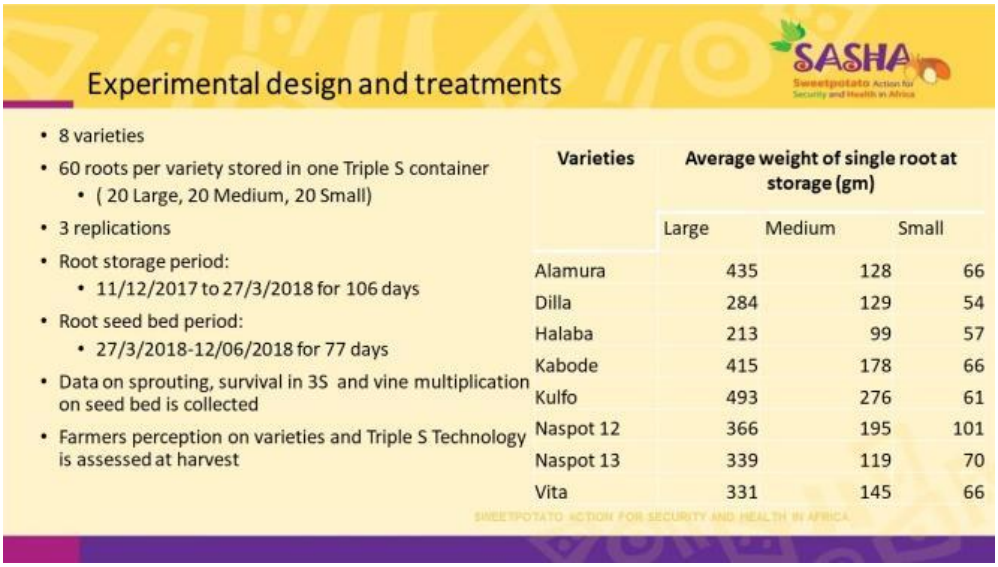
Although there are significant roles of women in vine multiplications and marketing, women have less access to extension. Own vine production is a very important and preferred seed conservation and supply system across the different farming systems. And therefore, future seed system interventions with TVMs should recognize the interaction of socio-economic, biophysical and institutional determinants.

2.3 Participatory evaluation of performance of OFSP varieties in Triple S

Mihiretu Cherinet

Storage in Sand and Sprouting (also known as Triple S) is an emerging climate resilient planting material conservation method. It was first tested in Uganda in 2012 on variety Kakamega and validated in Ethiopia (2015/16) on 1 white fleshed variety `Hawassa 83` and OFSP variety `Kulfo`. Previous studies showed that sprouting, survival and emergence on root seed bed are highly affected by variety, size of root, temperature and humidity that was first tested in Uganda and needs to be adapted for other agro-ecologies.

This study used a participatory approach to evaluate the performance of eight pre-release OFSP varieties to understand the relationship of root size, variety, sprouting and survival in Triple S and assess farmers` perception of performance of varieties and the Triple S technology. The results show that varieties and the root size significantly affect sprouting and survival of roots in Triple S storage. 'NASPOT 12', 'Kulfo', 'Alamura' showed the highest sprouting percentage. While the roots of 'NASPOT 13', 'Vita' and 'Halaba' showed the lowest sprouting percentage. Generally large root size showed highest sprouting.



Conclusions and recommendations

- Varieties affect sprouting performance and survival of roots in Triple S storage
- Root size affect the performance of sweetpotato roots in Triple S storage
- The effect of varieties on sprouting and survival in Triple S container affects planting material production potential in root seed bed
- Improving sprouting in Triple S and emergence in seed bed will increase planting material produced by Triple S
- Required number of roots to produce x amount of cutting is determined by variety and size of roots.
- It is important to assess varietal performance in Triple S

2.4 Scaling Sweetpotato Triple S Plus: What are we learning

Sam Namanda

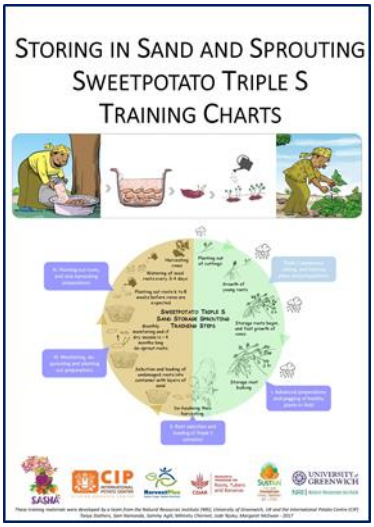
Women and resource poor households in SSA lack timely access to quality sweetpotato planting material, due to extended dry season and unpredictable rainfall patterns. Also, the limited shelf-life of storage roots limits the -consumption period and farmers cannot take advantage of peak market prices. Triple S was identified as a technology to solve some these challenges in SSA. This presentation highlighted lessons learnt from assessing the scaling readiness of the Triple S plus technology in Ghana and Ethiopia.

Gender responsive communication materials and approach

80,000 small-holder farmers (50% women) use Triple S PLUS with 30% higher sweetpotato root yields, enhanced home consumption, extended storage and sale by 2022

Some material used for scaling:

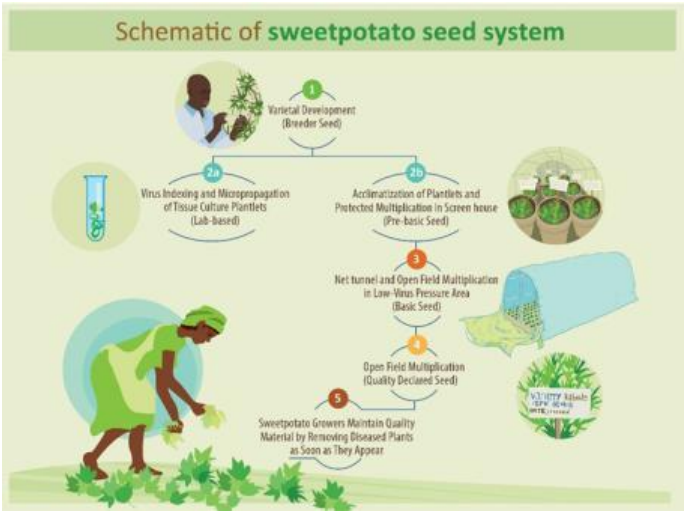
- Trainers' manual, flip charts and farmer handouts
- Video based extension & radio programmes



The scaling readiness tool helped the team to unpack the core components of the Triple S innovation package and identify missing components like complementary components. By partnering with other stakeholders, the scaling team was able to understand motivation for various partners and was able to find a common ground. The scaling team also learnt that the role and importance of different partners changes through the scaling process. The team also learnt the value of adapting their dissemination approach to the structure and approaches that scaling partners were already using. The team also appreciated the value of monitoring the context in which Triple S was being introduced like the seasonal and political conditions.

2.5 Strategies for strengthening the institutionalization of the Early Generation Seed (EGS) business by public institutions in SSA

Margaret McEwan



Eleven countries in SSA with pre-basic seed production and linked to basic seed multipliers have been supported to operate EGS business. This involves 1) predicting the customer seed requirements to plan for seed production. 2) Participatory self-assessment and peer-to-peer evaluation to refine the operation of the EGS business 3) market development and 4) product diversification.

A set of tools to develop a financially sustainable EGS business (SEGSBAT) has been used to assess the level of institutionalization EGS business in 7 of the 11 countries. The strengths and weakness of institutionalization of EGS business & revolving funds in these public institutions have been identified for each institution and various strategies were developed to use these strengths to maximize opportunities while minimizing the weaknesses to avoid threats. Consequently, teams fit for EGS business have been built (comprised of technical, administration/finance and senior management). These institutions are now using SEGSBAT for other crops.

2.6 Progress on microbial Control of Sweetpotato Weevil in sub-Saharan Africa

Milton Otema Anyanga

Sweetpotato Weevil is the most important sweetpotato pest worldwide. The project aims at re-engineering the soil microbiome for the control of sweetpotato weevils. Specific objectives include 1) exploring the possibility of moving microbes 2) Collect and sequence microbes 3) identify active microbes via a surrogate and develop a bioassay screen and screen strains against the target. Over 8000 microbes from Uganda have been isolated and sequenced and 69 microbes have been confirmed to be active with the Colorado potato beetle and the western corn rootworm some of which are already undergoing Bioassay screen.

2.7 Discussion

Kwame Ogero: Why didn't the team use well known *entomopathogenic fungi* like *Beauvaria bassiana* and instead chose to isolate microbes? Response: Most entomopathogenic pathogens have been proven to be effective only under laboratory conditions and most of them do not establish in the field.

Jim Lorenzen: What was the source of the seed for the subsequent seasons for the rice-sweetpotato trials? Response: The rice foundation seed was planted twice and replenished during the third season. However, the sweetpotato seed was obtained from BIOCROPS and was not recycled during the three rounds of rotation.

Kwame Ogero: What was the basis for considering the quality of vines from decentralized vine multipliers (DVM) to be better than that from traditional vine multipliers (TVM)?
Response: The quality of vines was assessed based on resultant storage root yield, prevalence of SPVD and vine vigor.

Jude Njoku: How does the dry matter content affect the sprouting ability of OFSP varieties? What biochemical properties contribute to sprouting? Response: Dry matter does not seem to affect the sprouting ability of OFSP varieties and the biochemical properties affecting sprouting is still a gap that needs investigation.

Srini Rajendran: Does the readiness for scaling tool put into consideration financial feasibility of the technology? Response: The financial feasibility could be considered after an early adoption study.

Benjamin Kivuva: Which of the two crops is most likely to benefit from the fertilizer application in the rice-sweetpotato rotation? **Response:** This will depend on the type of fertilizer you are planning to apply and the economic value of the crop.

SESSION 3 Advances in Sweetpotato Breeding

3.1 The Genomic Tools for Sweetpotato Improvement (GT4SP): Project Update - Developing next generation breeding tools for SSA sweetpotato breeders

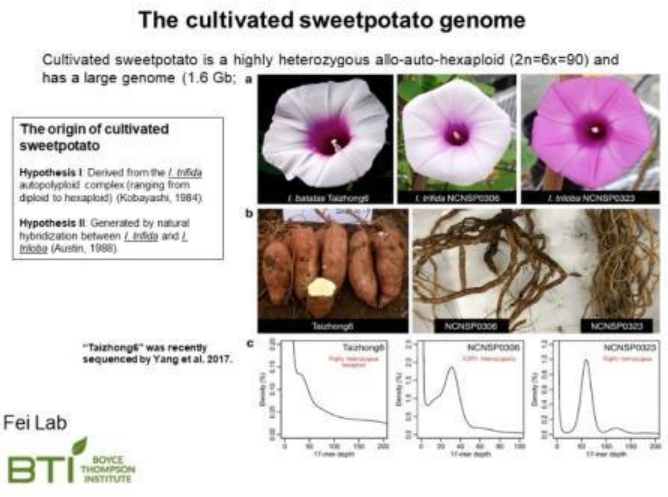
Craig Yencho

This is an ambitious project to sequence sweetpotato and develop modern breeding tools for the crop. There was no reference genome for sweetpotato before the project but now two high quality reference genomes have been identified. The project incorporates a vision for marker-assisted breeding in Africa (MAB). This entails a breeding pipeline that includes:

a) Genomic Resources
b) Phenotyping, analytics and database resources
c) Human resources and capacity development
d) A common vision and continuity of effort

Project update

Two high quality reference genomes, *Ipomoea trifida* and *Ipomoea triloba* have been identified. *Ipomoea trifida* covers 87.7% whereas *Ipomoea triloba* covers 92.3% of the estimated genome sizes. The two reference genomes were assessed as a utility for cultivated sweetpotato. Sequences from the two were aligned with the variety Tanzania. About 57.7% of the reads aligned better to the *I. trifida* while 31.9% of the reads aligned better to *I. triloba*. This shows that *I. trifida* is more closely related to cultivated sweetpotato than *I. triloba*. A Jbrowser genome browser that has gene tracks and models was developed and it shows genes that are up/downregulated in sweetpotato.



The project is also conducting analysis of allelic diversity in the carotenoid pathway in the Mwanga Diversity Panel (MDP). This will help identify specific alleles associated with flesh colour and beta carotene. The goal is to identify genes that can be used through marker-assisted breeding to boost the percentage of beta-carotene in sweetpotato. Other achievements during the reporting period include:

- SNP dosage calling pipeline to assist breeders with bioinformatics.

- Development of different mapping populations and phenotyping in multilocation trials done.
- Analysis of nutritional traits including beta carotene through quantitative trait loci (QTL). This information will be used for marker-assisted selection.
- Development of platforms for managing phenotypic data. These include a website (https://sweetpotatobase.org/) and a FieldBook App.
- Development of analytical tools for routine analysis of sweetpotato trials. These include the Highly Interactive Data Analysis Platform (HIDAP).
- Capacity development – several breeders have been trained on basic molecular biology techniques.
- Genetic selection to predict the performance of the best bet varieties. The models being evaluated will reduce the time it takes to generate improved varieties.

3.2 Understanding Drought Tolerance: Top Five Performers in Mozambique and their Characteristics

Maria Andrade and Godwill Makunde

Droughts have affected more people worldwide in the last 40 years than any other natural hazard. From 1970 to 2000 the percentage of the planet earth stricken by serious drought has more than doubled. Agriculture is the most affected sector by drought. Twelve million hectares are lost to drought and desertification each year, an area where 20 million tons of grain could have been grown.

Mozambique experienced 13 significant drought years between 1979 and 2016. Adaptive trials resulted in the release of nine orange-fleshed sweetpotato (OFSP) varieties in 2000. In 2002 these varieties were widely distributed in southern Mozambique as a post-flood disaster recovery initiative. They performed well in southern and central Mozambique until three seasons of consecutive drought hit in 2005.

Breeding varieties to survive drought is a complex process. For a variety to be permanently adopted, it needs to have vigorous vines and roots left in the ground at harvest (a traditional source of planting material) must sprout well at the beginning of the rains. Occurrence, duration and magnitude of drought during the crop life cycle vary from place to place and from time to time. Drought can be defined as early season, intermittent/mid-season and terminal depending on where it occurs during crop development:

1. Early season drought might occur due to delayed onset of rain that signals the beginning of the planting season. Sometimes rain might come but is inadequate for vine establishment or before root initiation. This leads to poor plant stand and reduced yields.
2. Intermittent drought results from sporadic rainfall that causes intervals of drought at varying intensities during the vegetative phases of crop growth and root initiation phases (4 to 8 weeks after establishment). Crops become stunted in growth and leaf area development becomes reduced depending on intensity and frequency of occurrence.

3. Terminal stress occurs when the crop encounters moisture stress during the root bulking stages due to an early ceasing of rains during the rainy season.

Plants have developed several physiological and metabolic strategies to proof themselves against drought stress. These can be classified into; drought escape, drought avoidance and drought tolerance. Drought escape is the ability of the plant to complete its life cycle before severe soil and plant water deficit occur. The mechanism involves early root formation and maturity and is a better mechanism in areas facing terminal drought. Drought escape in sweetpotato means that the crop can provide the first food and marketable product before harvesting of cereals. In drought avoidance plants adjust their metabolic and physiological processes once they sense drought to adapt to the changing environment. This is possible through dehydration avoidance and dehydration tolerance. Dehydration avoidance is supported by efficient water absorption from roots or reducing transpiration from aerial parts.

Survival of sweetpotato vines during dry periods varies with varieties due to genetics. Addressing this constraint requires an integrated approach that combines agronomy and breeding. Scientists in Mozambique have been breeding and selecting for drought tolerant sweetpotato varieties. The top five drought-tolerant varieties in the country include Irene, Sumaia, Delvia, Alisha and Ininda (Figure 1).

Variety name	Foliage biomass (t/ha)	Vine length (cm)	Stem diameter (mm)
Irene	22.32	75.17	5.4
Sumaia	24.89	93.4	5.6
Delvia	23.17	116.12	6.0
Ininda	25.39	71.40	5.2
Alisha	27.5	155.53	6.3
Xitsekele (local check)	21.2	150.05	5.6
Resisto (sensitive check)	10.5	152.15	2.8
Mean	**22.14**	**116.26**	**5.3**

Fig. 1: *Morphological characters related to drought tolerance in five Mozambican varieties.*

Stem diameter and vine length are key to vine survival under drought conditions. Cultivars with thick stems had better survival rate during prolonged dry spells. Cultivars with strong, short stems and small leaves are better than cultivars with long thin stems with numerous leaves.

Early maturing cultivars fit well in short growing seasons. They break the hunger period and are a source of income where sweetpotato is a commercial crop. In addition, early maturity reduces damage from weevils and other root injuries. Further research is needed to better understand mechanisms of drought tolerance because it is the basis of developing drought tolerant crop varieties. There is need to further explore look at dehydration avoidance mechanisms including:

- Stomatal conductance
- Deep rooting
- Osmotic adjustment
- Water Use Efficiency (WUE) &
- QTL mapping of genes governing drought tolerance trait

3.3 Genetic Gains using the Heterosis Exploiting Breeding Scheme

Wolfgang Grüneberg

Hybrid breeding is important in sweetpotato because each sweetpotato clone is highly heterozygous. The principals of hybrid breeding include heterosis exploiting breeding schemes (HEBS) and reciprocal recurrent selection (RRS). Advantages of hybrids include:

i. High commercial heterosis (storage root yields, number of commercial roots, foliage yield / animal feed, seed production)
ii. Easy to stack simple inherited traits (resistances and quality such as sweetpotato virus disease (SPVD) resistance, none sweet after cooking etc.)
iii. Hybrids are more yield stable than traditionally developed breeding lines (biotic stress resistances such as short crop duration, drought etc.)
iv. Clear breeding cycles and shorter turn-over of most suitable parents
v. Offspring-parent analysis and better statistics
vi. Clear monitoring of genetic gains per breeding cycle
vii. Opportunity of high value true seed dissemination with elite crosses (super-parents)
viii. Linkages between elite crosses and in-vitro germination and genome wide prediction

The breeding schemes at CIP to improve populations include:

a) Polycrosses with parental selection on clone performance per se
b) Reciprocal Recurrent Selection & Offspring Parent analysis

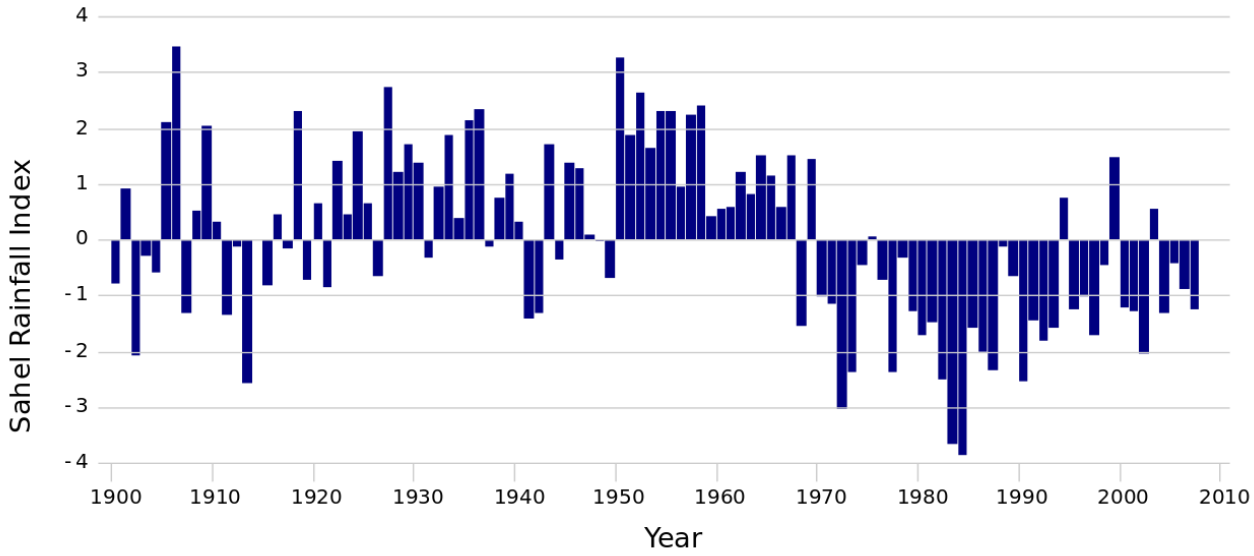
Six different intrapool crosses have been done. Large genetic gains and variability were demonstrated.

3.4 Sweetpotato breeding progress in the Sahel

Koussao Some

SAHEL is the region south of the Sahara Desert and north of the savannah grasslands. Sweetpotato farming in the region faces several challenges including:

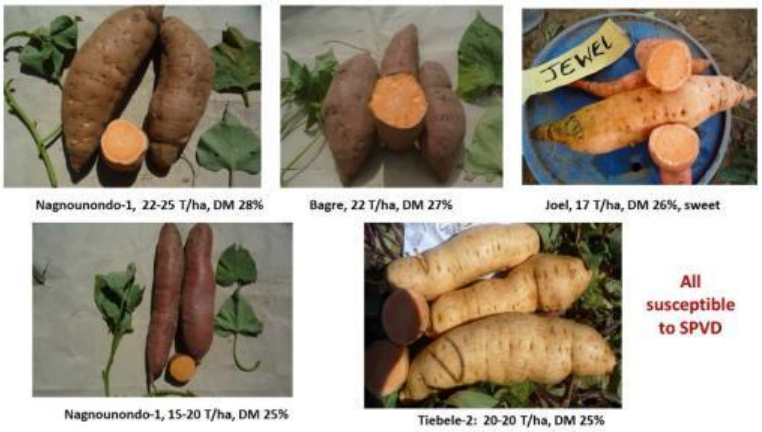
- Erratic low rainfalls that are not evenly distributed
- Sweetpotato weevils
- Sweetpotato virus disease (SPVD)
- Low yields especially for the OFSP varieties



To address the above challenges the Burkina Faso breeding team seeks to:

a) Develop high yielding sweetpotato varieties well adapted to the Sudano-Sahelian zones of Burkina Faso (90 to 105 days)
b) Improve the beta-carotene and dry matter content in the local sweetpotato
c) Develop varieties that are resistant to pests (weevil) and diseases (SPVD)
d) Address market-related traits: shape, shelf-life, taste, etc.

Currently, 387 local and introduced clones are being screened for resistance to drought, SPVD and weevils. The program is also looking at shelf-life. Due to this initiative five OFSP varieties were released and registered in the variety catalogue in 2014. Unfortunately, all of them are susceptible to SPVD. Four OFSP and one purple-fleshed varieties that are moderately resistant to SPVD are in the pipeline for release. Despite this progress the Burkina Faso breeding program faces several constraints including:



- Weak seed system
- Lack of tissue culture facility for producing clean planting material
- Water shortages especially during the dry periods

3.5 Developing and Naming Low-sugar

Eric Dery

The International Potato Center, Ghana country office, is partnering with national agricultural research institutes in Ghana and West Africa to develop low-sugar sweetpotato. This is because of the assumption that sweetpotato is not very important in Ghana and West Africa because it is sweet, so not a good staple. The team is interested in developing quality non-sweet varieties which may have alternative uses, including frying, since sugars produce

undesirable browning. The team has constituted a sensory panel team to help define sweetness. Consumer taste testing has been conducted on selected sweetpotato varieties based on their sweetness levels in different regions.

Proposed brand names for low-sugar sweetpotato have also been evaluated. The team now plans to explore more options for utilization of low-sweet sweetpotato varieties, marketing of the varieties, understanding the relationships between sensory and biochemical analyses and post-harvest storage.

3.6 Discussion

Hugo Campos: How many years of conventional breeding years are captured in one cycle of developing hybrids? Response: One cycle of breeding i.e. 4 years

Jim Lorenzen: What if your progress compromises other quality traits. Is it possible to put a threshold? Response: More traits have been considered in the intrapool crosses. Genetic gains can also be compared with a set of check clones. However, sometimes a breeder can choose to lose a trait if he is heading in the right direction with another.

Kirimi Sindi: How much of the breeding uses data collected especially on marketing traits and do we think about what the processors want? Response: Traits are linked to use. North Carolina State University is doing a great job in developing sweetpotato varieties with processor-preferred shapes. However, breeding for the processing market can be difficult and sometimes it is good to go with what you think will work. It is important to listen to what the market wants but it is also good be an entrepreneur.

Session 4 Viruses and Assuring "Clean" Seed

Moderator: Jan Low Rapporteur: Faith Njung'e

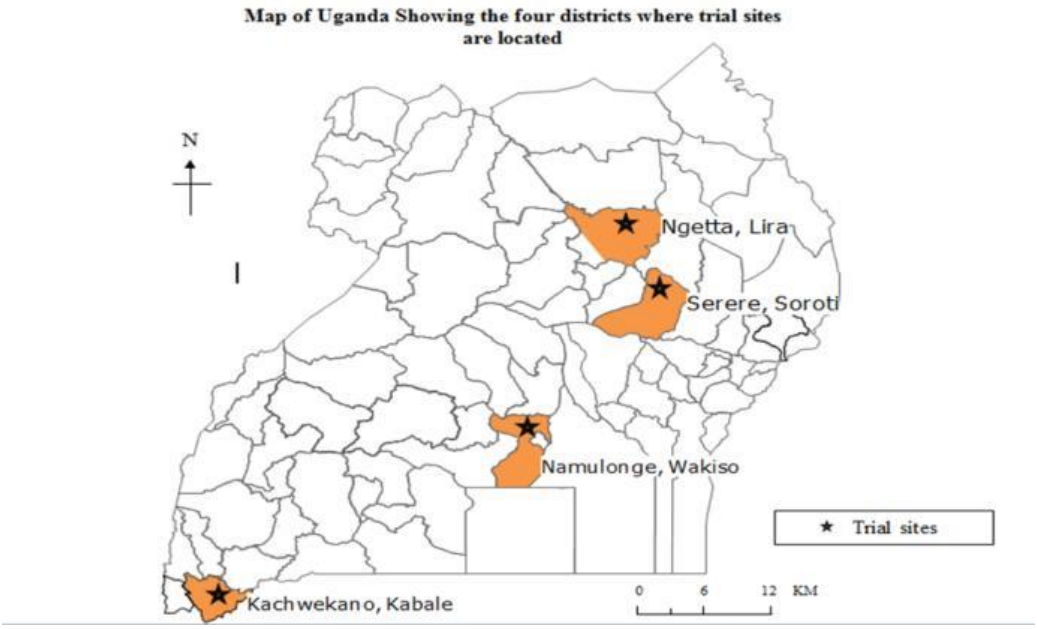
Panellists: Robert Mwanga (Uganda), Mercy Kitavi (Kenya), Segundo Fuentes (Peru), Bramwel Wanjala (Kenya), Kwame Ogero (Kenya) and Ivan Obari (Kenya)

Jan Low: We have been spending a lot of time discussing viruses because it is an issue we want to solve since it is a factor affecting the yield of sweetpotatoes. Farmers need quality planting materials. Having worked for 30 years, are we giving up, is it a slow but sure process? Discuss how getting virus resistance varieties is the way to address the virus problem and whether it is medium or long-term.

4.1 Conventional Breeding for Resistance: Slow but Sure?

Robert Mwanga

The pathogens are invisible. As breeders, it is a process because we are not only working with one simple trait. Mainly we must start with what we have in the virus, and later introduce germplasm. Also, there are other varieties from different geographical regions which we must identify their parents. During conventional breeding, the varieties can be cultivated in the field, and naturally, the weak ones are eliminated. Those that are infected but survive are selected for further analysis. These will be the parents that will crossed, bred and tested. The stronger or persistent varieties are further challenged.



The answer to the question is yes and no. The process is not straightforward. The progeny or offspring are put in different environment if they are under pressure, the material will survive. If they die, then the process becomes easy for the breeder. It is even easier if the white flies and aphids are absent since these are known to spread the virus. The environment should conducive for the crops and breeders as well. The challenge is that there are other concerns that the breeders must consider such root shape, colour and taste. These further complicate the breeding process. Sweetpotato virus disease (SPVD) causes significant yield losses (50->90%)

4.2 Challenge and Progress in Using Molecular Markers

Mercy Kitavi

Jan Low: Molecular markers are meant to speed up the breeding process. When will have the actual markers?

Currently, we do not have molecular markers for SPVD tolerant varieties despite the attempts made earlier. This is because the studies lack a reference genome hence the work is not reproducible or applicable. As for now, we have a reference genome which will be beneficial in developing molecular markers.

The attempt to develop molecular marker is an on-going process. The selection of traits is being done in Peru, Uganda, and Ghana. The study utilizes mapping populations by having multi-environmental trials in different geographical disease pressure-zones. This helps determine the specific areas that require much attention. For instance, the Obare sweetpotato variety is virus-resistant in Ghana but not in Kenya. Quantitative Trait Loss (QTLs) are important when we need to know the regions to focus on. The future of breeding relies on identifying trait markers for any characteristic such as β-carotene or starch content.

Meta-Genomics is the study of identifying the interaction between viruses associated with SPVD. There are 4 to 6 viruses that have been known to interact with SPVD. The study helps breeders in keying important information on developing the markers.

The challenges are that one of the bi-parental population between Beauregard and Tanzania (African cultivar known to be resistant). Beauregard seems to be more tolerant when the multi-environmental tests have been done. The challenge is to determine whether it is the gene or other functional parameter such as the transcripts that are responsible for the outcome. Another problem is that the QTLs have to be marked and fixed to be used which could take some time.

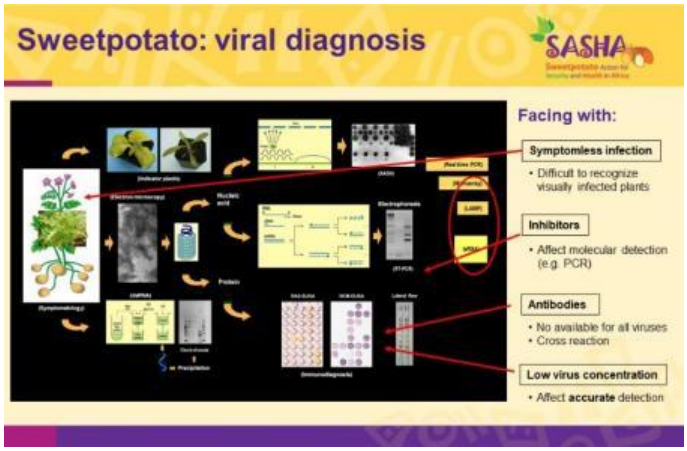
Jan Low: Approximately how long can we wait to have the markers?

