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Fifth Annual MPU Marketing
Processing and Utilization Community of Practice Meeting

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Venue: Lotus Hotel in Blantyre, Malawi.

Date: 23-24 April 2018

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Edited by: Tawanda Muzhingi

CIP INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

SASHA Sweetpotato Action for Security and Health in Africa

SPHI Sweetpotato for Profit and Health Initiative

CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas

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ACRONYMS

CIP	International Potato Center
CoP	Community of Practice
CRS	Catholic Relief Services
MISST	Malawi Improved Seed Systems and Technologies
MOA	Ministry of Agriculture
MLE	Monitoring, Learning and Evaluation
MPU	Marketing, Processing and Utilization
OFSP	Orange-fleshed sweetpotato
PPP	Public Private Partnership
RTB	Roots, Tubers and Bananas
RSE's	Root and Seed Entrepreneurs (RSEs)
SASHA	*Sweetpotato Action for Security and Health in Africa*
SBCC	Social Behavior Change Communication
SPHI	Sweetpotato for Profit and Health Initiative
SUSTAIN	Scaling Up Sweetpotato through Agriculture and Nutrition
TAAT	Technologies for African Agricultural Transformation
ToT	Training of Trainers
VAD	Vitamin A Deficiency
WASH	Water, Sanitation and Health

EXECUTIVE SUMMARY

The SPHI Marketing, Processing and Utilization Community of Practice (MPU CoP) held its 5th Annual Meeting on 23-24 April 2018 at the Lotus Hotel in Blantyre, Malawi. The theme of the meeting was **Orange-fleshed Sweetpotato (OFSP) Value Chains for Sustainable Food Systems in Sub-Saharan Africa.**

The meeting was attended by 78 (35% women) participants from 10 countries (Ethiopia, Kenya, Uganda, Tanzania, Ghana, Nigeria, Malawi, Mozambique, South Africa and the United States). The agenda was set by the MPU CoP leaders: Tawanda Muzhingi, Jean Pankuku, and Madjaliwa Nzamwita.

The keynote address was given by Dr. Wilkson Makumba who is the Director in the Department of Agricultural Research Services in the Ministry of Agriculture, Irrigation and Water Development in Malawi. His remarks highlighted the state of food security and nutrition in Malawi. In his remarks, he noted, "Investing in sweetpotato's image and especially in orange-fleshed sweetpotato as a healthy food for all—young and old, rural and urban, and rich and poor consumers are all bound to benefit economically and socially".

There was a panel discussion with private sector players (Euro Ingredients, Universal Industries, Kenya Bureau of Standards (KEBS), Tehilah Bakery and Value Addition Centre, and local farmers) who shared their experiences on the challenges and opportunities of OFSP processing in Africa. Presentations from the meeting will be available on www.sweetpotatoknowledge.org

Another highlight of the meeting was the presentations of 17 posters covering four thematic areas:

- Food Science and Processing Activities,
- Breeding, Seed Systems and Post-Harvest Management as it relates to value chains,
- Community Nutrition, Advocacy and Nutrition Sensitive Behaviour Change Communication (BCC),
- Food Systems, Gender and Youth

Participants visited the Tehilah Bakery and Value Addition Centre at Matindi in Blantyre. The bakery is pioneering the production and commercialization of Orange-fleshed Sweetpotato (OFSP) bread and buns branded Thanzi using OFSP Puree. Currently, the puree is bought from Universal Industries. Universal Industries has become a major sweetpotato buyer, including purchasing sweetpotato that otherwise may be left unsold, to produce OFSP soft cookies and crisps. Its business innovations are resulting in reduced sweetpotato postharvest losses, new market opportunities for smallholder farmers, and nutritional food products for rural and urban consumers.

There were also presentations from a group of women in care groups and they showcased how they carry out behaviour change activities in the community. They volunteer to train other women on issues such as personal and household hygiene, prenatal care, and nutrition of their children and their families. The group of women also showcased some of the food

products they prepare using OFSP. During the field visit, participants had a chance to see the processing facility (bakery) and visit the displays and sample the OFSP products made by the bakery.

The MPU CoP membership is made up of professionals working on all levels of the sweetpotato value chain, as well as private sector players who are innovating processing and utilization of orange-fleshed sweetpotato for commercial products.

A panel of judges selected the top three abstracts, while participants voted for the top three posters. The winners and runners-up were awarded prizes in recognition of their excellent work.

The top three posters were as follows:

- Number 1- Felistus Patience Chipungu and Eliya Kapalasa-Integration of Orange-Fleshed Sweetpotato (OFSP) in Small-scale Enterprises- Case for Nsanje women
- Number 2- Cecilia Wanjuu -The Physiochemical Properties and Shelf-life of Orange-Fleshed Sweet Potato (OFSP) Puree Composite Bread
- Number 3- Agnes Mdzomba -KEBS Standards Development as a Strategy for Creating Sustainable Market Access for OFSP
- Number 3- Evaluation of the evaporative cooling systems (Zero Energy Cool Chamber) for Sweetpotato Roots Storage.

Session 1 Jan Low (Chairperson) Faith Njung'e (Rapporteur)

1.1 ASSESSMENT OF THE AWARENESS OF ORANGE FLESHED SWEETPOTATO AND ITS UTILIZATION IN RURAL AREAS OF KWARA STATE

Fausat Kolawole

Kwara State is in the North Central Region of Nigeria and it is made up of sixteen local governments &three senatorial districts. The State has a population of 2.37 million based on Nigeria 2006 Census. It is popular due to the existence of many markets.

The OFSP is good for the malnutrition because it significantly improves the vitamin A deficiency in children under age five. It has a low glycemic index and has high fiber content. Vitamin A is essential for vision in dim light, cellular bone and tooth growth, formation and maintenance of healthy skin, hair and mucous membranes, reproduction and immunity boosting.

This study was conducted to assess the familiarity of the community about OFSP. This was done through a market survey, a short seminar, and then a consumer acceptability study was conducted. Agidi samples that were made from maize with 30% OFSP had the highest beta-carotene content and other vitamins and minerals. Also, they exhibited better sensory characteristics.

Market survey in Koara state

Though VAD remains a public health challenge, consumers are health conscious and willing to use OFSP and its products to curb the deficiency. However, it will be important to consider post-harvest storage, the Market Value Chain, Preservation of Puree, Stable OFSP Products and the willingness to pay for OFSP in Kwara State.

1.2 ENERGY AND MICRONUTRIENT DENSITIES OF COMPLEMENTARY FOODS DEVELOPED FROM A COMPOSITE OF TEFF, SOYBEAN AND ORANGE-FLESHED SWEETPOTATO

Mesfin W. Tenagashaw

Micronutrient malnutrition is prevalent among infants and children in developing countries, especially in Sub-Saharan Africa. Vitamin A deficiency in children under 5 years is a health problem in these countries. This is because families are used to the monotonous cereal-only or cereal-legume porridge. There is the need to develop complementary foods that have are low cost, are energy and nutrient dense and have the appropriate formulation and processing. The product must be of desirable consistency and acceptable by the community. In this study, teff.

Soybean and Orange-fleshed sweet potato were flour were processed and mixed in the ratio of 70:20:10. The mix was used to prepare a household and industrial-level complementary

food. The product's energy, β-carotene, calcium, iron, zinc, HCL-extractability and protein digestibility were analysed. The food met the recommended levels of micro-nutrient densities: –A, and minerals (Calcium, Iron, and Zinc). The losses in β-carotene content may be prevented by blending the OFSP after extruding a mixture of teff and soybean. The product is accessible to the low-income groups in Sub-Saharan Africa.

1.3 COMPARATIVE STUDIES OF OFSP FLOUR AND PUREE-BASED COMPLEMENTARY FOODS AND ITS COMMERCIALIZATION

Damian Laryea

The OFSP is being promoted as a more sustainable way of eradicating vitamin A deficiency in Ghana. The objective of this study is to develop an OFSP-based complementary food and assess its marketability. The most preferred formulation had the OFSP flour or puree mix with the highest ratio. About 62% of nursing mothers across four major hospitals in Ghana were willing to pay 3.36 USD for 400 g of the OFSP complementary food, popularly known as "Sweepolac".

Sweepolac OFSP complimentary food

This was because the complementary food was nutritious, appealing and fairly priced. However, the challenge is that established food companies are not interested in processing the product. The management argues that the already existing products providing them sufficient income. The solution would be to include the small-scale production of selected products by research institutions to attract entrepreneurs. In conclusion. The OFSP puree based complementary food has relatively higher β-carotene content than that of OFSP flour hence it can have used to address VAD in Ghana.

1.4 VIABLE SWEETPOTATO TECHNOLOGIES IN AFRICA (VISTA) TANZANIA PROJECT

Fredrick Grant

Over a quarter of the Tanzanian population lives below the poverty line. 33% of children aged 6-59 months and 37% of women aged 15-49 years estimated to be VA deficient. Nutrition-sensitive agricultural development has a crucial role to play. Particularly for poor rural households for which farming is the main source of food and income. Food-based efforts are highly complementary to other approaches to tackling VAD, especially for rural communities where alternative interventions face greater difficulty.

The aim of this study was to contribute to improved dietary diversity, nutrition, food security and incomes of smallholder households with children under 5 years by assessing the impact of the VISTA project. The program is an intervention on nutrition and food security outcomes of smallholder households with children under 5 years. This has been specifically accomplished through the production and consumption of OFSP, improvement in caregiver nutrition, health and childcare knowledge. The project has seen households diversify the diet

of their children to include vitamin A. The consequence has been food security at household level. The two-year intervention program (June 2015-July 2017) has linked the beneficiaries with quality OFSP planting materials. Additionally, they received improved nutrition education and counselling. The groups in the community that have benefitted the most are the caregivers.

