

# PanAfrican Agriculture

BALANCED AND AUTHORITATIVE

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## Farming to the Rescue

As oil wells dry, South Sudan sees alternative wealth in agriculture.

## Q&A

With Kenya's chief weatherman Dr David Gikungu on the Horn's worst drought in 40 years.

## New GMO country

What the lifting of a ban on cultivation of biotech crops means for Kenya's food security.

# The Last Staples

Fairtrade report warns of climate threats to popular food crops like banana and maize.



Photo Credit: Fairtrade



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# Editor's Note

## Keep the conversation on a resilient food system for Africa going in 2023

**Africa is coming off a tough year for its food systems.**

**G**LOBAL supply chain disruptions related to the Russian-Ukraine war and a prolonged drought and flooding in parts of the continent aggravated the crises of food shortages, high food prices and hunger that were triggered by the Covid-19 pandemic in 2020 and 2021.

Even as we reflect on these challenges, we also celebrate the efforts put in by everyone – from the small-scale farmers to agribusinesses, food traders, innovators, scientists, researchers, policymakers, and donors – to build resilience and achieve sustainable food systems on the continent.

As your agriculture and food security communication partner, we at *PanAfrican Agriculture* are particularly proud to have played a role in the conversation through our coverage of various research, innovations, policies, technologies, market trends, major events and key personalities.

In 2023, we will not only keep the conversation going but also introduce significant improvements in terms of the quality, variety and scope of our coverage and make your experience on our print and digital platforms much more friendly.

Our list of correspondents in different parts of the continent is growing, with the latest additions being in South Sudan and Zimbabwe.

We invite you to visit our revamped and user-friendly website [www.panagrimedia.com](http://www.panagrimedia.com) for up-to-date reports and videos.

This January-March edition of the magazine, the first this year, is coming out against the backdrop of a major international event hosted in Africa and a major national agricultural policy shift in one African country.

In November, delegates from all parts of the world converged in the Egyptian city of Sharm el-Sheikh for the 2022 United Nations Climate Change Conference, COP27, where threats of the global warming to Africa's agriculture were among the subjects of discussions.

Our main special report in this issue delves deeper into the COP27 discussions, including the highlights of a Fairtrade report warning about risks posed to key crops such as maize, bananas, coffee and cocoa and how climate-smart agriculture is helping smallholders to build resilience in countries like Zambia.

In the Q&A section, Dr David Gikungu, the director of the Kenya Meteorological Department, explains what the Horn of Africa's worst drought in 40 years and changing weather patterns say about climate change.

In Kenya, the new administration of President William Ruto in October lifted a controversial 10-year ban on GMO food imports and cultivation of biotech crops.

We bring you insightful reports about the implications of this policy shift on the country's efforts to achieve food security.

Enjoy your reading and we wish you a year full of promise.

*Cianki*



Photo Credit: Shutterstock





Photo Credit: BBC News

## 16. Climate risk on the table

Fairtrade, a global organisation co-owned by more than 1.8 million farmers and workers, unveiled a Non-Fungible Banana, as a warning to consumers and global leaders during COP27 held in Egypt. It warned that smallholder farmers and agricultural workers need support to mitigate and adapt to climate change or the future of one of the world's most beloved foods could very likely be a digital one. COP27 hosted the first ever Food Systems Pavilion and first ever Agriculture Day hosted by the COP Presidency, with food and agriculture featuring in the final cover text but with a narrow focus on agriculture rather than a food systems approach.

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### 43. Eat more beans rich in iron and zinc

Kenyans have been urged to eat more beans rich in iron and zinc, do value addition to make them more attractive to children and address malnutrition.

### 45. GMO maize approved and ready for farming

The National Biosafety Authority (NBA) has authorised the release of genetically modified organism (GMO) seeds to the farmers ahead of the long rains season in 2023 for cultivation. The approval of the release of seeds through a letter to the Kenya Agriculture and Livestock Research Organization (KALRO), which has been undertaking biotechnology (BT) trials in Kenya could see farmers start growing GM maize after all the necessary modalities are in place.