Craig Yencho: We can anticipate the 3 to 5 years- mark. We are utilizing the virus molecular markers well in all the heterosis groups that Wolfgang pointed out in the application of molecular markers to sort them out. There are different applications for molecular markers and specific traits such as SPVD, dry matter content, sweetpotato weevil resistant linked to a specific marker. Only that of the SPVD has not been established.

4.3 Speeding up Virus Detection and Removal

Segundo Fuentes

To control various diseases, we need to identify the virus that is affecting the plant. Unfortunately, we have several factors to measure. We have to consider that some are responsible for the inhibiting SPVD. The concentration of the virus is low in the plant, we have to use those that are very sensitive to the virus. For example, by producing viral free planting material, we followed one process which took longer to model.



We applied the detection method before and after the thermal therapy. After which, we obtained the planting material that we used for good quality vine multiplication. In SASHA project we focus on three methods. The first is the ClonDiag (tube array) which very sensitive and can detect different viruses at the same time. The second one is the LAMP and can be applied in the fields. The third is a complementary project that is based on new generation sequencing of the small RNA that is produced by the plant as a defence mechanism. When the virus attacks the plant, it reacts and disintegrates the virus into small pieces that we use to acquire millions of sequences which we assembled as the genome of the virus.

Diagnostic method	Target virus	Sensitivity	Facilities required	Sample type	Time result (per sample)	Cost (US$)
Indexing	many, know & unknown	high	yes	leaves, plant scions	5-6 months	154
ELISA	single, known	low	no	leaves	2 days (>1.5 months)	2.4 (>40)
LAMP	single, known	high	no	leaves, roots	30 min	6.38
ClonDiag	many, known	high	yes	leaves	2-3 days	70
sRSA	many, known & unknown	high	yes	any plant tissue	1 - 2 months	138.71

The method; we used the tubes which can detect at least 20 viruses simultaneously. The sRSA can detect any virus which affects the plants including those that are unknown. ELISA and LAMP do not require facilities in the laboratory. sRSA is cheaper and takes a shorter time when compared with indexing. ClonDiag is more sensitive and cheaper than ELISA. To conclude, yes, we can speed up virus detection and removal depending on method, with up to 60% reduction in time.

Question: Jan Low. I would like a clean-up done in 6 months, can that be done? Response: Segundo Fuente's: Since we are using one small RNA, we can detect the virus it can be in 2 months. To eliminate viruses, you need to know which part of the plant is affected, then conduct thermal therapy, and confirm if this has worked in eliminating the virus or not.

Comment: Jan Low. The capabilities of detecting more viruses is improving to the advantage of the virologists. The new PCR methods are helping discover the new viruses. However, are these of economic importance? If we are distributing planting materials with the phytosanitary certificate, then we must show the viruses that are absent

4.4 Are Begomoviruses Important?

Bramwel Wanjala

Jan Low: Do we need to worry about begomoviruses and what have you learnt in Kenya regarding the prevalence of the viruses, and are they important enough that we need to pay attention?

We know about two viruses, the sweetpotato feathery mottle virus (SPFMV) and sweet potato chlorotic stunt (SPCSV) which cause SPVD which is the most devastating sweetpotato disease. Begomovirus is a virus that was discovered in Kenya in 2006. It does not show symptoms and it is not easily identifiable.

We conducted a survey in Kenya to determine the occurrence and distribution of the virus. We did this in the main regions that grow sweetpotato that is in Western, Coastal, Central and some part of North Eastern Kenya. The virus is widely distributed, ranging between 20 -50 % depending on the region. Is there a cause for worry? We set up an experiment in KALRO, Kiboko, to figure out the contribution of Begomovirus in terms of yield and quality. The choice of area is because it expresses well in warm environments. We chose 2 varieties, Ejumula which is a susceptible variety and Kakamega which is a more tolerant variety. We measured the yield and quality parameters.

From the results Begomovirus on its own does not stand count or cause mild symptoms but in combination with SPVD and other viruses it results in low yields and affects the quality of the roots.

4.5 Can smallholders successfully manage viruses in their fields?

Kwame Ogero

Jan Low: Kwame has been doing a lot of interactive/ participatory research with farmers using different techniques. Can they successfully manage viruses in their field, particularly if they want to be multipliers and supplying to other farmers, and are they adopting good agricultural practices, virus management, or do we have to wait for the fully resistant varieties coming from our breeders to make a difference?

To control a virus, one must identify that it is a problem because of the reduction in yield over time and identify its causes and the symptoms mostly through awareness and training. The control strategies that are available include breeding for resistance, use of clean seeds that have been tested, use of on-farm management strategies to minimise virus re-infection such as use of isolation distances, use of blocking plants, weeding to remove hosts of the viruses, post-selection of seeds and crop rotation. Some can be applied by the farmers who are in seed or root production. Those in seed production should more vigilant.

Challenges in implementing the on-farm management strategies are related to the isolation distance or crop rotation due to the challenge of the size of the piece of land. Also, there is the challenge of the economics involved. For example, when a farmer is expected to log out infected crops. With training, farmers and multipliers can manage the viruses on farm, but they are expected to make the critical decisions.

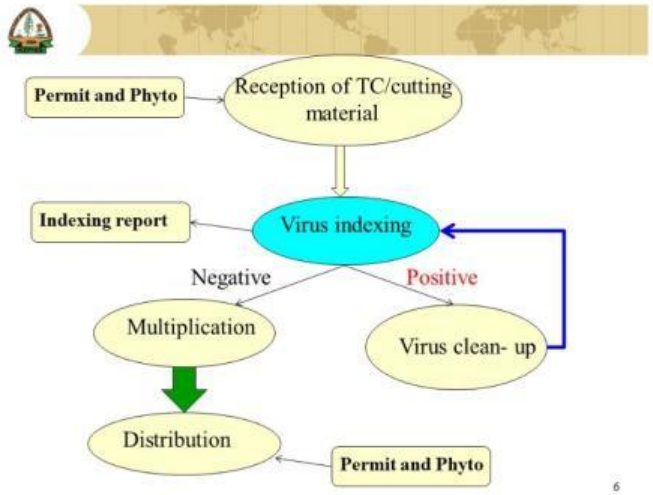
The multipliers need to have close links with upstream sources. On-farm managements only works when you have a source of clean starting material to minimize or completely eradicate re-infection. They must have the knowledge of how to identify the cause, and how to choose the control measures and help them realise the economic losses they are likely to incur.

Jan Low: You have been working with farmers and you encourage them to do good agronomic processes and it is with the goals of phase II of SASHA which have been working with national programs to advance seed system regulations for farmers, while considering the nature of the crop. Kenya has been positioned to get these in place. Ivan from KEPHIS, are seed regulations the answer for virus management? How do we come up with fair regulations? Is it going to be easily implemented in Kenya or will it be a challenge?

4.6 Are Seed Regulations the Answer for Virus Management?

Ivan Obari (KEPHIS)

Yes, seed regulations are the answer for virus management because we can prevent introduction of viruses into a region or a country and prevent it from spreading to another area. This can be done through certification schemes.



We have the phytosanitary certification schemes which involve the exchange of germplasms. Every country has certain criteria that should be met by the importing country such as, the crops must be free from viruses. We conduct virus indexing to ensure that the material is virus free. For infected material we do virus cleaning by meristem tissue culture and thermal-therapy. Once all conditions are met, we issue a phytosanitary certificate to guarantee that the material has met the requirements. We ensure all those distributing seeds are registered by KEPHIS. Also, the growers under the merchant must be registered. KEPHIS undertakes inspections to ensure that what goes to the farmers is healthy and virus free. Inspection is done visually even though viruses are invisible with the naked eye, hence the need to adopt laboratory testing. The cost of inspection is a concern because it is expensive but with the on-going discussions, certification may become cheaper even to the farmers.

4.7 Discussion

Jude Njoku: What informs the isolation distance? Isolation is in regard to which type of crop? Is it applicable to sweetpotatoes or cassava because the vectors that attack the crop may vary from one crop to another? On Inspection, is it not cumbersome to conduct seed inspection too many times, especially for the quality planting material in Nigeria.

Response: Kwame Ogero: We have different recommendation on isolation distances. We do not have sufficient data to explain what informs this practice. With isolation, you want to keep off all the vectors or pathogen, so you must consider its movement and how long it can fly, and what can be used to limit the movement, for instance using barrier crops. Currently I am conducting a study to determine suitability of isolation distance. This must be combined with other practices and distinguish the host plant. Regarding the cassava, cassava white flies do not transmit sweetpotato viruses hence it can be used as a barrier crop. Isolation refers to other sweetpotato fields or other crops within the morning glory family that can be vectors of the virus. Regarding seed inspection, it

depends on the country. In Tanzania, the current recommendation is about 4 weeks after planting and 2 weeks before harvesting.

Regarding inspection, we undertake inspection 3-4 weeks after planting and 2-3 before harvesting.

Jan Low: Seed systems in different countries, have specific isolation distance when you use a barrier crop and a different one if you do not have a barrier crop. What are the barrier crops that you would recommend? Response: In Ethiopia, their standards for QPS are 10m without a barrier crop and 5m with a barrier crop. Some recommended barrier crops are maize, cassava, that is, any crop whose white flies cannot attack the OFSP.

Temesgen Bocher: How can farmers easily identify viruses or drought or micro-deficiencies? Can a farmer be trained to differentiate these? If there are no visible symptoms, do we have technologies that farmers or scientists can use to identify Begomoviruses? Response: For farmers to be in a position where they can manage diseases, they must be trained for capacity building to distinguish the symptoms. We work with village extension officers who can reach farmers on daily basis hence in a position to assist them. This is a continuous process hence the need to continue training the farmers.

Response: Bramwel Wanjala. There are programs in existence where plant doctors work hand in hand with extension officers who can advise farmers accordingly.

Francis Amagloh: My client in Ghana needs 80M vines but the CSIR could not deliver. Should I tell the client not to send the material? I relied on what Kwame described to get quality vines for the beneficiaries. Then there is the issue with quality and availability of Obare, are there structures in place that guarantee availability. Is there an issue of science or practicality due to the dry seasons in the area? Is it suitable to be grown every year because that is what farmers are doing? Let's tone down the science and embrace practicality because farmers have been doing this. Is it because it is virus resistant or because we introduce it into an environment that is suitable for it. Response: Regarding demand vs supply and what is practical, we realized there is a breakdown in coordination. We have the different pricing strategies in the case of KEPHIS so that if someone made an early order, the prices are lower than for those who make late orders. We are trying to encourage coordination for those who need the planting materials in bulk, like the NGOs to place their orders in advance because cuttings can be produced based on the demand.

Mercy Kitavi: Regarding Obare, there is no problem about Obare and the idea about multi-environmental phenotyping comes in. Because you can get the same product from different environments. The phenotype is as result of the genotype and the interaction with the environment. Obare is suitable for West Africa but when it is second to a different environment, it is less suitable. Phenotyping the materials in different materials is to select materials that are suitable for that specific environment in the shortest time possible.

Hugo Campos: Robert, what is your take about using breeding values to identify different parents from an SPVD perceptive because unless you start with the very best parents to create genetic variations, the success is limited. Response: The proposed breeding procedures to improve traits, where they used polycrops with 25-30 parents. For drought and SPVD where the trait is recessive, problems arise because of hexaploidy. All the 6 alleles are recessive so that the trait is difficult to express. The conventional approach fails. Having worked in a hot virus pressure environment, where we put out the large numbers and select those that survive, since we still do not have the markers. The theory on paper does not work especially if you have high virus pressure on a recessive trait. The approach that we are using, is if we want to increase the frequency of alleles in our gene pool, we remove those that transmit the resistance from our population.

We have divided the sub-regions. East and Central Africa to breed for SPVD resistance and Southern Africa on drought, and West Africa on less sweet sweetpotato. This is due to the complexity of the traits and crops.

Comment: Craig Yencho. We are in the learning phase. The new genotype we are trying to make will be based diverse set of materials, but it is until we analyse these that we will get an idea on what is happening in the sweetpotato. We will understand this after we process and learn in-depth. My expectation is that genomic selection will help us identify the superior parents. If we have a couple of markers good for SPVD, weevil resistance, and other important traits, these will be good for several breeding populations.

Sammy: How expensive are these basic tools for the private sector? Entrepreneurs want to invest in simple and rapid test tools and the cost implication. Response: The costs were specific to our condition. You may have to pay more because of the geographical logistics

Jan Low: Segundo you showed the operation cost, is the equipment affordable? Response: All the cost price includes the device for any facility including laboratories, personal. The lamp kit is 6000 USD.

Session 5 Best Sweetpotato Scientific Paper of 2017

5.1 Awarding of the Best Sweetpotato Scientific Paper of 2017.

Hugo Campos, chair of Judging Committee

The award was created by Jan Low utilizing part of her World Food Prize award funds to encourage sweetpotato scientific publications. The criteria were based on the impact factor of the journal, the age of the first author since we are encouraging young researchers, and the number of readings hence need for open access, the number of downloads and citations from Research Gate. CIP believes that this is important because scientific papers need to raise interest and meet what the donors expect from us. The paper must demonstrate adoption for the farmers. Finally, it was based on the numbers of partners. The selecting team is composed of people from CIP, Oscar Ortiz, Guy Hareau, and Hugo Campus.

There was a 25% increase of papers submitted from last year, from18 to 24. Most papers were submitted close to the deadline.

The winner was Derick Malavi.

Session 6 Deep Dive Workshops

This year's SPHI had four deep dive workshop sessions. Participant's registered online in advance for the session they wanted to participate. The sessions were as follows:

1. Learning to be an Effective Biofortification Advocate- Tumaini Mikindo, Hilda Munyua and Joyce Maru
2. Creating Orange-fleshed Sweetpotato Products (Limit of 25 participants)- Chef Arnold Mawala and Daniel Mbogo & Vivian Atakos

3. Are you ready for scaling? Learn about the new "scaling readiness" tool and how it's been used for scaling Triple S" Margaret McEwan & team
4. Developing an Effective Consumer Panel for Evaluating Root Taste and Quality Traits (Limit 30 participants) Tawanda Muzhingi & Eric Dery

Reports from the deep dive workshop are under annexes.

Session 7 Youth Engagement in Sweetpotato Value Chains

Moderator: Temesgen Bocher Rapporteur: Srini Rajendran

Panellists: Angela Mwanri Tanzania, Josephat Mangeni Kenya, Caroline Komujuni Uganda, Mishael Ennuson Ghana, Temesgen Bocher Mozambique

Temesgen Bocher started the session by introducing the young agribusiness entrepreneurs from Ghana, Uganda, Kenya and Tanzania who are involved in the sweetpotato seed business and root processing business. He described the potential opportunities and challenges for youth in sweetpotato business.

7.1 Angela Mwanri from Tanzania. The Challenges and Opportunities OFSP based Job Creation

In Tanzania, the major challenge regarding sweetpotato is its seasonality. During periods of drought and floods the OFSP supply is low. Also, there is the issue of poor infrastructure considering that most of the farms are in the deep rural areas. This inhibits the access to markets and nutrition for the OFSP. The government policies do not support the youth. Another factor to consider is education. The youth are not engaged in trainings. In Tanzania, the economy posses a challenge for the youth especially those

who want to go the entrepreneurial way. The storage, lack of a market and fluctuation of the prices of OFSP.

The opportunities lie in selling the fresh roots. Farmers are encouraged to multiply the vines and grows the roots despite the challenge of lack of a market. The youth are encouraged to engage in growing the OFSP to meet the demand and supply. The processing industry is specific about the varieties that suit their final product e.g. bread or crisps. The puree technology should be introduced in Tanzania to enhance processing of puree- based products.

7.2 Josephat Mangeni Kenya

As a DVM, OFSP has helped me become successful in life. The OFSP contributes to alleviating malnutrition in my community. The root has created employment for other youths. With the diversification in farming, the OFSP vines can be used as fish and dairy feed. Through CIP, OFSP links the youth to a market for the vines.

The challenges include stereotyping since the OFSP is regarded as a poor man's crop which was meant to help those with HIV. The stigma is still existent. Another challenge is because of drought. There is need for technology that will boost OFSP supply during the dry seasons. Also, there is less government involvement in youth empowerment and employment.

The way forward, there is need to decentralize information through technology such as phones. We need to develop functionable groups, which are can entice the youth to join the OFSP value chain. Finally, we need to strengthen public private partnership such as health centres.

7.3 Caroline Komujuni Uganda

The OFSP has employed the youth and Women in Uganda. I acknowledge the assistance we have obtained from HarvestPlus who introduced the OFSP. The organization provided machines for chipping and driers. As a processor I have pure OFSP, milled OFSP, and OFSP rice soy. We have a steady source of OFSP. Also, we create awareness.

The challenges are in the processing capacity since we do not have enough production space. Also, we are required to get approval from UMB (Uganda national bureau of standards). We lack enhanced equipment. Since the OFSP is delicate and perishable, it is a challenge to handle and transport which translates to poor quality end-products. Another challenge is in the storage due to it perishability hence a reduction in supplies.

We need to create more awareness about the benefits derived from the OFSP. Our target market is the hospitals, school, supermarkets, and groceries. With the UMBA Certification, it will be easier to expand the target market**.**

7.4 Mishael Ennuson Ghana

In Ghana, we make products such as bread, ice cream and pudding and drinks from OFSP because we realized that selling roots was a challenge. These products are yet to be commercialized. With the right means, the products can be commercialized which will result in production of more roots, and an increase in vine multipliers hence more income to farmers.

Some challenges that we are facing include, growing quality roots with regard to size and appearance and consistencies hence difficulties in exporting the root to places such as Europe. The youth are involved throughout the value chain. We are supplying to the large shops such as the Farmers Market. The biggest challenge is in managing the supply chain because of lack of information and technical support. There is need to create awareness to all consumers as a marketing strategy. We need to get the government and key institution on board such as the FDA and Standards Board.

The opportunities lie in the availability of OFSP processing ideas. As the youth we have the electronic and social media at our disposal to help us market our products and ideas. We have an innovation platform where we can create synergies. The availability of CIP staff who are always ready to help. The way forward, would be to create a local interactive OFSP website which will work as an SSID or an application that organizes key stakeholders. The support system must be specific to a group e.g.farmers, technical team, wholesalers, retailers, and a platform where consumers can order products. We are doing this using Jumia. The OFSP needs to be branded properly. We should advertise to create awareness and expand the OFSP market. We should get the government and key industrial stakeholders involved so that it will be easy to register businesses and be certified. We should introduce OFSP awards and involve the youth in meetings and conferences. Having a youth leader as the advocates of the OFSP.

7.5 Case study working with youth in Mozambique: Temesgen F. Bocher

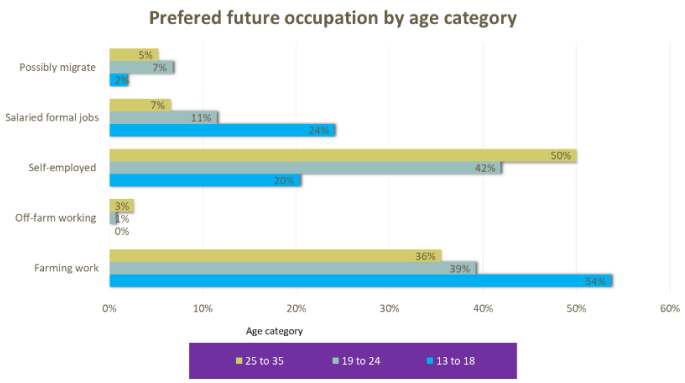
The Job Opportunities for the Youth (JOY) in Mozambique is a GIZ research funded project. We are interested in finding out which value chain the youth are interested in and the challenges and opportunities available. Due to the fast-growing economy and high population growth rates the unemployment in the youth is high. There are 300,000 new youth entering the labor market. Also, child malnutrition in Mozambique is rampant and more than 50% of the population is below the poverty line. We can fill this gap by engaging the youth in agriculture as the resource

JOY's technique is to engage the youth in the three sweet potato value chains, that is the seed systems (10 members), the S-Roots (90 members) who will specialize in root production, and S-processing under Tawanda which will be gender-sensitive involving 100% females. (40 members). First, we will identify the youth who are willing to work, group them, then develop training materials focusing on specific value chain such as vine conservation technology, production & post-harvest handling, bulking, transporting, food safety & sanitation, processing, and branding. We will provide the technical and material support required such as land, clean planting materials, farm materials, irrigation equipment, and puree processing machine. We will then make a follow up the implementation and inter group learning. We identified a land even though the ground is not fertile. Also, there is the challenge of drought, viruses and the fact that the youth cannot be DVMs because they do not own land.

In the business model, the seed group has 1 Ha of land, then the root production. We buy a subsidized 25% of the vines to sell to the root system group. The s-Root group has about 9 Ha and selling 25% of produce to the processors who are an all women-group who then market 100% of the products to NGOs,

the Government, private sector. With the start-up finances, the youth are engaged in productive activities.

Through a survey, we collected data from 218 youths, classified into 3 groups, those living in the rural, semi-urban and urban areas. The ages ranging from 22-35, 32% living in urban areas, 55% dropped out of school, 34% living with their parents and 58% employed. The most preferred agricultural activity was growing the roots and tubers followed by cereals. The youth are most interested in self-employment and mostly farming.



The challenge that the youth are facing is in lack of finances, knowledge and skills, access to land and market.

Discussion

Jean Ndirigwe: Why do you target 100% women in the S-processing while men could help especially in labour-intensive areas? Response: Temesgen. Women are good in cooking and nurture her family. Women-participation in the other groups is very low.

Comment: We have the puree technology in Tanzania, specifically in SUCEGO, and training is on-going especially for the youth who are interested in the producing baked products and juice at a low cost.

Ted Carey: What are the businesses the youth are involved in?
Caroline: I produce flour from OFSP, with 3 composites flour, maize, rice soya and pure OFSP which a multi-purpose for chapati, donuts and porridge.

Miheretu: Temesgen, why are you specifically targeting vine multiplication? And what technologies have you introduced? Response: Vine multiplication is the most income-generating business model due to the demand of planting materials. We are still involved in root production, transport, and processing.

Comment: Daisy Lanoi. I recommend incorporating students in the internship programs and through a follow-up system help impact positively on them

How do you use the social media to promote business?
Angela: We have in groups in Mwanza that use Instagram and social events such as Farmer's Day.

Enos: With applications such as Facebook, Twitter, Jumia, Amazon, Websites we can use photo or videos to promote businesses. Also, celebrities can be part of the promotion and advertising.

Mercy: Josephat, is there a preferred variety of sweet potato vines for the fish feed, either Vitaa or Kabode?

Josephat: I plant Kabode variety which I use to feed the fingerlings

To Enos- How much profit do you make from your business?
Enos: I am making 40% profit from selling bread and 20% from Gari, and 50% from roots**.**

Tanya Stathers: Watching the cinema slots on OFSP is very motivated to hear the youth speak about their businesses. These could be made available to encourage them to drive the value chain.

Maria Andrade: hHow does the OFSP gari taste?
Enos: Tastes like the ordinary gari but the catch is in the fortification with Vitamin A because it is blend with OFSP.
Jonas Mugabe: There is need for mentorship in the youth and especially in developing business plans. Communication is important especially for people in the same industry.

Reaching the Next Generation: Getting OFSP Materials into Primary Schools

Robert Mwanga
A BMGF funded project the leading institution in Tanzania and Uganda. Primary are being used as channels of cassava and sweetpotato seed dissemination. The partners include Sugarcane Research Institute (SRI)–Kibaha, Ministry of Agriculture, Food Security, and Cooperatives as the implementing partner and 10 institutions as the Collaborating partners, CIP being among them.
The project is known as "Fast-Tracking the Access to Improved and Popular Varieties of Root Crops by Small Holder Farmers: A Case of Sweetpotato and Cassava. It has five components which are 1 seed acquisition and agronomy, who distributed the seeds to primary schools and pupils took these to their homes. Nutrition and gender, Communication, policy and advocacy, Monitoring and evaluation and cost effectiveness of the approach, Partnership and governance

CIP is involved in the third component which is Communication, Policy and Advocacy. There were 10 objectives for this component. Objective 5 was to document the process and capture the learning as an evidence-based advocacy approach for policy influencing (nutrition, curriculum development, market, para professionals), resource mobilization and scaling up). CIP's specific objective was to introduce orange-fleshed sweetpotato in the primary school curriculum of Uganda.

In Tanzania, the prevalence of Vitamin A deficiency is 33% and 32.6% in Uganda. This translates to 51 people dying daily from Vitamin A deficiency. We have produced books for the approved curriculum and supplementary support materials which at the back is the WFP winners 2016. The project is meant to motivate the pupils to love agriculture and get involved. The teachers and curriculum developers went through an orientation and developed the OFSP materials**.** The children learn while enjoying, coming up with plays, poems, songs which also serve as an advertising strategy. Around 56 schools were used in the pilot project. The Ministry of Education and Sports approved the implementation of the curriculum. Books were delivered in August 2018 to the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) to cover 550 schools. Each school received 2 Teacher's manuals, and 20 copies to be shared by the pupils

In the Critical gaps, the 23000 schools must teach the OFSP curriculum. We expect that this approach will help reduce vitamin A deficiency. The approach can be modified to include other biofortified crops, e.g. High-iron beans and pearl millet, high-vitamin A cassava. We will continue to seek funds from donors. We implore the Government of Uganda to include implementation of the curriculum in the 2019/2020 budget.

Discussion

Maria How much did the project cost?

We had $350000 for 2.5 years. The National Curriculum Development Centre, Ministry of Education were not initially involved. CIP came in later.

Looking at the partnerships of the project, there were no schools involved, seems like these were based on research institutions.

The planning did not work well because the key partners such Ministry of Education and the National Curriculum Development Centre were not involved.

Joyce: Would it add value to translate the books to a local language or video?

In Uganda English is the formal and teaching language but the lower classes use the local language hence the need for translation. Using the teacher's manual, the teachers prepares lessons and teach in the language that children understand. Other countries can borrow the material and adapt it to suit them.

In Tanzania, they provided vines for the pupils to take home, were you involved in the same or another partner did this?

Each partner had a role. Those involved in seed and agronomy produced the sweetpotato varieties and distributed them to the schools, ensured these were planted and further distributed to their homes. The books contain all information required for the OFSP value chain.

Jude Njoku What is the sustainable strategy? Having integrated this into the curriculum, what is the probability of the next generation?

We are seeking funds and approved by the Ministry of Planning. Since the books were published by a private company, we anticipate that the Government will feel challenged to take up the project after one year into the implementation.

Comment Vivian: Having visited these schools earlier this year, the schools had gardens and the teachers used the local language, so they had to translate so that the children could understand. We have photos and videos on the uses of the OFSP. The idea would be to further distribute them

Hilda Munyua: Have you followed-up on the vines distributed to the pupils?

Response: If we had funds, this would have the baseline and target and online analysis to assess the impact at the end of year 3. We are working together with the National Curriculum Development Centre on this.

Craig Yencho: We have a similar project in North Carolina, is it possible to have a similar initiative for other staple foods considering impact it would have on nutrition.

The World Bank project that we are linked with covers Nutrition, Health, and Agriculture and Education. The approval was given at the highest levels.

Dufour Dominique: How did you proceed in how schools prepared the roots? How were the logistics towards delivering the foods?

The schools have meal programs. The project's objective was to use schools to distribute improved varieties of cassava and OFSP vines. The cooking is an added activity.

Session 8 Progress in Dissemination

Moderator: Paul Demo Rapporteur: Joyce Maru

8.1 Keynote: Lessons Learned from Scaling up Sweetpotato in Africa through Agriculture and Nutrition (SUSTAIN), a four country Effort to Scale OFSP

Dr. Sindi Kirimi (CIP - Rwanda)

Dr. Kirimi shared on behalf of his team the SUSTAIN's integrated approach, how the results were achieved through various seeds and nutrition delivery approached, improving nutrition knowledge of OFSP, markets and processing, promoting diversified use of OFSP/gender-aware OFSP product value chains, innovative social and behavior change communication, working with multiple partners, M & E tools. Dr. Kirimi also shared the key results achieved by SUSTAIN program over 5 years, findings from some qualitative studies conducted by SUSTAIN, lessons learned and way forward for SUSTAIN (more details in the See PowerPoint presentation)

Dr. Fred Grant presented the findings of a qualitative study conducted by SUSTAIN to assess the effects of nutrition SBCC on Knowledge, Attitudes and Practices (KAPS) among caregivers. Fred also shared the results of VISTA-SUSTAIN nutrition interventions on maternal and caregiver KAPs (more details in the See PowerPoint presentations).

Roundtable discussion – break into groups as outlined below

8.1.1 Table 1: Engaging commercial food processing sector for scaling of OFSP

Led by: Dr. Penina Muoki (CIP-Kenya)

It is a multiple stage effort with diverse actors. It has been a journey characterized by several feedback loops, trial, error, learning and improvement

What is the challenge/objective/task?

To commercialize products of research (technologies, varieties –roots and vines, approaches, innovations etc.) that are developed through publicly-funded research in order to benefit smallholder farmers.

What has been the approach?

A value chain approach, which integrates all actors in the value chain. These actors happen to be at different levels of preparedness to deliver responsibilities needed for an efficient value chain to be implemented. This calls for the research organization to provide leadership and cohesion among all actors.

Between Research and commercialization of OFSP, which one requires more resources (Financial, innovation, time, human resources etc.)?

- Both research and commercialization require resources. In both stages of rolling out an innovation, time resource is invested in testing, adapting, errors, learning and upscaling.

- Financial resource is equally needed, private sector involvement need to be sort. Research organizations may take part of the cost, but it is important that the private sector is well informed of their kind of financial requirement. A written guideline/ letter of agreement signed by senior management could be important.
- Human resource- Often expertise in marketing- consumer research will be critical. It is understandable that human resource in marketing are not often mainstream skill in most research organization- This appears to be a new resource need that as commercialization/ value chain approach becomes more and more prominent alongside research. The need to listen to consumers was highlighted as essential.
- Innovation: Continues even after the research output. Adapting the technology to the consumer needs- e.g. small packaging for affordability etc.

Motivation for commercialization seems to differ between the commercializing company and the researchers, how can the effects of these differences be mitigated?

- At commercialization stage, the private sector often need to lead while listening to the voices of the consumers.
- For novel innovations, co-sharing of funding will be necessary to de-risk the process of commercializing a new research product whose market feasibility is not established.
- Both researchers and the private sector need to agree that monitoring, learning and adaptation will be part of the commercialization process and therefore data sharing will be essential from both sides. Often it's good to have a letter of agreement, signed by top management for ownership.
- To retain the smallholder farmers during commercialization of research outputs, co-funding maybe needed to cushion the private sector from losses likely to emerge from high cost of transaction often characterised by smallholder farmers. Also use group approach/ aggregation to reduce transaction cost.