The monitoring and evaluation strategy is designed to assess the overall effectiveness and sustainability of the OFSP delivery approach by linking agriculture to nutrition behaviour change and communication (BCC) at the community level. The positive agricultural and nutrition outcomes documented in VISTA-Tanzania project have been because of household members being empowered to adopt OFSP technologies and management practices as well as increased active participation in nutrition club meetings.

Discussion

Fausat Kolawole -What will be the specific approach of creating awareness in Kwara State- The community was prior introduced to the crop but did not take it seriously. It will be a personal initiative to educate the community. However, there are challenges regarding how to store the roots due to electricity shortages. I intend to do the biochemical in vivo analysis.

Fausat Kolawole -How as preservation was used considering most rural communities don't have storage facilities? Preservation was done in cans because there an issue of power in Nigeria **Additional comment:** Maybe you can also use some recommended preservatives. **Fausat: We have not yet used preservatives or additives due to the cost and process.**

Mesfin- How was the complementary food preserved, how was its shelf life. What were the quality aspects that were analyzed? The processing of food complements preservation and its shelf-life. It was generally acceptable by the nursing mothers. In addition to sensory evaluation, the quality tests carried out were proximate analysis, β-carotene, and microbiology.

Mesfin-Mix of peanut butter and OFSP- what was the approach of cooking such a mix? Each product was pre-cooked separately, mill and mixed and cooked using avocado as the binder.

Additional comments from Mesfin

- Processing aspect is a challenge- It is not easy to process without the technology, getting the tech to rural communities is hard.
- Post-harvest is also another challenge, storing using traditional granary methods, in ground storage, women preferred in ground storage**.**

Damian- Is it scalable to merge the University vs private sector for scaling of OFSP products, what was the cost of the new product? The private sector is reluctant about taking up novel products. This a difficult commercial aspect. The students are forced to market the products. The new product was about 3 USD.

Grant- What is the attitude of men in clubs, how were the products mixed, what are the challenges experienced? In a club, men are about 5%. But we are slowly seeing an increment

in the number of men. Women are usually less talkative. We encourage discussions, demonstration, and success stories to ensure all of them participate.

Comment: The major challenge in OFSP is in the postharvest, storage. The storage options are either the traditional granary or the in-ground storage. The granaries have been modified to meet the temperature and humidity conditions optimum for storage.

Session 2 Henry Kalomba United Purpose (Chairperson) Faith Njung'e (Rapporteur)

2.1 PANEL DISCUSSION NUTRITION SENSITIVE AGRICULTURE AND FOOD SYSTEMS

Panelists

Facilitator: Dr. Robert Ackatia-Amah, Deputy Program Leader (SO1) and Regional Nutritionist, International Potato Center (CIP)

- **Ephraim Chabayanzara-**Regional Technical Advisor for Agriculture & Livelihoods in Catholic Relief Services
- **Daniel Van Vugt-** Project Manager, International Potato Centre (CIP), Malawi
- **Frederick Grant-** Country Manager and Nutrition Specialist, International Potato Center (CIP), Tanzania
- **Jude Asiimwe-**Marketing & Product Development Specialist, Harvest Plus

How is the area of agriculture that you are on influencing to nutrition? What do you do that is related to this topic?

Ephraim- As a regional technical advisor in the East African community, we have two programs major programs that support nutrition. These are Seed systems and starveling programs. The target group is the vulnerable in the society, that is, pregnant mothers, children under 5 years old, and the elderly. Primarily we aim at reducing iron and vitamin A deficiency. We organize groups to enhance penetration into households. This ensures that everyone has access to nutrition and can utilize these foods.

Daniel – Having worked at CIP Malawi and Feed the Future, I have worked on high-value crops such as sweetpotato and specifically OFSP, sorghum, orange maize, millet, iron and soybean, and cassava. The crops are most important to control malnutrition. With the support of the seeds systems and the availability of roots and vines, people have access to these high-value crops, hence acquire nutrition. Also, there is the agronomic aspect where farmers grow sufficient for consumption and excess for sale. We are developing recipes to enhance the value of these crops.

Fredrick Grant- In Tanzania, the project model used was developed about 5 years ago in the "Every You Wanted to Know About Orange-Fleshed Sweet Potato training. There are various stakeholders involved, starting from the district, ward, village level. We utilize root and seed entrepreneurs (RSEs) who are small to large landowners willing to grow the seeds. These provide sustainable seeds to other farmer and other extension services such as training.

Therefore, the economic and nutritional aspects are catered for. We are working in partnership with Farm Concern International to provide Quality seeds. Farmers are encouraged to avoid using old seeds because they are less productive, hence low yields. We have partnered with the private sector and prime minister's office to provide training materials. We target pregnant mothers and families with children under 5 years. Mothers weaning their babies into solid food form the basis for nutrition advice. These crops are a nutrition intervention for the whole household.

Jude- in Harvest plus Uganda, the main functions revolve around nutrition, seed systems, and marketing. We deal with high-value crops such as cassava, OFSP which has seven varieties, and high iron beans. Through fortification, we have seen a decline in VAD and Anemia. However, the rate of these malnutrition cases is still significantly high in Uganda. With the existence of seed systems, the current five-year intervention will see us progress in combating malnutrition.

To maximize on agriculture, different sectors are involved such as education, health, and social protection. There is evidence growing over time that highlights the importance of nutrition. How can we use education to promote nutrition?

Jude- Nutrition sensitive crops have an advantage of containing Vitamin A, minerals and high yields. For example, the OFSP contains significant amounts of these. We must use education to inform the community about these benefits. It is through effective communication that community becomes aware of these nutrient-dense crops. In addition, they can learn among themselves through drama groups to influence behavioral change. Education is the connection between agriculture and nutrition. In Uganda, we use the school feeding programs, demonstration, provide print literature materials that the community can access.

Fred- Since we work in the rural setting and group clubs, education translates to the transfer of knowledge. There are various approaches that can be used, the common one being the Counselling card. The card is a combine's aspects of nutrition, diet, and sanitation for mothers feeding children under five years, and for the general household. It provides hands-on experience and knowledge. Nutrition is not superficial. It is critical in controlling instances of stunting in children. It is not sufficient to provide a one-hour lesson in school. The health and nutrition specialist must incorporate nutritional knowledge for children and other social groups. From a social protection perspective, we can utilize women in their groups as entry points and the elderly who are head of households. The government of Tanzania has come up with a health and nutrition plan. We had to convince the government officials to include the biofortification policy for high-iron beans and fortified cassava.

Social protection programs are an avenue that agricultural scientists can use. What are do you propose about nutrition based on your experience

Daniel- In Malawi, the opportunity can be utilized to diversify and access schools, parents, and households in general. We can advantage of primary schools' feeding program as entry points.

Ephraim- In CSR, there are various programs we use in the different countries. We target most vulnerable groups like pregnant mothers and children under five-years. Mothers are being taught about various recipes and how to ensure they have access to a balanced diet.

Transformation, marketing and geographical aspects of food. It does not matter how nutritious a crop is, if it does not contribute to the farmer's income, then they won't cultivate. A farmer must be able to market it.

Open Discussion

Tawanda Muzhingi Transformation and processing of high-value nutritious food must preserve nutrients and ensure that the food is fit for consumption. Transformation avails food to everyone. The Food system approach avails nutritious food to all. Value addition plays a big role as a modern way of making food more nutritious

Daniel Mbebuwa who is a commercial farmer in Malawi agrees with this notion. He is interested in the agronomics. He says that the market has not been good for farmers to grow more OFSP.

Sindi Kirimi- There are concerns that the rate of obesity in Africa is increasing. What can we do at the rural level to enhance nutrition sensitivity?

Makeda Tsegaye- We cannot work alone. We need more actors in the chain distribution of food. Such partnerships are valuable for the benefit of every stakeholder. Farmers are clear on that if they cannot make money from a crop, then they are not interested. Therefore, we will be most impactful if we introduce viable products that can stand all challenges of the market.

We need to diversify products at the household level. We should not give false hope to farmers hoping to change their mind about producing the food. Nutrition-sensitive crops have an economic value, providing farmers with the surplus for their consumption, and sale as well.

Closing remarks

Ephraim Chabayanzara- We can utilize transformation approaches that target mothers with children under 5 years. We need to provide a market for agricultural products that will be a source of their income source. The foods must be affordable.

Fred Grant The process of introducing the high-value crops should be gradual to allow for the change of behavior of the community. It will important that farmers produce the crops in surplus to be marketed. The high-end supermarkets sell these products at a high price based on their nutritional value. Also, the breeders must take control to provide quality seeds.

2.2 THERMAL PRESERVATION OF ORANGE-FLESHED SWEETPOTATO

Michael Druga

Over 130 Million Tons of sweetpotato are produced globally with 7 Million of these being produced in Africa. However, approximately 40% is lost due to food waste. There is need to

process a shelf stable sweet potato puree with an extended the shelf life. This will help reduce spoilage, maintain the quality and nutrients and consequently expand distribution.

This can be achieved through thermal processing of OFSP. These technological processes include batch thermal processing – canned (retort). This may be the oldest form of sterilization but it is efficient. The processing time ranges from 30 minutes to 3 hours to achieve maximum thermal destruction.

Modernized thermal processing is characterized by continuous flow either during hot fill or aseptic packaging. The hot fill method is a low-cost solution for limited applications. Processing time is 1 to 10 minutes. The method is applicable when filling pouches, bottles and cups. The product must be of pH <4.0. Aseptic packaging is the highest cost and highest quality thermal processing method. It has the lowest processing time of less than 10 minutes. The method is flexible and does not limit the load.