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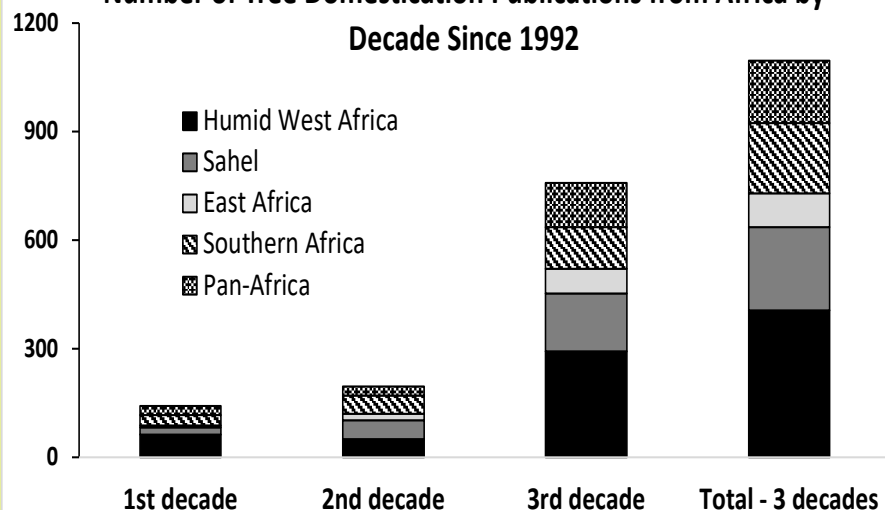
## Improve your competitive edge with the GGN label

Applicable to a wide range of fruit and vegetables, the consumer label helps you grow trust in your brand by making responsible farming visible on store shelves.



Join the initiative at  
[www.globalgap.org/ggnlabel](http://www.globalgap.org/ggnlabel)

**Number of Tree Domestication Publications from Africa by Decade Since 1992**



*The growth of tree domestication research in Africa done by 532 research teams from 34 African countries over the last three decades. Source: "The future of food: domestication and commercialisation of indigenous food crops in Africa over the third decade - 2012-2021", Sustainability 14:2355.*

## Correcting the global imbalance in agricultural development: mainstreaming indigenous African species as new crops

By Prof Roger RB Leakey

**M**EDIA reports sometimes tend to portray African agriculture as more about feeding the urban population than rebuilding resilient livelihoods for poor, food-insecure and marginalised communities across the continent.

Hopefully this article will show many of those engaged in up-stream technologies and business, ways in which their work could contribute to a stronger focus on

the local cultivation of indigenous African species to produce new foods, nutraceuticals, cosmetics and medicines.

The dominant line of thought in international institutions, and even many in Africa, is that African agriculture must mirror that pioneered elsewhere in the world. It is a legacy from colonisation, the industrial revolution and the

Green Revolution, which has been perpetuated by globalisation.

The perception has been fed strongly into research and development across the continent due to a failure to recognise the very different social, economic, and environmental conditions prevailing in temperate and tropical countries. For example, there is a general blindness to the day-to-day impacts of these differences on poor and marginalised smallholder subsistence households across African communities. These impacts arise from the very substantial differences in farm size, mechanisation, the inequalities in the social and economic structure of rural communities, and the poor access to financial capital.

Furthermore, inappropriate intensification policies, unfair international trade and the lack of income generation opportunities combine to constrain agricultural productivity by driving the downward spiral of 'Land Degradation and Social Deprivation'.

The effects of these outcomes are manifested as 'Yield Gaps' in staple food production which impede national programmes for food and nutritional security, social justice, climate change mitigation and protection of biodiversity habitat. Intricately intertwined with all this are issues of culture, community, dignity, and environmental rights, which are linked to the use of traditional foods, medicines and other everyday items originating from indigenous plants.

The solution, I believe, is to question, understand and address the complex drivers of Yield Gaps by thinking 'outside the box' embodied by the conventional approach to farm intensification. In much of Africa, this common approach is based on the growth of a small number of staple food crops as monocultures by households living on the brink of