Product development phase. Often this phase e.g. breeding of the current OFSP varieties have not involved the commercializing companies. Companies are being persuaded to process varieties whose breeding objectives were household utilization, either virus or drought tolerance etc.

What strengths and weaknesses exist in such an arrangement? Is it time for breeding programs to integrate the target end commercial application? Yes, or no, provide the reason.

- There was great support for breeding efforts to consider the end user while developing new varieties. Scenarios of adapting varieties to product development were identified and were seen as time consuming, often delaying commercialization effort.

- Private sector involvement could be more robust. Participatory variety selection in the field may not always give good indication on how a variety will actually behave during processing. Use of laboratory analysis of functional and physic-chemical properties may also guide possible industrial application of various varieties even at the breeding stage. However, the breeder needs to interact with the private sector to understand what the consumer needs or market opportunity that exist.

- Post- harvest qualities of new varieties may also affect commercialization and therefore need to be considered during breeding. Thus, stakeholder engagement is critical in breeding to accelerate commercialization.

Exit strategy for researcher to allow for commercialization. During commercialization period, research organization provides various services e.g. training of farmers and other actors in the value chain, support with processing equipment, reinforcement of quality etc. How do we ensure that these services are sustained to avoid collapse of the value chain? Who should take up these roles? What are the timelines to exit?

- Where possible, let exist strategy be integrated in the implementation plan from the onset. Adapt during the implementation phase without losing sight of the need for research actors to exist the value chain as inevitable. However, it was noted that the role of the researcher could evolve as the value chain matures and new research questions emerge.
- Keep communication clear- The private sector need to appreciate research activities at various phases of development is needed. This is important as research may take time before the private sector can actually enjoy its benefits.
- Exit strategy of the research organization should be clearly communicated to all actors including the farmers to ensure that the value chain actors understand the existence of research organization is intentional and in no way will affect the value chain/Commercialization effort.

Funding for commercialization. Agriculture remains grossly underfunded and this affects the rate at which commercialization takes place. Examples in which inadequate finance has affected OFSP value chain.

- Farmers- Inability to purchase vines or sell quality roots
- Puree processor- Delayed payment to farmers-demotivates
- Bakery- Delayed payment to puree processor

Overall this has resulted in inefficiencies within the value chain although gradually improving.

How can we enhance funding for scaling up OFSP?

- Package innovations/technologies in a clear, concise manner and communicate these to the private sectors. Profitability of such a package is paramount.
- Illustrate to the private sector how they stand to benefit. This may enhance funding from the private sector.
- Align with government priorities for project funds to receive funding from the government.

8.1.2 Table 2: Effecting dietary behavior change through OFSP – nutrition approaches

Led by Dr. Fred Grant (CIP-Tanzania)

SBCC approach for SUSTAIN/CIP

CIP tries to remove barriers to good nutrition at household level and to act as catalyst/does not reinvent the wheel

Interventions through community health club meetings include;

- Development and use of counselling materials – integrated with national governments ongoing initiatives

- New materials are introduced using OFSP as the vehicle – looks at how to integrate with other nutritious foods/variety of Vitamin A rich foods.
- Educating/training expectant and lactating mothers e.g. on feeding programs, Vitamin A rich foods
- Community nutrition education
- Cooking demonstrations focusing on nutritious foods that are locally available and edible
- Training on production of OFSP – how to grow so that they can integrate into the diets
- SUSTAIN has conducted an outcome evaluation/studies looking at 6 different parameters (see presentation) to evaluate the impact of the interventions. Findings show that participants who participated at community, households, individual levels improved on KAPs and better diet quality/diversity. In Rwanda there was no difference in the diet quality of the child for those who were exposed to knowledge and those who were not. Attributed to cultural perceptions around animal sources foods e.g. chocking from meat. No improvement in nutrition knowledge in Rwanda and Tanzania but improvement of dietary diversity – so cooking demonstrations are very key to message transmissions. Videos on complementary feedings and cooking demos would be impactful. UNICEF has up to 18 videos available – accompanied with interpersonal communication. Different approaches complement each other.
    - Sustainability? Work with the governments. Working with and through schools
    - Cultural beliefs – keep drumming home the message, target all stakeholders. Baby WASH

8.1.3 Table 3: Assuring quality and timely availability of seed at scale

Led by Jean Claude Nshimiyimana and Godwill Makunde (CIP-Rwanda)

A summary of the lessons learnt from the four countries (Mozambique, Rwanda, Malawi and Kenya) who participated in SUSTAIN project were presented to the group. The lessons are laid down as follows;

- **Put in place strategies and plan for vine multiplication and dissemination:** with annual basis, **the use of growing calendar** has helped so much to plan in advance on: *Who, How many, What, Where and When* and the cost for activities.
- **A regular follow up of activities.** A **regular monitoring and evaluation** helped to know the progress of achievement at each level of vine multiplication and then timely plan for dissemination
- **Availability and access to the adequate resources.** Is the resource needed available on time needed? If available, is it accessed? Most of EGS is produced at government institutions where the funds are not accessible all the time needed and for specific activities. Is the human capacity enough? Committed?
- **A mutual collaboration/ partnership with local government from village level.** If the collaboration is doubted, the success is far to be done. This has helped the project to achieve the targets.
- **Assessment of what people need for stimulating the market demand.** Farmers and consumers preferences are very important, which varieties and why? Which characteristics?
- **Awareness and communication.** This is very important for scaling up any new technology.eg. In Rwanda we have used different strategies which enable people to know the product even before they see it. Those were road sign markets, sign posts, TV, radio, social media, etc. This has increased the demand for both vines and roots
- **Involvement of youth and women in vine distribution:** facts and figures to be generated. **Women**- are always in the center of sweet potato activities and intervention. But when some activities (e.g. Vine production) start generating money, men start to come in and later they take over all high-income generation activities.

    - **Youth**- it takes time for youth to be engaged in new activities and business but once engaged, they do an extraordinary work- e.g. >50% of total sales in Rwanda.

- **Use of M&E tools in collecting vine Dissemination data**: vine multiplication and dissemination is the key element for all sweetpotato projects and all projects need to know number of beneficiaries, locations, name of varieties distributed, targeted group, number of cuttings per household and area covered. Use of M&E tools has helped to meet the donors' requirements, double checking for quality of data and evaluate the progress of vine dissemination.

What SUSTAIN did to promote women involvement in seed production in Mozambique

- Nutrition training accompanied by preparing different sweetpotato dishes as well as dissemination of nutrition information through the mass media (radios) motivated women to grow the crop to meet household needs and to sell the surplus. The demand for vines by those who received nutritional training but did not have planting material motivated those who had vines to sell and with time they turned to be seed producers
- SUSTAIN deliberately linked some women with the OFSP processor whom they signed a contract with. This created a ready market for roots and acted as a motivation factor for women to get into sweetpotato seed production to increase their production areas and to sale excess vines to some who needed.
    - SUSTAIN directed some institutional buyers (FAO, Concern) to buy vines from women DVMs and this motivated majority of women to enter vine production business with the view of also selling vines to the institutions that were buying OFSP vines. From that point some women started looking for organizations including government department of agriculture willing to buy vines. For Mozambique case, the OFSP seed production business is only viable where there are institutional buyers. Individual farmers are still bound by traditional practices in which sweetpotato vines are not sold but rather shared within the community.
- Low involvement of private sector in EGS production. Less profit if not supported at initial stage
- Nutrition information dissemination is important for OFSP demand creation. Many farmers would go to the DVM for acquisition of vines based on the nutritional information received through SUSTAIN trained community facilitators, nurses in local clinics or through mass media. In areas where nutrition dissemination did not reach the demand for OFSP vines was generally very low and dissemination was generally poor.
- When there was an influx of institutional vine buyers, the demand for vines from DVMs also rose as many people wanted to produce vines to sell to the institutional buyers. This created demand for vines and speeded up the dissemination process.
- When farmers became aware of the existence of an OFSP processor based in Chimoio town (Zebra farm) and that the price of OFSP was higher than that of WFSP in Chimoio and Beira market, the demand for OFSP planting material around Macate and Susundenga districts increased with the view of supplying roots to the processor and to the two markets in Chimoio and Beira. Dissemination was speeded up by the existence of roots market. The lessons learnt is that OFSP seed production business is only viable if there is a reliable market for the roots.
- Working with the national secretariat for food security and nutrition at provincial levels was instrumental in nutritional information dissemination in the communities particularly in national events and this helped in vine demand creation and hence speeded up the dissemination
- Public agricultural extension support is critical to facilitate sweetpotato vine dissemination through various networks.

The constraints identified during the implementation of the project were also shared with the group members as follows;

- High demand of planting materials at un-expected time. Order from NGOs
- Difficult to handle mass vine dissemination in short period: need of a lot of capacity, financial & human

- Vine multiplication during dry season. E.g. Rwanda where farmers do not have access to marshland for sweet potato vine multiplication

Constraints encountered in Mozambique are as follows;

- We could not adequately ensure that the farmers continue using the net tunnel for multiplication at smallholder level. Most of them have since abandoned the technology
- The juice processing was not as successful as the processor always wanted support from the project which the project could not do. Probably our choice for the processor was not good enough
- We could not create vine demand of vines by other private players other than institutional buyers. Not so many individual farmers are buying vines from the DVMs and paying fair price for vines. This makes sustainability of seed business questionable if many farmers continue sharing sweetpotato vines free of charge, as they have always been doing since time immemorial.

The discussion was opened to the group members and the following main questions were raised.

- Will we have a sustainable sweetpotato seed system where the farmers are the main buyers of vines/planting materials?
- How do we make sure that we scale up seed production and dissemination?
- *How can we ensure that EGS is available on time and in enough quantity*? Involvement of private sector in EGS? Do they have that capacity?
- *How can we sustainably involve youth and women in vine multiplication business?* Youth take time to be convinced; women are committed always but then men take over when money start coming in.
- *Which appropriate model that may be used* for increasing awareness on the use of quality seed? Radio, TV, Banners, FFS? Etc.
- *How can we increase the number of cuttings purchased* by individual farmers compare to the vines purchased by other sources? e.g. International and local NGOs

Way forward

- Increase investment from the private sector on EGS and work together with government institution at the initial stages.
- Encourage youth organization to be involved in agricultures business and vine multiplication in particular
- Increase the voice of women at the center of all activities generating money such as vine multiplication
- Proper and sustainable management and coordination of sweet seed system
- Increase storage root production to feed the OFSP fresh markets and emerging processing markets
- Follow the nutritious baskets approach
- Encourage commercial processing targeting the poor farmers
- Understand how decisions are made at household and community level
- Continue training farmers and extension agents on quality seed production.

8.1.4 Table 4: Evaluating of Scaling Efforts: Quantitative and Qualitative Approaches

Qualitative data equals questions to help understand the why and the how. It's difficult to collect this type of data as the quantitative data collection is particularly popular with economists. But to monitor and learn we also need to understand why and how things are happening or not happening.

Julius Okello: Overview of issues with quantitative and qualitative data for ML&E: In SUSTAIN they used several methods. In terms of monitoring progress, they started with a SMILER method simple measurement of indicators for learning and evaluation reporting, this is a method used intensively by CRS and they trained the SUSTAIN team in using SMILER. It's a very structured system. Data was collected by different groups using forms that were harmonized across countries.

Key questions asked was have we made progress in getting farmers to adopt the varieties we put in their hands every year? Are these varieties still available 1 year after the vines were handed out (quantitative data), and what factors were influencing whether they were planted and conserved between seasons or not? Did this in Kenya also going to look at what is it doing to diets as well? In Kenya found 70% of varieties were still being planted 1 year after they were handing out, and Kabode seemed to fare much better than Vita.

On the qualitative data: in Kenya at the beginning it was difficult to mobilise farmers to join and supply Organi with roots, because these farmers were widely space and had high transaction costs, so had to involved in extension in helping to engage them. Why was it difficult for farmers to consistently supply Organi and for Organi to supply Tuskys – biggest issue was coordination problems.

What lessons have we learnt and how can we be more effective in going to scale

- **Jan Low:** A challenge is the timeline of most projects. In any new context you move into need to do formative research. If we had had time to do the formative research it would have been possible to adapt the programme to overcome those issues. Even within one project you have cultural differences and agro-ecological differences. EU project is providing interesting learning opportunities in Ethiopia where there are v diff agro-ecologies. We usually always run to get a quant. baseline survey done, but we need the qual. research done up front.
- **Margaret McEwan:** We don't want to scale blue prints, we need to understand what is on the ground and then adapt it
- **Anna-Marie Ball:** But donors are saying but you have already done this, if you need to redo the qualitative work then is this scalable
- **Paul Demo:** In some places where we had the opportunity to do the context specific pre-study (sub-sector pre-phase) it benefitted the project was then built on that. Can we build that step into projects?
- **Kirimi Sindi**: In RAC they really looked at lessons learnt which then informed BNFB and likely helped that project. Can we at the end of each project build in that lesson learning process and then make them publicly accessible so they inform future work.
- **Hilda Munyua:** In RAC focus was on OFSP, but BNFB had new crops and we didn't understand the context of those other biofortified crops in Tanzania for example there was no iron fortified beans available – so even by the end of BNFB farmers have yet to receive seed of iron fortified beans – so a situation analysis would have benefitted the project. So, the main work there has been on promoting OFSP not the other biofortified crops yet.
- **Mairead Petersen**: This continent is full of pilot projects that never go to scale, lots are linked to the NGO timeframes and funding models too, we really do need to get these innovations into government systems if we really want to go to scale then they also get into policy.
- **Jan Low:** SETSON Benjamin was on the committee, and SETSON had the mandate to call all the multi-sectoral stakeholders together and government then adopted it and taking ownership of the innovation.
- **Mairead Petersen:** Now with so many countries decentralizing situation it is very challenging, but there is opportunity for one district informing another district.
- **Kirimi Sindi**: When we first went to Rwanda found that OFSP was banned from being grown in the lowland areas, and it was very difficult to work with them. But when we collected some numbers and showed the results in terms of income, production etc. then the local governments were able to say we want this and then later the national government accepted it. Now if you talk about any nutrition-agriculture project in Rwanda then OFSP is always included. But needed quantitative and qualitative data to get to that stage.
- **Birhanu Biazin:** In Ethiopia diversity is extreme even sometimes within one region, so the competitive advantage of SP can be very different, so I was quite surprised that the SASHA target had

already been achieved, while in Mozambique it was low. So, what are the factors causing low achievement of the targets in different places as that would be useful lessons for others such as our project that is working on VC in Ethiopia?

- **Mairead Petersen:** We need to be better at defining scale, so that we can project to what scale we will be aiming, in some places even reaching 60% of the country would be absolute maximum. Unfortunately, the few places that fail are the ones that are remembered
- **Mozambique:** In Mozambique we used dither Agriculture extension officers as the DVM, which helped re sustainability and scaling. Each ext. officers needed at least 1 ha.
- **Jan Low:** When we are scaling we are working with a lot of diverse partners, how do we get consistent data – as that is a challenge, does Ted have lessons from the JumpStart project
- **Some Koussao:** How do we consider the social issue when we are scaling up? One example from Burkina Faso is sorghum was being scaled, but in an area where it wasn't appropriate. So, need to understand the social aspects of selecting target groups and areas too.
- **Pietro Turilli:** A lesson learned is being very explicit and building in a MLE system, some donors are very supportive of that others not so.
- **Mairead Petersen:** Mention donor pressure timewise, so in the proposal put in some of the significant changes seen, particularly around behaviour change which is challenging to do within a 4-year progress.
- **Margaret McEwan:** What we are learning from the scaling project. Need to move out of project thinking and out of skip. We need to let go. When it is partners who are scaling that is real scaling. Partners have their own monitoring system and often we are only allowed to add 3 questions into this.
- **Tanya Stathers:** As we do in research projects we have a scoping and situation analysis stage, to help identify the physical and range of target groups to work with, we need to look at how we could do this in a simple matrix type way at the start of scaling activities, so they are better targeted
- **Luka Wanjohi:** Tech aspects/ tablet perspective. All researchers want their questions in a particular way – we need to standardize the questions.
- **Kirimi Sindi:** Independence of evaluation data collection, but the team hired didn't even fit with the agricultural seasonal calendar so collected data just after planting due to their original work plan which didn't make sense at all, and the information gathered this way can be very misleading.

8.2 Achievements and lessons learned from the Building Nutritious Food Baskets Project (BNFB)

Dr. Hilda Munyua – Project Manager (BNFB)

Highlight: *Hilda shared the BNFB's background, the approach, Key achievements and lessons learned*

Three-year project (Nov 2015 –Oct 2018) funded by Bill & Melinda Gates Foundation. Adopts a multi-crop – nutritious 'food basket' approach and Implemented in Nigeria and Tanzania - builds on the Reaching Agents of Change (RAC) project.

8.2.1 Key Achievements – Objective 1 – Advocacy & Behaviour Change Communication Materials

- 3 advocacy strategies developed and implemented at national and regional levels.
- Strengthened the capacity of 101 advocates and champions (national / regional levels - who are advocating for policy change / raising new investment.
- Supported and facilitated the raising of over $6.1M in support of initiatives on biofortification.
- Integrated biofortification into 11 major policy documents to guide implementation of programmes addressing hidden hunger.
- Influenced the inclusion of biofortification in 5 programmes aimed at reducing micronutrient malnutrition.
- National multisectoral policy platforms strengthened and discussing biofortification.
- 41 journalists who are producing high quality print / online articles, features, documentaries, radio programs.
- BNFB web page developed and is providing regularly updated information and knowledge on biofortification.
- Social media active in promoting biofortification through Tweets, Facebook, Instagram, WhatsApp.
- Biofortification Excellence in Journalism Media Awards in Tanzania – incentivizing objective reporting on biofortification.
- Diverse Advocacy and social and behavior change communication materials developed and widely disseminated and used to support advocacy and behavior change.

8.2.2 Key Achievements – Objective 2 – Capacity Development

- Strengthened the capacity of 40 national and community institutions – which are designing and implementing gender sensitive projects on biofortification.
- Four key learning toolkits have been developed and used for training:
    - **Updated ToT manual on Everything you ever wanted to know about sweetpotato;**
    - **Biofortification: a sustainable solution to hidden hunger;**
    - **High-iron and zinc beans: a biofortified solution for iron deficiency; and**
    - **Pro-vitamin A maize: a biofortified solution for vitamin A deficiency.**
- 6,405 (3,190 female) change agents trained, who are training others along the BNFB training model
- BNFB fast-tracked the release of 7 varieties of biofortified crops including 'Solo Gold'– a new OFSP variety in Nigeria.
- More than 980,865 households growing and consuming biofortified crops (includes data from HarvestPlus – using their own funds).
- The capacity of 4 private sector agri-preneurs strengthened to process and market biofortified food products - (1) AFCO Investment Co. Ltd - PVA maize and OFSP flour; (2) Mama Organic - OFSP

flour; (3) JAGEF Group – high iron and zinc bean flour; 4) Mahauty Health Solutions - OFSP infant-weaning products.

- 6 crop-specific platforms - OFSP, PVA maize and high iron and zinc beans established to accelerate uptake of biofortified crops.

8.3 Discussion

Maria Andrade: How is the regional and policy engagement like MNAIPs positioning OFSP in the two countries? Response: BNFB did not get an opportunity to follow up on specific crops for MNAIPs but the statements exist that support biofortification. Influencing MNAIPs next level

Ted Carey: Is there a lesson to learn? How is it possible to go through a careful project planning process then to later find out that varieties not available? Response: It has to do with assumptions made during the project design e.g. the varieties earmarked for scale up in Tanzania. PVA maize was going to use varieties from Zimbabwe but has taken longer than anticipated. PVA maize grain has been used to stimulate demand ahead of seed becoming available. Some components were not as ready as initially thought

Ted Carey: How did you measure if your capacity? Response: This is done through evaluation – to follow up on skills application. BNFB has also used RAC trainers for stepdown trainings

Jonas Mugabe: Linkages/integration with health sector were not apparent in the presentation. Response: Kirimi and Fred Grant SUSTAIN was deliberate in integrating the health sector and other key ministries during the implementation– worked with them directly. Trained health care workers, worked with health facilities. Other projects have adopted the SUSTAIN approach including at the national level in Kenya (training materials being adopted by government of Kenya)

Christiane Gebhardt: Preliminary impact not clear in the presentation and how SUSTAIN has achieved this- beyond reaching households – relating to long-time goals. Response: There were some details on this in the presentation including the impact studies conducted. More information is in the SPHI briefs shared and the presentation which will be also be shared.

Response: Impact Surveys have been conducted looking at the long-term impact. Results demonstrate that there is an impact on nutrition. 2 publications are in the pipeline

Mr. Msombozi: **What about the behaviour change approach to the target community specially to consume HiB?** Response: HiB/Zinc beans not yet available in the market. BNFB targets institutions. OFSP working with TFNC/PANITA – linking with NGOs and CBOs to link directly with community members to influence behaviour. They integrate BF crops in to their existing interventions including working with local authorities

Anastasia Mbatia: **Have you considered farmer-farmer exchange for data collection? Response:** OFSP is vegetatively propagated and therefore less attractive to the private sector. Big challenge in the development of seed system. Demo plots have helped to promote quality clean planting materials- this has promoted the vine multiplication as a business. It involves a lot of communication and promotion for OFSP

Anastasia Mbatia: How did you go about getting private sector interested? Response: Private sector come on board on the seed systems. Project bought seeds from DVMs to provide to farmers for free to test – giving for free helps to demonstrate value to the farmer. Private processors require a long time, capacity development and handholding on product development. Selling reasons – lowers cost of production, makes production easier, increases some sellable attributes – improves branding

Session 9

9.1 Scaling Strategies and Efforts, continued.

Moderator: Julius Okello Rapporteur: Norman Kwikiriza

The scaling strategy involves a partnership of five CGIAR centers, i.e. CIP, Bioversity, CIAT, CIRAD and IITA.

It also involves four flagship projects, i.e.

FP1: Enhanced genetic resources
FP2: Productive varieties and quality seed
FP3: Resilient crops
FP4: Nutritious food and added value

In scaling up a technology, researchers from several backgrounds come together to achieve a common goal through information sharing. Scaling up a single technology requires other complementary innovations.

Readiness does not guarantee widespread adoption, i.e. the actual use of innovations. In some situations, innovations that have high readiness have been used, are hardly being used by end users. The opposite is also possible in the sense that innovation packages with low readiness are used commonly. For instance, R4D projects with large scale project investments might lead to initial use of innovation by many users. However, the innovations became unused after the end of these projects. Scaling readiness measures both innovation readiness and innovation use.

He pointed out that Sam Namanda and his team elaborate a good example of scaling up i.e. The Triple S technology, which is ready for scaling up. As part of the scaling team, 20 best bet innovations were evaluated through peer review. Through this team, three awards were launched by the RTB scaling fund in 2017. In 2018, 5 proposals are still under assessment.

In the technologies evaluated in 2017, some had components that were not considered (and so did not meet the eight guidelines) and were therefore not taken up for scaling.

Two technologies that are ready for scaling up;

1. **The Triple S Technology**

Dry season makes the technology ideal for scaling up. It has been tested and thus ready for scale. It is also gender responsive and addresses a serious challenge of viruses. The technology has been tested in Uganda, Ethiopia, Kenya, Tanzania, Mozambique and Nigeria and has been found effective in addressing the drought challenge of vine availability.

The Triple S technology also requires complementary packages to be effectively scaled up.

2. **The Cassava peel for feed innovation**

The processing of cassava produces a lot of peels. Processing of cassava involves a lot of wastes. These peels are difficult to dry, and the y have high Cyanide content and mycotoxins. Cassava peels also have many other problems e.g. transport to the factory and hygiene, effluents etc. The cassava technology was on a higher level of readiness for scaling and thus was awarded the funds to develop a strategy on how to go to larger scale.

The scaling readiness tool can be used to unpack different components of the innovation package. It however involves Partnership scoping so that other actors, for example Government, NGOs are involved in the scaling up strategy. For example, for the cassava peels case, the Federal Government of Nigeria through the ministry of science and technology was involved to provide an enabling policy for waste disposal.

In summary;

- New projects take on scaling readiness approach, so that all components move along the scale and are ready to go jointly;
- There is a need to identify new components and identify new partners;
- There must be a continuous quest for knowledge on how scaling up can be improved and gaps therein covered.

9.2 Discussion

Srini Rajendran: Before selecting the technology. Scaling readiness, how is the measurement taking place?
Response: When we make a call, it is the research group that submits a concept note. We give guidelines for what would be feasible or worth submitting, and a scale is given with explanations and they do a self-appraisal. Several reviews look at note to see if it makes sense or not.
These are self-assessments, so we do not apply the screening. When groups are accepted for funding, they get together, for instance in a workshop, and apply the tools developed by the cluster. They have data entry tools that give a certain score, both existing and for development.

Cassava peels have high cyanide content, so they can't be fed to animals. There is a strong environmental impact from such wastes in terms of water and air contamination. This was an opportunity to tackle two bigger problems

at once, and generate income at the same time, while adding a natural stream of production for factories that produce flour from cassava.

In the future, if we have a product from OFSP, and a factory that peels it, we can think of ways to deal with the peels.

9.3 Panel Discussion

Moderator Anna-Marie Ball

Panellists: Akoto Osei- Hellen Keller International, Everlyn Matiri, Elia Kapalasa, Sylvia Magezi

9.3.1 Promoting OFSP alongside Other Crops: Lessons from HKI's Nutrition-sensitive Agriculture interventions

Akoto Osei- Helen Keller International

HKI promotes OFSP alongside other crops in a program known as Enhanced Homestead Food Production (EHFP). Implementation of the program revolves around 3 key pillars, which are i) Production of diverse plant and animal sources foods; ii) Social Behavior Change Communication (SBCC) on Essential Nutrition Actions (ENA) and Essential Hygiene Actions (EHA); and iii) Gender Empowerment.

Enhanced Homestead Food Production- Summary of achievements

- Increased production and consumption of diverse nutritious crop and animal foods household level;
- Improved nutrition and hygiene practices, especially of pregnant and lactating mothers;
- Increased women's involvement in household decision making and access to resources;
- Increased income of beneficiaries; and
- Improved nutritional status of women and children, particularly within the first 1000 days of life.

The project implemented by training beneficiaries to establish home gardens and backing this up with a village model farm which serves as a resource for sustainability purposes, for instance, consistent supply of productive inputs like vines to the households. This is combined with the SBCC on nutrition, water, sanitation and hygiene practices. The SBCC approach is based the ENA and EHA Framework to educate women about appropriate infant and young child feeding practices, particularly exclusive breast-feeding and complementary feeding, as well as education on adequate dietary intake of pregnant and lactating women. Beneficiaries are also educated and encourage to take advantage of other public health programs in their communities, such as immunization, growth monitoring and antenatal services. The educational messages are delivered through trainings, counseling, workshops and cooking demonstrations using a combination of various community platforms, including home visits by community health workers and volunteers and group education (e.g. women's groups), among others.

HKI EHFP programs where OFSP was one of the crops cultivated by households has been implemented in about 8 African countries, including Nigeria, Burkina Faso, Ivory Coast, Mali, Mozambique, Sierra Leon, Senegal, and Tanzania. In these programs, the sweet potato was promoted alongside other crops and animal source foods to ensures diverse diets for families. HKI has learned that various factors influence the adoption of OFSP by households in Africa, including household's awareness and recognition of the crop's nutritious benefits, yield, disease resistance, taste, and texture, based on different varieties.

In addition, other factors critical for successful implementation of EHFP programs that promote OFSP alongside other crops are: the importance of involving the government and other stakeholders in the program design and implementation; context analysis based on formative research to inform design of the program; appropriate targeting of the intervention, particularly focusing on families with the first 1000 days of life for significant nutritional benefits; and strengthening local systems through capacity building.

HKI assessed the sustainability of an EHFP program that promoted OFSP in Cote d'Ivoire, after 18 months of pulling out donor and partner support to the project. The findings showed that all the women's groups formed during the period of implementation of the project were still functional in most villages. However, of the households sampled, only 66% had active food gardens, and among these, only a third were still cultivating vitamin A crops, like OFSP. The village model farms were also active in most villages. However, these farms had fewer crops being grown than when the EHFP project was active with donor and partners support. HKI also realized that there was a shift towards individual ownership of these village model farms compared to the collective ownership that the program promoted. The knowledge of program beneficiaries about nutrition and WASH was largely similar after 18 months of close of the program, as it was during the time of the program. However, the proportion of beneficiaries practices the nutrition and WASH education promoted by the project had dropped. This suggest the need for continuous SBCC to ensure knowledge gained is translated into changes in behavior in such interventions.

9.3.2 Promoting OFSP alongside Other Crops Catholic Relief Services

Everlyn Matiri

CRS supports seven countries in the region. Promoting OFSP alongside other foods. CRS works in more 100 countries in the world. They have projects ranging from emergency response, HIV, agriculture, water, education, finance, peace building and partnerships, all of which are implemented in most countries. In Rwanda, they have an integrated nutrition and WASH, funded by USAID, Zambia- the Food and Nutrition Security by GIZ, Malawi, food for peace UBALE, Togo, Ethiopia, Kenya and Timor-Leste

CRS does integrated programming which is multi sectoral and identifies donor requirements for various programs. They are running 10 DIFAZ- development food assistant programs by USAID FFP projects. Integrated programming majorly focuses on commercialization, nutritional improvements, social protection, food security which are geared towards reduction of stunted growth in children. CRS targets Village Nutrition Schools and the Farmer Field Schools across different countries. They have started with an institutional capacity building of our staff because OFSP was a new concept for CRS.

The organization started off with a technical brief that was used to describe the OFSP using nutrition attributes, agriculture attribute and what value-added products that can obtained from the root. The second technical brief focused on the tools/technologies for conserving planting material, information on country-specific varieties/ breeders, seed systems and scaling strategies in the countries.

They also have the value chain prioritization tools. Basically, all the projects will target the value chain they may want to prioritize and promote within the project. They will look at the impact criteria, which is multisectoral, geared towards addressing stunting as the main objective or they use the feasibility criteria.

Regarding, impact criteria, the focus will be on nutrition, profit potential, climate smart and resilience, youth and women friendly, employment, the influence within the industry and practice, food security, scalability and value chain activities in line with livelihood conditions. Regarding feasibility criteria to assess why CRS needs to promote OFSP value chain.

An illustration is the Togo Pilot and OFSP. CSR is working beyond the 17 countries that SPHI is targeting. They are working with 4,245 female producers, who are women in their reproductive age, with children under 2 years in 23 villages. The aim is to improve their nutrition status. Some of the producer challenges include pests, storage and marketing. The barriers to adoption include culture, storage and food preparation.