Figure 1 Economics of Small Scale Processing

While choosing the technology to apply, it important to consider process heating options, product factors and economic factors. Processing options are either indirect heating such as tubular or scrape surface and direct heating using steam or a microwave. Product factors that will affect the process are viscosity, pH, particle size, and thermal sensitivity. The economic factors include yield, run size and energy efficiency.

2.3 FINANCIAL FEASIBILITY FOR SELECTED BUSINESS MODELS OF OFSP VALUE ADDITION INDUSTRY

Srini Rajendran

There are 3 Business Models that will be used to determine financial stability. Model 1 is the no storage model where Freezers will be used without vacuum packaging. Model 2 will utilize Cold chain storage with no preservatives in the puree. The puree will be vacuum packaged, stored in the freezers, hence requiring electricity. Model 3 will be made of a self-storable puree with preservatives. The puree will not require freezers or vacuum packages for storage. These models require investing in a puree machine, steamer, vacuum sealer, fryer, depositor, and an oven. These models have a spill over effect to various sectors such as the packaging, energy, logistics, and health sectors.

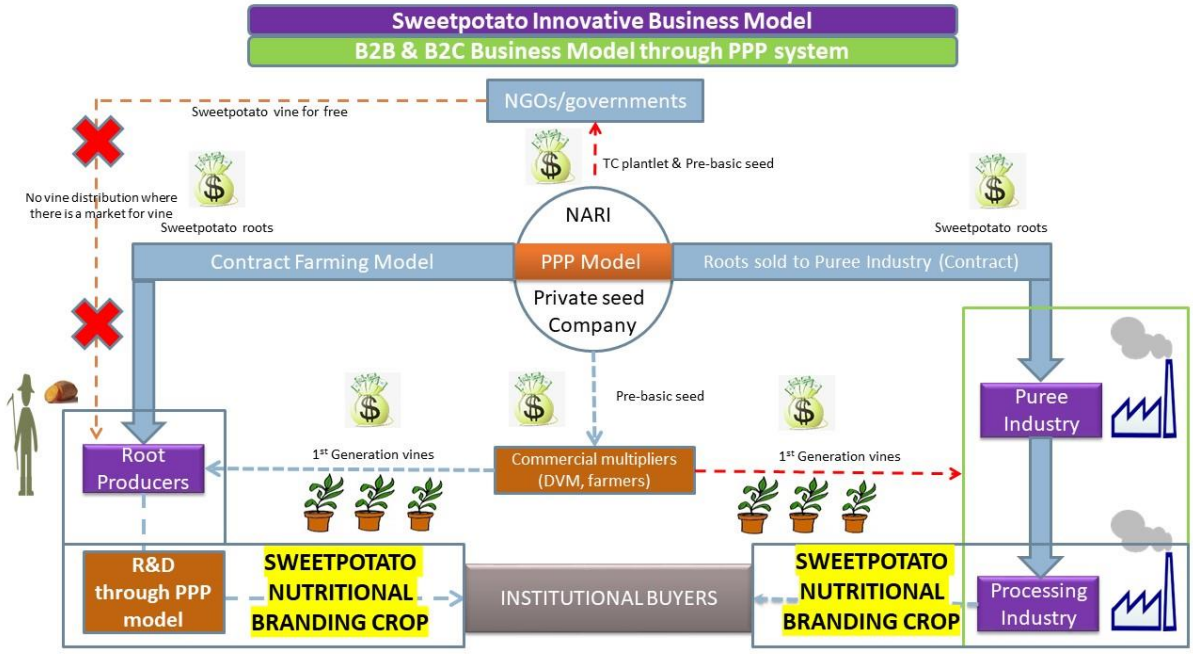


Figure 2 Sweetpotato Innovative Business Model

The models have been set up at the iNutri-RTB incubation centre (Youth –agribusiness graduates) through Public Private Partnership (PPP). The stakeholders involved include CGIAR which is an agri-entrepreneurs Farming Community & Input Industry, NARI which is the financial sector, academic institutions, and the private sector which is the processing industry.

DISCUSSION

Michael-How viable are the technologies in the SSA and what is the cost for a small-scale producer? Which would you recommend? How sustainable are the packaging materials?

I would recommend the 250 USD for small-scale production of 1tonne. It is capital intensive since the packaging materials must be used. The packaging materials have up to four layers to guarantee product sterilization and prolonged shelf-life since the layers act as an oxygen barrier. The technologies guarantee nutrient preservation after thermal treatment.

Srini-How did you determine prices of the products in each model?

Calculations were done based on gross profit and on an increasing cost. This is cash flow based on product take off**.**

Session 3 Ephraim Chabayanzara CRS (Chairperson) Cecilia Wanjuu (Rapporteur)

3.1 LINKING INNOVATIVE SMALL AND GROWING AGRO PROCESSORS TO CAPITAL, MARKETS AND TECHNOLOGY

Makeda Tsegaye

Is the Food value chain a challenge or an opportunity?

The challenges include the recent population explosion of about 2.2 billion people, an increase of the middle class which had both positive/negative impacts, urbanization, enhanced technology/ innovation, climate change and changes in consumer taste.

Drivers

The major drivers of Change and Global Food Supply Chain are investment, climate change, governance, and Technology. The positive drivers are more investment opportunities, improved productivity, availability, affordability, utilization improved food packaging and preservation system, efficient food processing and distribution systems. The negative drivers are; the unmet food needs and malnutrition, food safety and health concerns and food loss and food waste

The changes in food systems have been due to increase in income for in all classes of income. East Africa registers a 58% share of purchased food. The way forward is to foster strong partnerships among key actors across the food supply chain. These include the farmers, producers, input and technology suppliers, distributors, processors, retailers and wholesalers, government and Non-governmental organizations, the scientific community, financiers and investors, and consumers.

Social deficit and environmental impact create economic costs for companies. Community weakness affects company productivity. Social needs represent the largest unserved market opportunity.

How do Companies Contribute to Food Security through Shared Values?

They should consider longer term view of investment and Sustainable food value chain as a key element of the core business strategy – e.g. contract farming. Also, natural, fresh, organic and health items sourced from farmers should sell at premium prices. It is important to invest in the food supply chain to create efficiency. Factors to consider are postharvest infrastructure, logistics, energy, modern farm implements and other technologies. Innovations that enhance farmer's productivity, postharvest management, market linkages should be commercialized. Companies can forge impact enhancing partnerships which is a win-win situation.

Shared-Value Enables CIP to Scale-up OFSP. It is a collaboration of the public-sector actors such as (policymaking, regulation, education and smart subsidies) and the scientific community- that promotes innovation, technology, research and development, information and professional advice. Another key player are the food processors, financiers/investors, distributors such as stores/supermarkets, restaurants,

The model is FARM to FIRM for the investment ready agribusiness to facilitate growth in capital, technology and market. The process will involve investment facilitation approach that focuses on providing tailored investment readiness services to innovative and growth-oriented small businesses in East Africa. This has been implemented in Ghana for the industrial use of cassava and in Kenya, EABL breweries and use of white sorghum.

Discussion

How can companies' endorse innovators considering lack of investment? The crucial aspect is to market the willing buyer and seller.

How to attract financiers- create investments that are attractive to business models, product development, operations, corporate governance, and commercial capital availability. However, small scale farmers face the challenge of economies of scale.

3.2 THE CHALLENGES AND OPPORTUNITIES FOR OFSP PUREE BREAD VALUE CHAIN DEVELOPMENT IN AFRICA

A Panel discussion by Tawanda Muzhingi, Regional Food Scientist, International Potato Center (CIP)

Panelists

- **Jean Pankuku**- Food Technologist ,Universal Industries Ltd, 2 Managing Director / Tehilah Enterprise, Malawi
- **Fortunata Mmari** - AFCO Investment Company, Tanzania
- **Faustin Akimanishatse**-Agricultural Production Manager at SINA Gerald / Urwibusto Rwanda
- **Bethwel Lagat**- Factory Manager, Organi Limited, Homa Bay, Kenya.
- **Agnes Mdzomba**-Standards Development Officer, Kenya Bureau of Standards (KEBS), Nairobi, Kenya
- **Antonio Magnaghi**- Applications Director, Euro Ingredients Limited, Nairobi, Kenya

Antonio Magnaghi described his experience in processing of the orange-fleshed sweetpotato. As an ingredient analyst, he said that he is passionate about OFSP. He has learned the chemistry and math involved and how the starch and pectin can be utilized in processing. It is easy to manage, mix and blend the OFSP as a functional ingredient in dairy, bakery, juices products. The nutrition and color of the OFSP is a bonus.

Jean Pankuku addressed if the issue if processing OFSP was profitable in Malawi, a not-so-rich country. She said that it made sense to process OFSP because it was the raw materials and processing facilities were readily available. Wheat is an expensive commodity especially for the country which is landlocked. Therefore, the need to substitute wheat by maximizing on the utilization of OFSP. This reduces the cost of production because the puree has the properties of other ingredients as sugar, artificial color, fat, therefore, a cheaper option, also the bread is softer and nutritious.

Bethwel Lagat addresses the state of puree supply in Kenya. Organi Limited supplies puree to Tuskys and Naivas chain of supermarkets. They supply 1-2 Tonnes of puree for the processing of OFSP bread, buns and scones. Consumer awareness about the products increases the demand for the products and subsequent root supply. This, in turn, increases revenue to the local bakers.

Agnes Mdzomba was asked to discuss why the standards of OFSP and OFSP products do not exist. She retaliated that standards are generated on a need basis. KEBS generates standards for differentiated products by certifying the products, generating codes of practice, and limits for physical, chemical and biological contaminants. They regulate the food processors and industries activities. Standards. A lot of research and information should be available from all stakeholders, based on the Farm to Fork approach in the process of standardization. There are standards for similar products cassava and arrowroots, and potato, fresh and processed products.

