



**Transforming Cassava Production  
through Delivery of Clean Planting  
Materials and Business Development  
in Coastal Kenya**



## Our Vision

Vibrant transformative universities to catalyse sustainable inclusive agricultural development to feed and create prosperity for Africa



## Our Mission

To strengthen the capacities of Universities to foster innovations responsive to the demands of smallholder farmers and value chains through the training of high quality researchers, the output of impact-oriented research, and the maintenance of collaborative working relations among researchers, farmers, market actors, national agricultural research and advocacy institutions, and governments



## Our Motivation

"Transforming agriculture in Africa requires innovative scientific research, educational and training approaches. The education sector needs to be more connected to the new challenges facing rural communities and needs to build capacity of young people to be part of the transformation of the agricultural sector". Reinforced by the Science Agenda for Agriculture in Africa



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The Faculty of Agriculture is focused on achieving its mandate of capacity building, conducting research, offering consultancy services, promoting innovation and technology and outreach activities. The faculty offers technical training programs anchored at the different departments; Department of Land and Resource Management (LARMAT), Department of Food Science Nutrition and Technology, Department of Plant Science and Crop Protection, and Department of Agricultural Economics. At the faculty, we offer undergraduate, and graduate training programs at MSc and PhD level.

Our PhD programs are discipline based and the faculty is in the process of developing a curriculum for other taught PhD programs. The PhD in Dryland Resources Management is a taught based program that was initiated with RUFORUM's support and remains our flagship PhD program. It was the first Science based PhD program with a taught course component in the University and its success in timely completion rate informed the revision of PhD programs to incorporate a taught course component in year one. This aspect is now adopted widely in HIE system.

Our diverse agricultural programs attract a wide range of research projects that are anchored at the various departments. The current research programs range from provision of clean and healthy certified seeds, agronomic practices, pest and disease management, post-harvest processing and preservation and value addition to natural resources management. The faculty has identified and used the cowpea, the cassava project and the guava project to promote the current discussion and mandate of commercialisation of research work into student led start-ups.



The faculty offers consultancy services and outreach activities that are discipline based. Our main aim is to promote innovation and technology that come in handy in promoting climate smart agriculture, increasing economic value of varied crops. Key highlights are the current innovations in the cassava, cowpea and guava value chains that has attracted a wide attention within the faculty and in the entire university due to the emerging innovations.

I welcome you all to read this compilation of voices from field that documents experiences and lessons from interventions in supporting the transformation of cassava production in Kenya from delivery of clean planting materials to agribusiness development within the university and at community level. It represents our faculty's effort to respond to smallholder developmental needs.

**Prof. Moses M Nyangito**  
Dean, Faculty of Agriculture,  
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The agriculture sector provides a large share of the GDP for majority of the sub-Saharan Africa (SSA) countries. In Kenya, it contributes approximately 33% of total GDP, 60% of informal employment and 60% of exports come from the agricultural sector. Sub-Saharan Africa produces about 61% world cassava and contributes immensely to food security in Africa as a staple crop. In SSA, cassava is cultivated under a wide range of ecological and agronomic conditions. Cassava's adaptability to relatively marginal soils and erratic rainfall conditions, its high productivity per unit of land and labour, the certainty of obtaining some yield even under the most adverse conditions and the possibility of maintaining continuity of supply throughout the year make the crop very adaptable to rain-fed agriculture conditions.

In Kenya, cassava is mainly grown at the Kenyan Coast, Western and Eastern. However, cassava production is limited by pests and diseases and inadequate availability of disease free planting materials among other constraints.

The University of Nairobi has taken leadership to in part respond to this challenge; through capacity building for micro-propagation and certification of cassava planting materials to enhance productivity, incomes and food security and nutrition for small holder farmers in Coastal Kenya and Uganda. With funding support from the Mastercard Foundation and RUFORUM and with partnership from Makerere University, Kenya Agricultural and Livestock Research Organization (KALRO), and Kenya Plant Health Inspectorate Service (KEPHIS), Extension workers, Technical and Vocational Education and Training (TVET) institutions and private sector, the University of Nairobi is implementing a cassava project that seeks to: i) establish a micro-propagation facility and production of clean cassava planting materials, ii) building capacity for maintaining disease free planting material in the field and for processing and preservation of cassava and cassava products; and iii) establish an incubation and business hub in Seed Enterprise Management Institute (SEMIs) and TVET outreach centre.

The cassava program activities in Kenya are being implemented in Kilifi and Taita-Taveta with some activities taking place in Uganda. The project is implemented through an engaged university approach with the ten students serving both as researchers as well as providing technical support in technology transfer and engagement with farmers in a manner that allows full farmer participation.

The engaged university approach has helped the University in particular, the Faculty of Agriculture to be visible within Kenya as well as to respond to the Government of Kenya development priorities under the Bigger Four agenda; responding to both food and nutrition security as well as supporting smallholder farmer's response and adaptation to climate change.



Smallholder farmers including women and youth in Taita-Taveta and Kilifi counties have received training and linkages to private sector players and government institutions. As part of responding to climate variability owing to the semi-arid nature of the counties, the project is promoting companion cropping with the integration of cowpea in cassava crop production. Cowpea is the most extensively cultivated in these two counties. We have seen progress and community mobilisation deliver success with farmers further taking leadership in aggregating into a working platform with routine communication channels taking advantage of social media especially the WhatsApp platform. While not all farmers engaged by the research team are connected on WhatsApp, the few on WhatsApp share information provided in public meetings.

This has created a great demand for cassava. For example, verbal feedback from the County Minister for Agriculture has indicated that the cassava that was planted in Voi showground had exceptionally high yield. This has led the County to take action towards establishing

a Forty (40) acre cassava seed nursery for distribution next year. Using the outreach and complementary extension delivery, we plan to support with planting materials that enough for five acres. The Kilifi women farmers have seen opportunities in cassava and have taken up cassava seed production as a business. Thus, the value chain approach is bearing commendable fruits. To this end, we have so far impacted an estimated 46,800 lives in Kenya with gaining partnership with the County Governments, more lives will be touched and transformed.

Beyond the current project sites, there is a great demand for cassava planting materials and processed cassava products giving a clear and good indication for the need for training, clean planting materials, linkage to markets and value addition among rural communities. Through this project, we have established a mini Tissue Culture Laboratory as a start to produce disease free tissue culture cassava plantlets as part of ensuing continuous supply of clean planting materials. The larger Tissue Culture Laboratory is under construction and it is 75% complete.

In this series of the Voices from the Field, we share our experiences of a journey so far travelled in transforming cassava production through delivery of clean planting materials and business development among rural communities in Kenya. It is my hope that you will find these experiences worth your reading as well as provide lessons that can inspire you in taking action to support rural transformation in your respective communities and countries.

**Prof. Agnes W. Mwang'ombe, EBS**  
Professor of Plant Pathology,  
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## ***State of Smallholder Cassava Production, Constraints and Opportunities in Kilifi and Taita Taveta counties, Kenya***

Prof. Agnes W. Mwang'ombe, Principal Investigator

Cassava is a food security crop especially in semi-arid areas. In Kenya, cassava roots and leaves are used in preparation of dishes like Jora (Ugali) and Kimanga pounded boiled cassava roots mixed with legume. Cassava was a major source of income to smallholder farmers, it provided a livelihood, farmers were able to educate their children and build good houses using proceeds from the sale and marketing of cassava. In Taita Taveta County, most of the cassava roots were harvested for the production of fish feed for the Tanzania market. Following the closure of the fish feed factory in Tanzania, this lucrative business collapsed and farmers abandoned cassava production. However, the demand for cassava roots remains high because it is one of the key staples in the area.

Drought, floods, disease, insect pests, low quality planting materials and varieties, and a high cost of planting materials are some of the key challenges facing cassava production in Kilifi and Taita Taveta areas of Kenya. Following the drought of 2017, smallholder

farmers lost their cassava following the long drought and subsequent floods that were experienced in Kilifi county. This led to increased demand in planting materials that skyrocketed the prices. For example a seven-inch cutting was trading at Ksh 3.0-10.0 (US\$ 0.03-0.1). In one of our interactions with the smallholder farmers, one of them remarked "I am a very active cassava farmer, what I need is just cuttings". Smallholder farmers constrained by cost of planting materials, buy a few sticks then recycle to multiple and expand planted area within the backyard. While this practice in itself exposed them to increased diseases as the three most important diseases are transmitted through cuttings, smallholder farmers preferred this approach as they could undertake piecemeal harvesting whilst multiplying their planting materials.