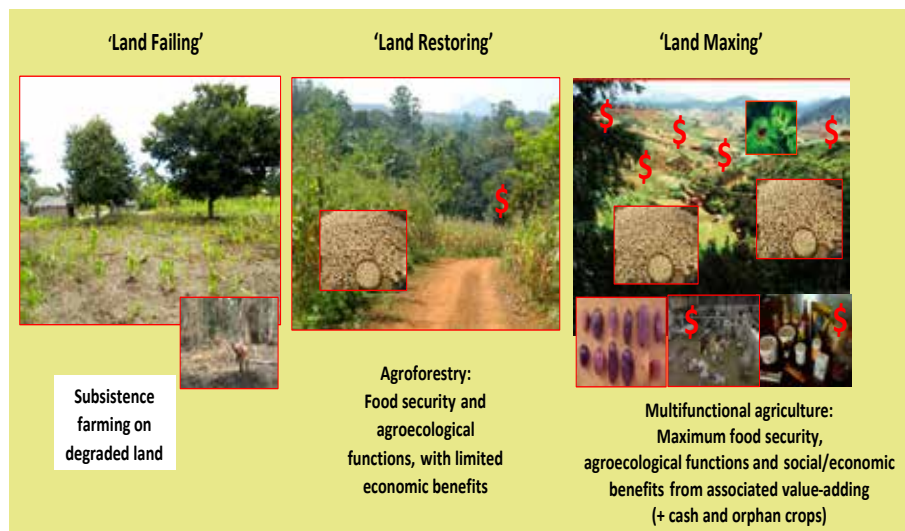
[1] *Converting 'trade-offs' to 'trade-ons' for greatly enhanced food security in Africa: multiple environmental, economic and social benefits from 'socially modified crops'* | SpringerLink



the cash economy with only small, often fragmented, farms of 1-3ha. This means that with little income to support the family's health, education and other social expenses, the farm is managed with almost zero access to inputs to enhance soil fertility and/or combat pests and diseases. Under these conditions, sustainable food production is extremely difficult. A practical alternative, with a different philosophy, is to find ways of farming that harness local natural resources and traditional knowledge through community engagement.

Thirty years ago, farmers in Cameroon asked for help to cultivate their traditionally and culturally important trees, overlooked by agricultural science – species that used to provide many of their daily needs before deforestation made them hard to find. Since then, amazing progress has been made with the domestication of about 60 indigenous, highly nutritious, and marketable food tree species for cultivation as new crops (Figure 1), especially when implemented by communities. Typically, the wide range of products from these trees are informally traded in local markets, but there is great potential to select and multiply the elite trees found in wild populations that produce fruits/nuts/leaves with the exceptionally high-quality traits needed by new local businesses and industries: supported by local processing and value-addition to extend shelf life and open-up wider and more prolonged trade.

To achieve all this, a multidisciplinary package of relevant strategies using low-cost, appropriate and practical technologies has been developed with farmers and published in two books: “Multifunctional Agriculture – Achieving Sustainable Development Goals in Africa” for academic readers and “Living with the Trees of Life” for general readership. In addition, these publications describe how this community-based participatory tree domestication can be coupled with the well-known agroforestry techniques



***The transition from agriculture failure to Land Mxing by resolving the 'Cycle of Land Degradation and Social Deprivation' through the combination of agroforestry and the domestication and commercialisation of indigenous African food and non-food species as novel crops that produce domestically useful and marketable products for new business in combination with restoration of wildlife habitat and the mitigation of climate change.***

using nitrogen-fixing leguminous trees and shrubs to restore soil nitrogen fertility and create functional and sustainable agroecosystems on a smaller area of land (<https://news.mongabay.com/2018/01/trees-are-much-more-than-the-lungs-of-the-world-commentary/>).

This then results in a three-step generic model for rural development by seeking income generation opportunities from the processing and marketing of these new products to diversify and enhance the rural economy (The Great Reset Project — International Tree Foundation). (<https://internationaltreefoundation.org/the-great-reset-project/>) Together this offers a better future for the local population within a diversified and much more sustainable form of agriculture, which additionally generates positive global impacts including the restoration of wildlife habitat and the reduction of greenhouse gas emissions). This has been described as 'Rebooting tropical agriculture' recognising that 'African Lives Matter'.

Importantly, in a related initiative, the further diversification of these mixed cropping systems can be achieved by adding some of the neglected African herbaceous food species to create even healthier landscapes and diets, as described in “My Food is African” published by the Natural Food Barefoot Guides of the Alliance for Food Sovereignty in Africa. These under-utilised indigenous food species have been called 'orphan crops' because they were overlooked by the Green Revolution.

In conclusion, enhancing sustainable smallholder productivity using indigenous and wild foods is an important international policy and business intervention. I believe that this is vital for achieving the 2030 Sustainable Development Goals and the rebalancing of the global economy by restoring and recapturing natural, social and human capital within new African indigenous food industries. What is the missing ingredient? – it is our political, corporate and personal will to change the status quo.