Fortunata Mmari discussed if there was room for processing of OFSP in Tanzania. She acknowledged that the root is an innovative product that is reducing instances of Vitamin A deficiency in SSA. Africa Investment Company used to produce OFSP flour. This is an expensive process. Currently, fresh roots are available in the local markets and supermarkets. The supplies are at 1 Tonne per month in supermarkets and 4 Tonnes per month in Kariokor market Dar es Salaam. However, there are challenges of storage and demand. The latest innovation is the use of a Solar drier that hardens the OFSP skin and

extends the shelf life for 2 weeks. Cold storage of solar dried roots extends their shelf-life for by one month. The company is currently piloting puree production that will be the functional ingredient in baking for 2 bakeries.

Faustin Akimanishatse addressed the situation of OFSP processing in Rwanda and how the market is responding to OFSP products. SINA enterprise is involved in the processing agricultural products, biscuit and doughnuts since 2010. There is need to provide technical assistance to the farmers by supplying sustainable raw materials. The processed products are acceptable to the consumers. They receive 1-1.5 Tonnes of OFSP puree per week for processing. The enterprise utilizes exhibitions to grow the market. The biscuits and doughnuts sell because they are organic**.**

Discussion

Since the certification process is rigorous and time-consuming what are the measures available for use as we wait for the specific standards? Agnes affirmed that there are temporary measures available and standards that can be adopted for the OFSP and OFSP products. The certified body provides a Quality Assurance officer to foresee the standards development process.

The issue of peeled/unpeeled OFSP puree, consistency of puree supply, Cost analysis, Bethwel confirmed that the unpeeling the sweetpotato saved up to 30% of waste. This has increased the yield of puree with up to (85-90%). The unpeeled OFSP puree is also nutritious providing dietary fiber to the consumers. OFSP products have analyzed and certified by KEBS. Organi faces the challenge of consistency in the supply of OFSP. Studies on how to store the root are underway, with the aim of ensuring consistency in supply in all seasons. The use of flour is expensive, puree costs 0.65 USD/Kg. Processors may pay more for the puree, but costs are reduced because they do not require other ingredients such as sugar and fat.

How to ensure that everyone in the rural areas has access to the nutritious OFSP? The processing of OFSP puree is easy and can be done at home.

Concerns about the shelf-life of OFSP products. No need to use calcium compounds to extend shelf-life of the baked products. The puree promotes stability of water activity, hence improved shelf-life.

3.3 EVALUATION OF TEN GENOTYPES OF SWEETPOTATOES FOR FRIES

Damian Laryea

Snacks especially fries have gained popularity in Ghana. However, there is limited information on the end-uses of the newly released sweetpotato varieties and genotypes from advanced trials of the CIP-breeding program.

The objectives were to determine the dry matter of 10 varieties fresh roots, to determine the sensory properties of the sweetpotato fries and to determine the fat, moisture, color and β-carotene content of the fries.

Evaluation 10 genotypes of sweetpotato fries

Apomuden had the least dry matter content and its fries had the highest sweetness score. The sensorial attributes varied among the studied genotypes. Browning index was highest in the orange-flesh and purple genotypes. Nanungungun had the highest beta-carotene retention.

3.4 PHYTOCHEMICALS CONTENT OF SELECTED KENYAN ORANGE-FLESHED SWEETPOTATO (OFSP) VARIETIES

George Ooko Abong'

The SSA is faced with the challenge of malnutrition with about 153 million people severely food insecure. This means that there is the challenge of meeting the Standard Development Goals (1. poverty 2. Food security). The staple foods are critical to food nutrition and security even though they are seasonal and faced with numerous drought episodes. The alternative is to have bio fortified crops and value-added nutritious products.

The OFSP is such a crop rich in provitamin a carotenoids, with a low-medium glycemic index (GI), antioxidants such as flavonoids, vitamin C, phenolics, and anthocyanins. The crop is resilient and can grow on marginal lands. It is also dual-purpose so that the leaves and roots can be utilized for food security purposes.

There is the need to analyze other beneficial phytochemicals in addition to the beta-carotene. This will give additional important for the promotion of OFSP. There are variations of the phytochemicals in sweetpotato leaves and roots, leaves being superior in all aspects evaluated including antioxidant properties. Tannins found in the leaves are anti-nutrients because they are water binding, therefore unavailing water-soluble nutrients such as iron. This information is important for diets and ration formulations. Determination of the effects of processing methods on these phytochemicals, give a better picture of the actual amounts being ingested by consumers of different OFSP products.

3.5 SOME QUALITY ATTRIBUTES OF JAM AND A NON-ALCOHOLIC BEVERAGE FROM ORANGE-FLESHED SWEETPOTATO

Ganiyat Olatunde

Nigeria is one of the leading producers of Sweetpotato in Africa (FAOSTAT, 2014). The nutritional potential of the OFSP has not been fully exploited due to limited awareness about the root, limited availability, seasonality and price fluctuations, high perishability, limited storage technology and minimally processed products.

Processing of OFSP addresses the limitations highlighted, adds value to the root, encourages product production and innovation, creates demand and generates employment, therefore increasing incomes and improves livelihoods.

The processing options of OFSP at domestic level include home recipes and dishes, or industrial processing of flour, baked products, fries and crisps, extracts such as starch, syrup, and sweeteners. Processing of a non-alcoholic beverage and jam will give additional health benefits to the consumer because of its high nutritional benefits such as beta-carotene content. The beverage and the jam were acceptable with favorable total soluble solids, titratable acidity, vitamin C, total carotenoids, and total sugars. The products from OFSP roots have quality attributes that could be exploited for commercial production.

Discussion

What did you use for frying? They used soybean oil in frying, for roots that were 4.5 months old. They considered the size of the fries before frying them.

Where there any studies on acrylamides on the fries? He stated that they did not do it.

George addressed the question about the limits of the phytochemicals in foods. He requested for assistance in finding the specific limits and minimum values for the same.

3.6 FARMERS INTERACTIONS- HOW FARMERS HAVE BENEFITTED, AND INSIGHTS FROM OSFP VALUE CHAIN DEVELOPMENT IN MALAWI

Two farmers from the districts of Blantyre and Nsanje in Malawi were invited to give their experiences regarding growing the OFSP. They named some of the challenges ranging from flooding and extreme drought. **Daniel Mbebuwa is a DVM who got the vines from CIP** and distributes them to other farmers. They cultivate the roots in groups. This way they can manage pests and diseases. They are paid as a group but share the money among the members. Bought a bicycle and a cow from growing OFSP.

Daniel Mbebuwa and Petno Zhuwaki

Another farmer, **Petno Zhuwaki** affirmed that he practiced farming of the root together with other farmers in a group. He asserted that the roots have improved their livelihoods. He has managed to build an iron-roofed house and a cow from proceeds received. Since its inception, the number of members of their groups has improved from 60 to 224 members, of whom 165 are women, and 59 are men. He has been certified by Department of Agricultural Research Services (DARS) as a multiplier and supplier of vines to members of the group. The OFSP is a source of nutrition and income. The root is bought by the members or marketed elsewhere. However, there are challenges of delays in payment, but when the finances arrive, they help them a great deal. The challenge of diseases has forced them to rotate the root with other crops such as tomatoes. There is also the challenge of storage. The pamphlet received on how to store the root would assist them in solving this problem.

The farmers have their own marketing initiative where vendors buy 15 tons of the roots in batches. They have an agreement on the terms of sale, selling time and price. To be a member of the group, a farmer pays a subscription fee of 0.7USD. Cultivation happens on individual and common plots. Individual plots generate income for the owners.

4. Session 4 John Macey (Chairperson) Felistus Chipungu (Rapporteur)

4.1 OPPORTUNITIES FOR UTILIZATION OF ROOTS, TUBERS AND BANANA (RTB) BY-PRODUCTS AND WASTE

Gerald Kyalo

The utilization of Roots, Tubers and Bananas (RTB) in fresh market and in processing chains generates significant amounts of by-products. The wastes include sweetpotato peels and vines, banana peels and peduncle, cassava peels and liquid wastes from cassava processing, potato peels and effluent from potato processing and pollutants such as smells, unappealing sites that are infested with pests and insects. Also, there is the global concern about emissions of methane which is a greenhouse gas that is more potent than CO_2, during anaerobic fermentation.

The solution would be to use banana peels and peduncle as animal feed, ethanol production, and using the wastes as a bio-mulching film. The potato, yam and cassava peels can be used in mushroom production, as biogas, animal feeds, fermentation enhancers, and a medium for yeast growth and propagation. The cassava bagasse is useful in the extraction of antioxidants and as a starch-cellulose binders.

The management of waste/by-products is important as it is an opportunity to increase the profitability of post-harvest processing of RTB crops. Also, there is the necessity to comply with the increasingly stringent environmental regulations.

For purposes of economic benefit, reducing the environmental footprint of RTB processing is becoming an integral element of corporate social responsibility programs and private sustainability standards. Therefore, there is the need to extract more value and revenues from a given quantity of raw materials and reduce costs of waste management at the enterprise level. The aim is to near the zero-waste economy. Waste management provides employment for the women and youth.

The regulatory and policy factors require compliance with the country's environmental laws regarding waste management. RTB waste can be critical in addressing packaging gaps by providing fibre/residual starch to produce various bio based packaging material.

Some programs are underway to curb waste management. These are silage work under RTB Endure in Uganda, SASHA 1 work in Kenya, silage work in Vietnam by CIAT and CIP. In Uganda, some entrepreneurs are already making and selling SP silage as pig feed. The GRATITUDE project uses cassava and yam peels for mushroom cultivation by Federal Institute of Industrial Research, Oshodi (FIIRO). The technology is already commercialized by NIJI LUCAS group in collaboration with Feed the Future Project, IITA and ILRI. There is the bagel work by the Biomass Web project in Nigeria, led by FIIRO.