The Mwendo project in Kenya is working in partnership with CIP to promote OFSP. One challenge is that there are many varieties of OFSP in the community which lead to OVC caregivers getting poor quality planting materials. Currently, they are relying on the CIP vine multipliers. There are concerns on crop prioritization regarding income and nutrition. In Timor-Leste we promoted OFSP as an Emergency response.

On the thoughts of promoting OFSP alongside other foods to address under nutrition/hidden hunger vs over-nutrition and obesity, whole meal vs processed foods, dietary diversity vs diet quality which include variety and optimal feeding practices. It is a concern that we promote OFSP and fail to point out other varieties that are rich in Vitamin A.

Comment: Anna Marie: The presentation has helped us expand on the kind of projects that can be included with OFSP along with the thoughts of promoting it with other foods. People can change a behavior around a color change.

9.3.4 Promoting OFSP alongside Potato and Cassava: The case of Malawi

Elia Kapalasa

The current project that we are implementing in Malawi focuses on three crops, cassava, OFSP, and potato. It is in the third phase where they are promoting OFSP and potato which have now been merged into on project and incorporated cassava. The three crops are the top food crops after maize which is a staple food. This is in terms of food security and economic value.

Sweetpotato and cassava are as secondary crops. There are several stereotypes associated with crops; they are crops consumed by low-income earners. To promote these commodities, the project has embarked on some initiatives such as promotional messages and trying to understand how the market works. They segmented the market based on the value addition of the crops. They have also engaged the media to help disseminate information that will help promote the crops. The project involves various partnerships with IITA which is working mainly on the cassava. The project is sensitizing farmers based on expert information and facilitating the training of trainers (ToTs) to be empowered with the adequate skills so that they can reach farmers with the right message.

The project has also organized rural area campaigns to promote the varieties and while promoting the message on nutrition, they also promote value addition of different products.

Eliya noted that there has been an improvement on the perception of the crop because it is no longer regarded as a poor man's crop with increased acceptability rates for value-added crops, e.g. They had an agricultural fair where the commodities were sold out. The project has also managed to influence government policies targeting the root and tuber crops which have been incorporated in the National Investment Agricultural Plan.

Way forward: The project is still promoting and introducing new products. They intend to introduce new varieties that meet the market requirements. They are also trying to encourage the engagement of youth in RTC crop business. The project is also strengthening collaborations with partners to ensure that farmers acquire the right information about the project.

9.3.5 Experiences promoting OSFP alongside other crops; a case of HarvestPlus-Uganda

Sylvia Magezi

The project work is similar to what SUSTAIN does which is to promote production, consumption and marketing of OFSP with other crops. HarvestPlus promotes OFSP together with iron-rich beans. Initially they thought that these crops, which complement each other and mostly eaten together, with the different micronutrients that work together in the body, would be very important to people. However, they realised that they had to manage the preferences. They had to emphasize on complementarity to ensure that people take both crops. They had to manage two cropping cycles since the crops grow at during different seasons. It became more complex during payback because farmers chose what they wanted, and this meant they had to deal with two sets of seed producers, traders, processors. There was confusion in the messages on nutrition benefits. Also, there was a mix-up in the data sets. Having to deal with two types of marketing systems posed challenges so that later they realized it is better to split the two crops and deal with different stakeholders.

Farmers grow other crops on their farms. For the smallholder farmers, 60% of whom are women. We must address the issues that are important to them such as nutrition yield, drought and pest tolerance, cooking time, the OFSP is soft and cooks very fast, and its taste is of key importance. Regarding utilization options, some people make flour out of the OFSP. However, due to the low dry matter, the yield of flour is low. Most mothers prefer that the crop has a longer shelf-life (3-5 months) after harvest which is not the case due weevils attack. HarvestPlus promotes the root on a balanced diet approach hence consider what other crops it can be eaten with by having cooking demonstrations. The crop has to serve the purpose for the mothers who are the main beneficiaries in the category of smallholder farmers.

Upon scaling-up HarvestPlus also works with the commercial farmers. The return on investment was important for the farmers regardless of the whether it is nutritious or not. They compare with the returns from other crops such as maize. They needed to know if they can sell the vines, roots and products and if a lucrative market exists that compares to what they already have. No one wants to invest in the unknown, they need assurance to switch to the OFSP.

As HarvestPlus deals with processors and exporters, the major concern is if they have the volume, consistent supply and aggregators. The producers are also concerned with shelf life and if it can last the shipping period. Also, the root shape is a concern because they want the slim, regular/uniform shaped roots, instead of the bulky amorphous ones that cannot go into the machine. The market system approach ensure that people identify the different players and the services they offer.

The key lessons that HarvestPlus has learnt when they are disseminating information:

- They must ensure that the needs are specific to the target community, either smallholders, large-scale or commercial farmers or processors.
- Farmers want crops that have higher returns.
- There is competitiveness of the product in the local and export markets.
- Need to know varieties and where they perform best and their different markets.

9.4 Discussion

Anna Marie-Ball: For Akoto Osei not being new to HKI, tell us about the challenge in Nepal and how you overcame it?

Having done the homestead production for a long time, the bulk of these seeds were not vegetatively cultivated. OFSP was new, having a lot of sampling and harvest, we ended up with a lot of vines for distribution. Initially we used to distribute small seeds packed in a sachet so having to distribute the vines was a challenge. Learning from partners such as CIP, HarvestPlus regarding diversified vine multiplication system, we realize how the homes are scattered within a village making the distribution of vines quite difficult.

In terms of agronomy, we promote particular type of home gardens at the community level based on how it is structured, the types of crops grown and if they farm all year-round. We have to demonstrate on good practices for farming. The mode of gardening is intensive so that farmers went back to their old farming practices. The plots are small hence it is difficult to have more than one crop and almost difficult to promote the diversity at the farm and household level. Another challenge is to understand the decision-making process at the household and community level. The community prioritizes some crops over others based on the returns. We can spread the nutrition message but during the planting season, farmers always prefer to plant maize or chili on their home gardens. It is important to understand who is making the decision and how to influence the decision-makers. One approach is to understand the crop calendar and plan the planting of OFSP.

For Everlyn Matiri: How important is the capacity building of staff in an organisation like CRS where you have 7 projects all that include the OFSP. What would you do different?

For the large multisectoral programs, we could look at the staff involved, build on knowledge of the OFSP, and how the partners such as CIP and HarvestPlus can come on board to influence on the capacity for scaling purposes. They need to understand the value chain of the root, from cultivation all the way to value addition. Capacity building is on the whole extent of the value chain. The agricultural extension officers, nutritionists must be engaged. If we were to do it differently, we would ensure the design stage of project sensitizes all proposal developers about OFSP or other biofortified crops for purposes of inclusion and prioritization. They need to know what OFSP is, and the materials or resources are available in the country.

For Elia Kapalasa: You have three crops and 3 different implementers, and other partners involved such as the government, how do you keep everybody in sync and. what would you do differently?

The 3 crops we are working on, two are implemented by CIP, and the other one by IITA, and the key partner was the government. Working with partners requires patience, understanding and be alert at all times. The project has been successful and proven that partnerships, if properly coordinated can bring the much-needed results. Some of our activities overlap across districts, with lack proper coordination, it is difficult for things to work. They require training, with a clear objective so they can understand the kind of commodity they are working on. Lack of efficient capacity building may result in beneficiaries or donors receiving contradictory information. We are involving every player along the value chain, from seed multiplication, production to value addition. At each point we involve the experts such as the nutritionists and integrate such knowledge into the project. If we would do anything different, we would strengthen the collaboration and ensure that partners deliver on time.

For Sylvia Magezi: What would you do differently?

We would understand the context, and position the crops where they would work best, understand the key players and how they can get involved.

9.5 Scaling in Tanzania under Feed the Future

Fred Grant

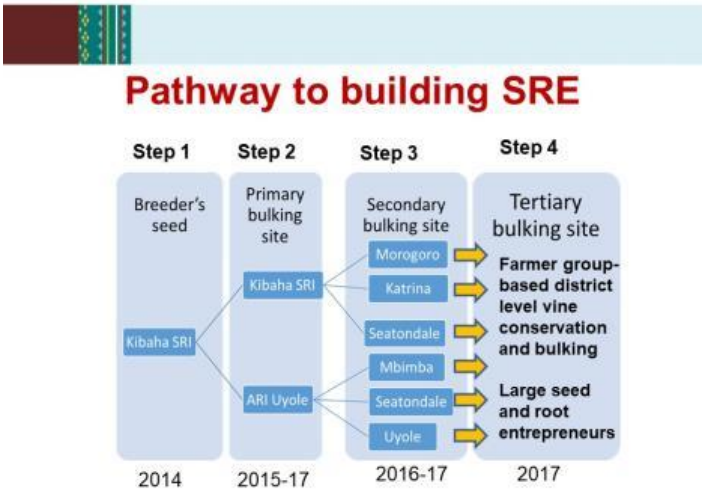
Food based-approaches is an important aspect of addressing vitamin A deficiencies and under or malnutrition. Other approaches would be food fortification and supplementation though these rarely reach those in the very remote areas where some they may not be reached during the government's approved annual supplementation. The supplemented foods are usually at the factory level and not accessible to the poor in the villages.

The VISTA project in Tanzania was project was from 2014-2017 implemented in the Eastern and Southern Highlands Zones of Tanzania where the food basket is. Ironically that is where the malnutrition is prevalent. The approach was to be integrated a bio-fortified OFSP, agriculture-nutrition education intervention into community-based nutrition caregiver clubs. The aim was to contribute to improved dietary diversity, nutrition, food security and incomes of smallholder households with children under 5 years.

On the methodology, we had a 24-months (June 2015-July 2017) intervention. VISTA linked beneficiaries to quality OFSP planting materials in the community level. They received improved nutrition education and counselling by the community-level caregivers' nutrition group meetings. The M&E strategy of the project designed to assess the overall effectiveness and sustainability of the OFSP delivery approach linking agriculture to nutrition behaviour change and communication (BCC) at the community level.

From the monitoring data, they had a total of 140 clubs established and run by 157 trained Community Health Workers, with 2,600 active members, that is mothers who attended more than four times with 22 000 caregiver reported attendees, and 1,200 club meetings in the 2-year period. Almost 28 000 eligible households received OFSP planting materials (300 cuttings of 5 varieties), together with brochures containing information on OFSP production, postharvest practices and utilization. The community health workers demonstrate to the mothers who get to test if the product is acceptable or not. They also get to try this in their homes. The CHWs are professionally trained and locally prepare the puree which can be mixed with other ingredients such as beans, peanuts and maize flour to prepare porridge. There is added sugar since the OFSP is sweet.

The project had a component of marketing and seed and root entrepreneurs. The pathways begin at breeders' sites seeds at Kibaha, Tanzania Research Institute (TRI). Through SASHA II they are bought under the screen houses, where they are multiplied, then distributed to the farmer groups in the villages on Morogoro, Mbimba, Seatondole and Uyole.



The SREs were trained by Farm Concern Internaitional for almost 1.5 years for business models to ensure that vine multplication and root production is for both system farming and business models. Each SREs has at least 2 acres of OFSP land production and they made sales in the market. They were making more money from the vines than the roots.

On evaluation, they had two cross-sectional survey, at baseline and endline to examined the effect of the intervention on beneficiary household. The Indices were developed to assess household wealth index and caregiver's knowledge on Vitamin A and nutrition, health seeking behavior and childcare practices as well as the requency of consumption of VA-rich foods (7-day FFQ) in the household and especially in young children.

From the results there were differences in maternal education and caregiver education and the maternal age. The data shows that the intervention had positive impact on production and consumption. There was a significant increase in caregiver knowledge on nutrition and Vitamin A. The common source of VA knowledge was the health units, followed by schools and community health workers. The average health-seeking and childcare knowledge score of caregivers improved from baseline to end line. There was significant improvement in diet quality at the household and young child. There was an increase in Vitamin A intake for children. There was improved food security among beneficiary households.

The lessons learnt: VISTA-Tanzania project: results-based management approach to document and analyse the planning, implementation & evaluation process. This saw the need for thorough diagnostic phase for the institutional & market systems, for 6 months which is being supported by USAID. This could help to redesign implementation activities. Because this was based on integration, there is the need to bring in all partners in terms of coordination done through quarterly meetings where they shared resources and inputs before moving to the

next phase. The community-level implementation staff (e.g. CHWs, VAEOs) are crucial to success of project. The establishment & training of community-based DVMs & SREs was critical.

The positive agricultural and nutrition outcomes documented in VISTA-Tanzania project was a result of household members being empowered to adopt OFSP technologies and management practices as well increased active participation in nutrition club meetings.

9.6 Lessons Learned from Promoting Sweetpotato Commercialization in East Africa

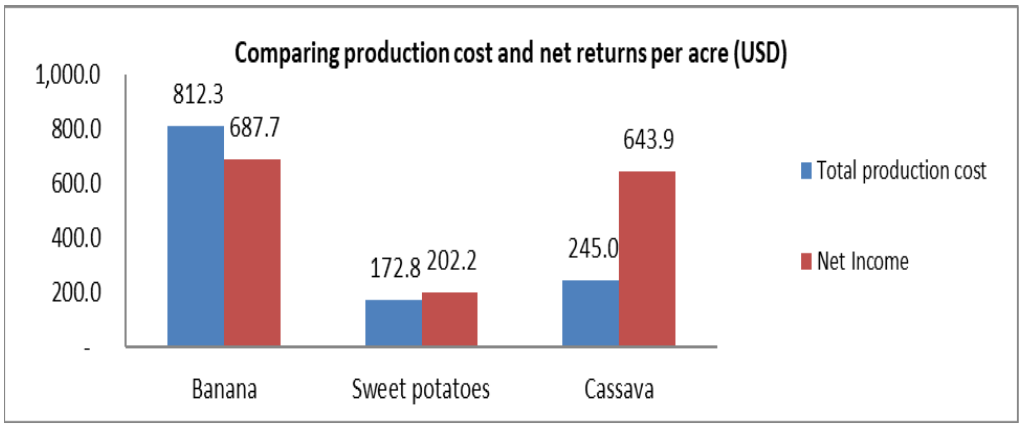
Stanley Mwangi

Seed-Farmer-Market-Consumer [SeFaMaCo] Integrated Value Chain Programme implemented in Tanzania, Uganda and Ethiopia. The programme has 3 grantees in Tanzania, 2 in Uganda and 3 in Ethiopia.

To date:

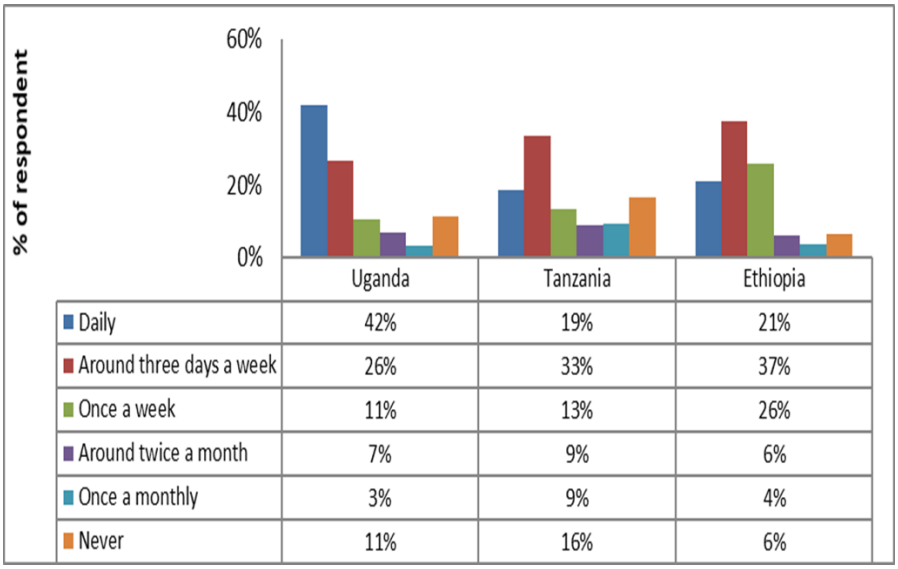
- 461,232 Smallholder Farmers (163,652 women - 34% and 116,638 youth - 24%) farmers
- 1,242 Commercial Villages (each Commercial village data has been captured in terms of yield, acreage, farm gate prices, incomes)
- A total of 607 seed enterprises were established enabling improved access to at least 1,413,316,360 clean planting materials

Farm concern looks at the overall costs from inputs to marketing of all crops in their respective value chain of the specific crop. In terms of total volume, they have results that will help in comparing the existing models.



There is more income, hence value if the crops are grown for sale in the market instead of consumption. Regarding organizing the markets, Farm Concern has assessed aspects such as aggregation, especially how we can help reduce transaction costs. At the market, the major cause of high prices imposed on the consumer is because of the “brokers” who has included packaging, transport, loading, levies-road cess, brokers commission, market association fees, administration costs among others. This creates the need for wholesalers’ association and village business forums where the wholesalers can interact and help get rid of the middlemen.

Farm Concern deals with OFSP together with other varieties of the sweetpotato.



	Uganda	Tanzania	Ethiopia
Daily	42%	19%	21%
Around three days a week	26%	33%	37%
Once a week	11%	13%	26%
Around twice a month	7%	9%	6%
Once a monthly	3%	9%	4%
Never	11%	16%	6%

- **327,215.9MT** - Contribution of Sweet potato to food security
- **USD 41,222,187** - Commercial value of Sweet potatoes that families consumed.

9.9 Our experience on coordinated partnerships in Malawi

Paul Demo

Dr. Paul highlighted that in Malawi they developed partnerships along the value chain of sweetpotato and cassava. Within the project, they did not have a full list of partners along the value chain who could enable them deliver from the research all the way to consumption. Most of the projects in Malawi do not have comprehensive and total number of partnerships. Therefore, they formed a Root and Tuber Innovation Platform which brought together all partners not previously included in the project design. These included the private sector, extension officers, the government, NGOs. The platform was sustained by the funding obtained from different projects of the partners. Regarding sustainability, our concern was if the platform would continue existing once the projects funding it ended. There is the need to move beyond the innovation platform and institutionalize it. The platform is now recognized as Malawi Root and Tuber Crop Development Trust. The board of trustees is led by the private sector with partners such as the government, donors. The role of convening all stakeholders of the value chain is given to the trust.

Session 10 Advances in Post-Harvest & Value Chain Research

Moderator: Srini Rajendran Rapporteur: Fred Grant

10.1 Progress in Developing and Utilizing OFSP purée

Tawanda Muzhingi

Tawanda began by highlighting that in order to have a shelf-stable product we must develop a puree formula to eliminate the harmful organisms. He pointed out that it is possible to make bakery products from the shelf-stable puree, but the formulation needs to be changed. With the puree containing sorbate which is anti-microbial, it affects yeasts which is a living microorganism required for dough rising. The citric acid reduces the pH of the puree, resulting in a sour bread, which is less acceptable.

A study they did compared the physiochemical properties of fresh puree, shelf-stable puree and of the standard white bread and found no significant differences in the fresh puree and shelf-stable puree in terms of proximate composition of the products. The specific volume was different from the standard white bread but not different

in the fresh and shelf-stable puree composite bread. The sorbate in the shelf-stable puree retards the yeast so it takes a long time to proof the bread, hence an obstacle to the large bakeries like Tuskys and Naivas. However, the small bakeries from the rural areas manage to proof the bread for longer periods and even overnight. Other application of the shelf-stable puree is in the baking of cookies, biscuits, mandazi, chapati where yeast- activity is not required. Therefore, the puree can be utilized by the informal sector.

How do we address the question for those who want to use the puree without preservatives? There are solutions for available. There are cheaper options of a shelf-stable puree with chemical preservatives.

People have become interested in eating foods that have low or no preservatives, and artificial colours. The technology is available where we can make shelf-stable puree that can last 12 to 36 months without refrigeration or preservatives. The technology will allow consumption of puree as a snack or an ingredient in the food industry in a variety of ways. The catering industries can use the puree as a soup, stabilizer, or a thickener.

FANEL is working with colleagues from North Carolina and the private sector that has advanced the processing of puree to develop puree that can last up to 3 years without change in quality such as colour and nutritional value. This is achieved through hot-fill where the hot packaging and product are packaged at a high temperature and rapidly cooled. The pH is less than 4.5 hence slightly acidic. In the microwave technology, they make a sterile product, while ensuring that the package is also sterile. Sterility ensures that there are no spoilage or pathogenic microorganisms. The product can have a shelf-life of 1-3 years without refrigeration or change in the quality attributes. There are publications regarding these advances. FANEL has also worked with SINNOVATEK and other companies to ensure that the microwave technology can be applied in the SSA and other low-income countries. They have come-up with a low-cost option for aseptic OFSP puree processing. It

makes about two tonnes a day. It is slightly expensive for most small-scale producers but affordable for those already in business. There are ways in which the puree can be used for value addition especially for most entrepreneurs. Such include complementary baby foods. FANEL is working to find out how to adopt such technologies to make food products that are pro-poor, that address the interests of those at the bottom of the pyramid. The research is in the packaging technology and incorporating other ingredients such as beans and vegetables. This will not only promote OFSP, but it will represent a nutritious food product.

USAID initiated a study in partnership with the Dalberg group to identify the impact of OFSP puree. They realized that there is real commercial value and opportunities in the OSFP and OFSP puree in Malawi, Kenya and South Africa. This was a case study, but it is applicable to other countries. The Dalberg consultants had a webinar in October where they shared their findings.

There are challenges that will need to be addressed to fully commercialize and scale this technology. In addition to aseptic puree processing, there is a need to identify other options such as storage, varietal development since not all varieties are applicable to different puree processing technologies. The women, youth, the indigenous and marginalized groups must benefit from such technologies. FANEL is looking at the scaling approaches which will be applied in this activity. Also, developing standards and policies for biofortification. There is a need to engage the private sector for regional development.

10.1.1 Discussion

Is aseptic processing applicable for Africa, how much does it cost? Response: This depends on where the equipment is being sourced from. The equipment was primarily from the US. China has adopted the technology hence a reduction in the cost. The processing and packaging unit in the equipment presented amount to 200,000 USD. An Israeli company have reduced the cost to 100, 000 USD while in China can be up to 50, 000 USD and it will depend on the supplier.
Looking at the ratios of SP to flour, is it by weight or soluble solids? Response: To make a 1kg of flour, you need 5-7 kg of fresh roots which is very expensive. Though it is not a direct comparison, 1kg of puree is obtained from 1.5kg of fresh roots with the moisture content. When baking, the ingredients must be reconstituted with water. This is not the case with puree.
Referring to wheat flour substitution, flour can go up to 20% substitution, while with puree up to 50-65% though this has not been scaled.
Dufour Dominique: What is the user need, what are concept for each product they are processing, specific needs? Response: This will be discussed by Simon from Tuskys who a processor and user of puree is.

10.2 Poster Session & Display of OFSP Products

Private sector processors in Kenya were invited to display, along with processors from Ghana, Nigeria, Tanzania, and Rwanda.

The following companies presented their posters and products:

Name	Company	Country
Simon Gule	Tuskys	Kenya
Bethwel Lagat	Organi	Kenya
Antonio Magnaghi	Euro Ingredients	Kenya
Depak Shah	Home Delish	Kenya
Tei Mukunya	Azuri	Kenya
Joleta Joseph	Sugeco	Tanzania
Mmachukwu Orizu	Mahauty Health Solutions	Nigeria
Zena Mshana	BMI Foods Tanzania	Tanzania
Enos Darkey	Edarkey & Associates (EDA)	Ghana
Ada Elyse	Carl Group Limited	Rwanda

10.3 Handling and Storage of Fresh Sweetpotato Roots

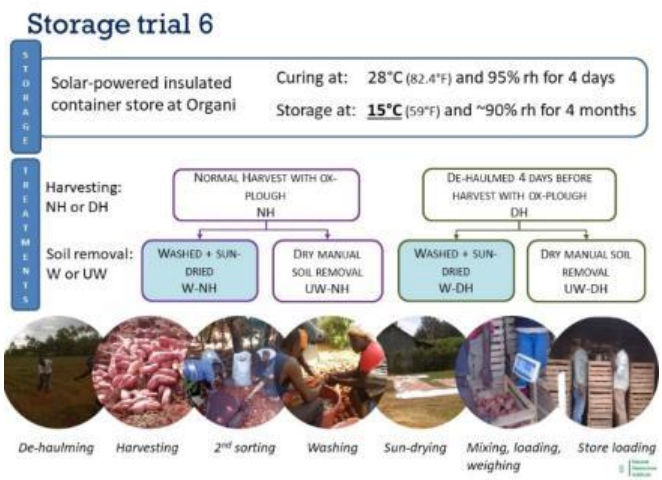
Tanya Stathers

Objective: Commercial-scale solar-powered storage of fresh orange-fleshed sweetpotato roots for processing into puree, in a tropical area of Sub-Saharan Africa

Commercial-scale storage of sweetpotato roots for ≤12 months, in US and South Africa in sophisticated purpose-built stores. In Sub-Saharan Africa, sweetpotato storage work has focused on small household-level pit stores, or traders keeping roots in piles.

A series of trials were run from 2015, assessing root quality after different storage durations and with different treatments. Initially, two evaporatively-cooled stores were created at Organi Ltd. – one powered by mains electricity the other by solar power. Results of main trial (LTS4) in the store rooms - shared at SPHI 2017.

LTS6 trial set up on 19-20 Feb 2018, at Organi Ltd, 81 crates (~37 kgs of roots/ crate). Roots sorted in field to remove broken, weevilled, rotten & small, and again at Organi (50% of roots suitable)/. Monthly sampling – root quality analysis, plus roots & puree sent for B-carotene and nutrient analysis.



Storage trial 6 – conclusions

- The unacceptably high incidence of rotting which occurred was unexpected
- High CO_2 levels during the trial, indicate high root respiration, which results in high weight loss and indicates roots were stressed. High CO_2 and rots cause root stress
- High surface mould incidence on washed roots at 1 month, would have increased the fungal spore load in the store
- Trials to test the impact of curing and storing conditions and duration on rot development are being planned
- Increased ventilation is being installed in the store to prevent CO_2 build-up
- Our previous trial found Vita stored better than Kabode, if storage becomes important, the storability of new varieties will also need to be studied
- Despite the disappointing results, there were indications that de-haulming 4 days prior to harvest reduces storage weight loss of roots, while washing appeared in this trial to increase it
- An economic analysis is investigating strategies to reduce capital investment and running costs to help widen the applicability of the storage approach

10.3.1 Discussion

Maria Andrade: What was the curing temperature? And how much was left after four months?

Tanya: To answer Maria- there overheating in the curer, it was 35°C, hence it was hotter. The auto-cooler was disabled. The roots gave out the heat as they respired, hence the need for an auto-cooler. When the temperatures hit 30°C, the auto-cooler started to cool the roots and keep the temperatures at a constant. We took the temperatures low to 28°C just to be safe. The optimal conditions of humidity and temperature were observed.

In terms of how much was left after four months, we assessed the market quality of the roots, as from the third month. We had between 30 and 40% of roots in most crates were of marketable quality. However, most were rotten.

The roots get stressed, what are these stresses?

Refers to when the roots are exposed to pathogens or the temperatures are too high, the root becomes stressed and it begins to increase the rate of metabolism and respiration resulting in higher weight loss. One of the reasons for curing roots is to help the skin to form a protective layer on the roots so as prevent weight loss. Any skin damage on the root makes it difficult to store the roots. We have been doing a lot of sorting at Organi, so the load stored reduced from 8T to 4T to remove any root which could be damaged. Skin injury is inevitable during the handling of the root so the higher the rate of exposure to pathogens. If we can reduce the stress and carbon dioxide levels in the stores, then the roots can be well cured

Hugo Campos: How do you quantify the percentage of rotting? Is it the rot per tuber or whole rot because if 70% of the tuber is rotten you must throw it away?

At each sampling, we sorted roots per crate, got the number of roots, weight of the portion, and chopped off the end of the root that is rotten and identify the fraction of the root that needs to be discarded.

Francis Kweku: I want you to contrast how to reduce temperature to appropriate humidity compared to the sandbox storage. We are also claiming that we can store our root for our farmers and plants. If this is the case, are we looking at the capital for investment or which one should we look for?

Good question regarding high tech vs low tech sand boxes method. Regarding capital investment, a lot is labour is involved when digging the pits, obviously a challenge in most communities. The high-tech store very expensive because the target end-users are different. The model we have is on a business/commercial scale or industrial development in a country. A small-scale sandbox will have a maximum of 200 roots while what we have can hold 4T. With the technology you would extend to the amount of your store to be kept within the four months for the processor for consistent supply throughout the year. From a grain perceptive, we must dry them before storage. In the triple S situation, it is about ensuring that the roots are in dry, cool soil before storage.

There is need to explore if the roots are indeed cured at 95% relative humidity and then stored at 90%. We know from a plant pathology perspective, curing gives them a warm and moist environment where bacteria and fungi thrive. The environment is therefore optimum for damage regardless that these are `the conditions being used in the large-scale storage in the US.

Michael: Do you keep the rotten root, or do you remove them as you go? The water loss that you observed, was it related to the rotten root or it was completely independent. Could it be that as the roots rot they lose their moisture content? It is interesting that at 95% humidity you have some water loss.

Yes, we did. We had 81 crates that fit in our store. In each sampling period we had 4 treatments and we looked at 4 crates of each treatment, therefore a total of 16 crates that we sort root by root. Those that were rotten were removed while the good roots were returned in the crates and then into the store. It is recommended to keep the conditions of the store constant and full always.

Yes, the weight loss is related to the root rot. The rotten roots are extremely light compared to the healthy ones. We have had a laboratory analysis of the roots analysing the β-carotene, carbohydrate, protein, moisture content. Over a period of four months the moisture content goes from 75% to 65 %.

Christiane Gebhardt: Could it be that the rotten spores come in through the ventilation?

It is possible that there are spores in the air being blown in, and we have water being vaporized in the store, the soil. The wooden crates are difficult to clean. It is possible that this have microbes in it. The crates are cleaned, scrubbing using a diluted bleach and sun-dried for 3 days. Rotting was not a problem before, so it was unexpected. Apparently, it started happening during the second month of storage.

Comment: Ted Carey. In the sand you may get a relative humidity close to that of the root which is quite high, since there is no air movement. There may be optimal conditions for curing in the sand. The idea that there are no losses in sand storage is not correct because during inspection, those that are spoiling are removed and

potentially used at household level. The study identified "useful" and useless loss. Ideally, there are losses expected, hence the need for inspection. If you left it all in the storage, you could lose it all.