***Prof Roger RB Leakey is the Vice President of the International Tree Foundation, Oxford, UK.***

2. *Multifunctional Agriculture - 1st Edition* ([elsevier.com](https://www.elsevier.com))
3. *Living with the trees of life. Towards the transformation of tropical agriculture* | CABI Books ([cabidigitallibrary.org](https://cabidigitallibrary.org))
4. *A re-boot of tropical agriculture benefits food production, rural economies, health, social justice and the environment* | Nature Food
5. <https://doi.org/10.3390/su1317252>
6. *Sustainability | Free Full-Text | The Future of Food: Domestication and Commercialization of Indigenous Food Crops in Africa over the Third Decade (2012&ndash;2021)* ([mdpi.com](https://mdpi.com))



*Prof Appolinaire Djikeng, new ILRI, Director General. Photo Credit: ILRI*



*Dr Eliane Ubalijoro, the new Chief Executive Officer (CEO) of CIFOR-ICRAF and Director General of ICRAF. Photo Credit: ICRAF.*



*Dr Simeon Ehui, the new IITA Director General. Photo Credit: IITA.*

# Three Africans to head CGIAR research centres

By Murimi Gitari

**T**HE International Institute of Tropical Agriculture (IITA) has tapped Dr Simeon Ehui, a senior executive at the World Bank, as its next Director General, making him the second African to lead the 55-year-old research and innovation institution.

Dr Ehui, a national of Côte d'Ivoire, will also double as the Regional Director for Continental Africa of the Consultative Group on International Agricultural Research (CGIAR) a global partnership of 15 international organisations involved in food security research.

His appointment is effective August 1, when he will formally take over from IITA's long-serving Director-General Nteranya Sanganya, who is retiring.

Dr Ehui has over 30 years' experience in agriculture and sustainable development and was, until his latest appointment, the World Bank's Regional Director for Sustainable Development in West and Central Africa.

The IITA Board of Trustees and CGIAR, in a statement announcing Dr Ehui's appointment, said the new Director General is expected to build on the organisations' proven track record of impact, working with teams and partners to improve livelihoods, enhance food and nutrition security, increase employment, and preserve natural resources across Africa.

Dr Bernard Vanlauwe, the IITA Deputy Director General and Director for Research for Development (R4D), will serve as the interim Director General before Dr Ehui takes over.

Dr Ehui's appointment at IITA is one of three major management changes at CGIAR centres recently, which have seen Africans take the top positions.

The Board of Trustees for CIFOR-ICRAF has also recently appointed Dr Eliane Ubalijoro as Chief Executive Officer (CEO) of CIFOR-ICRAF and Director General of ICRAF.

Dr Ubalijoro becomes the first African woman Director General of a CGIAR research centre and CEO of two centres in CGIAR's 52-year history.



Executive Director of Sustainability in the Digital Age, and Professor of Practice for public-private sector partnerships at McGill University's Institute for the Study of International Development. Over the past two decades, her research has focused on innovation, gender, and sustainable development.

"I see CIFOR-ICRAF as a critical institution, poised to accelerate its research and impact, leading the way to achieving the 2030 goals by harnessing the potential of forestry and agroforestry to create ecosystems that generate prosperity, sustainably," said Dr Ubaljoro, whose appointment is effective May 2023.

Dr Robert Nasi, CIFOR-ICRAF's acting CEO, will take up the position of Chief Operating Officer.

Dr Nasi is a globally recognised forestry scientist who has been researching the ecology and management of tropical forests for the past four decades, including the sustainable use of forest resources and the intersection of conservation and development.

At the International Livestock Research Institute (ILRI), Cameroonian Appolinaire Djikeng is set to take up his new role as the Director General on April 3, replacing Dr Shirley Tarawali, who has been serving in the position in an acting capacity following the retirement of Dr Jimmy Smith in December 2022.

Prof Djikeng, a globally recognised development expert, will also serve as CGIAR Senior Director of Livestock-Based Systems.

Speaking after the announcement of his appointment, Prof Djikeng said: "Livestock development is close to me personally and it is a huge honour and privilege to take the helm of the world's leading livestock research and development organisation, focused on improving outcomes for farmers, addressing challenges related to our environment and the sustainable use



*Professor Appolinaire Djikeng. Photo Credit: CTLGH*

of natural resources, and delivering solutions to our increasingly vulnerable food systems."

He joins ILRI and CGIAR from the University of Edinburgh, where he is currently a Professor and Chair of Tropical Agriculture and Sustainable Development, as well as the Director, Centre for Tropical Livestock Genetics and Health (CTLGH) based at the Roslin Institute.