Cassava varieties are highly stratified for food and income. Kibandameno is a prominent variety preferred for food due to its sweet taste and early maturing characteristics. Tajirika is regarded as everything in Kilifi County where it is significant for income generation owing to



*Cassava cuttings in a farmer's garden in Taita Taveta, Kenya*

its high yield. We found that cassava varietal diversity is narrowing faster with time due to the loss of the cuttings. Accordingly, healthy and improved varieties such as Kaleso, Karembu, Guzo, BitiAsman, Nzalauka and Karibuni were hardly found. The Guzo variety was praised for its morphological trait of growing a long-continuous stem that gives numerous cuttings after lifting the roots. A number of actors including government of Kenya, World Vision, Ustadi group and Kenya Agricultural and Livestock Research Organization Mtwapa from where cassava research is undertaken have contributed to existence of varietal diversity in the area. On the other hand, Taita Taveta County has minimal varietal diversity.

Our intervention was basic; to respond to the challenges facing smallholder cassava farmers through capacity building for micro-propagation and certification of cassava planting materials and value addition to diversify cassava products to enhance productivity, incomes and food security and nutrition. Through an engaged university approach that empowers communities and where farmers are active participants in knowledge generation; we started receiving positive responses from farmers piloting with few clean planting materials. Based on the pilots, a rapid growth in the number of farmers

participating in the cassava project to raise clean planting materials increased. Initially concentrating on multiplication at household level and at community level.

Expressions of gratitude were felt “thank you for the few sticks, from them I will have more than 30 plants through the use of the minisett technology”. Using the minisett technology facilitates the rapid multiplication of cuttings as compared to the conventional practice. As interaction with farmers continued, knowledge transfer on pest and disease diagnosis was undertaken as well as management practices and processes. Opportunities for agribusiness development within the cassava value chain were also explored. A group of farmers from Taita Taveta remarked; “cassava is wealth” following a one-week agribusiness training at the Seed Enterprise Management Institute (SEMI), University of Nairobi. Farmers are now better organized and leveraging the power of information age; utilizing social media platforms for information access and sharing, lesson learning and exploring market opportunities. Through these efforts, we have been able to demonstrate that small-targeted and focused interventions based on proper diagnosis can be effective in creating rural transformation.



*Focus group discussion with actors along the cassava value chain*



# Towards Achieving Improved Cassava Productivity in Kilifi and Taita-Taveta Counties

Florence Munguti, PhD Student, University of Nairobi

“A poor man’s crop” is what cassava used to be termed in many parts of Kenya. However, farmers in coastal region of Kenya especially in Kilifi County have found a hidden gold mine in cassava production. Through RUFORUM Community Action Research Program on cassava at the University of Nairobi, strategic interventions in cassava production areas in the coastal region are addressing constraints that hinder cassava productivity. The interventions have also looked at promoting cassava as a food security crop, an alternative source of income that has potential to improve livelihoods of communities at coastal areas of Kenya. During interactions with farmers in Taita Taveta, they noted that they all have a role to play in reducing the challenge of rural poverty and enhancing food security. Cassava in particular is a climate resilient crop that can be planted and harvested all year round. Farmers were keen to explore cassava production for food security and as a business to improve livelihoods in the Taita Taveta and Kilifi areas.

In the Taita Taveta and Kilifi areas, cassava productivity continues to be afflicted by a number of challenges including: poor varieties, inadequate disease-free planting material, poor agronomic practices, high cyanide levels in some cultivars, long maturity periods and pests and diseases. The most disastrous cassava diseases include: cassava mosaic disease (CMD), cassava brown streak disease (CBSD) and cassava bacterial blight (CBB) which lead to significant yield losses. This affects farmer’s commitment in cassava production.

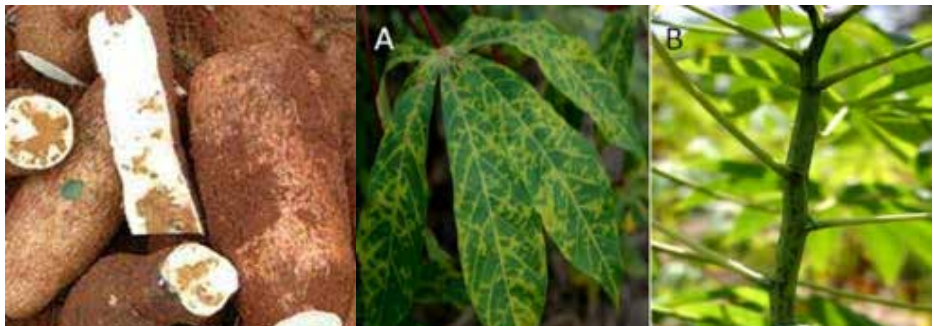
Through the capacity building for micro propagation and certification of cassava planting materials to enhance productivity, incomes and food security and nutrition for smallholder farmers in Coastal Kenya and Uganda, the University of Nairobi undertook a number of interventions that seek to revitalize cassava production. As part of these voices from the field series, we share some of our experiences and interventions undertaken.

## a. *Dealing with ‘hidden enemy’ within the cassava production system- cassava brown streak disease*

Taita Taveta and Kilifi counties at the coast of Kenya have in recent time been associated with cassava brown streak disease (CBSD). Smallholder farmer’s knowledge on the cause, spread and management of CBSD in Kilifi and Taita- Taveta counties remains limited. Unlike other cassava diseases, cassava brown streak disease symptoms on leaves are often mild depending on the variety and weather conditions and may remain undetected until the crop is mature. Most farmers are only aware that the crop was infected with CBSD during harvesting time when it is too late to put any management intervention measures.

Root necrosis caused by the disease renders cassava roots unfit for human consumption and unmarketable. Our interactions with farmers in Kilifi and Taita-Taveta counties raised awareness on importance of improved varieties, use of disease-free cassava planting material as well as on the management of cassava disease and pests. Farmers were made aware of the symptoms of different cassava diseases during the survey activity.

We used pest cards to educate farmers on how to recognize the disease symptoms as well as how to prioritize and apply management options. Farmers were later able to appreciate that use of infected planting material was a common source for continued infections.



Symptoms of cassava brown streak disease on roots, leaves and the stem



Using pest cards to show farmers how to recognize cassava disease symptoms

### **b. Strengthening certification of cassava planting materials**

Many countries producing cassava in Africa including Kenya have inadequate mechanism for adoption of improved cassava varieties and cassava seed systems are largely informal. The informal seed systems in these countries is characterized largely by exchange of cassava planting materials and use of low yielding and highly susceptible varieties. During the interaction with farmers in Kilifi and Taita-Taveta counties, we realized that many of them

planted a mixture of local cassava varieties which are low-yielding and highly susceptible to diseases. The training we conducted at the University of Nairobi for farmers in these counties focused on sensitizing them on the importance of certified clean cassava planting material to reduce the challenges posed by these diseases. Farmers were taken through the process of seed certification, the seed regulations and standards as well as on the requirements of becoming a seed merchant and seed grower/multiplier. SEMIS-UON is a registered seed merchant and therefore working with Kenya Plant

Health Inspectorate service (The national certifying agency in Kenya) with support from RUFORUM in this project to formalize the process of cassava seed certification in order to avail clean planting materials to farmers in these counties. Seed multipliers in the two counties were identified and taken through the process of seed multiplication deploying rapid multiplication technologies in the field as well as sensitized on how to maintain a disease-free crop to ensure continuous supply of cassava cuttings as planting material.

### c. Deploying field-based diagnostic assay for detection of cassava brown streak disease

Cassava brown streak disease foliar symptoms may not be expressed obviously on cassava leaves. As such, the disease can easily be missed by certifying agencies during visual-based inspection of cassava crop during certification. This brings in the importance of virus indexing to ensure that only cassava plantlets that are disease-free are deployed in the field for further multiplication. Several detection methods have been applied in diagnosis of cassava brown streak disease. However, there is need for a rapid, simple and sensitive field-based quick molecular diagnostic assay that can be used during certification of cassava planting material. Florence Munguti is the PhD student working

with the cassava CARP+ project team at the University of Nairobi. In one of her objectives, she is in the last stages of developing a quick field-based diagnostic tool that can be used during cassava inspections to certify clean cassava planting material. The diagnostic tool is able to detect cassava brown streak viruses in early stages of the crop when most foliar symptoms are often mild or remain unnoticed by either farmers or field inspectors. The sensitive diagnostic method will supplement visual inspection of symptoms and therefore greatly contribute towards dissemination of cassava planting materials that are assured of freedom from cassava brown streak viruses and farmers will continue to reap the benefits of certified cassava planting materials through improved cassava productivity.

Some of the cassava farmers that we have been engaging with have had worthwhile experiences as remarked by one of the farmer trainee;

*".....sometimes we have a healthy crop but nine months later, when we harvest the roots we find all of them rotten. Thanks to the TVET-Training at the University of Nairobi, we have become better at identifying cassava diseases in the fields for early intervention to reduce the losses"....*



Laboratory diagnostics to enhance early detection of cassava diseases for effective management

Through these diverse interventions, we have been able to demonstrate to the public that production is not just about production but it is a business undertaking that is only successful based on knowledge. Our success so far recorded is attracting proactive youth into the cassava value chain enterprise first as diagnostic experts and second as rural entrepreneurs. One of such youth is Amos, a youth from Taita Taveta whose life has been transformed through interactions and trainings offered by the University of Nairobi. The trainings provided by the University of Nairobi led him to explore agribusiness opportunities

in the cassava value chain. Amos harvested on average 13-15kg per plant after 8months of Kibandameno. Thus, with a plant population of 4,000 cassava plants per acre, on average yields are around 50,000kg. However, land size is a major constraints and with the newly acquired knowledge and business opportunity, the young and women farmers are hiring land from persons residing in urban areas to increase their plot sizes. Other farmers include Paul with his harvest in Mbale and Petero's disease free crop in Wusi, Taita Taveta County.