Tanya: True, the sand may prevent air movement and retain temperature and relative humidity close to that of the roots. In the previous studies during pit-storage, rotting was a common problem but we if we look at the data on weight loss, or percentage weevils of these roots, it could allow us to have a comparative study. They been used as a piecemeal storage to deal with the spoiling roots where households can consume the roots. This helps maintain the quality by ensuring that only the good roots remain in the storage facility.

Presumably, respiration continues at those high temperatures. The advantage of cool storage is that it stops the weevils from growing and slows down the rate of respiration. The roots are quiescent, but still respire hence losing weight**.**

Jonas Mugabe: Did you test different varieties of OFSP during this study? We have a case where three untreated varieties were shipped to Europe, but two of them failed. The one that survived was accepted into the market. We need to identify varieties that have high storage characteristics

In the first trial we had Vitaa and Kabode. Vitaa which had a higher dry matter stored well, having less rotting incidences than Kabode. In the beginning, we knew which variety every farmer had but during the fifth and sixth trials, we were dealing with DVMs, and the farmers were not aware of the varieties they received, as long it was OFSP. The assumption is that most of the variety is Kabode because the planting material replicates faster so most farmers prefer it. At the end we ensure that the varieties are well-distributed, but we are storing different varieties. In the US, North Carolina, the variety is bred for storage. Craig has a storage facility 500, 000T of sweetpotatoes. While here we store for other purposes.

Miheretu: The study is a starting point for finding solutions regarding storage conditions in the SSA. Are there instances of disease from the field, for instance *fusarium*? In the curing have you considered using a fungicide? When assessing the quality of marketable roots after the four months of storage were characteristics such as β-carotene, anthocyanins, and other quality aspects due to respiration and sprouting.

We were not scoring or monitoring for any diseases. Instead we sorted roots that are rotten. Yes, we have considered using a fungicide. Ideally, we do not want to add chemicals in the root, hence the puree because it is mostly because ii is going through the young child feeding program. Also, the processing work is going towards "The Clean Label". Other factors to consider is ozonation as the case in Europe and ways to reduce these problems. Regarding chemical analysis, the reports suggest a decrease in the β-carotene from the roots or puree made for those roots stored after 4 months.

Jude Njoku: Are there some crates that were left for the entire four months in the storage, so we can implicate rotting with the period of storage.

We left some boxes untouched from the store. We had 81 boxes, analysed a different batch of 16 crates for each month. Obviously how the roots are handled in the field, and during sorting has the potential to transfer pathogens from our hands to the roots. In large scale storage, they minimize handling for some of these reasons and reduce skin injury.

Maria Andrade: In North Carolina the roots are stored in plastic crates, do you have any experience with these considering that it is easy to disinfect these than the wooden ones?

Penina and I did some shelf-life study and we experimented using sacks, plastic and wooden crates. It was a short-term study, for about two weeks.

Comment: Jan Low: The first engineer strongly recommended using the wooden crates, they are easily repairable, the plastics tend to crack and break. Therefore, looking at the cost issues over time, it is best to use the wooden crates.

10.4 Communication for Change Award for 2017

This is a counterpart to the scientific articles award. This is how we get messages out and communicate effectively to the end user. It is the communication for change award. A Panel led by Howie Holmes, from RTB, CGIAR program Sarah Quinn, Rosemary Kihiu evaluated the submissions.

The 2 major categories of how they judged the entries was based on originality and quality (50%) and results of communication project (50%) based on evidence contributed, whether videos, pictures, newspaper article as long it shows the impact. 28 papers were submitted, an improvement of the year before. We received only four videos.

Winner: Sweepot yoghurt- Prof Ibok Oduro

10.5 Evaluation

1 Introduction

The 2018 SPHI participants were requested to evaluate various components of the annual meeting namely: the exhibition, presentations at during the main technical meeting sessions, and meeting organization. Then they were asked to provide recommendations for improvement and potential topics for subsequent meetings. A total of 80 participants responded to the evaluation call. Most of the responses, 73.8%, were submitted electronically, while the rest were submitted using paper. Results were compiled and analyzed by Luka Wanjohi.

2 Participation by age, gender and organization

The age of the participants at the 2018 meeting ranged from 25 - 67 years, with 46% being 45 years old or greater (Figure 1). Male participants continued to dominate the meeting with their participation standing at 71.25% (Figure 2). Most of the participants indicated they were from research organizations, with those from other types of organizations such as development and private sector making up 25% of the total. Seventy percent of the respondents came from research organizations, 12.5% from the private sector, 8.8% from development entities, 3.8% from business associations such as cooperatives and 2.5% from government. 2.5% of the respondents did not indicate their organization type.

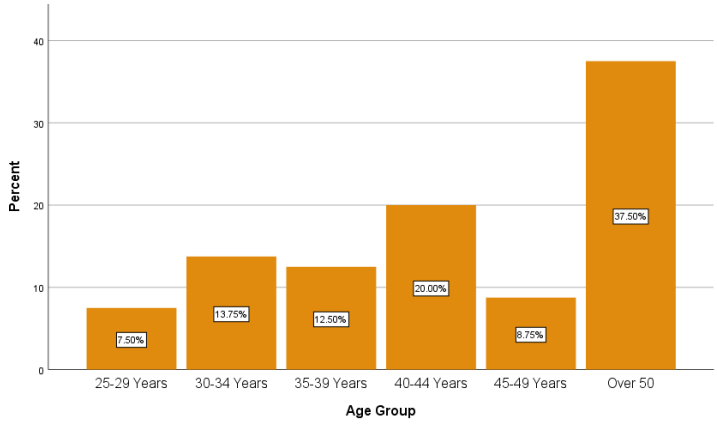


Figure 2 Participants age distribution

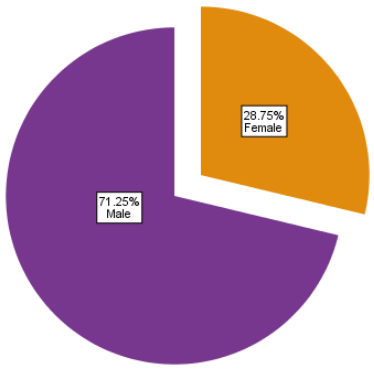


Figure 1 Participants by gender

3 Technical meeting content

3.1 Presentations

Most respondents felt that the meeting had met their expectations and 15% felt that it exceeded their expectations (Figure 3). Over 92% felt the quality of the presentations was good or very good (Figure 4). 92.5% of the respondents attended the first day of the technical meeting. All respondents were present for the second day of technical presentations on day three.

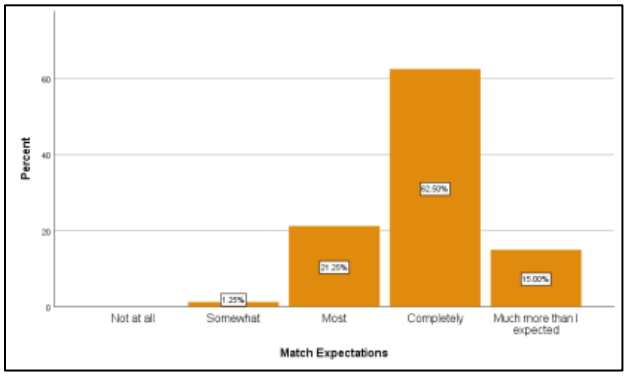


Figure 3 Rating on whether technical meeting matched expectations

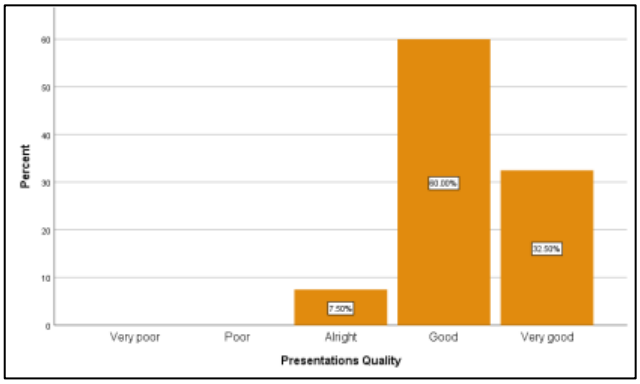


Figure 4 Quality of presentations in terms of content

3.2 Deep Dive Workshops

93.8% of the respondents indicated that they participated in the deep dive workshops, with the clear majority of these reporting that the workshops were either good or very good (Figure 5). The deep dive workshops received 47 cumulative mentions as the most useful and second most useful sessions of the 9th meeting.

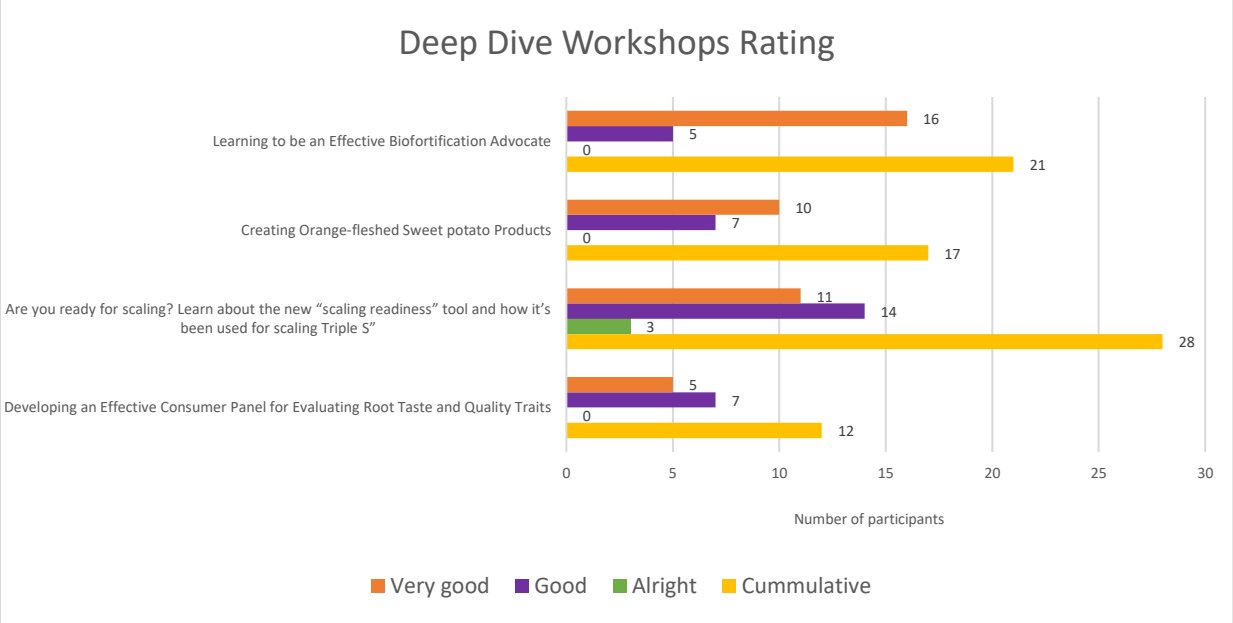


Figure 5 Rating of four Deep Dive Workshops held on Day 2

3.3 Panel Discussions

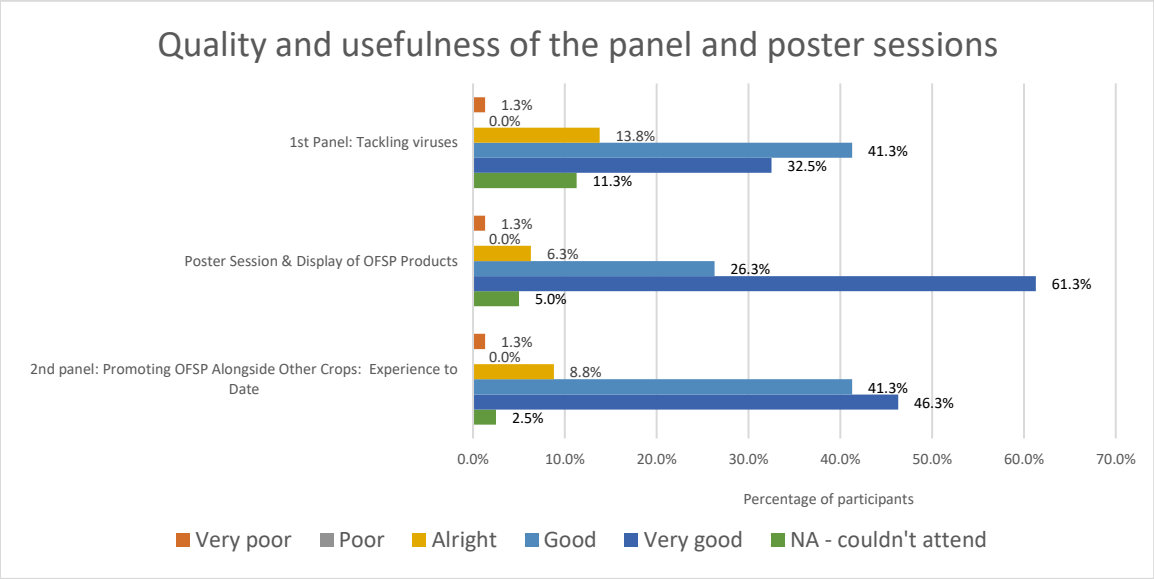


Figure 6 Ratings of the Quality and Usefulness of Panel Discussions & Poster Sessions

Both panel discussions, one on tackling sweetpotato viruses and one on promoting OFSP alongside other crops, were well-liked, with over 70% of participants noting their quality and usefullness (Figure 6). The poster session combined with the display of processed products by private sector agro-processors provided to be very popular, with 61.3% of responding that this activity was very good.

4 Meeting organization (logistics and communication)

Fifty percent of participants rated the organization of the meeting as very good; 44% as good (Figure 7). One respondent commended the good hotel facilities. Some respondents felt that the presentations were too packed and there was not enough time to do things outside of the formal program.

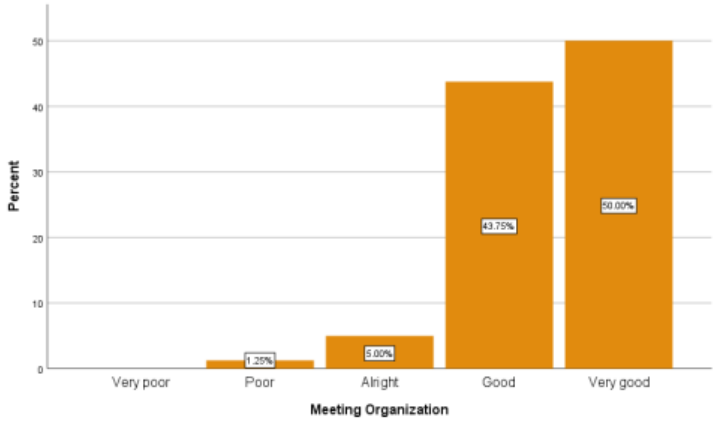
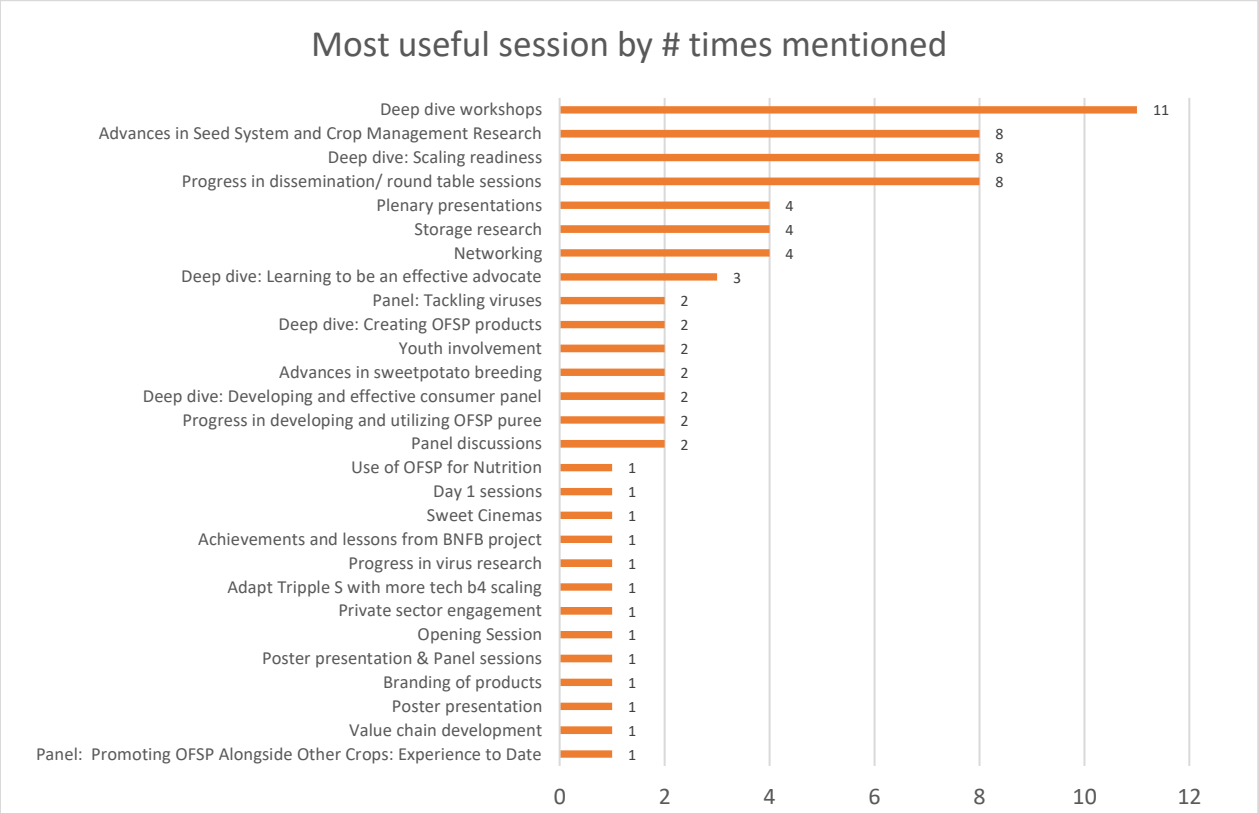
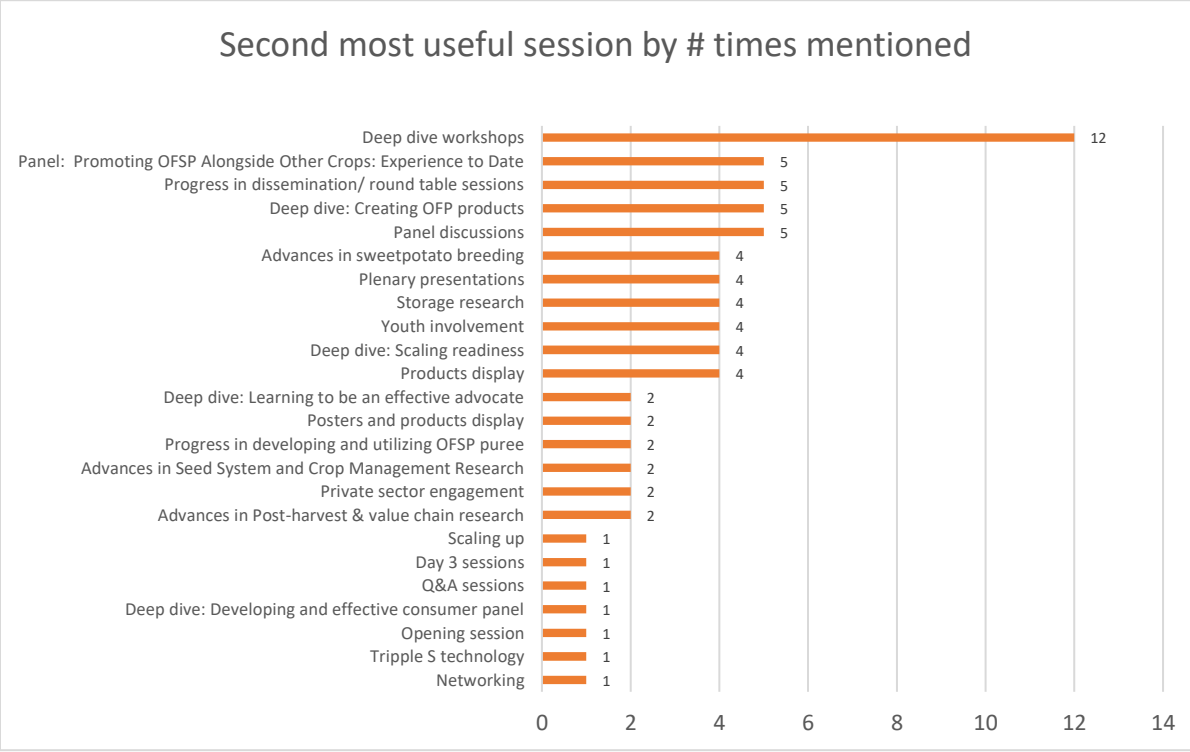


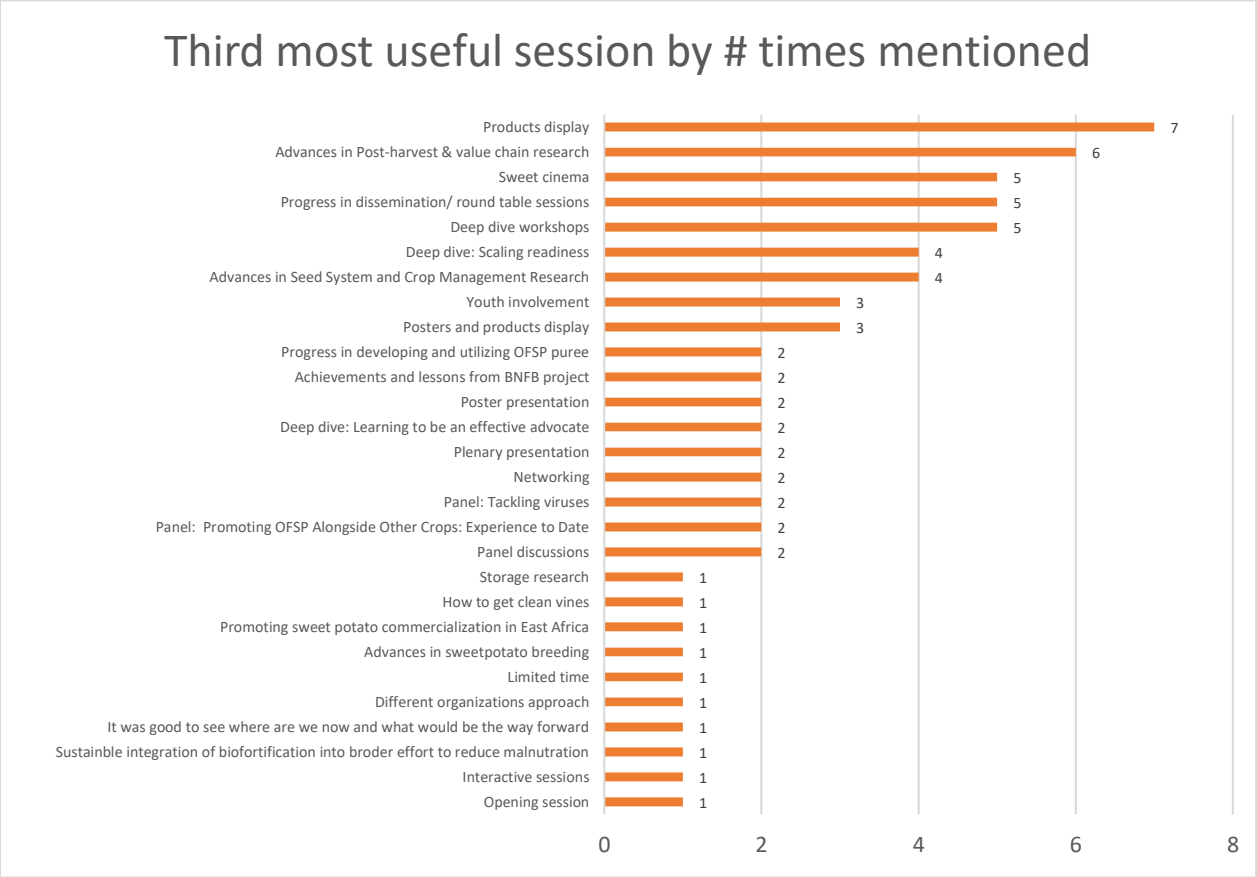
Figure 7 Rating of the organization and logistics of the SPHI meeting

5 Other comments and suggestions for improvement

Respondents were asked to list the three most useful sessions, the two least useful sessions and provide suggestions for future improvement. As seen below, deep dive workshops were a hit.






Third most useful session by # times mentioned
Products display 7
Advances in Post-harvest & value chain research 6
Sweet cinema 5
Progress in dissemination/ round table sessions 5
Deep dive workshops 5
Deep dive: Scaling readiness 4
Advances in Seed System and Crop Management Research 4
Youth involvement 3
Posters and products display 3
Progress in developing and utilizing OFSP puree 2
Achievements and lessons from BNFB project 2
Poster presentation 2
Deep dive: Learning to be an effective advocate 2
Plenary presentation 2
Networking 2
Panel: Tackling viruses 2
Panel: Promoting OFSP Alongside Other Crops: Experience to Date 2
Panel discussions 2
Storage research 1
How to get clean vines 1
Promoting sweet potato commercialization in East Africa 1
Advances in sweetpotato breeding 1
Limited time 1
Different organizations approach 1
It was good to see where are we now and what would be the way forward 1
Sustainble integration of biofortification into broder effort to reduce malnutration 1
Interactive sessions 1
Opening session 1
0
2
4
6
8

Least Useful Sessions:

- Achievements and lessons from BNFB project
- Advancement in scaling up sweet potatoes
- Advances in Post-Harvest & Value Chain Research
- Advances in Seed System and Crop Management Research
- Advances in sweet potato breeding
- Advocacy
- Best sweetpotato scientific paper
- Cocktail
- Creating OFSP products
- Day 2 sessions especially the ones on genetics
- Deep dive workshops
- Genetic gains using heterosis
- Government involvement in Sweet potatoes promotion
- Informal discussion
- Integrating OFSP with other crops to improve diversity
- Integration of OFSP with government politics
- It was all fine, but the program fell apart a bit on the last day
- Limited time
- Panel on tackling viruses
- Panel: Promoting OFSP Alongside Other Crops: Experience to Date
- Panel: Tackling viruses
- Plenary sessions
- Post-harvest loss control
- Poster sessions
- Private sector engagement
- Products display
- Progress in dissemination
- Round table discussion on SUSTAIN experience
- Round table- the groups were too large, could not hear each other
- RTB scaling up
- Scaling strategies
- Seed Prices reduction
- Session on products ended early and so much time wasted hanging around.
- Some presentations were related, and information repeated
- Storage research
- Sugarless SP varieties
- SUSTAIN - lessons
- Sweet cinema
- Tackling viruses
- Tea breaks
- The number of partner organizations and businesses is not fair among the different countries.
- The youth panel discussion. They failed to answer critical questions and no proper plan for way forward
- The youth panel should be more organized
- There were fewer refreshers this year
- Triple S
- Videos were helped participants to visualise the application of Triple S technology
- videos which were not played
- Youth involvement
- Youth panel-- youth needed more preparation in advance
- Youth presenter session - they did not give concrete facts, they did not seem well prepared.
- Youth speaker #3: Uganda

6 Suggestions for future improvements and other comments

Below is a summary on suggestions made by participants for future improvements by major categories:

Deep dive workshops

1. Deep dive: Deep dive would be presented in plenary session
2. Deep dive: Divide sessions into areas of relevance, create break-out sessions and let people chose topics they want to attend
3. Deep dive: Increase time for Deep Dive Session
4. Deep dive: Make deep dives rotate so that you can attend one, even if you facilitate one yourself, or allow for a plenary session where results are communicated to other participants
5. Deep dive: The in-depth workshops seem to be a good addition-- maybe just 1/2 of a day. One workshop for next year could be how to cost out a product and/or construct a business plan
6. **Dissemination**: Need to give facts and evidence of impact

Field trips

7. Field trips: Field trips are very important. We came in at night and left at night, so we couldn't see the town. Seeing the host city is very important
8. Field trips: Field visit for show cases, very important for next meeting

Keep it up

9. Keep it up: Amazing work all around, thank you.
10. Keep it up: Good quality standards in everything
11. Keep it up: Keep going with the same level of enthusiasm, creativity. Nice to have a field day (which we didn't).
12. Keep it up: Keep on exposing us to different learning opportunities and mixing up the format of the meeting I enjoy that it keeps it fresh
13. Keep it up: You did a great job

Logistics

14. Logistics: Improve flight booking to reduce stress in arrival and departure
15. Logistics: It was difficult to see the projected screen during presentation
16. Logistics: Luka great in dealing with challenges of presentation technology

Meeting participation

17. Meeting participation: Attending for the 1st time, I hope next we will be able to show case what we have done with OFSP in Save the Children and present on how we have imparted on the lives of women and children
18. Meeting participation: I suggest inviting some Chinese scientists to attend this meeting (*Editor note: there were 2 Chinese scientists in attendance)*
19. Meeting participation: Invite a decision maker (e.g. commissioner of agriculture) to give a presentation
20. Meeting participation: The meeting should be balanced between scientists and non-researchers.