He will retain his affiliation with the Roslin Institute of the University of Edinburgh to strengthen the

partnership with ILRI and the CGIAR system. Prof Djikeng previously worked with ILRI from 2009-2016 as Technology Manager and then Director of the Biosciences Eastern and Central Africa (BecA)-ILRI Hub. He has received numerous awards, including the 2020 Nelson Mandela Justice Award. He was also recognised by the Decade of Health as one of the 10 people in the United Kingdom changing health.

*Photo Credit: ILRI.*



*Lucy Muke, a farmer in Mbalmayo in south-central Cameroon displaying processed and bottled liquid pepper, ginger and garlic. Photo Credit: Elias Ngalame.*

# Non-timber product earnings spice up forest conservation in Cameroon

By Elias Ngalame

**L**UCY Muke, a farmer in Mbalmayo in south-central Cameroon, points happily to the pile of processed and bottled liquid pepper, ginger and garlic in front of her door, which she plans to supply to supermarkets in the capital Yaounde.

The 36-year-old mother of three belongs to a group for rural women farmers who have benefited from a government programme called AGROPOLE.

The programme, launched in 2014, seeks to promote small and medium-sized agricultural enterprises in rural areas.

It provides training and funds for farmers to process and market spices and other forest-grown

plants, to boost incomes and jobs, while conserving trees and limiting climate change.

Muke says the project, introduced in her region in 2019, has enabled her to make more money, with which she can send her children to school and feed the family.

This season she harvested and processed a dozen 10kg bags of pepper that sold for 600,000 Central African francs (\$975).

A bag of fresh pepper fetches 20,000 CFA francs, but when processed into a liquid and bottled, farmers get as much as 50,000 CFA francs for the same weight.

In the past, Muke and her peers lost much of their fresh produce through spoilage due to hot tropical conditions.

But processing and packaging a range of spices is becoming more popular here and in other parts of Cameroon, as it helps small-scale farmers beat the heat.

“Now we can preserve our harvest for weeks and months without any damage,” says Martin Nkili, another Mbalmayo farmer.

AGROPOLE national coordinator Adrian Ngoó Bitomo said the programme had helped more than 400 farmer groups in the last five years, four-fifths of them in forest communities, distributing about 22 billion CFA francs (\$35.7 million) in grants.



### **The programme tackles food security, forest conservation and climate change.**

The support it provides includes farm inputs, processing equipment and start-up funding, he added.

The development of a market information system is also helping to balance supply and demand by providing a channel for buyers and sellers to communicate on prices.

Each group of at least 10 members gets start-up financial support of 10 million CFA francs or more, inputs for planting, training, a grinding machine and a digital weighing scale.

### **Rich Resources**

In February, some 10 forest community groups showed off an assortment of their processed and packaged products in Yaounde at a week-long international trade exhibition, the country's largest, that takes place every two years.

"The government support has made us see the rich resources in our forest," said Helen Ojong, coordinator of Mas Provence Spice Enterprise, a group of more than 60 women producers based in Mamfe, southwest Cameroon.

Others have specialised in making herbal remedies, and selling leaves and flowers for decoration, she added.

Forestry officials said the project had improved livelihoods for those communities, especially women and young people, and helped them understand the need to care for their environment.

"Indigenous forest people are better-placed to protect their forest, not just because they love trees and other resources therein, but because it is very important for poverty reduction," said Bruno Mfou'ou, director of forests at the Ministry of Forests and Wildlife.

The new skills they have acquired in processing herbs and spices mean they no longer have to rely on the charcoal or bush meat trade to make a living.

Strengthening rural livelihoods with alternative sources of income is part of the government's efforts to protect forests and biodiversity.

"Once communities understand the value of their forest, they become its 'voluntary guardians', helping the state to curb illegal activities such as logging," Mfou'ou said.

"That, in turn, curbs climate change by keeping trees standing as stores of planet-warming carbon."

### **Limited Land**

Locally produced spices now fill

shelves in supermarkets, restaurants, hotels and schools in Cameroon and neighbouring countries because of their original quality, officials said.

"By consuming locally processed spices and other food items, we help promote our agriculture and empower our farmers financially," said Delor Magellan Kamseu Kamgaing, president of the Cameroon League of Consumers.

Bitomo, the programme coordinator, says training farmers has not been easy, with many lagging behind due to high illiteracy.

"Lots of patience and longer time is needed to help them catch up," he says.

The farmers also face challenges in expanding their output because of limited cultivable land - most have only one or two hectares - in addition to a lack of finance.

Bernard Njonga, coordinator of the Cameroon-based Support Service for Local Development Initiatives, which aids rural communities, blamed the barriers holding farmers back on a lack of opportunity for them to shape agricultural policy.