4.2 FORTIFICATION OF CASSAVA WITH VITAMIN A THROUGH THE USE OF ORANGE-FLESHED SWEETPOTATO (OFSP) DURING PRODUCT DEVELOPMENT AND THE ESTIMATED PROFIT MARGIN

Madjaliwa Nzamwita

Cassava is among the major food security crops in Sub-Saharan Africa. It is a staple food and the fourth most important source of carbohydrate in the tropics after rice, maize, and sugar cane. However, the cassava is deficient in β-carotene. In this study, the fermented roots, commonly known as kwanga and cassava flour were mixed with OFSP with the aim of fortification with Vitamin A. A total of sixteen new products containing various forms of OFSP and cassava were developed. All the products were subjected to sensory analysis and were found to be acceptable by the consumers. Therefore, these could be used as foods that will vitamin A deficiency in sub-Saharan Africa and other developing countries.

4.3 CLIENTS AND METHODS MATTER: THE RELATIONSHIP BETWEEN BREEDERS, NON- INDUSTRIAL FARMERS AND EMERGING SWEETPOTATO SYSTEMS

Mercy Kitavi

Plant breeding is the art and science of changing the genetics of plants for the benefit of humankind. It is done to improve the genetic potential of plants and the process involves combining parental plants to obtain the next generation with the best characteristics. Breeders improve plants by selecting those with the greatest potential based on performance data, pedigree, and more sophisticated genetic information. Breeding improves the plants quality food, feed, fibre, fuel, shelter, landscaping, eco-systems services and a variety of other human activities.

The role of plant breeding is to guarantee food security by developing new varieties that are higher-yielding, resistant to pests and diseases, drought-resistant or regionally adapted to different environments and growing conditions. The desirable characteristics of the OFSP include high β-carotene content, improved storability, high dry matter content, round shape, chipping qualities, size, good flavour, firm texture, easy to wash and peel, high tolerance to heat and drought, improved frying qualities, and less browning.

Breeders can achieve this through active networking and a steady exchange of information and knowledge. This creates synergies that enhance the outcomes and accessibility of information to the end-users.

A coordinated approach offers opportunities for innovation that builds on the shared needs. This will result in achievement of the economies of and at the same time avoid overlaps.

However, there are challenges due to lack of raw materials because the OFSP relies on rainfall. Also, the roots do not have the desired geometry. Most are long tapered which makes it susceptible to injuries during harvest, packaging and transport. Breeders depend on the knowledge in the genetic relationship in the parental materials before making crosses. CIP breeders are now utilizing heterosis (combining ability and performance of different parental materials) in identifying varieties, selecting parents and keeping track of landraces and released varieties through DNA fingerprinting.

Discussion

Gerald Kyalo- On the models of waste management presented, one may choose a combination of models depending on the products and also strategies or donor policies.

Madjaliwa Nzamwita Upscaling of products developed is through a recipe book that has been developed. Beta-carotene analysis on final products is yet to be done e.g. example in Chikwangwa to assess beta carotene retention.

Mercy Kitavi- She summarized that breeding alone will not achieve high yields, but farmers also need the right practices. Breeding also targets end users therefore evaluation should be in multi-environments; or farmers participating in non-sweet sweetpotato variety selection. Thus, clients and methods of breeding matter to meet increasing food demand, prevailing undernourishment in SSA. Diverse of sweetpotato naturally exist to address such demands. Farmers experiencing low yields should be trained on agronomic practices and also choosing a variety that fit their environments best.

5. Session 5 Charity Kambani (Chairperson) Wells Kumwenda (Rapporteur)

5.1 Orange-Fleshed Sweetpotato Compact -Technologies for African Agricultural Transformation (TAAT), CIP, Africa Development Bank (AfDB)

Sindi Kirimi

More than 160 million Africans are food insecure & malnourished. Over 32 million African children under 5 are underweight, with ~ 10 million severely so; 14.3 million wasted (with low weight for height). Africa's recent economic gains are at risk if this continues. Low agricultural productivity & value addition are at the heart of the malnutrition, employment & income challenges in Africa. Agriculture accounts for 50-70% of employment in African countries but produces only 25% of Africa's GDP.

Productivity Gap

- Weak linkages to the market
- Insufficient attention to private sector value chains

- Weak policy and regulatory environments
- Insufficient effort to take existing technologies to farmers at scale
- Limited Government investment in the Agriculture Sector

The Context

The Bank & its partners, therefore, seek to refocus the technically excellent but hitherto uncoordinated efforts of CGIAR and others & their network with NARES (represented by the continental umbrella, FARA).

The result will be a Regional Technologies Delivery Infrastructure (RTDI) with emphasis on agro-ecological zones & priority commodities that will reach 40-50% of African farmers with the most relevant food production technologies by 2025.

Figure 3 Sustainability of TAAT

Opportunities in TAAT

- Embrace a new approach needed to scale technologies
  - Cut back on unnecessary regulatory bottlenecks
  - Fast track release of technologies across similar AEZs in one go
- Help to open the regional seed industry/markets & lead to
  - Faster uptake of technologies

This is what TAAT will do through the Regional Technology Delivery Infrastructure (RTDI) of CGIAR centers & other technology providers, NARES, FARA & SROs. TAAT will work in concert with other initiatives to foster deployment of commercially viable technologies with improved access to markets/other enablers.

TAAT PROGRAM COMPONENTS

- The creation of an enabling environment for deployment and adoption of food production technology by farmers

- Regional Technology Delivery Infrastructure (RTDI) –provision and deployment of needed food production technologies
- Deployment of appropriate food production technologies, through crop/livestock campaigns in RMC. via increased food security and income,
- raising farmer's household incomes by an average of US$600 per annum, reaching an estimated 11.7 million households, representing on average 40 million people, over ten years, and reducing by as much as a third the total number of hungry people on the continent. The increased food production will also influence food prices, reducing the amount households spend on food, and further increase access to more food, in a positive feedback loop. TAAT is expected to add 3.15 million direct farm jobs over eight years.

The Focus; the 9 Priorities Value Chains for Food Production Technologies

- Water Efficient Maize for Africa (WEMA),
- Import-quality rice for the West African lowlands,
- Cassava for industrial use,
- Small livestock (goats and sheep),
- Sorghum/millet for the Sahel,
- Aquaculture
- High yielding wheat varieties
- Orange-fleshed Vitamin A rich sweetpotato varieties
- High iron beans varieties for Africa

OFSP compact will pursue three specific objectives:

- Objective 1: Increased productivity and production of OFSP among smallholder and large-scale farmers
- Objective 2: Improved incomes from roots and processed OFSP based products along the value chain
- Objective 3: Create awareness about the nutritional benefits and the availability of OFSP fresh roots and processed products

Proposed Countries of intervention

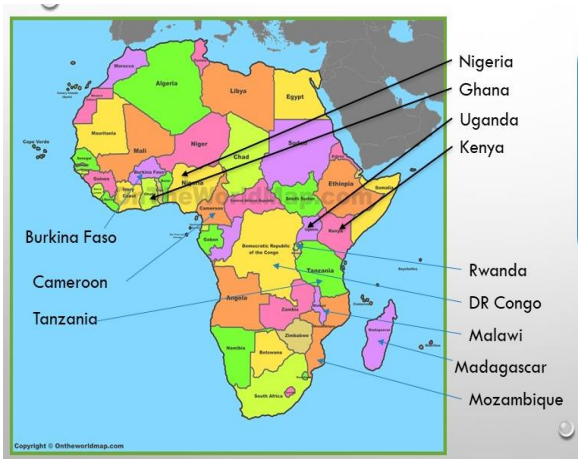


Figure 4Proposed Countries of intervention

TAAT intends to reach per country:

- 2 large, 5 small-scale processors
- 10 vine multipliers
- 200 farmers linked to the value chain
- 40,000 farmers and
- 100,000 consumers

Technology Toolkit

Technology key traits:

- High in Vitamin A
- High yielding –most of the varieties yield above 25 T/Ha and can get up to 40 T/Ha compared to the farmers varieties that yield 3 -7 T/Ha
    - Early maturing –between 3 -4.5 months compared to farmers varieties that mature between 5 -7 months
- Some varieties are drought tolerant
- Moderate to high sweetpotato virus tolerant
- Silage technology for animal feed

Associated technology package

- Building OFSP Seed System within each country to ensure high quality seed
- Good agronomic practices
- Vines conservation to ensure material lasts longer in the farmers field
- Nutrition trainings for food diversity–pull mechanism for adoption
- Household and processor level trainings of product development and marketing
- Post-harvest handling in harvesting and storage
- Linking producers to the market –processors, restaurants and wet markets

Enabling Environment

- Work with the governments to have well defined seed law that recognizes the
- certified seed and quality declared planting materials
- Work with the government and NARES for seed multipliers to access OFSP basic seed
    - Work with the National Bureaus of Standards to recognize sweetpotato puree as
- An ingredient for different products (Bread, Cakes, Biscuits, Ketchup, spaghetti, Yoghurts, Ice-cream, Juice, etc.
    - Work with the governments to ensure that sweetpotato (OFSP) is part of their priority crops in particularly for nutrition and incomes

Way forward

This is not a traditional project that builds everything but in partnership of already going projects and partners.

- Discussions with country TAAT leaders to finalize country action plans
- Launch of the TAAT project in each country with a planning meeting with all partners
- Cementing the partnerships in each country (this is not a CIP project but a partnership)
- We need quick wins to ensure that we have something to deliver before November 2018
- We will quickly set up an online MLE system that will be used by all project partners

Questions

What will be the criteria for selecting role players?