*Kibandameno crop in Wusi.*



*The cassava root held by Paul weighed 2kg which is heavy for kibandameno which gives very low yields if started with infected cuttings.*



# Common Cassava Pests and Farmer Management Practices in Kenyan Coast

Rose N. Kamau, MSc. Student, University of Nairobi

Cassava pests remain a major challenge facing smallholder farmers in Kenya. In order to strengthen farmer capacities in management of both cassava pests and diseases, a qualitative and quantitative survey in Kilifi and Taita Taveta counties along the Kenyan Coast was undertaken. Among the diseases noted of concern were Cassava Mosaic Disease (CMD) and Cassava brown streak disease (CBSD). The CMD incidences were quite high in both counties at the time of the survey while CBSD incidences were noted in Kilifi County but lower than the cases of CMD. We observed that the prevalence of CBSD was lower in Taita Taveta County. Though farmers were familiar with CMD symptoms, farmers thought that it is the natural appearance of the popular local variety “Kibanadmeno”.

This misconception had provided room for lack of management interventions among smallholder farmers in the area. Further, our observations in the field found that farmers do not relate viral pathogen transmission with the whiteflies occurrence in the area. However, during the survey that was conducted after the clean cuttings had been planted next to diseased cuttings, they noted that the disease could slowly spread to the clean crop over time.

Termites were observed to be one of the major pests of concern affecting cassava productivity. Termites were devastating cassava at any stage of growth from cuttings, to stems and to the roots. It was particularly intense during the dry season. During planting, termites heavily affected cuttings and reduced sprouting by up to 80%-100% in the experimental fields.



Farmers identified whiteflies, mealy bugs, green mites, termites and white peach scales (see a leaf with heavy mealy bugs infestations in Kayafungo, Kilifi County. CBSD Symptoms Photo by R.N. Kamau mealy bugs infestations in Kayafungo, Kilifi County-R.N.Kamau). During the surveys farmers indicated that they had noted that pests incidences were higher during dry seasons than during rainy seasons. Using photographs, farmers were able to identify pests during the survey including termite infestation.



Farmers in Taita Taveta County confused CBSD symptoms with those of termites' damage or rotting due to flooding. This was confirmed after diagnosis using physical observable symptoms of roots which farmers had indicated that they had noticed CBSD. White Peach scales were noted to be causing heavy damage in Mbololo area, Taita sub-county. The cassava plants were heavily defoliated (see a farmer's defoliated cassava garden in Mbololo) this reduced cassava productivity.



*Farmers defoliated cassava plants –top left corner photograph. Our assessments in the Kilifi and Taita Taveta area also revealed existence of storage pests that farmers grapple with in particular; The White Peach scales as seen in the top right corner and the Large Grain Borer (LGB)-see the damage it causes to stored cassava.*

Smallholder farmers in the area use a combination of management practices; the traditional approaches and introduced approaches. We observed a high utilization of intercropping of cassava with other crops as a common practice for pest management. Although the practice is well documented in cassava pest management, majority of farmers' reason to intercrop to overcome the challenge of small land size to increase land productivity per unit area. Besides, farmers indicated that cassava is a drought tolerant crop and in the event that maize will succumb to drought then they will rely on cassava hence intercropping is also done for food security reasons. Crops that were popular as cassava intercrops were maize, cowpeas, green grams and pigeon peas.

Meanwhile, some farmers had noted difference in whiteflies occurrences in different intercrops, majority were not keen to observe the difference. Most farmers do not apply any management practices on whiteflies and relied on nature like heavy rains to clear them out. The few who manage is as a result of spillover effect due to pests' management on intercrops. A major challenge on intercrop was wild life as it was noted during experimental set up. While intercrop were destroyed by monkeys in Kilifi County, the same were grazed by tortoises in Mwatate, Taita sub-county. We continue to build capacity of smallholder cassava farmers in pests and disease identification and to mobilize farmers to take management interventions that help them to better realize benefits from cassava production.

# Cassava consumption, preservation and entry into agribusiness by smallholder cassava farmers in Kilifi and Taita-Taveta counties

Samwel A. Onyango and Amos Tirra, MSc. Students, University of Nairobi

Appreciation of cassava as a crop has gained traction in Kilifi and Taita Taveta on three grounds; droughts have become common in the area but cassava can be harvested even when there is a drought occurrence. Cassava is readily consumed during religious festivals and cassava is affording producers alternative and perhaps a reliable source of income. The optimism about cassava is high. One of the women group leaders from Jezaulole farmers group noted that:

*“Nikona shamba langu ambalo nimetenga ya kuku za muhogo, mimi huweka muhogo kila mwaka. Nitawapeleka muone msitu wa muhogo. Kila mwaka mavuno yangu yanipaa \$5000 nikiuza wakatiwa Ramadhani, enyeweTajirika inamaanisha tajiri” translated as “I have dedicated my farm to cassava growing, I never run and shy away from cassava growing, I will take you to my farm, you will not believe it, I have a plantation of Tajirika. The word tajirika means wealth. I make \$900 whenever I harvest and sell during the period of Ramadhan”.*



Women Farmers Training session on cassava value addition at Mama Janes' Kitchen in Mbale, Taita Taveta

Smallholder farmers in Kilifi and Taita Taveta are enthusiastic about cassava consumption and a majority of the farmers appreciate the crop as being available all through the year. The farmers recognized cassava roots as one crop that needs to be put even in the small home gardens for food security. In the one of our focus group discussions, one farmer in Kilifi remarked:

*“...kwa shamba langu ya nyumbani mimi huweka mboga za kienyeji nakuweka muhogo humondani. Hapa kwetu coasti, sisi hupata ukame na maranyingi muhogo ndo sisi hutumia kulisha familia kiamshakinywa na chajjo. Mimi hutayarisha mizizi kwa kuchemsha na kuwapa familia na jio ni unga wa muhogo ndo kilakitu” translated “.....I never fail to keep a crop or two behind my house garden. I put a few vegetables and throw in some cassava stems. Here at the coast, we tend to have unpredictable drought that is often accompanied with food shortage- hunger and cassava becomes the meal both for breakfast and supper. I cook the raw roots and feed my family on the boiled roots for breakfast and during dinner I do my vegetables and Cassava flour and thus I believe cassava is my ultimate security crop.”*

Smallholder farmers in Kilifi and Taita Taveta have made milestones in value addition, cassava post-harvest handling and agribusiness. Most cassava farmers sell their cassava produce as fresh cassava roots at farm-gate to either final consumers, bulkers, wholesalers or retailers. Some farmers also take their cassava to the open-air market or in schools for sell.

Smallholder farmers in Kilifi and Taita Taveta are enthusiastic about cassava consumption and a majority of the farmers appreciate the crop as being available all through the year. The farmers recognized cassava roots as one crop that needs to be put even in the small home gardens for food security. In the one of our focus group discussions, one farmer in Kilifi remarked:

*“Ukitumia unga wa muhogo kwa chakula chako, unashiba siku nzima, na unaezaenda siku nzima bila kusikia njaa” translated as “when you prepare ugali made from cassava flour, you will be in a full stomach for the better part of the day. When you consume your cassava, you stay long while satisfied.”*

Cassava is sold either in bundles or in sacks according to the quantity being transacted. Most bulkers in Kilifi County take the cassava to Kongowea market in Mombasa where it is sold to wholesales or retailers who may in turn sell it at the same market place or take to other markets at the coast. On the other hand, most bulkers in Taita Taveta take the cassava produce to Taveta market where it is sold to wholesales or retailers who may in turn sell it at the same market place or take to other markets at the coast. Motorbikes, tuktuk and humans are the most common means used to transport cassava produce to the market. There is no a standard measuring unit for cassava being sold and therefore cassava prices are mostly determined through negotiations between the buyer and the seller. However, a few farmers sell per Kg and prices vary from as low Ksh15 in Kilifi to Kshs 150 (US\$0.15 to 1.5) in Taita Taveta per kg.



Cassava is highly demanded at the coast, fetching highest prices during the Ramadan season every year. The most cited challenges in cassava marketing include; high cassava perishability, fresh cassava bulkiness, low cassava prices, inadequate market and lack of a standard measuring unit during cassava selling. On the other hand, traders complained about the inconsistent supply of cassava products making it difficult for establishing

processing firms. In addition, traders also complained about the low quantity of cassava produced in every region, making it difficult for a trader to send a truck to collect the cassava at the farm level thus increasing the cost of transportation. In spite of these complains, we share cases and experiences of farmers that have shown that cassava production is profitable; see the case of Mama Jane and the Case of Mr. Ngoo.