"Any measure aimed at addressing agricultural challenges must involve farmers to achieve maximum success," he said.



*Processed and packed liquid pepper, ginger and garlic. Photo Credit: Elias Ngalame.*



Founder and CEO of ColdHubs, Nnaemeka Ikegwuonu. Photo Credit: ColdHubs.

# Cold chains, a hot issue for food security

By Busani Bafana

**M**ORE than 500 million tonnes of food, enough to feed around one billion people, is wasted and thrown away without being eaten, says a new joint United Nations report, calling for investment in sustainable food cold chains.

The number of people affected by hunger in the world rose to 828 million in 2021, a year-on-year rise of 46 million, the United Nations warns in the report indicating that almost 3.1 billion people could not afford a healthy diet in 2020.

This was a rise up to 112 million people from 2019, as the economic impacts of the Covid pandemic drove up inflation.

The Ukraine war has triggered spikes in the prices of basic grains threatening food security, the global body said. The challenges come on the back of the world losing an estimated 14 percent of all food produced for human consumption before it reaches the consumer.

The lack of an effective cold chain to maintain the quality, nutritional value and safety of food is one of the major contributors of the food loss.

According to the Sustainable Food Cold Chains report by the UN Environment Programme (UNEP) and the UN Food and Agriculture Organization (FAO), food cold chains are key to meeting the

challenge of feeding an additional two billion people by 2050 and harnessing rural communities' resilience, while avoiding increased greenhouse gas emissions.

"At a time when the international community must act to address the climate and food crises, sustainable food cold chains can make a massive difference," said Inger Andersen, Executive Director of UNEP following the launch of the report, during the COP27.

"They allow us to reduce food loss, improve food security, slow greenhouse gas emissions, create jobs, reduce poverty and build resilience – all in one fell swoop."



The report was developed by the UNEP-led Cool Coalition in partnership with FAO, the Ozone Secretariat, UNEP OzonAction Programme, and the Climate and Clean Air Coalition.

It says developing countries could save 144 million tonnes of food annually if they reached the same level of food cold chain infrastructure as developed countries.

“As post-harvest food loss reduces the income of 470 million small-scale farmers by 15 percent, mainly in developing countries, investing in sustainable food cold chains would help lift these farm families out of poverty,” the report says.

The food cold chain has serious implications for climate change and the environment with emissions from food loss and waste due to lack of refrigeration totalling an estimated one gigatonne of carbon dioxide (CO<sub>2</sub>) equivalent in 2017, about 2.0 percent of total global greenhouse gas emissions.

Reducing food loss and waste could make a positive impact on climate change, with new cooling-related infrastructure that are energy-efficient and run on renewable energy.

The adoption of the Kigali Amendment to the Montreal Protocol and the Rome Declaration on “the contribution of the Montreal Protocol to sustainable cold chain development for food waste reduction” provide a unique opportunity to accelerate the deployment of sustainable food cold chains.

The report notes that projects around the world show that sustainable food cold chains are already making a difference. In India, a food cold chain pilot project reduced losses of kiwi fruit by 76 percent while cutting emissions through the expansion of use of refrigerated transport.

In Nigeria, a project to install 54 operational ColdHubs prevented the spoilage of 42,024 tonnes of food and increased the household income of 5,240 small-scale farmers, retailers and wholesalers by 50 percent.

In Nigeria, food loss accounts for 40 percent of all food produced in the country, according to the World Bank. An estimated 93 million smallholder farmers and food supplier chain actors are affected by food loss.

Nnaemeka Ikegwuonu, the founder of ColdHubs Ltd, is a Nigerian social enterprise that designs, installs, operates and rents walk-in cold rooms known as ‘ColdHubs’, has observed farmers at local markets racing to sell their produce before sundown to avoid throwing it away after it spoiled.

The ColdHubs can store and preserve fresh fruits, vegetables and other perishable foods, extending their shelf life from two days to 21 days. The transportable, stand-alone units give local farmers an affordable, pay-as-you-go option for keeping their beans, peppers, tomatoes, and other produce fresh for days or weeks. The unit’s solar panels are connected to a battery storage system that allows the coolers to operate completely off the grid 24-hours a day. Each unit is also equipped with multiple sensors so they can be monitored remotely via either a computer or mobile phone app that keeps tabs on temperature, and energy consumption.