Key partnerships will be based on mapping key players who have participated in the last 5 years.

How can we ensure that the Governments commits?

It will be important to build a relationship with the government by making them aware of the project without attempting to outshine them. It is important to be ubiquitous by presenting attractive products and services to the government officials. There is the need to harmonize standards and policies for purposes of advocacy.

5.2 INTER-COP INTERACTIONS DISCUSSIONS (THE ROLE OF EACH COPS IN END-USER PREFERENCE OFSP BREEDING)

Facilitator: Dr. Tawanda Muzhingi ***Rapporteur: Wells Kumwenda***

Panelists:

Luka Wanjohi-Senior Knowledge Management Associate, CIP (MLE CoP)

Srini Rajendran-Agricultural Economist, CIP (Seed Systems CoP)

Mercy Kitavi-Molecular Breeder, CIP (Speed Breeders CoP)

Sindi Kirimi -Marketing, Processing and Utilization CoP

Why COP (Jan Low)

OFSP has gone through a diverse progress in SSA therefore there is need for special technical skills that is why Community of Practice groups were formed. These groups include: Seed systems, Marketing, Monitoring and Evaluation and Breeding. The groups meet regularly and evaluate progress achieved so far and give feedback to each other. The objective of this panel was to enable each of these groups to talk to each other and highlight their objectives and identify gaps.

ICT systems

The ICT group keeps everybody connected and it is involved in timely data collection and analysis.

Breeders

The role of breeders is to come up with new varieties that are acceptable by the consumers and processors, but the current question is what agenda do they focus on?

Up to now several surveys have been conducted on sensory tests, processing and other attributes but there has been a failure to package this information and forward it to the breeders.

Several problems have been noted including the following:

- Consumers want a product/shape of the roots to be of a specific shape which is crucial in processing not just high yield or pest tolerant.
- Storage life – The market wants a root that can keep for a longer life in storage so that it can be transported far from the production area and kept for a longer period.
- Different consumers require a specific root: for example, House hold consumers require a root that has high dry matter content which might not be the best for processors of puree which require a soft fibrous free root. To the breeder these roots behave differently.

Seed systems

There is need for critical linkages that should exist between the breeders and consumers to enable the systems to be successful. There are various stages along the seed chains that need to be followed for it to be successful. On the business angle, how can farmers get good planting material on time? This requires the breeders to release the right breed on time which is clean of diseases.

However, there are some challenges:

- Most farmers are not willing to buy improved vines, they prefer to get them free from other farmers.
- Improved early generation vines are bought and given free of charge by some NGOs whereby stifling the demand for purchasing from the vine producers.
- There is limited information flow about the demand of vines and roots on the market which the producers can plan to respond to during the production planning.

Response from the panel members

- The panel acknowledged that COP is the best way to go to sort out emerging problems because this brings in more ideas and new thinking due to the diversified composition of its members.
- It was agreed that breeders need to produce seed that is satisfactory to the consumers but there is need to inform breeders about the needs of the consumers so that they can work towards those needs.
- Breeders are working on traits that can help on characteristics such as shape, colour and dry matter.
- Shelf life is tricky because different countries have different weather patterns for example in Africa there are different climatic zones ranging from the hot ones which might be more problematic than the cooler ones. Cooler countries can easily keep the roots better for a longer period than hot countries.
- It is not easy to improve the Beta-carotene and the dry matter of the roots at the same time as these characteristics are not collected. As you increase the beta-carotene you find that the dry matter reduces but breeders are working on isolating the traits at the chromosome level so that they can match the useful ones to improve the roots.

- The key aspect of ICT in the COP collaboration has been in showing the evidence of the benefits of OFSP in the communities. It has also produced a monitoring manual with standard data collection and reporting methods so that there is uniformity and quick data aggregation. There are nine modules in the manual that define the activities that can be used in monitoring and evaluation.

Discussion

Roland Brewer CIP-Ethiopia: MPU should put more emphasis on marketing issues because this is very crucial.

Antonio Magnaghi from Kenya: Private sector should be invited to the COP meetings because they can present to the meeting current consumer demands. Breeders should work on the colour of the roots because processors would like to maintain it to reduce time and labour of removing it at the same time it is more nutritious to incorporate skin in the puree.

Gerald Kyalo from Uganda: The size of roots must be considered as too big roots are not liked by some consumers such as processors. The seed systems should rigorously follow up inspection protocols to make sure that farmers get good seed.

Anna from Ghana: Seed systems should consider the changing environment. There is need for breeders to follow up the behaviour of varieties over the seasons to make sure that they are consistent.

There is need to create dialogue between the breeders and the consumers so that all concerns about colour, root size, beta-carotene and dry matter are considered.

5.3 DESIGNING NUTRITION EDUCATION FOR BEHAVIOURAL CHANGE: EXPERIENCES FROM QUALITY DIETS FOR BETTER HEALTH IN SNNPR, ETHIOPIA

Jan low presenting for Emily Faeber

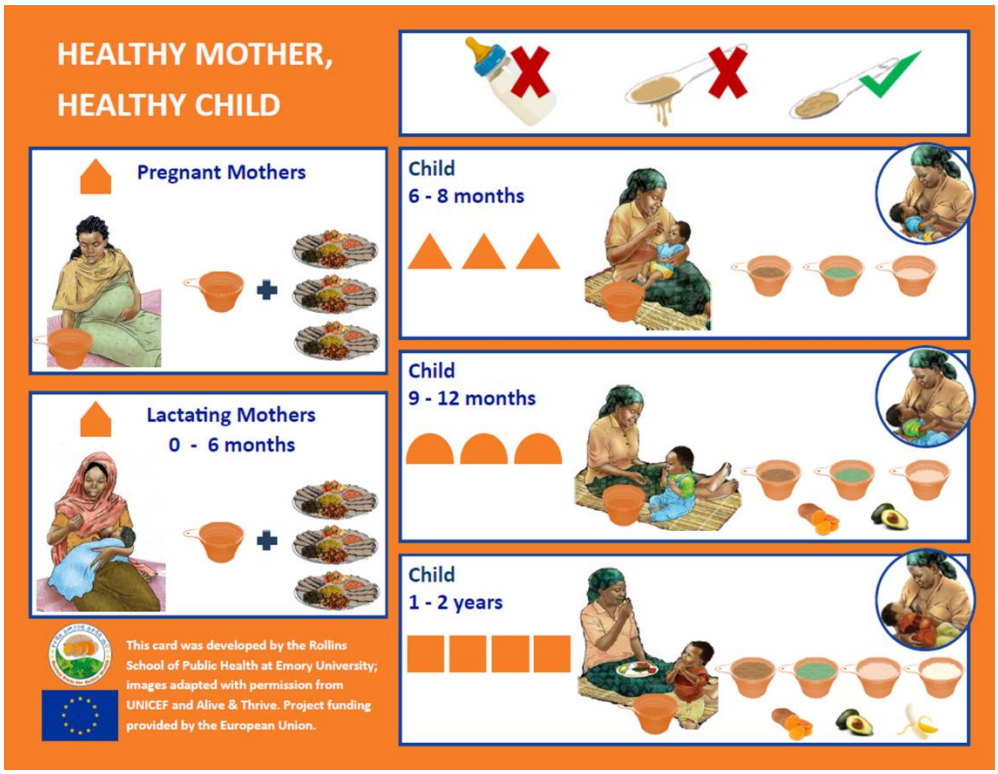
The nutrition program aims at providing Quality Diets for Better Health. The target population is the Southern Nations, Nationalities, and Peoples' Region (SNNPR), in Ethiopia.

The objective is to improve diets of women and young children by introducing a reliable, bioavailable source of vitamin A and energy into the food system. The target population are households with pregnant women and/or children < 2 years. The approach will be to support homestead production of orange-fleshed sweetpotato (OFSP).

The Health Living Clubs to disseminate nutrition and agriculture education. They provide Healthy Baby Toolkit that determines the portion size, meal frequency, nutrient density, and a counselling card that educates about the dietary diversity hygiene.

The Healthy Living Clubs consists of groups of 30 households, made up of mothers, fathers, and (sometimes) grandmothers. The meet approximately monthly, for 8 months, to learn about nutrition and/or OFSP agriculture. The clubs are facilitated by a government and are sponsored by volunteers from the communities. Often older mothers or grandmothers with experience provide counselling services. Government-employed health extension workers

(HEWs) train volunteers and support their activities. They identify barriers, facilitators and motivators of current and recommended practices. Also, assess the acceptability of project components (OFSP, Healthy Living Clubs, and Healthy Baby Toolkit). The methodology targets Focus Groups Discussions (FGDs) with mothers, fathers, and grandmothers and Key Informant Interviews (KIIs) with health workers and community leaders.



There is a specific desired behaviour change for each audience segment, for instance, the mothers will prepare and feed thicker porridge. The motivators of the desired behaviour will be identified in the formative work like the mothers want relief from breastfeeding. The key messages will be that feeding thicker foods will keep a child full longer. They will not need to breastfeed as often and this can provide relief for mothers from breastfeeding.

Each month, the community health workers train volunteers to prepare for the session. Each session includes a review of last session, problem-solving of challenges faced in reaching goals set in the previous session, activity such as audio stories or cooking demonstration, gender-specific discussion time, key message, and goal setting.

The audio Stories ensure that the message fidelity across communities. It relieves community volunteers from having to read long scripts or detailed instructions. The characters include mother, father, a community health worker, and a trusted community leader. By the end of the session, there are discussions and questions that prompt the mothers, fathers, and grandmothers to act.