### Case 1: Mama Jane

Mama Jane is a cassava farmer who has grown cassava for quite some time; about thirty years. Her interest in the cassava value chain is on value addition. A visit to her kitchen illustrated how passionate she is in doing some boiling and frying of cassava roots and selling to make a living. The returns were quite low and being the bread winner in her family she struggled in meeting her family' daily requirements like any other typical African home. Through our interaction with Mama Jane Ndela and her attending a farmers training seminar that was conducted at the University of Nairobi for One week, she managed to learn a few simple and quick steps of value addition of using cassava to make baked products and formulation of flours for consumption. Our interaction and constant communication with Mama Jane through the CIE-TT WhatsApp group has greatly impacted her life and motivated her to push beyond her limits. Today, she is able to make personal steps towards the actualization of her dream of being a baking expert and making a living through cassava crop. She says she is able to pay school fees for her child in the University. The Taita-Taveta County has recognized and now uses her to train other women groups.

At the initial stages, Mama Jane was only known within the vicinity of her home, however after our constant visits to the coast, our continued interaction with farmers and the progress of the farmers groups trained has attracted the attention of the Taita-Taveta county and today, the Ward MCA would want to accompany the university to the fields just to ensure she equally keeps with the pace of the cassava value chain revelation in her Ward as these are her voters. Mama Jane and mama Zipporah have bought grinding mills for grinding sundried cassava chips into flour for various uses.

Mama Jane having had a one week full training on Cassava value chain, is today appointed as the cassava ambassador to other farmers in the county. She has become the face of cassava value chain and is currently educating her fellow women through the varied women groups on the need to promote cassava growth. Mama Jane has managed to represent the county government of Taita-Taveta since receiving the cassava training at University of Nairobi in two conferences at KICC in Nairobi and the Commonwealth fair for women in Nairobi end of September to



*Women undergoing a community based training in cassava value addition for household consumption*

start of October 2019 to show case the cassava value chain. Today mama Jane is able to pay fees to her children and comfortable take care of her family, something that a while ago was a daily struggle. What is most fascinating is the changed perception of Mama Jane regarding Cassava farming. In her own statement through Whatsup is " I am seeing dollars from the cassava value chain" reported mama Jane after attending a conference on behalf of the county government. Through training at SEMIs, University of Nairobi, she intercroops cassava with cowpea and if able to formulate cassava flour with dried cowpea leaves for improved nutrition.



*Preparation for making doughnuts using cassava based flour by Mama Jane during her routine training sessions at Mbale in Taita-Taveta County.*

## Case 2: Mr. Ngoo

Ngoo is a medical student at the University of Maseno. The student has often been off and on college due to lack of school fees. During the routine visits in the project site, Ngoo learnt of the Cassava PI, Prof. A.W Mwang'ombe visit. The medical student called for any support as she had previously assisted in the initial fundraising for first year fees. Through telephone discussion when he needed advice on tuition fees as he was sent away due to lack of fees. The student raised his situation with the professor for a possibility of being linked with any sponsors. The professor knowing that Cassava never misses in most homesteads asked the student what the family had at home. "Professor, I have been struggling to pay my fees in time and this has made me stagnate in my medical program. At home, we only have

some cassava but we don't get as much money to sustain us. My uncle equally has cassava but the crop is not fetching us enough money to sustain anyone here." Through our interaction with the student, we managed to train the student on simple but aseptic/safe ways of drying the cassava harvest, making flour and selling to the near markets. In addition, the student was guided on how to get out and scout for markets for his cassava roots which are greatly demanded by consumers. Once he conducted market surveys and sensitized people, he managed to sale fresh roots at US\$ 1.5 per kg and he even was ferrying cassava roots to Voi town where the crops fetch relatively higher prices. "I have made more money from cassava, than I never imagined ..." and returned to continue with my studies.

The cassava value chain in the coast region is developing with both vertical and horizontal integration that is facilitating the pooling of resources together and sharing information. Through these groups, farmers are being gradually empowered with information that enables them not to sell their cassava products under pressure. One of the major breakthrough is the farmers changing the transaction mode from selling in bundles to weighing in kilograms; this is enabling them to increase on their profit margins. We have also encouraged farmers to form marketing groups to facilitate semi-processing and aggregation of their produce in order to boost their bargaining power. This would also bridge the gap between traders and farmers. One of the traders in Kilifi market remarked that:

*"...Huwezi kupata muhogo sahi sa anne kwa soko. Muhogo huletwa asubuhi mapema na kuisha mapema tena. Ukitaka muhogo kuja kesho mapema na pia saa zingine hutapata. Siku zingine hawa waleti....." literally translated as "if you need cassava come very early as it sells very fast and even at times they never bring".*

We have observed a sort of contradicting parallels that we are working to help bridge. The farmers say there is no market while the traders say there is nothing to sell; this is a clear signal of a gap between the two groups. We believe that to address this gap, it is vital for farmers to form marketing/aggregation groups that would foster certainty in the market.

Cassava has the potential of contributing immensely at the actualization of Kenyan Big Four agenda. The cassava crop is a food security crop to the farmers in Kilifi and Taita-Taveta counties thus if well promoted and

production scaled up, then these counties can be food secure. There is value in Cassava as farmers can make good income if they get focused on this crop as demonstrated by a few farmers. Mama Dhahabu in Kilifi County made US\$6500per acre in one season and she dedicated the money to put up a new beautiful home for her family who lived in temporary structures. In her own words if another person drops cassava stem end cuttings, she picks and plants. For mama Dhahabu, cassava is everything in her family. The value could increase if healthy seeds and proper agronomic practices are followed.



*Mama Dhahabu carrying cassava cuttings She purchased from cassava seed producer*



## Utilization of Cassava Leaves as a Vegetable: A new alternative in scarcity

Samuel Mwathi, MSc. Student, University of Nairobi

**M**icronutrients malnutrition is still high in Kenya despite the availability of nutritious food which includes a variety of seasonal leafy vegetable and perennial crop vegetables such as cassava leaves. Although cassava leaves are high in crude protein content, vitamins, minerals and fibre they also contain anti-nutrients that binds minerals and make them indigestible and unavailable to humans. The anti-nutrients include cyanide, phytate, fibre, nitrate, polyphenols, oxalate and saponins.

Cassava leaves are rarely utilized by local communities in Kenya due to the scare of high cyanide and other anti-nutrients, ineffective processing methods to reduce the

cyanide and anti-nutrients levels and presence of other alternative vegetables. However, during the drought period communities in the Coastal counties of Kenya which are among the biggest producers of cassava have been reported to be utilizing high amounts of cassava leaves as a vegetable.

Through the RUFORUM supported CARP project we documented the modes of utilisation and methods of preparation of cassava leaves in Taita Taveta and Kilifi County. In Taita Taveta County, the consumption of cassava leaves as a vegetable was still low and only tagged to the dry season. The preferred varieties were 'KibandaMeno' and they would pick any of the top eight leaves.

We pick only a few top leaves as picking too many will affect the plant health. *"Sisi huchuna majani kadhaa, kama vile manne hadi nane ili mmea usiadhirike". Hii tuna-ponda kwakinu, kuosha kwa maji kiasi, kuchemsha na kukaanga kwa maji ya nazi.* Translated as "Our tradition is to pick the leaves, pound them, cleaning with adequate water, boiling and frying using coconut oil"



Photos showing variety of other leafy vegetables in Kilifi county

Kilifi had more varieties of cassava; Tajirika, Kaleso and the local varieties. Tajirika was the most preferred. They would also pick the first top four leaves only when mixing them with certain local leafy vegetables to make a meal that was also be perceived to have some medicinal value. Normally they would pick the 4th to 8thleaves. They also had a well-defined pounding and boiling method to reduce cyanide and make leaves tender. They would also use coconut cream extract for the cooking of the vegetables.

Cassava leaves provide a green dietary supplement to rural households in the coast. They use simple traditional methods such as fermentation, pounding and sun drying to reduce the cyanide scare to allowable level and hence gain from the leaves high protein, vitamins and minerals content. Improving and

standardization of these methods will lead to production of cassava leaves products that are of uniform chemical and microbial quality. These products will be more available and easy to use which would save labour and time households use in food preparation and adoption by other communities will be easy.

Standardization of cassava fermentation, storage and packaging will solve the problem of insufficient control characterized by traditional method of fermentation. This can be adopted by food industries and small scale producers and help generate job opportunities among the small scale producing farmers. Combination of these processing methods; fermentation, dehydration and packaging can be optimized to produce dietary supplements that can keep for long and be utilised in many other ways in addition to vegetables.