Partners

21. Partners: Interesting to capture activities of partner institutions, might be good to better capture from them their impressions of the collaboration with CIP-what works well, what could be improved.
22. Partners: It may be good to invite more partners (research organizations, business people) from every country.
23. Partners: Will like to hear more on how challenges with partnerships are addressed

Private sector

24. Private sector engagement: Engaging private sectors investment in sweet potato value chain
25. Private sector engagement: Greater involvement of the business sector
26. Private sector engagement: Select good private for more sharing

Reporting

27. Reporting: A general overview of the projects active in SPHI, their intervention areas, and major outputs/outcomes would have been useful
28. Reporting: Improving the reporting from output-based to result-based

Scaling

29. Scaling: Harmonise terminologies especially on scaling. What is an innovation, technology and method? Experience from FARA indicates that they got a consultant to harmonise the terminologies. We could share their experiences or share their documents if possible.
30. Scaling: Scaling up beyond the projects

Standards

31. Standards: Add something on getting standards for products
32. Standards: How to get standards involved

Time & Session Management

33. Time & Session Management: Allocate enough time especially during discussion
34. Time & Session Management: Give communication and science paper award to more than one person to encourage more participation Prize 1-3
35. Time & Session Management: Have a less dense agenda and more time for interactions
36. Time & Session Management: Help the presenters you suspect will have problems presenting before a large audience
37. Time & Session Management: I think question after the talk should be answered directly. Collecting questions makes it often confusing and the answers are often not up to the point because the speaker could not keep track of the questions as well.
38. Time & Session Management: Maybe not pack the meetings till evening
39. Time & Session Management: Precise and concise presentations of the presenters can be improved.
40. Time & Session Management: Presentations of the presenters can be improved.
41. Time & Session Management: Sometimes did not have enough time for discussion and asking questions.
42. Time & Session Management: The program was too loaded so many presenters rushed through their presentations
43. Time & Session Management: The technical meetings should end at 1730 HRS latest every day
44. Time & Session Management: Time allocation for most presentation was not enough. We should learn to present within the time allocated and respect the time keepers.
45. Time & Session Management: To finish session earlier
46. Time & Session Management: Too many topics, no enough time to discuss.
47. Time & Session Management: We need more group discussions. Well done
48. Time and Session Management: Breeding sessions and virus sessions were too heavy and technical. May be scientists have to try to simplify the language given the audience diversity/non-scientists/technical people among the participants

Value chain research

49. Value chain research: Additional assessment on wider and deeper market development for fresh roots as well as deepened focus on consumer assessment
50. Value chain research: Consumer preferences
51. Value chain research: Findings of the Dalberg study on commercialization efforts and the findings of the study that was mentioned regarding consumer demand, perceptions etc. of OFSP in supermarkets and informal settlements in Kenya.
52. Value chain research: Increased opportunity for businesses to present their experiences about their commercialization efforts, opportunities as they see them etc.
53. Value chain research: More business models and money generating ventures using OFSP
54. Value chain research: Other value chain commodity actors on biofortification

Youth

55. Youth: Add more youth engagement
56. Youth: Also, youth session was very good-would help to hear more from them on their experiences in getting started, what helped, what did not.
57. Youth: Better selection next time of youths coming to event.
58. Youth: Have the youth discussion come early in the day. Being the last item made it difficult for people to participate due to fatigue."
59. Youth: I suggest that focus will be made on the youth to promote their engagement in agriculture
60. Youth: Involve more youth in the presentations,
61. Youth: Keep trying to get more youth involvement
62. Youth: more youth engagement
63. Youth: Panel discussion on youth could have been deeper
64. Youth: Youth is very important. They need guidance so that all of them are prepared for meetings like this.
65. Youth: Youth session can be done better. Business plans lacked, and panellists didn't give figures on investments and profits.

Others

66. Adoption study
67. Commercialization mindset skills presentation for breeders and product development
68. This workshop provides an avenue for learning sharing and improving for the future R&D for addressing food security, nutrition security and commercialization of products.
69. Seed system/storage and value addition
70. Sessions on business mentorship, linkage to agribusiness incubators and establishing OFSP innovation platforms
71. Need more innovation and technologies on OFSP
72. Need to plan to have revolving fund that support training and they charge the off-takers in order to have sustainability at the end of each project
73. I will like to hear more on concrete examples of upstream marketing of OFSP. What models have worked well
74. I wish you the best next year
75. Irrigation (small scale irrigation) techniques for improving OFSP availability in year round
76. It was an information sharing workshop for future improvement of R&D, food and nutrition security and commercialization of products

10.6 Cocktail Party & Photo Contest Awards

A cocktail party was held at the Concord hotel. The annual awards for the photo contest were awarded in 2 categories for distinct CIP and non-CIP participants (12 in all). The names of those receiving the photo contest cash prizes are provided in Annex 4.3 and the photos are posted on the Sweetpotato Knowledge Portal.

11 Annexes

11.1 Agenda

SPHI TECHNICAL MEETING
Annual SPHI Steering Committee Meeting
Annual SASHA Project Advisory Committee Meeting
CONCORD HOTEL
NAIROBI, KENYA

Progress in Research for Development for Sweetpotato in Africa

DEEP DIVE WORKSHOPS: 25 SEPTEMBER 2018 TECHNICAL: 24 & 26 SEPTEMBER 2018
STEERING COMMITTEE: 27 SEPTEMBER 2018 SASHA PAC: 27 SEPTEMBER 2018

Time	Subject	Responsible
	23 SEPTEMBER 2018, SUNDAY	
	Participants arrive in Nairobi. Transport pickup will be available if your flight details have been sent to the organizers.	
	24 SEPTEMBER 2018, MONDAY	
8:00	Registration	Bernice Wairimu
Session 1	**Opening Session**	*Moderator:* Jonas Musabwa Mugabe, Forum for Agricultural Research in Africa (*FARA*), Manager of the Platform for African-European Partnerships in Agricultural Research for Development *Rapporteur: Rosemary Kihiu*
8:15	Welcome to the meeting & introductions	Dr. Jonas Musabwa Mugabe, *FARA*
8:30	Official Opening	Dr. Oscar Magenya, representing: Prof. Hamadi Iddi Boga, Permanent Secretary for Agriculture and Research, Kenya
8:50	**Keynote:** Integrating Orange-fleshed Sweetpotato into Government Policy & Creating an Enabling Environment	Mr. Augustine Kungu Olal, Assistant Director, Department of Coordination of Government Business Office of the Prime Minister, Tanzania
9:20	Status of Sweetpotato in SSA Update	Julius Okello (CIP)
9:40	Returns to Vine Multiplication in Tanzania and Uganda and Implications for Scaling-out Quality Planting Material	Norman Kwikiriza
10:00	Questions on Session 1	
10:15	Health Break & Group Photo	
Session 2	**Advances in Seed System and Crop Management Research**	*Moderator: Tanya Stathers* *Rapporteur: Reuben Ssali*
10:45	*SWEET Cinema #1:* What is Triple S?	6-minute video
10:55	Sweetpotato Seed Production in a Low Virus Pressure Rice Scheme: Win-Win through Rotation	Jimmy Lamo & Gerald Kyalo

Time	Subject	Responsible
11:15	Determinants for smallholder farmers to engage in traditional vine multiplications under different sweetpotato production systems in southern Ethiopia	Birhanu Biazin
11:30	Performance of different Orange-Fleshed Sweetpotato varieties for Triple S method of vine conservation and multiplication	Mihiretu Cherinet
11:45	Scaling Triple S: What are we learning	Sam Namanda
12:00	Strategies for strengthening the Institutionalization of the Early Generation Seed (EGS) Business by public institutions in Sub-Saharan Africa	Margaret McEwan
12:15	Progress in Microbial Control of Sweetpotato Weevil	Milton Otema Anyanga
12:30	Discussion	
13:00	Lunch	
Session 3	**Advances in Sweetpotato Breeding**	*Moderator: Robert Mwanga* *Rapporteur: Kwame Ogero*
14:00	Genomic Tools for Sweetpotato	Craig Yencho
14:20	Understanding Drought Tolerance: Top Five Performers in Mozambique and their Characteristics	Maria Andrade & Godwill Makunde
14:35	Genetic Gains using the Heterosis Exploiting Breeding Scheme	Wolfgang Grüneberg
15:00	Breeding Progress in the Sahel	Some Koussao
15:15	Developing and Naming Low-Sugar Sweetpotato	Ted Carey & Eric Dery
15:30	Discussion	
15:45	Health Break	
Session 4	Viruses and Assuring “Clean” Seed	*Moderator: Jan Low* *Rapporteur: Faith Njung’e*
16:15	*SWEET Cinema #2:* Towards Sustainable Pre-Basic Seed for Kenya, a video produced by KEPHIS	7-minute video
	Panel on Tackling Viruses	*Moderator: Jan Low*
16:15	Conventional Breeding for Resistance: Slow but Sure?	Robert Mwanga
	Challenge and Progress in Using Molecular Markers	Mercy Kitavi
	Speeding up Virus Detection and Removal	Segundo Fuentes
	Are Begomoviruses Important?	Bramwel Wanjala
	Can smallholders successfully manage viruses in their fields?	Kwame Ogero
	Are Seed Regulations the Answer for Virus Management?	Ivan Obari (KEPHIS)
Session 5	**Best Sweetpotato Scientific Paper of 2017**	
17:30	Awarding of the Best Sweetpotato Scientific Paper of 2017	Hugo Campos, chair of judging committee
17:40	Presentation of findings of Best Scientific Paper 2017	To be Announced
18:00	Close of day 1	

Time	Subject	Responsible
25 SEPTEMBER 2018, TUESDAY		
Session 6	**Deep Dive Workshops: Sign up for one in Advance**	**Organizer(s)**
8:30	#1: Learning to be an Effective Biofortification Advocate	Tumaini Mikindo, Hilda Munyua and Joyce Maru
	#2: Creating Orange-fleshed Sweetpotato Products (Limit of 25 participants)	Chef Arnold Mawala and Daniel Mbogo & Vivian Atakos
	#3 Are you ready for scaling? Learn about the new "scaling readiness" tool and how it's been used for scaling Triple S"	Margaret McEwan & team (Faith-communications)
	#4: Developing an Effective Consumer Panel for Evaluating Root Taste and Quality Traits (Limit 30 participants)	Tawanda Muzhingi & Eric Dery (Nathan-communications)
13:00	Lunch & Voting for the People's Choice in the Photo Contest	Faith Njung'e
14:00	Continuation of Deep Dive Workshops	
15:30	Break	
Session 7	**Youth Engagement in Sweetpotato Value Chains**	*Moderator:* Jonas Mugabe *Rapporteur: Srini Rajendran*
16:00	Challenges & Opportunities to Make Sweetpotato an Attractive Business for Youth	Dr. Jonas Musabwa Mugabe, *FARA, Moderator*
16:00	Youth speaker #1: Tanzania	Angela Mwanri
16:10	Youth speaker #2: Kenya	Josephat Mangeni
16:20	Youth speaker #3: Uganda	Caroline Komujuni
16:30	Youth speaker #4: Ghana	Mishael Ennuson
16:40	Working with Youth speaker #5: Mozambique	Temesgen Bocher
17:00	Discussion	
17:15	Reaching the Next Generation: Getting OFSP materials into Primary Schools	Robert Mwanga
17:30	Wrap-up and thoughts for the Way Forward	Jonas Mugabe
26 SEPTEMBER 2018, WEDNESDAY		
Session 8	**Progress in Dissemination**	*Moderator: Paul Demo* *Rapporteur: Joyce Maru*
08:15	**Keynote: Lessons Learned from SUSTAIN, a Four-Country Effort to Scale OFSP**	Kirimi Sindi
	Round Table Discussions on SUSTAIN Experience: Research findings and lessons for future programming	Break into 4 groups
08:45	Engaging the commercial food processing sector for scaling of OFSP	Penina Muoki
	Effecting dietary behavior change through OFSP-nutrition approaches	Fred Grant

Time	Subject	Responsible
	Assuring quality and time seed at scale	Jean Claude Nshimiyimana and Godwill Makunde
	Evaluation of Scaling Efforts: Quantitative and Qualitative Approaches	Kirimi Sindi
09:45	Achievements and Lessons Learned from the Building Nutritious Food Baskets Project	Hilda Munyua
10:00	Discussion	
10:15	Health Break	Faith Njung'e
Session 9	**Scaling Strategies and Efforts, continued.**	*Moderator: Julius Okello* *Rapporteur: Norman Kwikiriza*
10:45	The Scaling Strategy for the Roots, Tubers and Banana Program	Michael Friedmann
11:00	**Panel: Promoting OFSP Alongside Other Crops: Experience to Date**	*Moderator: Anna-Marie Ball* *Rapporteur: Faith Njung'e*
	Helen Keller International	Akoto Osei
	Catholic Relief Services	Everlyn Matiri
	Africa Rising	Elia Kapalasa
	HarvestPlus	Sylvia Magezi
12:25	Scaling in Tanzania under Feed the Future	Fred Grant
12:40	*SWEET Cinema #3:* Saving Sweetpotato Vines for the Rains	4-minute video
12:45	Lessons Learned from Promoting Sweetpotato Commercialization in East Africa	Stanley Mwangi
13:00	**Lunch**	
Session 10	**Advances in Post-Harvest & Value Chain Research**	*Moderator: Srini Rajendran* *Rapporteur: Fred Grant*
14:00	*SWEET Cinema #4:* Orange-fleshed Sweetpotato Purée: The Golden Ingredient	6-minute video
14:10	Progress in Developing and Utilizing OFSP purée	Tawanda Muzhingi
14:30	Poster Session & Display of OFSP Products *Private sector processors in Kenya will be invited to display, along with processors from Ghana, Nigeria, Tanzania, and Rwanda*	Daniel Mbogo & Vivian Atakos
16:00	Break	
16:30	*SWEET Cinema #5:* Storing Roots in a Sandbox	
16:40	Handling and Storage of Fresh Sweetpotato Roots	Tanya Stathers
17:00	Discussion	
17:15	**Communication for Change Award for 2017**	Jan Low
17:30	Evaluation of Meeting	Jan Low & Luka Wanjohi
18:00	End of Meeting	
19:00	Cocktail Party & Photo Contest Awards	Bernice Wairimu
	Welcome remarks	TBA
	Awarding the Winners of the 2017 Photo Contest	Faith Njung'e with slide show

Time	Subject	Responsible
27 SEPTEMBER 2018, THURSDAY		
08:00-10:00	**Closed Session Meeting for Members of the SPHI Steering Committee**	**Jan Low and FARA Representative, Room to be announced**
	Break	
10:30-13:00	**SASHA Project Advisory Committee Meeting: Closed meeting for PAC members only**	Anna-Marie-Ball, Chairperson, Room to be announced
13:00	Lunch	
14:00-16:30	**SASHA Project Advisory Committee Meeting, cont.**	Anna-Marie-Ball, Chairperson

11.2 Best Scientific Paper

Food Safety Knowledge, Attitude and Practices of Orange Fleshed Sweetpotato Puree Handlers in Kenya

Nyabera, Derick & Abong, George & Abong, Ooko & Muzhingi, Tawanda. (2017). Food Safety Knowledge, Attitude and Practices of Orange Fleshed Sweetpotato Puree Handlers in Kenya. Food Science and Quality Management. 67. 25171-603.

Abstract

Orange Fleshed Sweetpotato (OFSP) puree is a nutritious food ingredient for promoting Vitamin A intake in processed food products in Sub-Saharan Africa (SSA). OFSP puree handlers play an important role in ensuring production of consistently safe and quality OFSP puree and related processed products. Lack of or insufficient knowledge on food safety coupled with poor practices by food handlers are major causes of foodborne illnesses and deterioration in food quality along the food chain. The current study assessed levels of food safety knowledge, attitude and hygiene practices (KAP) of OFSP puree handlers in Kenya. A cross-sectional study using a self-administered structured questionnaire was conducted among 35 OFSP puree handlers chosen by exhaustive sampling during the period of July and August 2016. The mean percentage scores for knowledge, attitude, practices and overall KAP were 73, 89, 80 and 81, respectively. OFSP puree handlers in this study had low level of knowledge on personal hygiene, food contamination, foodborne illnesses, cleaning and sanitation with mean scores of 80, 64, 76 and 63%, respectively. Training had a significant impact on knowledge ($p=0.020$), attitude ($p=0.050$), practices ($p=0.006$) and overall KAP ($p=0.001$) with majority of the OFSP puree handlers (63%) having received a training on food safety. A significant moderate positive correlation existed between knowledge and practices ($r=0.358$, $p=0.035$) and attitude and practices ($r=0.42$, $p=0.013$). As per adjusted linear regression analysis, food safety practices significantly ($p=0.045$) increased by 0.32% with one percent increase in knowledge and by 0.38% ($p=0.018$) with one percent increase in attitude. OFSP puree handlers had low level of knowledge and practices but demonstrated a positive attitude on food safety. Frequent food safety training is needed to improve knowledge and hygienic practices of OFSP puree handlers. Read more

11.3 Communication for Change Award

Sweetpot Yoghurt, a fortified yoghurt snack to help curb vitamin A deficiency syndrome

Sweetpot yoghurt is a flagship brand that produces delicious yoghurt enriched with highly nutritious Orange-fleshed sweetpotato (OFSP). The brand was developed in a final year thesis of Maame Ekua Manful under the supervision of Prof. Ibok Oduro with the aim of promoting the consumption of OFSP and providing markets for OFSP farmers in Ghana whiles increasing the nutritional quality of widely consumed snack trending in Ghana by supplementing with Vitamin A and dietary fibers.

In 2017 they explored the potential of using entrepreneurship and communication as a vehicle to move sweetpot yoghurt from the laboratory to startup brand and a real solution for the world. This innovation with potential to scale has attracted national and global attention due to the awards merited. Sweetpot yoghurt is creating a robust sweetpotato value chain with several job opportunities right from the farm, sourcing from small holder farmers in Ghana to the shops.

Links to any associated coverage about the product:

- https://vimeo.com/267621328
- https://vimeo.com/267621444
- http://sweetpotatoknowledge.org/story-sweetpotato-yogurt/

11.4 Photo Contest

The photo contest had two themes:

Sweetpotato's Role in Food Systems: This category is aligned with the theme of this year's SPHI meeting: Building Resilient Food Systems with Sweetpotato. This category emphasized how sweetpotato fits with other crops in different production systems, how it is traded, and its diversified use in processed products and integration into traditional dishes.

There were two types of entrants in each theme: 1. International Potato Center (CIP) staff members 2. Partner organization members

View the winning photos at www.sweetpotatoknowledge.org

The top 3 photographs in each category won a cash prize: • Winner: $120 • 2nd place: $70 • 3rd place: $45

Sweetpotato Technology Transfer:

CIP Winner: Kwame Ogero

2nd place: Cherinet Mihiretu

3rd Place: Godwill Makunde

Partner organization

Winner: Elizabeth Macharia

2nd place: Fortunatha Joseph Mmari

3rd place: Lagat Bethwel

Children Benefitting from Orange-fleshed Sweetpotato

CIP Winner: Asfaw Frezer

2nd Place: Benjamin Rakotoarisoa

3rd Place: Norman Kwikiriza

Partner Organizations

Winner: Laira Kyazike

2nd Place: Aurelie Bechoff

3rd Place: Sylvia Magezi

People's choice award – Vivian Atakos

11.5 Deep Dive Workshops

11.5.1 Learning to be an Effective Biofortification Advocate

9th Annual SPHI TECHNICAL MEETING

Report Submitted by: Tumaini Mikindo

1.0 Introduction

SPHI Project held its 9th Annual technical Meeting from 24th -27th September 2018 in Nairobi. During this meeting, a deep dive session was held to enhance understanding on the process of being an effective biofortification advocate.

1.1 Objectives

The overall objective of the session was to share experiences on advocating for biofortification and equip participants with skills on becoming effective advocates.

1.1.1 Specific Objectives:

1. Discuss the importance of having clear objectives or the "intent" and expected outcome for advocating;
2. Apply advocacy tools for a successful advocacy movement for biofortification (with special reference to orange-fleshed sweet potato), and learn how to engage policy /decision makers;
3. Learn how to develop effective advocacy messages and appropriate communication channels.

1.2 Output of the workshop

By the end of the workshop all participants were expected to understand the role advocates/champion for of biofortification of Orange Fresh Potatoes.

1.3 Training delivery

The workshop employed various methods to deliver intended knowledge to participants. These methods include Group discussions, Case study presentation (Experience sharing), General discussions, Presentations as well as question and answers.

1.3.1 Introduction to Advocacy

The first presentation was about Introduction to Advocacy; this topic aimed at enhancing participants' understanding on Advocacy, to enable them to differentiate between Advocacy and Lobbing. Facilitator of the session began by posing a question to the participants on what they know about Advocacy and Lobbing and why do we do advocacy? Below statements was the response from participants on what they knew about Advocacy and Lobbing.

- The first group said Advocacy is Activity that aims at influence decision or mindset that can lead to social change in a system or policy change for the good over the target group.
- Second group said Advocacy something that make at scale policy level
- Third group responded that: Advocacy is a formal way of pushing an agenda; it should have formal evidence lather than just making noise.
- Other said that Advocacy simply an act of championing your idea that you believe.

At the end of discussion around meaning of Advocacy it was agreed that Advocacy has no single definition; the way participants defined advocacy there are some characteristics of advocacy from each definition, these characteristics includes Activity, process, formal way, at scale, policy, evidence and targeted audience.

Lobbing

- The first group said lobbing target small group of people particular with power to make sure that something gets though.
- Another participant said Lobbing is all about creating alliance for common objective.
- It is an initial stage in advocacy and informal way for small group.
- Lobbing is the act of advocating for identified key members of social group that can influence decision and meet with them and sell your product to some, to convince them to your side.

It was agreed that Lobbing is aggressive way of influencing things, and participants were argued not to use lobbing to champion biofortified crops since it may have different connotation in deferent countries, particularly US. Further noted that some of the donors do not allow use if the project resources for lobbying.

1.3.2 Why do we advocate for Biofortified crops?

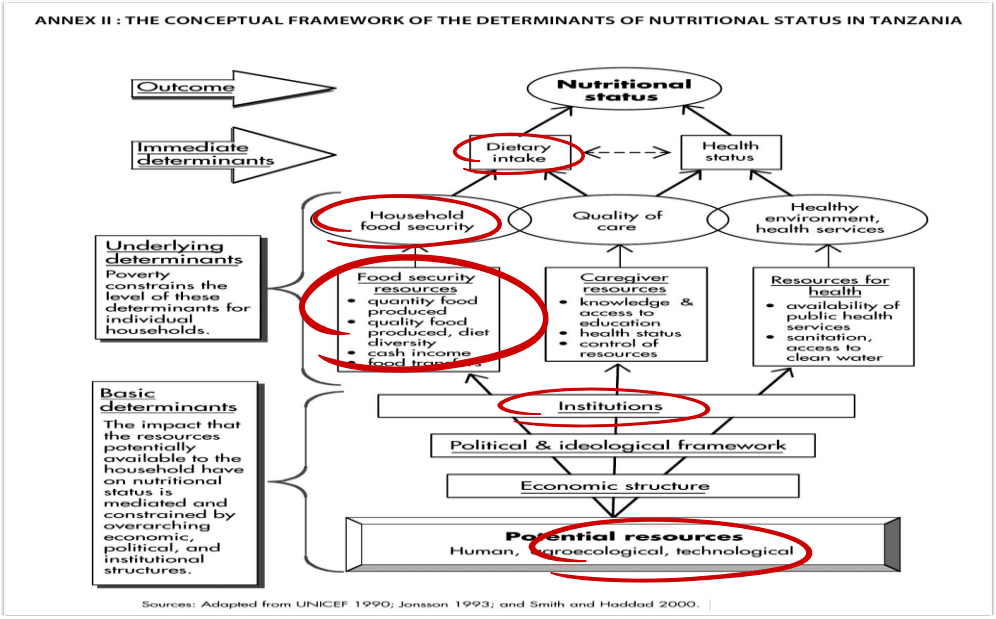
Participants mentioned the following reasons as why they advocate for Biofortified crops.

- Combat vitamin A deficiency.
- It's a complementary mechanism around existing way which is cost effective.
- To make sure that biofortified crops getting more prioritized within government plans.

Generally, it was agreed that Advocacy in all its forms seeks to ensure that: People, particularly those who are most vulnerable in society, can have their voice heard on issues that are important to them, defend and safeguard their rights have their views and wishes genuinely considered when decisions are being made about their lives.

1.3.3 Conceptual Framework of the Determents of Nutrition (UNICEF Diagram)

The session aimed at bringing participants common understanding on the determinants and the multidimensional nature of Nutrition; and the need for streamlining the agenda into the broader nutrition-agriculture agenda. Essentially discussion used the UNICEF diagram to elucidate different determents at different levels on how they influence nutrition out comes. Also, participants were made to appreciate how the work that they are involved with in the SPHI project, bee it seeds breeding, seed systems, processing of the tubers into other food products fits in the chain to improve the nutrition outcomes. Further it was emphasized that for whatever aspect that they are involved with, for it be effective on combating malnutrition it requires collaboration with other sectors and advocacy is critical condiment for that process. In essence, this diagram elucidated the multisectoral and multidimensional nature of nutrition.



1.3.4 Countries Case Studies- Nigeria & Tanzania

To cement this concept of multisectoral collaboration**,** participants got an opportunity to hear experience from two countries (Nigeria and Tanzania). Nigeria shared experience on seed system especially Orange Flesh Sweet Potatoes breading in Nigeria, Mr. Jude shared in a nutshell the entire process from research to have new breed to its release; as well the use of the varieties by farmers. It was clear from his narrative that advocacy was critical piece in achieving the goal of the use of new OFSP variety under the RAC project. This was followed by presentation from Richard Kasuga who shared experience on Scaling Up model of biofortified crops in Tanzania. The presentation touched how BNFB Project managed to spearhead some work around advocacy; and most important how BNFB Project managed to demonstrate how different actors are needed in various levels as far as nutrition conceptual framework is concern. This session was meant for participants to appreciate multi-sectoral and Multi-dimensional nature that nutrition requires to move on an advocacy campaign.

1.3.5 Developing Advocates/Champions for Biofortified agenda

This session aimed at equipping the participants with knowledge of who is a champion, how does someone become champion, qualities of champion and effective way of working with champion towards pushing the Biofortified crops agenda.

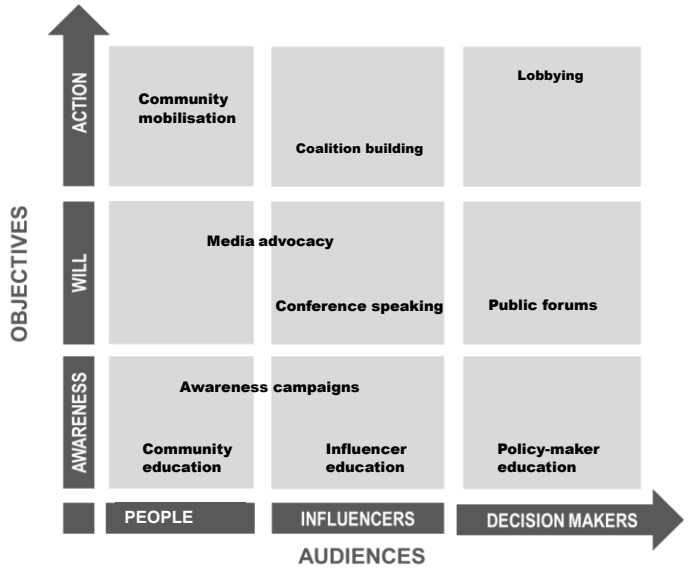
The session covered the theoretical concepts and model for developing advocates/Champions for effective advocacy. These included, but not limited to: The champion Models which is basically derived from diffusion of innovation theory, the behavioural Change Models and the Champion Scale. This was critical for this session, as it provided the scientific basis for using champions as means for effective advocacy. Also, it covered in detail the entire process that a person who is developed as champion should go through, as to be an effective advocate/ Champion. This is measured against the champion scale. This change process is subject of behavioural change too.

It was emphasized that by using champions we are increasing likelihood of achieving the objective of the advocacy campaign. In choosing a champion, it further noted that; Behavior and moral aspect of the individual, respect He/ She commands from the target audience must be taken into consideration and not the knowledge on the subject matter

1.3.6 Advocacy Fundamentals

This session covered key elements that will enable participants to prepare and conduct successful advocacy campaigns. However before going into specific tools that for advocacy, Facilitator introduced the concept of advocacy frame work (fig 2), that will guide the design and implementation of the advocacy campaign. It further highlighted that, objective of advocacy can be Awareness, Will and Action; wile to achieve these you should also define your targeted audiences, which can be People, Influencers and Decision makers. This matrix helps to guide which strategy to use and these can be Community education level, Influence education, Decision maker's education, Awareness campaign, Public speaking forum, Coalition, Community awareness, depending on the expected outcome and the specific audience as shown on the fig. 2 below. Also, participants were introduced to the concept of power mapping in advocacy. This process will enable participants to map out the center of power while doing advocacy, as it is critical to know the center of power, if you want to get action out of the advocacy campaign. Other key areas vital for successful advocacy process that were discussed includes: Environment / Context, Audience, Capacities, and building effective Partnerships

Fig.2 Advocacy strategy: Framework



1.3.7 Advocacy and Communication strategy

This session covered effective communication as one of the key tools for any successful advocacy work. It also aimed at sharing experience and lessons from BNFB project.

Facilitator emphasized the fact that need for the massage you communicate to touch the emotional and it should be rational if you want to get action form the individual who listen it; that means it should touch heart and mind.; which means it must create common ground for understanding and people should believe in you. Thus, it should be evidence based i.e. this would require use of some statistical data and facts.

Participants were provided with tips for developing good massages, these included: Clear and simple language e.g. avoiding the use of jargons in massages, Knowing the audience. Contextualize the massage according the audience you're communicating to e.g. Parliamentarian, how you dress up among others, Evidence base advocacy like case studies, and use of technology and success stories.

The session also captured the critical role of media in advocacy since it helps to convey massage to reach broader audience. Also, it was noted that, relationship with media should be strategic and long term, for it to be effective in advocacy.

Finally, participants were provided with the tips of a good message, which are: Clarify your massage, consistent, get some trust from the audience, communicate benefit, call for action, Keep for the heart and head

1.3.8 Aligning with the regional/country priorities

This session emphasized on the need to link country advocacy efforts on other regional and global initiative, as the case of BNFB project. This project covered Nigeria and Tanzania, but though FARA they were able to influence some regional policies that are key in achieving country led advocacy process in support of moving forward biofortified crops agenda in country and communities at large. This is essentials as country policies and action are also influenced with regional policy documents and strategies.