The monitoring and evaluation session has specific checklists, monthly debrief sessions with supervisors and periodic household visits to monitor the progress of the participants. The

evaluation process includes a longitudinal survey with the families in first the Healthy Living Clubs (and control households).

However, there are challenges involved during training. At times the message fidelity and detail are lost at every step down in the training. There are delays in the printing of educational materials due to budget concerns. There is the issue of language barrier since the project covers 2 zones with different local languages. The materials (audio stories) should be in a language that is most comfortable for participants. During the process of monitoring, there are many field activities and project staff seem to have competing interests. This results in less attention to monitoring activities. Also, the agriculture cycle may not favour the Healthy Living Clubs. Ideally, the sessions should line up with agricultural cycle. For example, OFSP nutrition education during OFSP root harvest. Additionally, the rains have been unpredictable in the past year.

In conclusion, the formative work helps to understand where we start and what drives behaviours. Behaviour change requires more than just telling someone to do something since one must first understand what influences behaviour to best know how to promote behaviour change. It is necessary to incorporate adult learning theory into any behaviour change intervention. The main components of adult learning theory must include experiential learning.

6. CLOSING SESSION

6.1 VOTE OF THANKS BY PARTICIPANTS

Jan Low appreciated the work that has been done by CIP, and the efforts that the CoP has made to bring the international organizations on board. She also commend the work by the CIP team into planning the meeting.

6.2 AWARD OF POSTER PRIZES

The award of prizes for the best poster presentations was done by Jan Low.

1. Felistus Chipungu, F.P., Kapalasa, E., Chadzala, T. and Kazembe, J. - Poster 15 Integration of Orange-Fleshed Sweetpotato (OFSP) in Small-scale Enterprises- Case for Nsanje women
2. Cecilia Wanjuu- Poster 12 -The Physiochemical Properties and Shelf-life of Orange-Fleshed Sweet Potato (OFSP) Puree Composite Bread
3. Agnes Mzomba- Poster 9 -KEBS Standards Development as a Strategy for Creating Sustainable Market Access for OFSP
4. Evaluation of the evaporative cooling systems (Zero Energy Cool Chamber) for Sweetpotato Roots Storage

ANNEXES

Annex 1: Marketing Processing and Utilization Community of Practice meeting evaluation report

Luka Wanjohi, CIP-Nairobi, 26th May 2018.

Introduction

The 2018 annual Marketing Processing and Utilization (MPU) community of practice (CoP) meeting was held on the 23-24 April 2018, at the Lotus Resort, Blantyre, Malawi. Participants were requested to evaluate the quality of the sessions and the general logistics that went into setting up the meeting. A total of 37 participants responded to the evaluation call out of the 75 participants who attended the meeting. The evaluation was carried out using paper and the data subsequently digitized using CSPro.

Participation by age, gender and organization

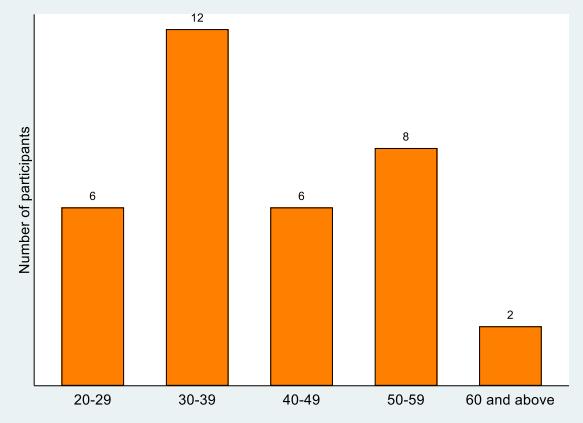


Figure 1 Age distribution

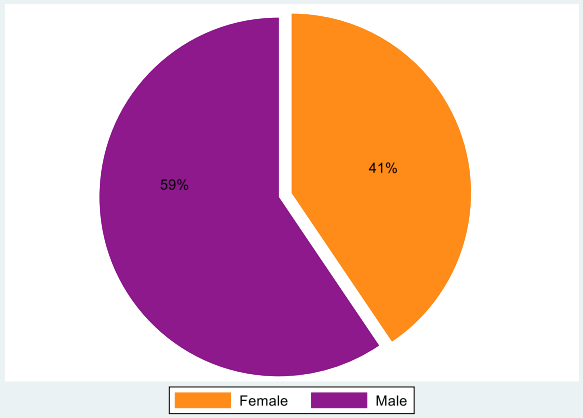


Figure 2 Participants by sex

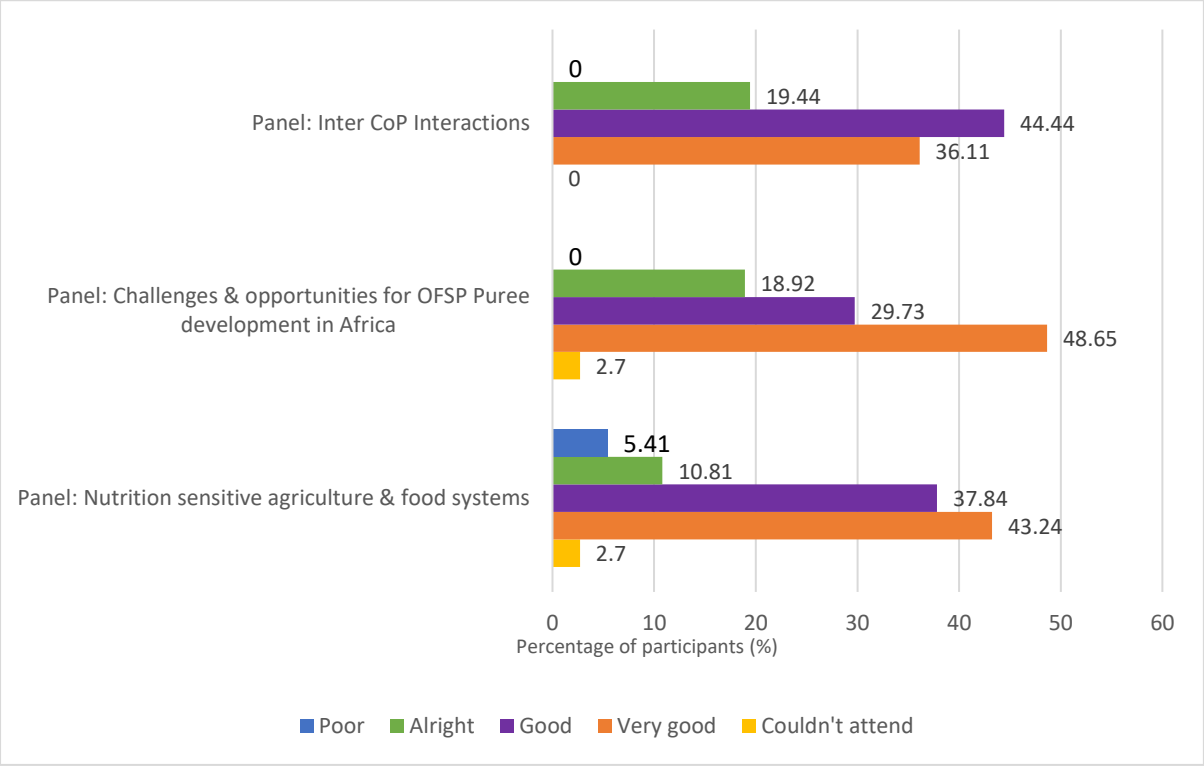
The age of the participants ranged from 22 to 62 years. Three respondents did not provide their age. Majority of the respondents were male at 59%, with female respondents standing at 41%. 46% of the respondents were from research-based organizations. One respondent did not attend the first day of the meeting.

Presentations, Panel and Poster Sessions

37.8% of the respondents reported the meeting exceeded their expectations, with 54% reporting the meeting completely met their expectations.

3. Did the meeting match your expectations?	Freq.	Percent	Cum.
Somewhat	1	2.70	2.70
Most	2	5.41	8.11
Completely	20	54.05	62.16
Much more than I expected	14	37.84	100.00

The second panel on challenges and opportunities for OFSP puree bread value chain development in Africa was rated as very good by 48.65% of the respondents followed by the panel on nutrition sensitive agriculture & food systems with a very good rating by 43.24% of the respondents.



The poster session was well rated by all the respondents, with all the responses being alright, good and very good. Many participants listed the panel sessions as the most useful part of the meeting. Some participants mentioned time allocated to different sessions as not being enough.

9. How would you rate the quality and usefulness of the poster session?	Freq.	Percent	Cum.
Alright	8	22.22	22.22
Good	13	36.11	58.33
Very good	14	38.89	97.22
Not Applicable - couldn't attend	1	2.78	100.00
Total	36	100.00	

Two respondents said they did not attend the field trip. The rating of the field trip from the rest of the respondents was 57% very good, 34% good and 9% alright.

Summary of most useful parts

- Sharing | Presentation of individual Research/Abstract
- Presentations, discussions, field trips, posters were useful
- Poster presentations / video on puree processing | Field trip
- Breeding presentation
- The panel discussions with presenters.
- Inter-CoP interactions
- Interactions with farmers
- Information in the flash disks/folders are also informative
- Nutrition
- Business model for investing in puree
- The business model of OFSP
- Economics of business models
- The assessment of the awareness of OFSP in rural areas
- The presentation from TAAT - moving planting varieties materials across countries
- TAAT OFSP compact and implications for CIP and CGIAR center model
- Presentations mainly TAAT and the experience from Ethiopia (Jan Low)
- The way forward from African Development Bank
- Project on nutrition - Dr. Jan Low
- Linking innovative small and growing agro problems capital, markets & technology
- Session 2
- Sharing information on product development
- Feedback from four units
- Storage of OFSP
- Clients & methods matter; The relationship btw breeders, non-industrial farmers
- Microwave technology & side discussion with speaker
- Utilization of the waste byproducts
- Invitation of private partners to share technology
- Designing Nutrition education for BC-Ethiopia (and others)
- Partnership
- Financial analysis of puree processing option
- The display tables and posters put up across the meeting room making or simplifying the SASHA-SPHI initiative visually.