*Packaged cassava leaves*



*Training women to prepare cassava leaves vegetable sauce*

## Breaking Barriers to Chicken Feed Deficit through Integration of Cassava Peels in Poultry Feeds

Elijah Mwangi, MSc. Student, University of Nairobi

Kenya faces a huge challenge of producing maize; the main source of carbohydrate for human and animal consumption. To cope with year-round demand, its importation from neighboring countries from time to time has increase exponentially. This means that animal feed is produced at high cost depending on the prevailing cost of maize, making animal production very expensive. Feed constitute 60-75% of the total cost of production of poultry. To reduce the cost of energy rich ingredients in animal diets and in the production, alternate and affordable sources such as cassava comes handy. Besides being inexpensive and accessible source of energy, the use of cassava roots and peels in animal feed industry in Kenya could be considered as a way of reducing the cost of producing and availability of livestock feed. This will help increase livestock production.

Our engagement with farmers in Taita Taveta County found farmers disposing cassava peels to the waste pits from where they would be burnt upon drying up. Our dialogue with farmers indicated that they feared to feed cassava peels to livestock because

of possible cyanide poisoning. Farmers also lacked the know-how of various affordable methods for reducing cyanide content in cassava tubers and peels so as to make them fit for livestock consumption. Meanwhile, farmers in Kilifi County fed raw cassava roots and peels and even young stems of cassava to cattle, goats, and poultry (especially ducks). This practice could have detrimental effects if the livestock ingested large quantities of unprocessed cassava products. Through the cassava Community Action Research Program (CARP+), training content on various processing methods for cassava peels to reduce the cyanide content and feed formulation were made during farmer training workshops held in SEMIs at the University of Nairobi for farmers from Kilifi and Taita Taveta counties.



Broiler and indigenous chicks-Photos by A. W. Mwang'ombe





*Mr. Faizo Kasule interacting with a farmer in Bukedia in the farmer's cassava garden.*

## ***Isolation Distance as a Solution to Manage Cassava Viral Diseases in Uganda***

Faizo Kasule, MSc. Student, Makerere University

**B**ill Gates had this to say; “innovations that are guided by smallholder farmers, adapted to local circumstances, and sustainable for the economy and environment will be necessary to ensure food security in the future.” Engaging with smallholder farmers in the innovation process is critical particularly within technologies that have immediate livelihood outcomes and impact such as in crop varieties and disease management. Our intervention in cassava production by responding to disease management constraints was received among smallholder farmers with considerable interest especially to understand the unique methodological application and to appreciate the expected returns.

Cassava (*Manihot esculenta* Crantz), is an important staple food crop cultivated in many parts of Uganda. It is a good source of industrial raw materials, substitute in animal feeds and the chief source of dietary food energy for the majority of Ugandans. In the country, highest cassava production is in the eastern, followed by northern region. Cassava production in Uganda is greatly constrained by a number of abiotic and biotic factors.

However, of the biotic factors, cassava brown streak disease (CBSD) caused by cassava brown streak viruses (CBSVs) and cassava mosaic disease (CMD) caused by different species of cassava mosaic geminiviruses (CMGs) are the major viral diseases leading to severe yield losses in cassava of up to 100%,



thereby resulting into increased food and income security. Both diseases are transmitted by whitefly *Bemisia tabaci* and spread through cuttings, which is exacerbated by the virtue that cassava is vegetatively propagated.

The cassava seed system is dominated by farmers who plant conventional field sourced (F.S) planting materials obtained from own seed, neighbors, friends etc. whose virus status is unknown while a few farmers have adopted the use of tissue culture (T.C) stem cuttings, multiplied by seed multipliers from isolated open fields in Uganda. In our work over Uganda especially in eastern Uganda in the districts of Bukedea and Kumi, we documented the prevalence of viral diseases on farmer preferred cassava and farmer knowledge on isolation distances in controlling viral diseases.

In Bukedea district five sub-counties including Malera, Kabarwa, Kidongole, Koena and Kocheke were sampled while in Kumi district four sub-counties including Ongino, Kumi, Kanyum and Ngero were sampled.

From these sub-counties, I got a chance to visit and interact with 150 cassava farmers; 74 in Bukedea district and 76 in Kumi district. Many farmers preferred NASE 03 and NASE 14 owing to their associated attributes such as tastiness, good cooking quality and tolerance to diseases. However, these preferred cultivars had a high incidence of both CBSD and CMD in all sub-counties surveyed in eastern Uganda. We also observed that recently released cassava cultivars such as NAROCASS 1 and NAROCASS 2 that are high yielding and CBSD/CMD tolerant/resistant were not widely adopted by farmers.

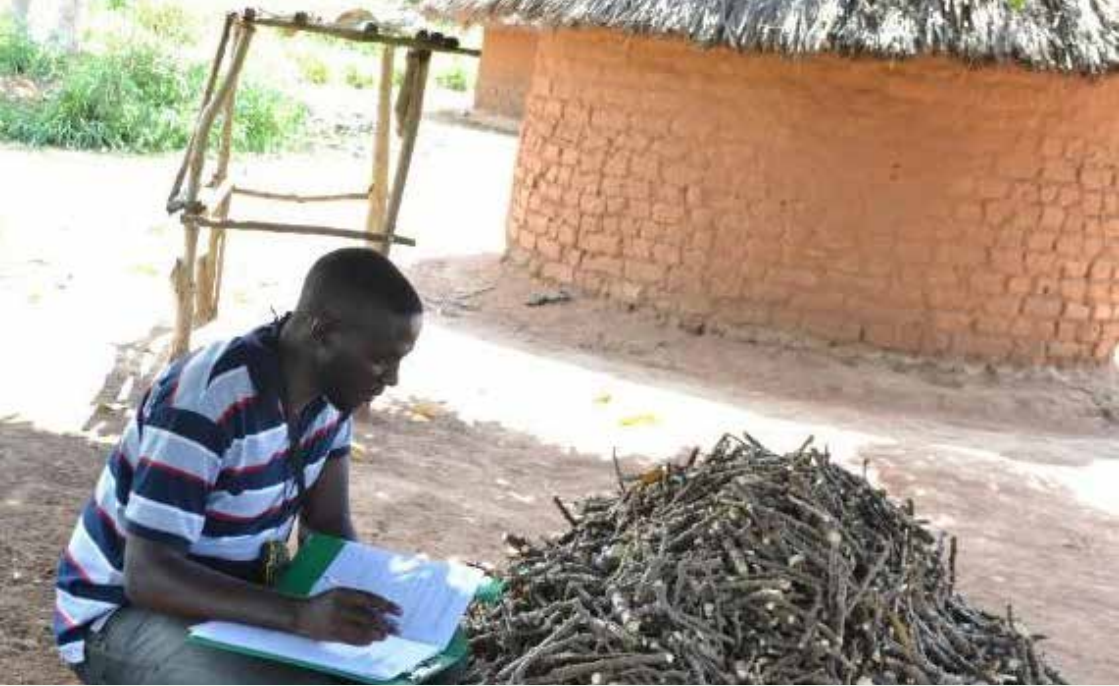
The source of planting materials for many farmers in eastern Uganda was field sourced

cassava planting materials obtained from own seed, neighbors, friends, community and NGOs whose virus status is unknown while a few farmers adopted the use of tissue culture (T.C) stem cuttings. Meanwhile, management practices for CBSD and CMD in the eastern region were mostly intercropping followed by uprooting and discarding infected plants, spraying, use of tissue culture plantlets and use of tolerant/resistant cultivars.

Our surveys did not find farmers in the region taking into account the isolation distances suggested in FAO convention, 2012. The cassava fields of most farmers were located in close proximity to neighboring fields and this eased the spread of CBSV and CMV infections from one farmer field to another causing a faster transmission by whiteflies *Bemisia tabaci*.

Although a number of phytosanitation strategies have been used to control cassava viruses, CBSD and CMD are still the most prevalent and important diseases of cassava in Uganda. The major control strategies used, among others, are through the use of clean planting material obtained from tissue culture and use of seemingly healthy cuttings multiplied by seed multipliers from isolated open field seed multiplication blocks in the country.

It has previously been suggested that cassava fields having breeder seed should at least have 200 meters separating breeder seed (certified level 1 – C1) from neighboring cassava fields and 100 meters for basic seed (C1) and other fields. These isolation distances have been adopted by some seed multipliers and inspectors in Uganda but there is no experimental research that has been done to establish the effectiveness of these isolation distances in preventing CBSV



*Field sourced cassava planting material*

and CMV infections in tissue culture derived (certified level 1 – C1) and field sourced cassava planting materials (C2) in Uganda and the world.

My encounter with cassava farming communities in Bukedea and Kumi provided me with an exciting experience but rather challenging one. As a student pursuing plant breeding, I realized the need for more improved varieties that are not only high yielding and disease resistant but also with 'good' taste attributes. Furthermore, farmers in this part of the country were growing cassava varieties that were susceptible to major viral diseases but with sweet taste as it is beyond disease resistance when selecting cassava varieties for planting in eastern Uganda. I also realized that farmers need to be sensitised on the benefits of starting with clean/virus-free planting materials obtained from credible sources. Such material could be obtained from tissue culture laboratories as

basic seed and multiplied in isolated places before dissemination of material to farmers. This underpins the importance of community based seed systems development in these rural areas.