Annex 1: **Agenda for the Deep Dive Session –**1: **Learning to be an Effective Biofortification Advocate**

Time	Activity	Description	Moderator
8.00-8.30	Registration		CIP
8.30-9.00	Self-Introduction	Names, Affiliation and Experience in Advocacy	Joyce
9.30-9.40	Objectives of the Session and Expected output		Hilda
9.40-10.10	Introduction to advocacy	Definitions and basic concepts	Mikindo
10.10-10.30	Health Break		CIP
10.30-11.15	Group work	Why do need to advocate for biofortified products/OFSP	Hilda
11.15-11.45	Conceptual Framework of the Determents of Nutrition (Unicef Diagram)	The idea is to get a common understanding on the determinants and the multidimensional nature of Nutrition and the need for streamlining the agenda into the broader nutrition-agriculture agenda Example-Case of OFSP Breed in Nigeria-Jude	Mikindo/ Jude

11.45-12.00	Sustainable approach for integration of Biofortified agenda into broader malnutrition reductions efforts ▶ Country level case study-Tanzania	This will be framed basing on the case of BNFB approach in Tanzania Various engagements, national level, MNAPs, global level What it takes at country level	Kasuga
12.00-13.00	Developing Advocates/champions for Biofortified agenda	Presentation on Theory and model for developing advocates: The champion Models, Champion Scale and The Change Model BNFB champions and advocates approach: Multi-sectoral approach	Mikindo
13.00-14.00	Lunch		
14.00-14.20	Group Work	Why is it difficult to realize result in advocacy	Mikindo
14.20-16.00	Advocacy Fundamentals	Environment / Context Process Power Audience Capacities Partnerships	Mikindo
16.00-16.30	Communication & Media Engagement	Effective message development Use of various channels for communication The heart of advocacy Need for evidence base Advocacy materials Where to get the advocacy materials	Joyce
16.30-16.50	Aligning with the regional/country priorities	Pan African picture, country level (Malabo, MNAPs, ASDPs) Examples from Africa What they can influence CS-SUNNN reports	Hilda
16.50-17.15	Forward thinking on next steps…	Any thoughts of planned engagements/	Mikindo

11.5. 2 Creating Orange-Fleshed Sweetpotato Products

9th Annual SPHI TECHNICAL MEETING

Report Submitted by: Vivian Atakos

This workshop was conducted under the direction of consultant chef Arnold Mawala. The aim was to showcase various ways of preparing the orange-fleshed sweetpotato (OFSP). Local recipes incorporating OFSP were also showcased. At least twenty participants took part in this activity. Participants worked in groups of five to prepare each of the following recipes:

- **Orange-fleshed sweetpotato (OFSP) fries**
- **OFSP salad**
- **OFSP mushenye (with ordinary beans)**
- **Twice baked OFSP**
- **Bacon wrapped OFSP**
- **OFSP chapati**

SPHI participants were able to sample each of these products. The most popular was the bacon wrapped OFSP and the salad respectively.

❖ OFSP FRIES

Preparation time 10 min, cooking time 40 min

Yield: 3 servings

Ingredients

- 1kg orange-fleshed sweetpotato (OFSP)
- ½ tsp paprika
- 4 tablespoon salad oil (60 ml)

Method

1. Pre heat oven to 175 degrees Celsius
2. Wash and peel the OFSP
3. Cut into wedges (I medium potato to produce 6 to 8 wedges)
4. Pat dry with absorbent towels
5. Mix with the salad oil and paprika
6. Bake for 30 to 40 minutes.

❖ OFSP SALAD

Preparation time 10 min, cooking time 50 minutes

Yield: 2 side salads

Ingredients

- 2 medium orange-fleshed sweetpotatoes
- 1 small ripe avocado
- 1 red sweet pepper (hoho)
- A pinch of salt

- A pinch of freshly ground black pepper
- Lemon juice (2)
- 2 tablespoons vegetable oil

Method

1. Wash, dice the OFSP
2. Season and bake in a moderately hot oven for 30 -40 minutes or until cooked.
3. Cool the OFSP
4. Wash and dice the sweet pepper
5. Wash peel and dice the avocado
6. In a salad bowl mix all the ingredients and dress with lemon juice, vegetable oil, freshly ground black pepper and a pinch of salt.

❖ OFSP MUSHENYE

Preparation time 10 minutes

Cooking time 2 hours

Yield: 3 portions

Ingredients

- 1 kg OFSP
- 100 grams beans
- Knob of butter
- Salt to taste

Method

1. Soak beans overnight if they are dried
2. Boil beans until tender
3. Wash OFSP, peel, cube and add to the beans
4. Boil the mixture and simmer until OFSP is cooked.
5. Drain excess gravy, set aside and mash mixture to a mashed OFSP consistency.
6. Add a knob of butter and salt to taste to final product.

❖ TWICE BAKED ORANGE FLESHED SWEETPOTATOES

Preparation time 15 min

Cooking time 1 hour

Yield: 12 biting's (2 pcs each)

Ingredients

- 12 medium sized OFSP
- 4 tablespoons salad oil
- 250 grams cream cheese or
- 250 ml natural yoghurt
- ¼ cup brown sugar
- I tsp vanilla essence
- ½ cup chopped walnuts
- 1 tablespoon paprika

Method

1. Pre heat oven to 175 degrees Celsius
2. Wash and dry the OFSP
3. Oil and cover with cooking foil and bake for 30 to 40 minutes.
4. Split the OFSP half lengthwise and scoop the flesh maintaining a firm skin
5. Mash the scooped out OFSP with the rest of the ingredients
6. Fill back the skins
7. Sprinkle with paprika and bake for a further 5 to 10 minutes.

- **BACON WRAPPED ORANGE FLESHED SWEETPOTATO**

Preparation time 15 min

Cooking time 30 min

Yield: 12 bitings

Ingredients

- 3 medium OSFP peeled and cut into desired shapes
- 400 grams bacon
- 4 tablespoons honey
- Cayenne pepper
- 2 tablespoons water

Method

1. Pre heat oven to 175 degrees Celsius
2. Wrap OFSP with bacon and secure with a toothpick
3. Bake for ten minutes and baste with honey water mixture
4. Sprinkle a little bit of cayenne
5. Bake further until bacon is crispy and OFSP is soft

❖ OFSP CHAPATIS

Preparation time 25 minutes

Cooking time 1o minutes

Yield: 12 chapatis

Ingredients

- 1 kg all-purpose flour

- 400 grams pureed OFSP
- Salt to taste
- 10 grams cardamom powder
- 300 ml corn oil
- ½ liter of water

Method

1. Put half the water in mixing bowl
2. Add 3 tablespoons of corn oil
3. Add pureed OFSP and all-purpose flour
4. Salt to taste
5. Cardamom powder
6. Knead all ingredients and let the dough rest for 10 minutes.
7. Rollout on floured board, sparingly oil, cut into strips and roll into balls.
8. Cover with a kitchen cloth and allow resting a further 15 minutes.
9. Roll the balls into round shapes and cook on a hot skillet or tawa sparingly oiling both sides as they cook.

11.5.3 Are you ready for Scaling? Use of the scaling readiness tool for Triple S

9th Annual SPHI TECHNICAL MEETING

Report Submitted by: Rosemary Kihui

Figure 3: Photo Collage of meeting events Credit: F Asfaw

Present

Bramwell Wanjala	Kwame Ogero	Mairead Petersen	Sammy Agili
Ivan Obare	George Aristotle	Tanya Stathers	Mishael Ennuson
Erick Joseph	Jolenta Joseph	Wilfred Mushobozi	Issahaq Suleman
Shira Mukiibi	Jonas Mugabe	Rosemary Kihiu	Reuben Ssali
Richard Annobil	Birhanu Biazin	Tom van Mourik	Akoto Osei
Anne Marie Bell	Michael Friedmann	Mihiretu Cherinet	Mohammed Liman
Naico Abdul	Bayainn Rallostoasiboa	Josephat Mageni	Jean Claude Nshimiyimana
Hugo Campos	Christiane Gebhardt	Enos Darkey	Some Koussou
Margaret McEwan	Frezer Asfaw	Pietro Turilli	Paul Demo

Agenda

25th September 2018, Tuesday

Deep dive session #3 – Are you ready for scaling? Learn about the new "scaling readiness" tool and how it's been used for scaling Triple S"		
Time	**Subject**	**Responsible**
8.30 – 8.45	Introduction: technology readiness; technology use	Margaret
8:30 – 9:30	Pictorial journey of Triple S: Ethiopia, Ghana - milestones	Mihiretu Cherinet, Issahaq Suleman, Rosemary Kihiu
9:30 – 10:00	Quiz and feedback from participants	Frezer
10:00 - 10:30	**Break**	
10:30 – 11:00	Panel discussion on burning questions about Triple S	Panel: Sam, Mihiretu, Issahaq, Sammy Agili
11:00 – 11.30	Design your own Triple S innovation scaling package	Tom van Mourik, Margaret McEwan
12:00– 12.30	Testing your readiness to scale Triple S	Frezer Asfaw
12:30 – 13:00	What have we learnt what would we do differently: Ghana & Ethiopia	Sam Namanda
13:00 – 14:00	**Lunch**	
14:00 – 14:30	Preliminary results on scaling readiness	Frezer Asfaw
14:30-15:30	Feedback from participants on completion of tools How do we improve our scaling readiness (technology and use); Is CIP ready for scaling?	Rosemary Kihiu, Tom van Mourik, Margaret McEwan and invited participant

Introduction and Overview

The session began with an introduction by Margaret McEwan, and a brief discussion on the outline of the agenda. McEwan refreshed participant's knowledge on what scaling readiness is by displaying a graph on the use of a technology and the level of readiness. The two should ideally progress towards the top right- hand corner of the graph.

Photo journey of the Triple S journey in Ethiopia – presented by Mihiretu Cherinet

Highlights

- OFSP household consumption increased as the farmers had access to roots for longer through storage.
- Because of Triple S, availability of planting material has improved, households now have enough roots to eat and sell
- Triple S project started by developing and refining the innovation. Next step was to increase no. of farmers using the technology
- Started with 4 agro-ecologies – the scaling projects goal is to reach 25,000 farmers, through partners such as the Bureau of Agriculture, NGOs and education training institutions. We have conducted

training for partners, held workshops and different consultation forums to create awareness about the technology.
- We have also carried out on-field trainings and technical trainings e.g. on how to plant out.
- The triple S started from validation and testing, use and now scaling.

Question and Answer Session (discussion)

Qn: Anna-Marie - Irish Aid: As you are scaling up, how about private sector? Market for demand, not all roots are for consumption.
Ans: Our farmers in Hawassa now have a lot of planting material, next is looking for a ready market. We linked the farmers to colleagues from other projects, they are supplying to supermarkets in neighbouring towns. This is with the aim of collaborating with different projects working on value chains for sweetpotato.

Qn: Jean Claude Rwanda - curious about the length of the dry season, which appropriate length of dry season can fit with Triple S?
Ans: we tried it in different agro-ecologies: scaling currently going on in bimodal areas, in unimodal areas scaling has not yet started - targeted to start in 2019. We have different recommendations for different agro-ecological areas.

Qn: What is the capacity of the basin? Largest volume tested is 40-80 roots, small holder farmers, not more 2-3 karis.
Mozambique: Volume of the container? Tweaking, adjusting containers to meet need.

Qn: Jonas Mugabe FARA- A bit confused, are we talking about adoption or innovation? You are talking about technology? Are you still on the pilot? - We all know that pilots never fail but never fly? At FARA we know only 3 types of innovation: technological, institutional, and infrastructural.
Ans: We are first talking about exposure of farmers to the technology (not yet adoption). Our complementary components deal with institutional and infrastructural criteria for scaling (so determine scaling readiness)

Qn: Michael Friedman RTB - if you target DVMS who are large scale producers, can they get enough vines to supply farmers, where do you get clean roots?

Qn: Wilfred Arusha: our concern is distribution of quality vines, I like the idea of using tubers, and how are you putting in a quality control system? Are all tubers you are initiating free from viruses?
Ans: Triple S does not ensure clean planting material if you are using infected roots. So, we source our roots from certified multipliers. It is important to ensure starter materials are clean and certified as clean from the authorities and the roots used for storage and sprouting come from apparently healthy plants.

Qn: Jimmy Namo NARO Uganda: this is a dry season activity, in my place millet is stolen from granaries, how sure are you that the material is safe and will not be stolen?

Qn: How sustainable is this technology?
Ans: Sam Namanda: Under scaling we have built the technical capacity of house hold scaling champions in every village to respond to any emerging questions arising from radio programs (airing on local radio stations) and to monitor implementation in respective villages.
In Uganda, Nsanje and other areas in the region, this method built on the farmers' own traditional practices which makes it more acceptable and builds ownership. We just improved on what they were practicing making it more efficient

Photo journey of the Triple S journey in Ghana – presented by Issahaq Suleman

Highlights
- Storage has been a serious problem in Ghana. Other projects have tackled this problem in Northern Ghana – which experiences over 4 months of dry period. Some previous projects have addressed post-harvest bottlenecks

- The Step pit and sand box were identified as viable storage options. The step pit is constructed outside the household, with a fence around it. The sand box is set up inside a room.
- As this technology was disseminated to farmers, it was initially meant to address food security concerns, then we began to think about planting material.
- Roots were stored for 4.5 months. The sprouted roots were planted in gardens, watered and vines ready for the planting season.
- The technology had been validated in the country. Ghana had good scores. We then scouted and looked for partners. One of the qualifications was the partner had to have activities going on around cultivating sweetpotato. MEDA and USAID – RING qualified.
- Had an initial meeting with partners, agreed on where we were and where we were going. Have quarterly meetings to assess progress and challenges as we take the technology to scale.
- MEDA identified a gap in upper west region where they did not have DVMs, CIP trained 25 women who had access to water to become DVMs. However, this number is still not sufficient to meet the demand for vines and some still have had to be procured from Northern Ghana for the last planting period.

Qn: Government engagement? Is this happening? Government is important to scaling up especially at district level?
Ans: We were working with MOFA officers for sustainability. But our two main partners are RING and MEDA who already have existing projects.

Qn: Hugo Campo CIP: Two main learning points, what mistakes should we avoid?
Ans. This will be addressed in a session later in the day.

Qn: Benjamin Mozambique: When scaling, how to we know production volume that we need?

Qn: George, Farmer: As a large-scale farmer, what size will work for us? Will a small root produce vines?
Ans.

- A single sprouted root produces about 40 cuttings after planting and irrigating for about 6 weeks, if you continue to irrigate after that, you can obtain another 80-100 cuttings after about 4 weeks
- 13k for each acre, making it 100 sprouted roots. Takes about a month and a half to generate vines for the first cutting
- You need 33,333 cuttings to plant one hectare, so dividing 33,333 by 40 cuttings per root (for the first cutting) means you need 833 roots.
- When you have more time and can stagger the planting using the second cutting, you divide 33,333 by 140 cuttings per root 250 roots for a hectare, consider the time needed to plant and irrigate sprouted roots for 1.5 months
- 80 - 92% of the roots sprout depending on the variety.
- Triple S technology works to delay biological process, roots will not dry and sprout quickly. Core technology, the rest of the technology is complementary

This technology is not validated for larger farmers. American farmers use roots as planting materials, so it could also work for larger farmers in Africa. Depends on planting methods: on ridges or mounds. Ridges use more planting material.

Qn: Dodzie Enos Darkie, Ghana: Does storing the root change size, taste? Especially looking at our European export market.
Ans. In BF, farmers were able to store 2 tons. Cold storage is yet to be widely used.

Qn: CIP Rwanda: Is the labour investment too much? Digging the pit etc.

Qn: Shira ICIPE: Focus is on small holder farmers, what about commercial and large farmers? Think about private sectors, to drive demand.

Qn: Jonas Mugabe, FARA: what is the exit strategy for sustainability?

Ans: Triple S wanted to procure vines and distribute to farmers free, but this did not make sense because after project exit, then what? Women had VLSA savings groups and they were encouraged to buy vines with their funding so that they no longer depend on free things.
Ministry of Food and Agriculture helps us in that after project end, they will include this in their farming training approaches.

Qn: Birhanu CIP Ethiopia: is it more applicable for women or male led households? What is the technological challenge?
Ans: Ghana is looking at household food security, farmers want to store for both food and planting material. Women champion storage for food. The two partners in Ghana RING and MEDA work exclusively with women (this has had some negative effect from men.)

Panel Discussion on burning questions on Triple S

Panelists

Sam Namanda
Issahaq Suleman
Sammy Agili
Mihiretu Cherinet

1. Is there evidence of promoting scaling up of Triple S? There seems to be no information to key player's government agencies/private players?

Answer: S Namanda

- Evidence is available. The technology was first tested in dry areas of Uganda. It was tested for 4 months and later increased to 7 months.
- Adopted in Uganda through HARVEST Plus project. Evidence generated by exposing technology to farmers. At end of system the farmers/researchers meet to evaluate success/Challenges.
- Publications/pamphlets are available on Triple S
- Extension workers agreed to implement Triple S in Oyam District
- FAO/Mercy Corps extension workers working in Karamoja have acquired training on the technology
- Average number of cuttings produced by Triple S Technology varies with variety.
- Traditional producers linked with DVMs

Sammy Agili: Kenyan experience. Technology recommended for adoption in one of stakeholders meeting due to prolonged droughts in Homabay/Migori. Sustainability validated, extension officers involved in ToT and with stakeholders.

- Ministry of agriculture incorporated Triple S in work plan and offer advisory services to farmers
- Cost benefit done in some countries
- Triple S delays germination. Science based evidence available in literature and publication.

2. How many roots are needed per area of land, what type of farmers should be targeted?
   - You need 33,333 cuttings to plant one hectare, so dividing 33,333 by 40 cuttings per root (for the first cutting) means you need 833 roots.
   - When you have more time and stagger the planting using the second cutting, you divide 33,333 by 140 cuttings per root 250 roots for a hectare, consider the time needed to plant and irrigate sprouted roots for 1.5 months

- Technology has potential for large farmers but not validated in Africa. America uses roots for vine production and we could learn a lot on how the system works.

3. What is recommendation on recycling Triple S planting material
   - Starting material should be clean from virus/weevils. There is no evidence on root recycling. Farmers are advised to select and peg healthy plants before harvesting and then select those plants when harvesting and use these roots for Triple S.
   - How long can you recycle planting material from roots before you should replace? When the starter material is clean virus tested TC material, up to five cycles have been recorded in Uganda; in low virus pressure areas. However, varietal response to viruses is a critical factor and depends on virus pressure.

4. Criteria for site selection for Triple S. Size, free from weevils/nematodes
   - Not near previous fields. Isolation distance and previous crop.
   - Safe from distractions from animals
   - Near adequate source of water
   - Rotation with other crops is necessary (pulses, cereals, vegetables).
   - Prolonged period of 5-7 months dry periods
   - Positive/negative selection for mother roots

5. Gender roles on Triple S. Impact of Triple S on women roles. Empowering/ disempowering of Triple S on women
   - Sweetpotato mostly women crop because of its role as food security.
   - Men assist in digging pits for SP storage
   - Ethiopia. During validation engage equal participation of men/women. This leads to successful adoption of technology. All family members are educated on the importance of root storage for seed as this ensures availability of planting vines at the onset of the rains. Men sell roots for money while women prefer roots for consumption.
   - Triple S gave women control in ensuring availability of planting material. Watering /weeding was minimized by this technology. In addition, women are assured of ready supply of planting material.

Design your own Triple S innovation scaling package

Participants went into groups, grouping together similar countries, to discuss the potential of their innovations

Rwanda, Kenya

Technology components:
New location - sand, length of dry season
New types of farmers - size of land, no of basins
Market linkages for sweetpotato
Infrastructure - potential of community storage of roots as opposed to per household.
Training and dissemination farmers - through trainings,

General discussion as there were 3 countries: need to validate these for each country

Burkina Faso and Ghana

It will be good to design specific containers for root entrepreneurs, not the simple ones for Triple S
Good to do processing and utilization trainings
Have a way to guarantee quality of vines produced through triple S systems
Target private companies to buy roots
Develop messaging for Triple S with women and small holder farmers as targets.

Develop innovations to create demand for SP - websites, social media, have celebrities promote root consumption

Malawi, Mozambique, Tanzania
We started by looking at length of dry periods Mozambique - 7 months, Malawi 7 months Tanzania 5 months
Complementary innovations
If we are not careful, the roots may be converted to food instead of seed. Need to have a mindset innovation - encourage beneficiaries that in as much as they need food, the also need seed at the start of the rainy season
Education innovation - to disseminate, use videos alongside flipcharts, harnessing solar power
Improved methodologies for storage other than pits - granaries, sacks
Need for advocacy when scaling up to show that the technology is working and there is need to invest in it.

Testing your readiness to scale Triple S

Participants took about 20 minutes to answer online questions that sought to assess their readiness to scale.

What have we learnt; what would we do differently? Ghana & Ethiopia

Ghana

- Partners: Very happy with the possibilities of the partners. RING was ready to reach 75,000k
- Where the technology was validated, good progress was made. Where not validated, progress was slow.
- We had difference in project focus with some partners. MEDA was promoting soya bean but also wanted to promote OFSP. Later they realized that OFSP was overshadowing their soya bean activities so wanted to reduce on the focus on OFSP.
- The two partners did not need contractual funding from us. Both a good and a bad thing, but this also meant that we did not have much say in their project implementation.
- Some partners projects were at their tail end, it is important to establish this at the beginning to be in line with our project timelines. We reached out to the government ministry of agriculture for sustainability and plan to continue the scaling with local NGOs and the department of agriculture.
- Gender Issues: Partners focused on women empowerment, but this was creating some constraints. There is need to purpose to include the men.

Tanya Stathers - some of the partners take over may not have the necessary skills yet. As researchers, we develop a technology and at some point, we have to let them go.
- We need to strengthen our collaboration to the third party so that we can continuously build the capacity of the main partner.

Qn: Birhanu CIP Ethiopia: Have you tried to trigger farmer to farmer training?
We are working only with OFSP, but this can also be used for WFSP, this approach can be used to scaling out other crops.
- We strengthen the capacity of field officers through step-down trainings
- We develop radio messages and air them.
- We use the talking book from MEDA

We are in the stage where we are developing the tools that partners can use to really go to scale
Staff turnover at ministry of agriculture

Margaret McEwan - our challenge is working in the project funding. What will be the trigger to take the technology to next level i.e. self-scaling?

Ethiopia

- Validating the technology: Creating ownership at farmer level is very important. These farmers are your testimony and will champion the technology when you go for scaling - farmers believe other farmers.
- Core and complementary components keep changing when scaling. We thought that video was a complementary component but 5 months later, it became a bottleneck in some areas. So, it appeared that it was a core component.
- Readiness level of each technology keeps changing and appears affected by gender. We did not think it was critical to engage the 'women's army'. We initially thought we needed to train only agriculture workers, then we also realized that we needed to engage nutrition workers as they have closer interaction with women.
- Your partners affect your approach. The Bureau of agriculture using existing capacity building and training systems to cascade our technology and trainings.

- With both partners, we are using different communication strategies. For the project we use demo plots and trainings. For Bureau of Agriculture we use video and training.

- Some of the components we thought were important or not important we removed or added. We did not initially think it was important to give nutrition and marketing support but without these, OFSP adoption and Triple S would not get traction.
- In the areas we thought nutrition was important we found it was not the case because they were already producing WFSP.
- 50% of targeted districts do not grow sweetpotato right now so do not have roots/seed to conserve so we must think of what to do next year (how to get needed roots to sprout from?).

Qn: How are we taking advantage of farmer to farmer training?
Ans: technology is self-scaling at some point. Encouraged by household scaling champions, need to respond to emerging questions when radio messages are aired

Preliminary results

Murat Sartas sent through preliminary results on his analysis of the data filled in by participants in the tool.

Feedback from participants on completion of tools

Was it user friendly?

- It is convenient because it is interactive, need to allow a bit more back and forward between the questions. (next /back)
- There are some questions with several competing choices making it difficult to select one. Consider reducing the choices.
- Some questions asked of other options of involvement, what this captured in the summary report
- I expected that once I submit I would get an assessment of my readiness level
- Questions not clear enough, should be at country level as opposed to individual level. (Ans: the more who take the test, the better able to assess the countries readiness)

How do we improve our scaling readiness (technology and use); Is CIP ready for scaling?
Do you see any spill over into other areas of your work?
Michael Friedmann - scaling and associated tools already used for 2 other projects.
Adoption - there will be early adopters and lagers who need an aggressive marketing campaign to get traction.

Enos: Triple S is a product, do farmers see this as a superior product? If yes, they will promote it to other farmers especially if the results are visible

Mihiretu: Whenever we engage new countries, it is important to explain the core technology and what do you need to take this to beneficiary farmers.

Sam: The technology should address the different nodes of the chain e.g. marketing, production, dissemination (farmer)
Some of the ideas in the room would have contributed positively to the baseline.

Tom: This technology may be adapted for more commercial use, it was initially developed as a technology for subsistence farmers. What would be the setting, volume and economic implications if we want to take this technology to a commercial level?

Jimmy Lamo: During presentation I was comparing with the rice experience. Irrigated rice had poor uptake. We targeted small farmers, trained them to produce seed and they made good income. Then came commercial farmers overtaking subsistence farmers as seed producers.
We need to find a niche for the small-holder farmers for seed production so that they can exist.

Hugo: Unlock the power of the core innovation notwithstanding the total innovation.

11.5.4 Developing an Effective Consumer Panel for Evaluating Root Taste and Quality Traits

9th Annual SPHI TECHNICAL MEETING

Report Submitted by: Nathan Ronoh

Participants

- Dominic
- Craig Yencho
- Maria Andrade
- Tawanda Muzhingi
- Robert Mwanga
- Kirimi Sindi
- Srini Rajendran
- Nancy
- Eric Dery
- Stanley Mwangi
- Prof. Ibok Oduro
- Lisa LaFountain

For CIP materials to meet the expectations for consumers and farmers. There are certain traits that are key. One may want it sweet or may want it deep orange in color.

Purpose of the workshop

To appreciate sensory as a science. To appreciate the importance of sales and science.

Eric went through the training and is part of the team that will take the team through the theoretical part of the session.

Lisa LaFountain will oversee the booth sessions. There is a consent form for them to agree on the use of data gathered from the booth. The sensory booths are designed to give environment to taste food product away from destruction.

Dishes include to be tasted include;

Boiled sweetpotato, traditional dish made from sweetpotato. It is called Mshenye and a salad also.

Eric Dery

Sensory is something we all experience. Trying to use your various sense orders to pass judgement.

Visuals- color, shape and how it appears. Some terminologies in sensory include Odor, aroma, taste, flavor and stringency.

Not everybody is a good sensory material. Before we ask someone, we screen the person. The candidate must pass standardized process to qualify to provide meaningful information. People do not know which organ to use to evaluate certain attributes. Before you recruit the panel, verification must be done. For people limited in their sense organs, they need to be eliminated at the beginning stage.

The process can take either of the two ways; **Consumer and trained panel**. The first gives general comments. The latter (panel) is trained and will be used as an instrument. You must get the best people who are sound. The consumer panel does not give much insight. We need to know exactly what good shape means when the consumer says it. The panel is well equipped with sound vocabulary. They will break traits into measurable qualities.

Dominique also added that it is important to note that panelists do not take positions on whether they like or not. They give qualities and statistical analysis of sweet, etc. It is a biophysical analysis. It has nothing to do with preference. Acceptance preference and panel evaluation are two different things.

Discussion

Question: Is there any standard to consider the timeline the farmers should take the new variety to taste it? They always compare it with the old one and is the new one given time? Sometimes they may not like it at first but like it later. What about the frequency?

Comments:

Dominique: We use more than 150 people to taste in the acceptance evaluation. It's brings all the users together and they have different preferences. The trained panel is cheaper. We have interaction between bitterness and sugar. We need to qualify that. The problem is mainly bitterness. The panel adds value to all this required information.

Craig Yencho: We have objective methodologies to quantify individual components of sugar. We can quantify acid etc.

Tawanda Muzhingi: There are two separate fields (acceptance vs panel). Acceptance is general.

The panels are used for objective measurement. If people like yellow color, you can use color meter and you can differentiate the colors. The panel can be presented with the food and visually score the product. The panel is recruited 8-20 people. They are tools. The scoring is standardized with the panel. They have been trained and calibrated to taste food attributes and then score them objectively. We use statistical tools to quantify different traits. What is sweet people will say is nice, but the role of panels is to come out with clear definitions for these traits.

Dominique: Lesley* has a big lab for analysis. They have 12 people in a panel. If the new product is rejected by the panel, it will not be released. The product must go through the trained panel.

Craig Yencho: The role of the sensory panel is not to judge but to objectively quantify the attributes of the product.

Kirimi: Do we use this part of science to do the work?

Maria Andrade: A while ago, we sent two jars to Tawanda and Eric. The report came back with 6 pages. This workshop motivates the real science in the private sector.

Robert Mwanga: Let's say we choose a variety from three. We will ask what in the variety made us release it. It is not enough to get what the consumer says. We need more. For example, the flavor, aroma, odor. All this add up if the sensory panel gave it. The sensory panel will be set up so that they help the breeders to see which of those characteristics are helping to contribute to the preferences.

Dominique: To help the breeder, we need tools. We need high proof tools based on certain traits.

We need to assist the breeders primarily. But the panels are not restricted to the breeders. Lesley is using it. The same tool can be used by private sector. They are generally embedded in the product development

Maria Andrade: There was a big Cassava disease in Mozambique. IITA bred a Cassava but it took three years for the farmers to give up and return to their original Cassava because of such attributes. This will not only assist the breeders but also the market. You may have resistant products, but nobody wants to eat them.

Srini Rajendran: Linking the sensory panel with the market and choice experiment and economics is important.

Dominique: Household consumption is also market. When we do acceptance, we ask a lot not only the taste. Panel is key to reach these product profile for Chips market etc. **There is no nutrition if there is no consumption**. We need to reach all levels from the household to the industry.

Sindi Kirimi: Market is not going to the shop and selling it. Every next user is a market. The household is also a market. A person who boils is a market.

Dominique: In another context In Uganda, people say that transport is a big problem. You need to identify the problem to respond to the market. If market is far you need to have good storage.

Tawanda Muzhingi: this is one of the reasons why we have such discussions. They never took place. People have different understanding of the sensory signs. This is a platform to bring the diversity of ideas and understanding. The discussions will continue. Lisa will take us through the next step.

NC STATE UNIVERSITY- Lisa Lafountain

There are different types of sensory signs. The judgment can be discriminative or analytical. Analytical-Descriptive panel vs difference tasting. Difference test depends on the size of the product, amount of sample. Selection of tests depends on specific problem you want to solve.

A and B

They are presented with both samples at intervals. They will then be presented with a third one. The product will be in the same format. They will then be required to match the third one to either A or B.

Hedonic scale (9 point hedonic)

1 dislike extremely and 9 like extremely. Increasing the number of the scale gives better data unlike the 5-point scale.

Kirimi: A 9-point scale is good for a panel which can read. If you are going to the farmers, 9-point scale is impossible. In demo plots, we do some testing with the farmers and using a 9-point scale. People however are critical if you do not use a 9-point scale. However, Lisa points out that so long as you justify, there is no issue. Also, the sensory panel sometimes looks at the purchase intent. A practical session to be conducted later in the afternoon.

Tawanda Muzhingi: Temperature plays a key role in judgement of food. This discipline is critical. When we eat food, we don't do it objectively. For the panel we allow you to take time with it. It is key to train the panels in the process of evaluating the food product.

12 is a common sample. Some people do not detect bitterness or sweetness. You must be trained to describe the taste. You need to eliminate people. There are guidelines to select the panel. People who smoke are eliminated.

The sensory data can be correlated to the instrumental data.