Summary of least useful parts

- Some discussions were participated mainly by the panelists themselves
- Limited time for the same presentation
- Poster session given too short time
- Interacting with internationals on OFSP
- The presentation from outside Africa. They cannot be implemented in Africa.
- Thermal preservation of OFSP

Suggestions for future sessions and improvement

- Field trip should have included visit to field not marketers
- Consumer education and trust on OFSP products. Farm to fork (processing visit)
- Training day on making quality SP puree
- Community based OFSP processing, preservation & storage
- Include something in grading of roots / Quality of supply to processors, weevil problem.
- Scaling up activities - production & processing
- Life time of the products made with OFSP studies. More about the presentation of OFSP at the community
- More presentation on product development on OFSP processing
- Marketing the OFSP products
- Each organization should present what they have done on OFSP in their respective countries e.g. GVT, NGO, PMT etc.
- Concrete conclusion on each day with key taken home messages of that day
- Organizers have to check the implementation of the past meetings.
- Success stories and progress made from research and private sector (farmer, processor, market) linkages
- I saw the invitation from the Ministry of Health. I did not see them participate in the meeting. This is a lost opportunity because Ministry is key to the strategy to stimulate domestic demand for OFSP. Unless domestic demand is stimulated it will be different to pull production because the demand is no
- My suggestion for next year is to take a topic concerning trade onion
- Need to pair participants up among the research and the field & CIP groups for in-depth interaction especially researchers from the universities.
- Topics to cover next year: Assessment of return on investment in OFSP value chain from production of roots / vines to processing and marketing in different countries
- Increase panel discussions. Reduce number of presentations
- I think that we should avoid transforming CoPs in scientific meetings. The form should remain on learning and exchange, looking for ways forward.
- Session on understanding bio accessibility & bioavailability.
- Sharing on other approaches to nutrition education / behavioral change
- More on how to incorporate business into OFSP and involve the youth as well in the OFSP.
- The discussion was more interesting and many issues were coming out. Next time, we might need to talk more on advocacy & social behaviors change in relation to OFSP.
- The time was very limited the program was so complex. It required more than 2 days to fully understand all the sessions.
- I do appreciate the activities I saw so far. I suggest if the time is extended by at least one day so that participants can share more experiences. Moreover, to suggest if more time and attention is given to posters.

Meeting organization (logistics and communication)

Majority of the participants rated the meeting organization as being very good. Some respondents however would like to have more time allocated to the meeting in the future to the different presentations and to allow for more time for social activities. Internet connectivity was also mentioned by some respondents as another area that needs improvement in future meetings.

5. How would you rate the meeting in terms of organizatio n (logistics, communica	Freq.	Percent	Cum.
Alright	5	13.51	13.51
Good	14	37.84	51.35
Very good	18	48.65	100.00
Total	37	100.00	

Summary of logistical areas needing improvement in the future

- ICT: Internet connection
- Power (electric interruption)
- Time keeping issues
- Very poor internet connectivity
- Give more time for the meeting, because involve more sessions and a lot experience exchange
- Challenges with internet
- Extend days so we get to rest/see the city
- We needed a little more time for the poster session.
- Good and convenient venue for an international conference. Extend the presentations to others outside research. i.e. extension
- The number of days for the meeting is small. I think 3-4 days should be considered.
- Too tight provide a two-hour trip to shopping mall

Annex 2: Agenda

COP Marketing, Processing and Utilization meeting

Lotus Resort, Blantyre, Malawi

April 22-24, 2018

22 April, 2018	Arrival of participants	
22th April, 2018		
16:00 – 18:00	Registration and Sweetpotato Knowledge Portal training & publishing	Emily Ndoho, Faith Njung'e and Luka Wanjohi
23th April, 2018		
	Session 1 Chair/Rapporteur Jan Low (Chairperson) Faith Njung'e (Rapporteur)	
8:00 – 8:15	Welcome to participants and Introduce the CoP MPU meeting	Jean Pankuku- Chair person, Root and Tuber crops Development Trust (RTCDT)
8:15 – 8:30	State of Food Security and Nutrition in Malawi	Dr. Wilkson Makumba
8:30 – 8:50	Assessment of The Awareness of Orange Fleshed Sweetpotato And Its Utilization in Rural Areas of Kwara State	Kolawole, F. L
8:50 – 9:15	Energy and Micronutrient Densities of Complementary Foods Developed from a Composite of Teff, Soybean and Orange-fleshed Sweet Potato	Mesfin W. Tenagashaw
9:15 – 9:30	Comparative studies of OFSP Flour and Puree-based Complementary Foods and its Commercialization	Damian Laryea
9:30 – 10:10	Integrated Agriculture, Nutrition Education and Marketing with Biofortified Orange-fleshed Sweetpotato (OFSP) in Southern Highlands of Tanzania for Improved Maternal Knowledge, Food Security and Dietary Intakes.	Fredrick Grant
10:10 – 10:30	Discussion	Daniel VanVugt
10:30 – 11:00	**Group photo and Health break**	
	Session 2 Henry Kalomba United Purpose (Chairperson) Faith Njung'e (Rapporteur)	
11:00 – 11:45	Panel Discussion-Nutrition sensitive agriculture and food systems CRS, HarvestPlus, CIP MISST, CIP VISTA	Robert Ackatia
11:45 – 12:15	Thermal Preservation of Orange-fleshed sweetpotato	Michael Druga
12:15 – 12:30	Public-Private Partnership Business Models for OFSP Puree Processing	Srinivasulu Rajendran

12:45 – 13:00	Discussion	Ganiyat Olutande
13:00 – 14:00	**Lunch**	
Session 3 Ephraim Chabayanzara CRS (Chairperson) Cecilia Wanjuu (Rapporteur)		
14:00 – 14:30	Linking Innovative Small and Growing Agro processors to capital, markets and technology	Makeda Tsegede
14:30 – 15:15	Challenges and opportunities for OFSP puree bread value chain development in Africa) (EIL, UIL, KEBS, MBS, Tehilah, SINA, MH)	Tawanda Muzhingi
15:15 – 15:30	Evaluation of Ten Genotypes of Sweetpotato for Fries	Damian Laryea
15:30 – 15:50	Phytochemicals Content of Selected Kenyan Orange Fleshed Sweetpotato (OFSP) Varieties	George Ooka Abong'
15:50 – 16:15	Some Quality Attributes of Jam and a Non-Alcoholic Beverage from Orange-Fleshed Sweetpotato	Ganiyat Olutande
16:15-16:30	Discussion	Paul Demo
16:30-16:45	Tea Break	
16:45 – 17:15	Farmers interactions (How farmers benefits and insights from OFSP value chain development in Malawi)	Felistus Chipungu
17:15 – 18:00	Poster session and CIP Malawi and partner poster Exhibitions	Madjaliwa Nzamwita
24th April, 2018		
Session 4 John Macey (Chairperson) Felistus Chipungu (Rapporteur)		
7:30 – 8:00	The Role of Agroprocessing in Trade and Economic Development in Malawi	Mr. Clement Phangaphanga
8:00 – 8:30	Opportunities for Utilization of Roots, Tubers and Banana (RTB) byproducts and waste	Gerald Kyalo
8:30 – 8:50	Fortification of Cassava with vitamin A through the use of Orange-fleshed Sweetpotato (OFSP) during Product Development	Madjaliwa Nzamwita
8:50 – 9:30	Clients and Methods Matter: The Relationship between Breeders, Non-industrial Farmers, and Emerging Sweetpotato Food System Models	Mercy Kitavi
9:30 – 10:00	Discussion	Paul Demo
10:00– 10:15	**Health break**	
Session 5 Charity Kambani (Chairperson) Wells Kumwenda (Rapporteur)		
10:15- 10:30	Introduction to AfDB TAAT OFSP Compact and implications for CIP and CGIAR center model	Kirimi Sindi

10:30– 11:00	Inter-CoP interactions discussions (The role of each CoPs in end-user preference OFSP breeding)	Tawanda Muzhingi
11:00 – 11:30	Presenting for Emily Faeber: Designing Nutrition Education for Behavioral Change: Experiences from Quality Diets for Better Health in SNNPR, Ethiopia	Jan Low
11:30 – 12:30	Lunch and Field trip transport	Jean Pankuku/ Felistus Chipungu
12:30-13:00	**Field Trip departure and Lunchbox**	
13:30	Arrival of guests at the bakery	Jean and CIP Malawi
13.30 – 14.30	View of displays	
14.30 – 14.40	Opening Prayer	
14.40 – 14.50	Welcome remarks	
14.50 – 15.00	Speech by MTI	
15.00 – 15.15	Speech by Jan Low	
15.15 – 15.30	Interaction with Ntonda Care group	
15.30 – 15.45	History and Vision of Tehilah	
15.45 – 16.00	Tour of the Bakery	
16.00 – 16.30	Sampling of products	
17:00-18:00	**Back to Hotel from Field Trip**	
18:30 – 21:30	Cocktail and CoP MPU Closing Remarks Best Abstract and Posters winners	

Annex 3: Participants List

CoP Marketing, Processing and Utilization meeting
Lotus Resort, Blantyre, Malawi
April 22-24, 2018

PARTICIPANTS LIST

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

SASHA
Sweetpotato Action for Security and Health in Africa

CIP
INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

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