I also observed that while the scientists recommend for cassava fields to be at least 200 to 250 metres apart from each other, this was not the case in eastern Uganda where the average isolation distance between farmers' fields was only 33.56 metres for Bukedea district and 19.18 metres for Kumi district. These short isolation distances combined with high whitefly population in eastern Uganda could be responsible for the high CBD and CMD prevalence.

Therefore, phytosanitary measures, such as those involving the use of virus-free planting material preferably tissue culture derived, coupled with effective isolation from surrounding potential sources of infection,

offer excellent potential for clean seed multiplication and CBSV and CMD control in eastern Uganda.

The use of isolation distances as a solution to manage viral diseases in cassava needs to be exploited. In this regard, determining the optimum isolation distance in preventing CBSV and CMV infections in tissue-culture derived and field-sourced farmer preferred-cassava planting materials in cassava seed multiplication blocks has been our focus as a research team. We undertook a field based study at the Makerere University Agriculture Research Institute, Kabanyolo (MUARIK) in central Uganda, in 2018/2019 to establish an effective isolation distance for management of cassava virus infections.

MUARIK a known hotspot for whiteflies and cassava viral diseases hence buildup of inoculum and its spread was presumed. The isolation distances used in this study were 50, 100, 150 and 250 metres. CBSV and CMD severity and incidence for plants from both

tissue culture (TC) derived and field sourced (FS) planting materials decreased with increase in isolation distances; the 50 metres isolation distance had the highest prevalence and 250 metres had the lowest prevalence; which is within the recommended distance.

Cassava seed multipliers in eastern Uganda need to adopt the 250 metres isolation distance as this distance can prevent both CBSV and CMV infections in both susceptible and tolerant cultivars. The 250 metres isolation distance limits a big number of CBSV and CMV carrying whiteflies from reaching the healthy plants, thus the observed no CBSV and CMD prevalence at 250 metres isolation distance even though seed multiplication is done in an area that is a hotspot for CBSV and CMD and with a high whitefly infestation. This will enable the farmers to have access to clean cassava planting materials thereby providing hope for enhanced CBSV and CMD management in farmer preferred yet susceptible cultivars in the region.



A farmer shows no yield in his cassava fields due to CBSV



One of the farmers in Bukedea showing CBSV root damages



*Duke Enterprise team in the value addition processing facility at the University of Nairobi*

## ***Building the Future Proof Universities: SEMIs Innovation, Business Incubation and Acceleration Hub (SIBIAh)***

Peter Kuria GITHINJI & Prof. Agnes M Mwang'ombe

While “entrepreneurship spirit at HEIs has been identified as a need and a prerequisite to the facilitation of employability and job creation for graduates, gaps in the human and institutional capacities remain. An improved ecosystem that is supported by access to technologies, appropriate financing instruments, training on business models, service delivery and design also importantly requires a vibrant production and productivity base. This is critical for a robust value chain development and the associated enterprises.

Cassava value chain farmers like most farmers in the Global South face multiple challenges: from lack of adequate and timely planting materials, prevalence of viral and

bacterial diseases (impact on production and productivity), uncertain market dynamics, poor knowledge and support framework (agronomics) including policy incoherence. In Kenya, the devolved County Governments, in addition to the above face gigantic problems of unemployment, elevated levels of under-nourishment, and debilitating household level poverty. While education is seen as a trajectory out of this trap, the design and focus of education, especially higher education has recently come under consistent criticism for producing graduates who are not in tune with the new trends and demands by industry or society. It has been pointed out and generally accepted that there is a huge disconnect between student’s research, industry and societal demands.



This has led to graduate students acquiring academic papers, but with limited relevance or impact to the market, industry, sector or society adding to the unmitigated crisis of under and unemployment.

To address this challenge, the University of Nairobi, Seed Enterprise Management Institute (SEMI) in collaboration with Regional Universities for Capacity Building in Agriculture (RUFORUM) developed a project designed to address this disconnect. With financing from Mastercard Foundation, the cassava project was developed with an explicit component focused on building an incubation Hub whose objective was to build entrepreneurship in students, graduates and researchers. African Agribusiness Incubator Network (AAIN) was brought on board to provide the technical assistance that led to the establishment of the SEMIs Innovation Business Incubation and Acceleration Hub (SIBIAh).

This involved a deep planning and interrogation of the internal and external ecosystem which allowed for a structured review and assessment of the operational ecosystem across variables. The results informed the planning, design, management systems development and how the hub would sustain the activities. It also allowed the design to take advantage of the prevailing ecosystem and thus providing a nexus through which students got supported to develop innovative contextual solutions for farmers, the industry, ride on policies and the business environment as demanded by society.

A cohort of students were inducted into SIBIAh and within 3 months, 8 enterprises had emerged along the cassava value chain, guava and bee keeping. MuMiSET COMPANY LIMITED is focused on providing planting material which are validated by CAS TEST

LTD leading to the certification of disease free material for farmers. The CASSAVA ECONET COMPANY is focused on logistics, bulking and primary processing, while CAV STARCH LTD is an off taker of bulk cassava and produces starch to meet the market for starch. The processing of starch derivatives such as biodegradable plastic is also a viable venture. The biodegradable derivatives will become a big industry in the future since the ban of plastics has opened a completely unexploited market and with huge potential. At the markets and consumer level, EHENA FOODS is focused on producing healthy, high quality consumables from cassava to the diverse market.

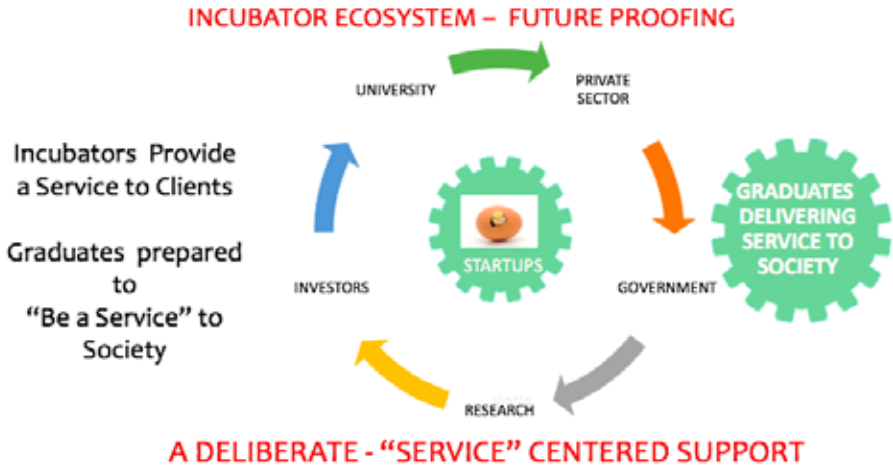
The students have also developed a services tool, the MUHOGO TIBA. It is focused on delivering extra value by leveraging and exploiting existing ecosystem gaps using ICT specifically AI driven diagnostics of bacterial and viral diseases (data driven). On the guava, DUKE Enterprises has exploited the untapped guava fruit to produce 6 products which are in the process of being patented, trademarked and commercialised. NYUKI MSOMI business in a box is curated and targeted at creating jobs for youth and growing the bee sector. NYUKI MSOMI were incubated and mentored to a point of securing investment from one of the highly competitive national pitch competitions.

All the enterprises managed to demonstrate and showcase their products and services at the International Nairobi Innovation Week (NIW), the College for Agriculture and Veterinary Sciences (CAVs) stand attracted over 2,000 visitors in two days. "These innovations are what will save our universities...", these were the words of CS Education Professor Maghoha on visiting the students stand at the Nairobi Innovation Week.

In equal measure, SIBIAh has supported undergraduates and is currently developing a strategy that strengthens the collaboration with TVETs especially those working closely with communities. The training of the 25 TVET affiliated students and farmers is a powerful link between the University (SIBIAh and the farmer community). The first set of trainees (25) from Taita Taveta have been trained at the SEMIs facility and afforded an after-care support, where the trainees are constantly supporting each other and building this ecosystem. This has enhanced the entrepreneurship ecosystem

by linking viable enterprises to interested parties, and creating a pathway to accelerate viable youth enterprises and businesses along the cassava value and others. Undergraduates (92) have been supported through pitch training, mentorship and links to industry for attachment, while 15 other students have been individually supported to develop their ideas.

The ecosystem building is a fundamental aspect that affects the sustainability and functions of the incubator hub.



Peter Kuria GITHINJI 2019

*Future proofing education through a robust ecosystem*

Besides the internal ecosystem within the University, the external ecosystem is a fundamental aspect that contributes to the transformation of the University. This places the university as a service to community as opposed to the University producing graduates that add to the jobless burden.