A report by the Rockefeller Foundation indicates that the increase in the commercial sale and use of loss-averting technologies among smallholder farmers and value chain actors is an opportunity to reduce spoilage. Fruits and vegetables have the largest losses across developing countries, accounting for 42 percent of the developing country loss and waste globally.

With less than seven years to the deadline for the 17 Sustainable Development Goals, the FAO has called for global action to reduce food loss and waste. SDG Goal #12 is about ensuring sustainable consumption and production patterns with a focus on reducing waste. A target of SDG#12 specifically calls for the halving of global per capita food waste at the retail and consumer levels and reducing food losses along production and supply chains, including post-harvest losses.

To expand sustainable food cold chains globally, the report recommends the adoption of a holistic systems approach to food cold chain provision as well as the quantification and benchmarking of the energy use and greenhouse gas emissions in existing food cold chains.



*A farmer sorts out her produce before loading it into a cold storage unit.  
Photo Credit: ColdHubs.*





*An agricultural engineer at AEATREC displays and demonstrates the use of an agro processing machine at the Source of the Nile Jinja Agricultural show ground. Photo Credit: Lominda Afedraru*

# Uganda cassava flour millers upgrade to meet brewers' standards

By Lominda Afedraru

**T**HE traditional method of processing the cassava flour can be tedious and wasteful.

In Uganda, it normally involves peeling the tubers, chopping them into pieces and leaving them to dry in the sun for days before it can be milled into flour.

However, with brewery firms in the country increasingly demanding higher quality cassava flour local millers are adopting better technology and upgrading their factories to meet the high standards.

One such agro-processor is Win Wood Millers based in Lira, which processes and supplies between 20-30 metric tonnes of cassava flour every month to Uganda

Breweries Limited (UBL) and other confectionary industries.

The company's upgraded plant has a capacity of milling seven metric tonnes of cassava per day.

One cassava tubers are purchase from farmers, it is peeled by the factory workers and taken to the washing chamber where it is thoroughly cleaned.

It is soaked in water overnight to ensure the cyanide is completely removed. The cassava is then placed in a machine grater to make a wet cake. The cake is then placed in another machine, which is used to press the cake, extracting the starch and cyanide in the cassava cake.

The product comes out as compacted dry cake, which is later transferred to

the drying grater machine to break it into pieces and taken to the flash drier infused with the heat generated from an oven where they are dried before milling.

Win Wood Millers intends to increase the processing capacity to 20 metric tonnes per day due to increasing demand for the product by various industries.

## **Farmer relations with the miller**

There are about 300 farmer groups as well as individual commercial growers who supply the factory with fresh cassava. Every five metric tonnes of fresh cassava is purchased at USh1.5 million. Therefore, the miller advises the farmers to supply the factory by bulking their produce.

Allan Otim, the Win Wood Millers operations manager, says they have





*An engineer demonstrating how a processing machine works.  
Photo Credit: Lominda Afedraru*

no purchase limits as long as the farmers are providing quality cassava tubers.

Win Wood Millers was established in 2011 by Ivan Okor, a local entrepreneur, to process quality cassava for industries.

It expanded its factory processing capacity after it struck a supply deal with UBL for high-quality cassava flour, which is used for brewing beer.

Farm Uganda HOCF, another cassava processing plant, is located in Kiryadongo area where farmers have embarked on growing the crop on a large scale.

The company owned by Sosimu Twesiga is sensitising the farmers who supply it with cassava to dry

the produce on raised racks to reduce the risk of contamination.

The miller currently processes cassava flour for the open market since UBL no longer purchases from them.

It normally hires women to peel the cassava tubers and pays each of them USh1,500 (KSh187,80) per wheelbarrow load.

The plant is operated in such a way that heat from the hot oven is pumped through the chambers where hot water runs through to the drying room where fans pick it and spread it in the entire room.

The pressed cassava chips are dried on trays, which are spread in the drying room. Once they are dry, they are taken to the milling machine for processing.

The miller uses 300kg of fuel wood to dry 70 metric tonnes of cassava, notes Mr Twesiga.

Charles Liri is a cassava breeder working with National Agricultural Research Organisation (NARO) but he has since ventured into growing cassava on more than 200 acres in Kiryadongo.

He processes cassava flour on his farm for the local market and supplies some to Mr Twesiga's processing plant.

Mr Lirri also sources cassava tubers from farmers in Masindi and Kiryadongo for processing.

He harvests between 400- 800 metric tonnes per season and he is working with about 200 youths in the district involved in the cassava value chain.