Role That Sensory Tools Has Played to Shape the Program

Craig Yencho

10 years ago, major companies became interested in sweetpotato. They wanted to make French fries from sweetpotato. This re-changed the breeding program in a year. We started doing sensory evaluations. We fried hundreds of clones and evaluated them. They wanted the reducing sugars to be low but fructose high.

Getting the crunch in sweetpotato is hard. The processor must add butter to give the crunch. They wanted to have the crunch without the butter. We have a standardized panel on how we describe the French fries. It has changed our breeding program.

Chris: They work with private institutions and even work with private companies. It's a waste of resources if the product is not adopted. If we can adopt the process the private sector is using, we can avoid that. This tool will unlock the monetary value key to success of the breeding programs.

Discussion

Srini: How do you decide which product to study? For example, why French fries?

Do you pass the information to the breeders? Is there any project where this has been completed and is there any impact assessment?

Dominique: we will be measuring this later. We need to develop the variety and evaluate the impact.

People complain that if you boil the SP too much it becomes too soft. Tawanda suggests we steam it.

Stanley Mwangi: dietary behaviors vary from one country to another. OFSP was for an audience that has vitamin A deficiency. It is good to have a detailed dietary behavior analysis. Do they boil, or do they fry?

Initially the OFSP introduced was low dry matter.

Maria Andrade: we need to deal with different issues. It was the dry matter in Uganda and now storage material in Mozambique.

Srini Rajendran: OFSP has advantage over other potatoes. What strategies do we have to promote OFSP? What is the cost to promote OFSP compared to other nutritional crops?

Maria Andrade: In Mozambique they know it is good for their children. I HAVE been promoting OFSP in Mozambique for 20 years. The strategies I use I never change. I use the traditional means.

Tawanda Muzhingi: we are doing public funding and there was little interest from the private sector. In US, there are mandatory laws when it comes to the nutritional factor.

Dominique: Is OFSP adopted in your community. Why?

Adoption takes time. Some cultures are proud of their cultures and their foods. If we measure adoption in 5 years, some companies would be discouraged.

In Ethiopia there are problems in adoption because of the dry matter content. We teach them to change the cooking methods of OFSP. The yield of white flesh is higher than orange fleshed. Also, in the droughts resistance of OFSP. They harvest low vines for animal feeds.

Maria Andrade: When it comes to the missionary state of the crop, most people who do the work do not believe in it. They should approach a missionary strategy. I still go back despite the challenges.

Stanley Mwangi: OFSP has had slow uptake attributed to the fact the dietary behavior is that sweetpotato is a snack. The high dry matter issue comes in.

It is thought to be highly perishable. Treatment of OFSP has a niche product by the majority poor. Also, the low amount of seed to match the supply to the market. They haven't matched the yield of the traditional SP varieties.

Prof. Ibok: In Ghana, the people driving it are not missionaries of the product. If you do not eat, then you won't know. The taste has been a problem in Ghana for a long time. The food in Ghana is not sweet. If you want to change the diet, then the young people are the best target. Women are now the target too. We have zones in Ghana. Some do not eat SP. We have Yam, cassava etc. and the in roots should not target everyone in the region. Storage is another issue. The weather condition is unfavorable. They want to try it but keeping it becomes the problem. The whole issues of production and demand arise from here.

Domonique: Did you test storage?

In Mozambique Maria points out that this is done in the kitchen. However, this needs to be done in large scale. For Southern Africa, dual purpose sweetpotato fits for Zambia, SA, Malawi; Often OFSP is compared with the white. In the market, they do not wash the Sweetpotato.

Craig Yencho: We store up to 14 months. We have over a billion pounds. We harvest one time. The opportunities for storage are there through technology.

Robert Mwanga: Varieties are higher in Rwanda than in Uganda. Political push in Rwanda gives it an advantage. Kabode gave higher yields than the traditional varieties.

Project with farm radio international in local languages where people were sensitized about OFSP. Northern Uganda has higher adoptions than Central Uganda where you would expect it to be higher. Burundi is slightly behind. World vision is back, and it is picking up.

Gerald Kyalo: NASPOT 8 has high dry matter, starchy and aromatic sweet. NASPOT 13 is more aromatic and slightly more orange than 8. Kabode (NASPOT 10) is high yielding. It's softer in Uganda.

Most of what is grown are improved varieties.

Key words

- Storage.
- Nutritional Awareness
- Dry Matter
- Mouth fill
- Texture
- Storage
- Yield.

Practical Session on Sampling Sweetpotatoes

The afternoon session involved the practical bit of the workshop. The participants assumed the role of panelists and sampled three different samples. They gave feedback on what they felt about the sweetpotatoes, but not giving judgement on whether they liked it or not. They gave feedback with regards to appearance, flavor, taste and texture.

The purpose of this discussion was to expose everyone to science of sensory evaluation which will lead to the goal of more adoption.

Participants List

SPHI MEETING 23RD-28TH SEPTEMBER, 2018
NAIROBI, KENYA

No.	Title	First Name	Last Name	Gender	Title	Institution	Address	Country	Telephone number	Mobile number	Email	skype
1	Mr	Abdul	Naico	M	Project Manager	International Potato Center	AV das FPLM 2698, Recinto do IIAM, Maputo, Mocambique	Mozambique		+ 258 829849584	A.Naico@cgiar.org; naico@yahoo.com.fr	sumanaico
2	MS	Ada Elyse	Irirashenono	F	Co-founder	CARL group	c/o International Potato Center, Rwanda Kacyiru Road St. 563, Plot No. 1490- Gasabo	Rwanda		+250 785802254	iradelisia@yahoo.com	
3	DR	Akoto	Osei	F	Regional Director, Nutrition for HKI in Africa	Hellen Keller International		Senegal	+221 338691063		aosei@hki.org	
4	DR	Alan	Tollervey	M	Team leader	DFID	DFID, London			+ 44 207 023 1661	a-tollervey@dfid.gov.uk	
5	MS	Alessandra	Furtado	F	Head of project management	International Potato Center	c/o International Potato Center Box 25171	Kenya		254 713676146	A.Furtado@cgiar.org	
6	MS	Anastasia	Mbatia	F	Technical Manager- Agriculture	Farm Africa	Farm Africa Kenya Country Office	Kenya		+254 722875189	anastasiam@farmafrica.org	
7	MS	Angela	Mwanri	F	Entreprenuer	Crop Bioscience Solutions (CBS)		Tanzania		255686084646.00	mwanri31@gmail.com	
8	DR	Anna-Marie	Ball	F	Director External Affairs, Chief of Staff	HarvestPlus	1201 I St NW, Washington DC	USA		120 26274125	A.Ball@cgiar.org	dramball
9	MR	Antonio	Magnaghi	M	CEO & Application director	Euro Ingredients		Kenya	+254 722700665	+254 721 782767	antonio@euroingredients.net	gelatoking
10	MR	Asheber	Kifle	M	Research Associate	International Potato Centre (CIP)	ILRI P O Box 5689, Addis Ababa, Ethiopia	Ethiopia		251 938049914	asheber.kifle@cgiar.org	
11	MR	Augustine	Kungu OLAL	M	Assistant Director	Business, Office of the Prime Minister,	Prime Ministers Office 2ND RAILWAY STREET	Tanzania		255 718760679	aollal@yahoo.com	
12	MR	Benjamin	Rakotoarisoa	M	Project manager	International Potato Centre (CIP)	Avenida 21 de Abril, Vila de Massinga, Inhambane province	Mozambique	+258 862462416	+258 825464912	b.rakotoarisoa@cgiar.org	benjaarisoa
13	DR	Benjamin	Kivuva	M	Head of Root & Tuber Program	Kenya Agricultural and Livestock Research Organization (KALRO)	KALRO headquarters, P.O.Box , 57811, 00200, Nairobi Kenya.	kenya		+254 720 824484	benmusem@yahoo.com	benjamin.kivuva4
14	MS	Bernice	Wairimu	F	Program Specialist	International Potato Center	c/o International Potato Center Box 25171	Kenya		+254 723697795	B.Wairimu@cgiar.org	
15	MR	Bethwel	Lagat	M	Operations Manager	Organi	78 Kadongo Kenya	Kenya	254-726433702		B.Lagat@cgiar.org	
16	DR	Birhanu	Biazin	M	Value Chain Specialist	International Potato Centre (CIP)	ILRI P O Box 5689, Addis Ababa, Ethiopia	Ethiopia		+251 916829891	B.Temesgen@cgiar.org	
17	MR	Bramwel	Wanjala	M	Research Associate/ PHD Student	International Potato Centre (CIP)	P.O Box 25171 Nairobi	Kenya	254 722408256	0722408246	B.wanjala@cgiar.org	bramwelwanjalas
18	MS	Caroline	Komujuni	F	OFSP processor		C/O CIP Plot 47, Ntinda II Road, Naguru	Uganda		+256706 707332	eltonjean1@gmail.com	
19	MR	Chef Arnold	Mawala	M	chef			kenya		+254 721 680 777	masombe45@yahoo.com	
20	MS	Christiane	Gebhardt	F		Max-Planck Institute of Plant Breeding Research	mpifor plant breeding research carl von linne weg 10 50829 cologne	Germany	+ 49 (0) 2253 545413		gebhardt@mpipz.mpg.de	

21	DR	Craig	Yencho	M	Professor	NC State University	Dr. G. Craig Yencho Department of Horticultural Science 2721 Founders Drive	USA	+ 1 919 513 7417	+1 919 218 0618	craig_yencho@ncsu.edu	craigyencho
22	MR	Dan	Haswell	M	Program Manager	GAIN		Kenya			dhaswell@gainhealth.org	
23	MR	Daniel	Mbogo	M	Texhnology Transfer Officer	International Potato Center	International Potato Center (CIP) ILRI Campus, Old Naivasha Road P.O. Box 25171 – 00603, NAIROBI, KENYA	Kenya		254 724875428	D.mbogo@cgiar.org	mbogo.daniel
24	MR	Dawit	Sahlu	M	Project manager	People in Need		Ethiopia	251 462123135	251 462 124024	dawit.sahlu@peopleinneed.cz	Dawit Sahlu
25	MR	Derrick	Malavi	M	research associate	International Potato Center	c/o International Potato Center Box 25171 Nairobi, Kenya 00603	Kenya		0712654008	M.Derick@cgiar.org	
26	MR	Donald	Mavindidze	M	Regionla Director, Africa	Harvest Plus	P.O. Box 823 -00621 Nairobi Kenya	Kenya		254 702462989	d.mavindidze@cgiar.org	
27	MS	Dorcas	Mwakoi	F	KCDMS component lead on Policy.	RTI International		Kenya		254 22890594	dmwakoi@kcdmsd.rti.org	
28	DR	Dufour	Dominique	M		CIRAD	73 rue jean François Breton 34398 Montpellier Cedex	France		33 769893356	dominique.dufour@cirad.fr	Dominique.dufour
29	DR	Edward	Carey	M	Ghana Country Manager /Regional SP Breeder	International Potato Center	CIP c/o CSIR-CRI P.O. Box 3785	Ghana	+233 546938599	+233 546938599	E.Carey@cgiar.org	ted.carey
30	MR	Elia	Kapalasa	M	Market chain development officer	International Potato Center	International Potato Center P.0. Box 31600	Malawi		+265-99 9788130	e.kapalasa@cgiar.org	eliya.kapalasa
31		Elke	Vandamme	F	Food Systems Agronomist	International Potato Center	International Potato Center, Rwanda Kacyiru Road St. 563, Plot No. 1490- Gasabo	Rwanda	250 780301968		e.vandamme@gmail.com	
32	MR	Enos Dodzie	Darkey	M	Director of Operation	E.Darkey and Associates Ltd	P.O.Box 7155 Accra-North	Ghana	233 547893659	233206357242.00	miniclip024@yahoo.com	
33	MR	Eric	Dery	M	Research Officer	International Potato Center	CIP-GHANA, CSIR-CRI, BOX 3875, FUMESUA, KUMASI, GHANA	Ghana		233 24072078	e.dery@cgiar.org	ek.dery1
34	MR	Erick	Joseph	M	production manager	Tanzania Horticultural Association	P.O.Box 16520 Arusha	Tanzania		255 689066811	erick.joseph@taha.or.tz	
35	MS	Everlyn	Matiri	F	Regional Technical Advisor - Nutrition	Catholic Relief Services	P.O. Box 49675-00100, Karuna Close Rd., Westlands Nairobi	Kenya		+254 780 221170	everlyn.matiri@crs.org	
36	MS	Faith	Njunge	F	Communication Specialist	International Potato Centre (CIP)	c/o International Potato Center Box 25171	Kenya		+254 726 545794	f.njunge@cgiar.org	
37	DR	Francis	Amagloh	M	Senior Lecturer & Head of Dept	University for Development Studies	Department of Food Science and Technology,	Ghana		+233 (0) 507113355 / (0) 262577434	fkamagloh@uds.edu.gh	Fkamagloh
38	DR	Frederick	Grant	M	Project manager	International Potato Centre (CIP)	IITA REGIONAL HUB, PLOT #25, MWENGE-COCA COLA RD, MIKOCHENI, DAR-ES-	Tanzania		+255 759184824	F.Grant@cgiar.org	fkgrant
39	MR	Frezer	Asfaw	M	Data processing assistant	international Potato Center	P.o.Box 8914 Addis Ababa	Ethiopia		+251 921 402424	F.Asfaw@cgiar.org	frezer.a
40	MR	George	Momanyi	M	Coordinator, PRA & Surveillance	Kenya Plant Health Inspectorate Service(KEPHIS)		Kenya	+254 709 891000	+254 722279784	gmomanyi@kephis.org	

***

41	DR	Gerald	Kyalo	M	Senior Research Officer	international Potato Center	Plot 47, Ntinda II Road, Naguru	Uganda		256 774431623	gerald.kyalo@cgiar.orgg	gerald.kyalo
42	DR	Godwill	Makunde	M	Sweetpotato specialist	International Potato Center	International Potato Center IIAM Av. FPLM 2698. PO.Box 2100	Mozambique	+258 825135177	+258 825135177	G.Makunde@cgiar.org	Godwill Makunde
43	MR	Haile	Okuku	M	Data consultant	International Potato Center	c/o International Potato Center Box 25171	Kenya		254 722679064	H.Okuku@cgiar.org	haile.selassie.okuku
44	DR	Haile	Tesfay	M	Project coordinator	CIP- Irish Aid project in Tigray	138 Mekelle, Ethiopia	Ethiopia		251 914709323	h.tesfaye@cgiar.org	
45	DR	Hilda	Munyua	F	Project Manager-BNFB	International Potato Center	P. O. Box 25171 - 00603 NAIROBI	Kenya	+254 20 422 3671	+254 720 297464	H.Munyua@cgiar.org	
46	DR	Hugo	Campos	M	Director Research	International Potato Center	International Potato Center Apartado 1558, Lima 12, Peru	Lima	+51 (1) 3496017		h.campos@cgiar.org	
47	DR	Ibok	Oduro	F	Provost	Kwame Nkrumah University of Science and Technology	Department of Food Science and Technology, Kwame Nkrumah University of Science and Technology	Ghana	+233 32060312	+233 244288315	ibok.oduro@gmail.com	
48	MR	Ivan	Obare	M	Plant Inspector	KEPHIS		Kenya		254 723178990	iobare@kephis.org	
49	DR	Jan	Low	F	Principal Scientist, SASHA Project manager	International Potato Center	c/o International Potato Center Box 25171	Kenya	+254 20 422 3601	+254 733 411010	J.LOW@CGIAR.ORG	janhigh3
50	MR	Jean	Ndirigwe	M	Head of Program	Rwanda Agriculture Board (RAB)		Rwanda	+250 732800154	+250 788527320	ndrick3@gmail.com	
51	MR	Jean-Claude	Nshimiyimana	M	Research Associate	International Potato Centre (CIP)	International Potato Center, Rwanda Kacyiru Road St. 563, Plot No. 1490- Gasabo	Rwanda	+250 788500053	+250 788639417	J.Nshimiyimana@cgiar.org	njclaude5
52	MR	Jim	Lorenzen	M	Program Officer/Agricultural Development	BMGF	500 5th Aren seattle, WA 98102 USA	USA	+ 206 770 2284	+1 206 661 3491	jim.lorenzen@gatesfoundation.org	
53	DR	Jimmy	Lamo	M	Principal Research Officer	National Agricultural Research Organization (NARO)	National Crops Resources Research Institute (NaCRRI)| 17Kms Kampala-	Uganda		+256 772 342 757	jlamoayo@gmail.com	jimmylamoayo
54	MS	Jolenta	Joseph	M	nutritionist	Sugeco	P.O.Box 3223 Morogoro	YOUTH-Tanzania		255 789319119	jolentajoseph.jj@gmail.com	jolenta.joseph1
55	DR	Jonas	Mugabe Musabwa	M	Manager of the Platform for African-European Partnerships in Agricultural Research for	FARA	12 Anmeda street,Roman Ridge	Ghana		233 547318911	yakinbamijo@faraafrica.org	
56	MR	Josephat	Mangeni	M	DVM	Youth Entrepreneur		Kenya	254 700811668		jmangeni11@gmail.com	
57	MS	Joyce	Maru	F	Capacity Development and Communication Specialist	International Potato Center	c/o International Potato Center Box 25171	Kenya	+254 20 422 3692	+254 707 627645	J.Maru@cgiar.org	
58	DR	Jude	Njoku	M	Assist Director/Coordinator SNR Agronomist	NRIRI	National Root Crops Research Institute, Umudike Umuahia	Nigeria	+234 803 547 9261	+234 8035479261	Jcnjoku@yahoo.com	Junjiku1
59	DR	Julius	Okello	M	Impact Assessment	International Potato Center	Plot 47, Ntinda II Road, Naguru	Uganda		+256 756024761	J.Okello@cgiar.org	
60	DR	Kalimuthu	Senthilkumar	M	Agronomist	Africa Rice		Madagascar		261 343386057	K.senthilkumar@cgiar.org	
61	DR	Kirimi	Sindi	M	Country Manager/Scientist	International Potato Centre (CIP)	International Potato Center, Rwanda Kacyiru Road St. 563, Plot No. 1490- Gasabo	Rwanda	+250 787113357	+250 787113357	K.Sindi@cgiar.org	sindiki

62	MR	Kwame	Ogero	M	Regional Research Associate	International Potato Center	1433 MWANZA, TANZANIA	Tanzania	+255 689 457461	+255 689 457461	K.Ogero@cgiar.org	OGERO.KO
63	MR	Lauren	Good	M	Senior Program Officer	BMGF	PO Box 23350 Seattle WA 98102 USA	USA		+ 1 (206) 726-7158	Lauren.Good@gatesfoundation.org	
64	DR	Liman	Mohammed	M	Chief of Party	Save the Children	No. 4, Danube Close Off Danube Street, Maitama, Abuja.	Nigeria		+234 (0)8037043816	mohammed.liman@savethechildren.org	
65	MS	Linly	Banda	F	Student PHD	Pan African University	Pan African University (PAUSTI) JKUAT Main Campus PO Box 62000	kenya	254 743123193		linlybanda@gmail.com	
66	MS	Lisa	LaFountain	F	Graduate Research Assistant	North Carolina State University (NCSU)	308 Mainsail Dr, Cary NC 27511	USA		19195646269	ljlafoun@ncsu.edu	
67	MR	Luka	Wanjohi	M	Data Manager	International Potato Center	c/o International Potato Center Box 25171	Kenya		254 22302271	l.wanjohi@cgiar.org	luqato
68	Mr	Magama	Abduallhi	M	JIgawa State team Leade	Save the Children	Block B state new secretariat Dutse, jigawa state Nigeria	Nigeria		234 8065944635	abdullahi.magama@savethechildren.org	Mabdul42
69	MS	Mairead	Petersen	F	Regional nutrition advisor	Irish Aid	Embassy of Ireland, Arwa House, Private Bag B490, Lilongwe 3, Malawi	Malawi	265 997306855		mairead.petersen@dfa.ie	
70	MS	Margaret	McEwan	F	Senior Project Manager	International Potato Center	c/o International Potato Center Box 25171 Nairobi, Kenya 00603	Kenya	+254 20 422 3611	+254 733 681155	M.McEwan@cgiar.org	McEwan-cip
71	DR	Maria	Andrade	F	Senior Country Liaison Scientiest	International Potato Center	International Potato Center IIAM Av. FPLM 2698. PO.Box 2100 Maputo-Mozambique	Mozambique	+258 21 461 610	+258 842791993	M.Andrade@cgiar.org	
72	DR	Mercy	Kitavi	F	Post-Doc Breeder	International Potato Center	P.O BOX 25171-00603	Kenya		+254 722 913723	M.Kitavi@cgiar.org	mercykits
73	MR	Mhlombo	Musa Mtileni	M	Agronomist	National Root Crops Research Institute		South Africa	27737152178	27128088000	mmtileni@arc.agric.za	
74	DR	Michael	Friedmann	M	Senior Science officer	International Potato Center	CIP HQ	Lima		51 999091794	m.friedmann@cgiar.org	
75	MR	Mihiretu	Cherinet	M	Research Associate	International Potato Center	ILRI P O Box 5689, Addis Ababa, Ethiopia	Ethiopia	+251935923781	+251935923781	M.Cherinet@cgiar.org	
76	MR	Mikindo	Tumaini	M	Executive Director	Partnership for Nutrition	P.o. Box 32095, Dar Es Salaam	Tanzania	+255 22 270 1753	+255 719 676646	ed@panita.or.tz	tmikindo
77	MS	Mildred	Irungu	F	Program Management Specialist	USAID	62900621 gigiri nairobi	Kenya	254 208622221	254 722206766	mirungu@usaid.gov	
78	MR	Milton	Anyanga	M	Research Officer	NARO/NACRRI		Uganda		256 772833104	moanyanga@yahoo.com	
79	MR	MISHAEL	ENNUSON	M	Finance director	E.Darkey and Associates Ltd	P.O.Box 7155 Accra-North	Ghana	233 240586972	233 244724608	mennuson@gmail.com	
80	MS	Mukiibi	Shira	F	Business Development Manager	ICIPE	Duduville Campus, Kasarani P.O. Box 30772-00100 Nairobi, Kenya	kenya	+254 20 863 2432	254 798011635	smukiibi@icipe.org	
81	DR	Mutimaamba	Charles	M	Country Manager	Harvest plus	c/o CIMMYT, 12.5km peg Mazowe Rd P.O. Box MP228, Mt Pleasant, Harare,	Zimbabwe		263 772219892	C.Mutimaamba@cgiar.org	
82	MR	Norman	Kwikiriza	M	Research associate	International Potato Center	Plot 47, Ntinda II Road, Naguru P.O.Box 22274	Uganda		256 782308031	n.kwikiriza@cgiar.org	norman.kwikiriza
83	DR	Paul	Demo	M	Regional Director-CIP	Regional Director-SSA	c/o International Potato Center Box 25171	CIP		265 881555470	p.demo@cgiar.org	
84	MS	Penina	Muoki	F	Agriculture value chain specialist & Team Leader	International Potato Center	c/o International Potato Center Box 25171	Kenya	+254 771 953 761	+254 771953761 +25406284877	P.Muoki@cgiar.org	penina.muoki
85		Pietro	Turilli	M	Resource mobilization	International Potato Center	CIP-HQ	Peru	+51 1 349 6017		p.turilli@cgiar.org	pietro.turilli
86	DR	Reuben	Tendo	M	Plant Breeder Associate- Post Doc	International Potato Center	Plot 47, Ntinda II Road Naguru, Kampala.	Uganda		256 67023626	r.ssali@cgiar.org	r.tendo_1
87	MR	Richard	Agetu	M	Head Operations Processing	RICHSI FOODS	Richsi Foods 3f6, Threshold Business Suite, Olusegun	Nigeria	234 8173762018	234 8057607194	rcagetu@gmail.com	Richardricheerich
88	MR	RICHARD	ANNOBIL	M	Deputy Director	Ministry of Food and Agriculture	Ministry of Food and Agriculture P.O. BOX M.37	Ghana		207062229	richardkannobil@gmail.com	
89	DR	Richard	Kasuga	M	Senior Country Coordinator	International Potato Center	P.O.Box 34441 Dar es Salaam	Tanzania		255 655 239946	richard.kasuga@gmail.com	richardk2013
90	DR	Robert	Mwanga	M	Breeder	International Potato Center	Plot 47, Ntinda II Road, Naguru P.O.Box 22274	Uganda	256 772825765	+256 772 825725	R.Mwanga@cgiar.org	r.mwanga1
91	MS	Rosemary	Kihiu	F	Communication and KM	International Potato Center	c/o International Potato Center Box 25171 Nairobi, Kenya 00603	Kenya		254 722751884	R.Kihiu@cgiar.org	
92	DR	Sam	Namanda	M	Senior Research Associate	International Potato Center	CIP Kampala, P.o.Box 22274, Kampala	Uganda		+256 772 419112	s.namanda@cgiar.org	sam.namanda
93	DR	Sammy	Agili	M	Director	Rural Livelihoods Improvement International		Kenya		254 722365784	sammagili@yahoo.com	
94	DR	Segundo	Fuentes	M	Senior Research Associate	International Potato Center	Centro Internacional de la Papa Apartado 1558, Lima 12, Peru	Lima		51 13496017	s.fuentes@cgiar.org	segundo.fuentes3

95	MS	Shira	Mukiibi		Business Development Manager	ICIPE	Duduville Campus, Kasarani P.O. Box 30772-00100 Nairobi, Kenya	kenya		254 798011635	smukiibi@icipe.org	
96	MR	Simon	Gule	M	Bakery Manager	Tuskys Supermarket		Kenya		254-725160422	simon.gule@tuskys.com	
97	MR	Eric	Joseph	M	Executive Associate	TAHA	P.O.Box 16520 Arusha	Tanzania		255 689066811	simon.mlay@taha.or.tz	
98	DR	Some	Koussao	M	Plant breeder	INERA	INERA 01 BP 476, Ouagadougou, Burkina Faso	Burkina Faso	+226 25319208	+226 76615894	koussao@hotmail.com	some.koussao
99	DR	Srini	Rajendran	M	Agricultural Economist	International Potato Center	PO BOX 25171 NAIROBI	Kenya	+254-711033685	+254-739 104 556	srini.rajendran@cgiar.org	
100	MR	Stanley	Mwangi	M	Commercialization Specialist	FCI	FCI – Africa Office, KALRO Campus, Waiyaki Way	Kenya	+254 715 408650	+254 715 408650	stanley.mwangi@farmconcern.org	stanley.mwangi
101	MR	Suleman	Issahaq	M	Agronomy &Post Harvest Officer	International Potato Center	P. O. Box 52 Nyankpala -Tamale	Ghana		233 242 655999	issahaqs@gmail.com, Issahaq.Suleman@cgiar.org	Issahaqs
102	MS	Sylvia	Magezi	F	Country Manager	HarvestPlus	Sylvia Magezi P.O.Box 10969, Kampala	Uganda	256 772483304	256772483304 256312263613	S.Magezi@cgiar.org	Sylvia Ruhweza Magezi
103	DR	Tanya	Stathers	F	Food and Markets Department	NRI	Central Avenue Chatham Maritime	UK		+44 (0)1634 883813	T.E.Stathers@greenwich.ac.uk	tanya.stathers
104	DR	Tawanda	Muzhingi	M	Food Scientist	International Potato Center	c/o International Potato Center Box 25171 Nairobi, Kenya 00603	Kenya	+254 20 4223639	+254 718608534	T.Muzhingi@cgiar.org	
105	MS	Tei	Mukunya	F	CEO	Azuri		Kenya		254-707762777	tei@azurihealth.co.ke	
106	MR	Temesgen	Bocher	M	M&E	International Potato Center	Temesgen Fitamo Bocher International Potato Center	Mozambique	258 879079462	+258 846375065	T.Bocher@cgiar.org	temesgen.sani
107	DR	Thomas Alexander	Van Mourik	M	Project Manager	International Potato Center	IWMI, Martin Odei Block Airport Residential Area, Accra	Ghana	+233 302 784753	233 265 347339	T.VanMourik@cgiar.org	tom.van.mourik
108	MS	Vivian	Atakos	F	Regional Communication Specialist	International Potato Center	35106 - 00200 Nairobi	Kenya	+254 20 422 3693	254 720924757	v.atakos@cgiar.org	
109		Wellington	Jogo	M	Project manager and impact assessment specialist	International Potato Centre (CIP)	ILRI P O Box 5689, Addis Ababa, Ethiopia	Ethiopia	+ 251 116172306	+251 965915173	W.Jogo@cgiar.org	
110		Wilfred	Mushobozi	M	CEO	Crop Bioscience Solutions (CBS)		Tanzania	255 754282182		mushobozi.w@cropbioscience.co.tz	
111	DR	Wolfgang	Gruneberg	M	Sweeetpotato breeder-Global Leader	International Potato Center	CIP-HQ	Lima			w.gruneberg@cgiar.org	
112	MS	Yan	Hui	F	Sweeetpotato breeder	sweetpotato institute CAAS		China		254 757628808	yanhui_sweetpotato@163.com	
113	MS	Yei	Ruixue	F	Sweet potato breeder	sweetpotato institute CAAS		China		254 757628806	yuerutixue-1983@163.com	
114	MS	Zena	Mshana	F	OFSP processor	BMC Products		Tanzania	+255 763 311 090	+255 763 311 090	zermmshana2016@gmail.com	
115	MS	Daisy	Lanoi	F	Masters Student	Egerton University		Kenya		254 720484222	daisy.lanoi@gmail.com	

SPHI

Sweetpotato for Profit and Health Initiative

The Sweetpotato for Profit and Health Initiative (SPHI) is a 10 year multi-partner, multi-donor initiative that seeks to reduce child malnutrition and improve smallholder incomes through the effective production and diversified use of sweetpotato. The first five-year phase (2010-2014) concentrated on Proving the Potential, building up the supply of adapted varieties and testing models of delivery of improved varieties to producers and consumers. The second five-year phase (2015-2019) focuses on Achieving the Potential, ensuring that effective "seed" systems are delivering improved planting material to 10 million sub-Saharan African households.

SASHA

CGIAR Science for a food-secure future

UKaid from the British people

USAID FROM THE AMERICAN PEOPLE

Irish Aid Government of Ireland Rialtas na hÉireann

AGRA Growing Africa's Agriculture

Bill & Melinda Gates foundation

CIP International Potato Center

CGIAR Research Program on Roots, Tubers and Bananas

Helen Keller International

University of Greenwich Natural Resources Institute

Farm Concern International

CRS Catholic Relief Services

FARA Forum for Agricultural Research in Africa

HarvestPlus Breeding Crops for Better Nutrition

NC State University

PATH

Farm Africa

CIP thanks all donors and organizations which globally support its work through their contributions to the CGIAR Trust Fund.