While the 8 startups at the SIBIAh are a catalytic seed in the ecosystem of change, there is however the foundation for success and sustainability- and the institutional buy

in especially at the administrative level is a fundamental part of the process. Additionally, the following are key to the sustainability of the process of change at the HEIs:

- a. **Incubator Hub:** There should be support and development of the human capacity for the incubator HUB, the appointment or hire of substantive incubator Hub manager. They are a key catalyst inside the incubator ecosystem.



*Purchasing of Guava Fruits from Taita Farmers The fruits have very limited economic value as the fruits are rarely sold nor processed Thanks to*

- b. **Incubatees:** There should be an incentive program to support and motivate incubatees. This can be through building value networks, development of a financing kick start programs, structured coaching, and mentorship. The integrating their time spent at the incubator and development of business concepts should be part of the academic curriculum and should earn credits.
- c. **Academic staff** should be supported to understand innovation and incubation management, they should also be mentored and coached on how to turn their research into enterprises. In the case of acquiring an IPR or trademark, there should be mechanisms or processes that are conducive for co-founding enterprise and development theme with students. The time spent with students at the incubator or coaching the startups should be recognised as part of their official work.
- d. **Institutional development:** University should design robust entrepreneurship and innovation management curricula that is integrated across all disciplines.
- e. **The private sector** should be actively engaged in the evolution of curricula, the development of content as well as in the delivery of the content to students. In the case of SIBIAH Initial partnership with partners have been discussed for example Industrial and Commercial Development Corporation (ICDC), SIEMENS, Agriculture Finance Corporation (AFC), MoU with AAIN drafted. This should aim at building the bridge that assists graduates cross into the private sector with the right tools, competence, skills and knowledge.
- f. **There should be strong and purposeful Investment** to assist incubators and incubatees manage risk, prototype concepts and accelerate ideas to market. Financing from AfDB (ENABLE) and similar institutions should be designed to support hubs within the University.

## ***From Research Dissemination to Knowledge translation: How Minisett Technology is catalysing cassava production in Lodwar-Turkana, Kenya***

Patrick Clay Kidasi, University of Nairobi

Integration of knowledge and innovations from research institutions faces a challenge of adoption by the intended farmers. In an attempt to facilitate knowledge sharing, University of Nairobi organizes Nairobi Innovation Week purposely to showcase amongst others; new knowledge and innovations to the community generated by the university researchers and students. As an interactive session that attracts all people from diverse areas and backgrounds, researchers exhibit their innovations emanating from their research activities which address from the basic everyday needs of individuals to imagined competitive world of complex science.

During the Nairobi Innovation Week (12th June 2019) under the theme Innovation and Kenya's Big Four Agenda the entire Cassava Community Action Research Program PLUS (CARP+) team was privileged to showcase five (5) start-up companies, amongst which was the MuMISSETT Company Limited. The MuMISSETT Company Limited addresses the persistent problem in cassava production related to the unavailability of healthy certified cassava planting materials. Herein, the company through research on cassava Tissue Culture and minisett technology, a rapid multiplication techniques that harnesses cassava nodes, attracted attention due to its innovative ability to timely multiply and avail cassava minisetts as disease-free planting materials.

During the Innovation Week, the CARP+ project booth received a total of 4,000 visitors. One of these visitors was particularly more

engaging than all the others. He came from a drought prone area of Kenya whose food and nutrition insecurity status is always a concern; Lodwar in Turkana County in northwest Kenya. Mr Brizan Were, a Project Manager at Value Villages was particularly impressed with the cassava minisett technology. He took the initiative to grow cassava minisetts in Lodwar supplied by the Cassava CARP+ project from the College of Agriculture and Veterinary Sciences, University of Nairobi.

The minisetts were prepared three weeks before dispatch to Lodwar around August 2019. At first, 150 cassava minisetts were shipped using air transport from Nairobi to Lodwar. Additionally, another 500 minisetts were to follow later. Despite, the fears of a harsh environment with high temperatures of over 35°C, the establishment and growth was remarkable revealing a high adaptability and suitability of cassava to the area's marginal soils.

The CARP+ team kept contact with Mr. Were and his team leveraging the power of technology to communicate including WhatsApp and telephone calls to facilitate and support cassava management and in particular to respond to questions raised by visitors to the demonstration plots. Interest, excitement and curiosity of cassava in Lodwar has risen and this is understandable considering that cassava is a new crop in this pastoral and nomadic sub-region of Kenya.





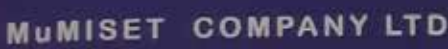
*Prof A.W Mwang'ombe presenting cassava and guava products to VC University of Nairobi Prof. Kiama at Cassava Value Chain Plus++ both on Nairobi Innovation Week...*

One additional unique reported attribute of the cassava in the current period of emergencies is that the locusts that invaded the area did not damage the crop. The crop's canopy remained rather intact and well established (Picture 7-8). After nine months from transplanting, the harvest as seen in the pictures below, is commendable. This formed the basis for the next level of engagement; value addition. The farmer has been trained and guided on cassava flour production.

The growth and harvest exhibited by the cassava in Lodwar has demonstrated that it is possible to produce cassava in this marginal soils. The expansion of the cultivated area will now happen considering that the foundation clean planting material has been established in Lodwar.

This will provide an alternative and reliable food security crop to the pastoralists in the area.


The cassava CARP+ project team now requires further support of the County Government of Turkana to extend this technology and innovations beyond the capacity of the project to the wider community, support extensive multiplication of cassava plantlets, distribution and extension advisory. The cassava CARP+ team is remains committed to supporting rural transformation and food security in marginal areas of Kenya.



we are supplying cassava minisetts to seed entrepreneurs and farmers in Africa

### Business Case

Cassava has the potential to drive industrial growth, food and nutritional security and is a Climate change mitigation crop. Kenya productivity is at 1.2 MT/ha which is far away compared to Nigeria at 60MT/ha annually. The productivity is affected by lack, limited and timely supply of clean planting materials. This impacts negatively on the cassava seed system and the industry growth.




### THE MARKET

Cassava cultivation is practiced by millions of small-scale farmers worldwide. In Kenya, cassava is estimated to cover about 77,502 ha of land. MuMISSET avails clean minisetts in a timely and efficient manner to farmers. 20,000 miniset cuttings are required per 1 ha. Clean minisetts can impact the production and productivity from the current 1.2 to 40-60MT/ha annually, multiplying profits and thus attracting new actors into the cassava industry.


### CASSAVA MINISSET TECHNOLOGY

MuMISSET COMPANY LIMITED is a start-up business to supply clean cassava planting materials through the miniset technology. The Cassava Miniset Technology has significant potential in producing and supplying certified planting minisetts in a timely and efficient manner because of its rapid multiplication rate. This will result in a sustainable system of sourcing cassava minisetts on time that increased the cassava production along its value chain.



### MuMISSET OPERATION

- Farmers preferred culture
- Kenya Agricultural and Livestock Research Organization (KALRO)
- Rapid multiplication through linear culture
- Certification by National Plant Protection Organization (NPPO)
- Youth and women seed entrepreneurs + Farmers
- Multiple miniset cuts



### TARGET MARKET AND SERVICES OFFERED

- Youth & women seed entrepreneurs → Clean minisetts
- MuMISSET → Hardened tissue culture plants
- Farmers → Agricultural consultation

### PARTNERS ROLES

- Farmers Sacco's-Recruitment of trained seed entrepreneurs and marketing platform
- Kenya Agricultural & Livestock Research Organization's- Sourcing of cassava varieties
- Kenya Plant Health Inspectorate Service- Certification process
- Kempoly Limited- Provision of packaging trays

### THE ACTION PLAN

MuMISSET as a start-up business, its practical realization of its objectives requires greenhouse infrastructures, laboratory services, packaging materials, labour, logistics and advertisements facilities.

### TEAM MEMBERS

- Patrick Kidai- Crop Protectionist
- Antony Livi- Plant Pathology
- Florence Murgub- Bioinformatics

University of Nairobi is ISO 9001:2015 certified

A start-up business-MuMISSET Company Limited Poster



Mr Patrick Kidasi (MSc Student) exhibiting cassava value chain to visitors



Cassava value addition demonstration table



Cassava minisetts establishment (A month old crop)





*Cassava minisett establishment (A month old crop)*



*Growing cassava minisett*



*Grown cassava from minisett in Lodwar*





*Harvested cassava root at Lodwar*



*Harvested roots from two cassava crops only.*

# *Cassava: a food security saviour for smallholder farmers during the COVID-19 pandemic Lockdown*

Prof. Agnes Mwangombe, Principal Investigator

The global pandemic, COVID-19, has greatly affected nearly all sectors of the economy. The global impact is quite massive but a close observation of the impact of COVID-19 pandemic along the Kenyan Coast counties of Kilifi and Taita-Taveta gives a glimpse of hope. The Kenyan farmers do exhibit some resilience in terms of agricultural productivity. During this pandemic period, an understanding of how resilient the local food systems and adaptiveness of smallholder farmers to shocks has been enhanced. As many of the world economies slide into recession, conversations of farmer preparedness to adapt their food systems and rural economies to new realities has increasingly become apparent with a focus on supporting smallholder farmer's response, recovery, and resilience. Resilient crops such as cassava have provided smallholder farmer households a buffer for food security in the heat of the current crisis in the coastal region as well as in eastern Uganda.

Covid-19 containment measures that were adopted by Governments of Kenya and Uganda including the lockdown limited mobility of persons from one locality to another. These measures further disrupted the marketing channels and business of several agricultural actors. However, in many farm households at the coastal Kenya that had adopted and planted cassava, noted that as their purchasing power for other foods got tremendously disrupted, the cassava gardens provided a unique and consistent food supply source for the households. Cassava consequently became a household food security saviour amidst the pandemic situation.

The realities and testimonies of the smallholder farmers in Kilifi and Taita Taveta have convinced the County Governments of Taita Taveta to take immediate action in supporting cassava as one of the priority food crops in the area. The County Government has subsequently allocated 40 acres of land for clean seed multiplication under a partnership with the University of Nairobi Cassava CARP+ project. This partnership is meant to off-set the dearth shortage of clean planting materials in the county. The University of Nairobi Cassava CARP+ project has continuously propagated clean planting materials through tissue culture and miniset technology, however, the production is low compared to the demand. This partnership with the County Government will significantly increase the capacity of the Cassava CARP+ project to provide tissue culture and minisets based clean planting materials for rapid multiplication with possible available of cuttings within 9-12 months period.

Smallholder farming communities have over this COVID-19 period proven that at short notice, their resilience spirit and dynamism can easily be mobilised to survive adversity. Within these rural communities, one of the most affected groups were the religious leaders especially the pastors owing to the church closures. They have had waded through hardship as their revenue streams were dramatically affected. However, around this time, the Cassava CARP+ project team had been training smallholder farmers on cassava value addition and composite foods from cassava and other vegetables. It has been said that necessity is the mother of all inventions, the simple training offered to farmers on cassava value addition, farmers passed on the knowledge to the



*Cassava wholesaling at Kongowea market*



*Cassava retailing at Kongowea Market*



*Cassava Dry chips retailing in Kongowea market*

pastors and other farm households to process both cassava roots and leaves into delicious meals. An amazing feedback from the local farmers shows how church compounds have quickly been turned into small gardens in an attempt rapidly make pastors food secure. This situation has dramatically increased the demand for cassava in the area.

Champions are important cornerstones in taking innovations to scale. In the Cassava CARP+ project, Mama Jane Ndela has demonstrated impeccable commitment as a cassava champion farmer. Her commitment and dedication has earned her recognition by the County Government. She has subsequently been appointed to provide local trainings at community level based on her experience as well as the technical capacity she has built overtime in engagement with the Cassava CARP+ project team. Mama

Jane Ndela has developed seven (7) varied dishes from cassava roots. Her adaptiveness, innovativeness and entrepreneurial acumen enabled her to earn from the sale of cassava value added crisps, cassava baked fish balls, and cassava beans incorporated dishes at the height of the pandemic lockdown. From the stories of Mama Jane Kitchen, the farmers truly understand the value of the cassava crop.

The cassava crop has truly proven to be a household food security saviour at the time of adversity. As a research team dedicated to ensuring rural food security and rural transformation through ensuring value addition and dynamic entrepreneurship, the task and journey has just started, the successes we have seen over this period, provide the team with request fuel to drive further and remain resolute to the tasks a head!

# RUFORUM Community Action Research Programs as 'Scaling Laboratories': A reflection

Dr. Anthony Egeru, Training and Community Development Manager, RUFORUM Secretariat

Universities have a fundamental role to play in supporting rural development in the global south. Universities can play this role by supporting research and innovation, technology transfer and continuous skills development at various spectrums. Societies have increasingly come out strong demanding for the relevance of universities in contributing to the improvement of economic and social living conditions of communities. This increased demand for the relevance of universities is now redefining how universities approach their space in national and regional discourse. Increasingly, universities are paying attention to the third role of outreach with a strong articulation for engagement such universities are seen as engaged institutions connecting with communities to address their everyday challenges and development aspiration. Further, universities are reshaping the narrative around their to extending it to industrialisation and production of goods and services in what is now commonly considered as Education 5.0 and being used to reconfigure university education. This has gained significant currency in Zimbabwe under the stewardship of the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development .

The Regional Universities Forum for Capacity Building (RUFORUM) has been focused on strengthening engaged universities as part of catalysing the role of universities in contributing to rural development. Over the years, RUFORUM has done this through a unique sub-granting mechanism of the Community Action Research Programs (CARPs). The CARPs are designed as innovation platforms that represent spaces for

learning and change, bringing diverse actors together to co-design, co-innovate, co-produce and co-implement innovations and solutions responsive to challenges faced by the actors in the agricultural system. Within the context of RUFORUM, the CARPs are implemented along commodity value chains with the aim enhancing production and productivity, value addition and commercialisation.

RUFORUM initiated the CARPs in 2009 as a mechanism for taking to scale the several pilot innovations generated from the Graduate Research Grants (GRGs). The GRGs had generated several technologies, innovations and management practices but were too scattered at pilot level and not significantly engaging communities. It was time to reduce researching on the community to researching with the community and playing an active role in transforming agricultural practice among the smallholder farmers in Africa. But, this required a platform for universities to play this role and this platform was provided by the CARPs.

The initial CARPs; fish (Malawi), Cassava (Uganda), Dairy (Tanzania), and Wheat (Ethiopia) were implemented with funding support from the Bill and Melinda Gates Foundation. The success realised from these initial CARP projects laid the foundation for an expanded approach to utilisation of the CARPs in the RUFORUM programming as 'scaling laboratories'. With the support from the Mastercard Foundation through the Transforming African Agricultural Universities to meaningfully contribute to Africa's growth and development (TAGDev) program, we have extended this model to more countries and value chains including: two Cassava projects (Kenya) two Potato projects (Kenya and Kenya), Baobab (Benin), Pineapple





*Amos preparing cassava minisets for a demonstration in Taita Taveta*

(Ghana), Safflower (Botswana), Sheep and wool (South Africa), Rice (Uganda), Piggery (Uganda), cereals, legumes and water harvesting (Zimbabwe), encroacher bushes (Namibia), famine crops (Sudan), vegetables (Sudan), apiary (Sudan) and natural resources management (Sudan). As the international development community strives to ensure that interventions go beyond fragmented and one-off projects to scaling of successful innovations and pilots for maximising achieve impact at scale, the CARPs provide a unique and illustrative platform to serve as 'scaling laboratories'. The CARPs as 'scaling laboratories' provide for solutions co-creation with a practical orientation in demonstration and learning points to support going beyond a successful pilot.

In this Volume 4 of the Voices from the Field, illustration of success in how the cassava CARP has served the role of a 'scaling laboratory' is provided. While the initial target

of the project was to engage 6,000 farmers, the illustrative implementation of this project using the innovation platform approach has provided opportunity for taking to scale the aspects of clean seed delivery, development on community based seed system, value addition and cassava commercialisation. These actions taken together have impacted over 46,800 lives in Kenya and Uganda, trained at least 11 graduate students (9 masters and 2 PhD) as well as incubated over 100 graduate, undergraduate and TVET students in enterprise development at the Seed Enterprise Management Institute (SEMI), University of Nairobi.

Further, by Cassava CARP extending taking cassava seed minisets to Lodwar in north western Kenya, a semi-arid area prone to food security, the project was demonstrated indeed that the CARPs can be a strong scaling instrument that can be effectively deployed to harness sustainable impact at

scale. The project has equally been able to awaken discourse on alternative pathways to food security in Kenya; a country that has been deeply dependent on maize as a primary food security crop. Evidence of food security and buffer against COVID-19 induced shocks in Taita Taveta and Kilifi among cassava producing households, demonstrates how adoption of technologies going to scale is critical. In addition, the decision by the County Governments of Taita Taveta and Kilifi to strategically take the cassava program to scale in two counties is a reality check of how the CARPs serve as platforms for going to scale from pilots.

The CARP model as implemented by RUFORUM is thus an opportunity for scaling through iterative innovation and learning.

As the current Cassava CARP project at the University of Nairobi receives an overwhelming demand to intervene in several places and communities in Kenya and Uganda, it is a re-assurance that; universities can strongly play a catalytic role in not only technology development and dissemination but in driving the adoption, creating convergence of interests and actors and provide evidence of what works and how it works and further support community level change. RUFORUM's quest is that the development community recognises that working with universities and deploying unique models such as CARPs, provides a long-term and sustainable solution that allows for innovations and technology scaling as well as sustained capacity and skills for continuous skills development and facilitation of change at community level.



*Amos, a youth trained by the Cassava CARP+ team teaching one of the farmers in Taita Taveta to establish a cassava miniset multiplication plot*









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