*Non Fungible Banana. Photo Credit: Fairtrade International.*

# Climate risk on the table

By Busani Bafana

**A** **DIGITAL** banana could be the closest people will see and never taste if the world delays acting on climate change which is threatening food security, says Fairtrade, a global farmers and workers organisation.

Bananas, a key food and income source for millions of people around the world, are vulnerable to climate change. Without urgent action to protect agriculture, the foods we enjoy such as coffee, cocoa, and bananas could disappear from our plates, a study by Fairtrade warns.

Furthermore, climate change is threatening the production of maize, a staple in many countries with researchers pointing to changes in growing conditions affecting lands where maize is grown.

"Climate change will mean we have less food and it will be of lower quality," Joao Campari, the global food lead for the World Wide Fund for Nature (WWF), said.

"Some studies have predicted significant declines of maize across the four countries that produce two-thirds of the world's maize – namely the US, China, Brazil and India. It is imperative that we limit global warming to 1.5 degrees Celsius to minimise impacts on food security. Food will be a victim of climate change, but it is also currently part of the problem," said Campari.

Fairtrade, a global organisation co-owned by more than 1.8 million farmers and workers, unveiled a Non-Fungible Banana, as a warning to consumers and global leaders at COP27. It warned that smallholder farmers and agricultural workers need support to mitigate and adapt to climate change or the future of one of the world's most beloved foods could very likely be a digital one.

"The Last Banana is Fairtrade's call to the world that if we don't step up and achieve inclusive

and equitable climate solutions with farmers and agricultural workers at the centre of climate action, we risk losing our favourite food products forever," Melissa Duncan, Executive Director at Fairtrade International, noted in a statement on the launch of the non-commercial digital artwork which was viewed by global audiences in a digital gallery.

Climate change has affected the yields of major crops, says Aditi Mukherji, Director of Climate Change Impact Area Platform, CGIAR. She cites the Intergovernmental Panel on Climate Change (IPCC) assessment report showing crop yield declines of up to 5.0 percent or more for crops like rice, wheat and maize since the 1960s due to human-caused climate change.

"These yield declines are projected to rise at higher levels of global warming, and further reduce both agricultural productivity and the nutritive value of our food," Mukherji adds. "Similarly, productivity of many other important crops, like coffee and cocoa are projected to decline... under different emissions scenarios."



She also warned of a reduction in maize yields in the absence of adaptable seed systems.

Researchers at the CGIAR project a reduction of around 10 percent in maize production in Africa and Latin America under various climate scenarios by 2055 and this is corresponding to losses of \$2 billion per year.

In Africa, maize will experience heat and drought stress, as well as shorter crop durations.

"This means growing seasons may not be long enough to allow maize plants to fully mature, with potentially catastrophic results for farmers and the millions of people who regularly consume maize," says Mukherji. "Climate-smart, drought-tolerant varieties of maize can help ensure food security, bolster climate resilience and grow the livelihoods of resource-constrained farmers. These varieties give at least 25-30 percent greater yields than conventional varieties in drought-prone environments."

Zambian maize farmer Esther Zulu attended COP27 and participated in discussions highlighting the threat of climate change on the future of food. In her village in the Eastern Province of Zambia, she has witnessed rivers drying as droughts intensify, crop yields dwindle and thinning pastures unable to support livestock.

"This means I can only sell a few bags and keep the rest for my family's needs but the situation has changed in the last few years since I adopted climate-smart agriculture (CSA)," Zulu said.

"I still get a good harvest even in a time of drought."

Practising CSA for the past five years has seen Zulu nearly triple her maize harvest. She has been training other farmers in her district on CSA since she learnt about it through the Community Markets for Conservation (COMACO) organisation in Zambia.

Zulu, who also grows soya beans and sunflower, lamented that the shift in rain patterns has meant she grows her crops late and they never reach

maturity without more rains but she has found a solution.

"I am now using climate-smart agriculture which has taught me the benefits of conserving the natural resources by planting *Gliricidia* sepium trees which bring back nutrients into the soil," she said.

In the 2020/2021 farming seasons, Zulu harvested 145 (50kg) bags of maize. This was a big increase from the 50 bags of maize she used to harvest before she adopted climate smart agriculture methods. She earns about ZKW35,000 (USD2,008) annually from her maize production.

"I am very much afraid that many of the foods we eat could disappear if we do not do something about climate change," she said outside the Zambia pavilion at COP27.

Despite causing a third of emissions, only 3.0 percent of climate finance is currently dedicated to agriculture, according to Lim Li Ching, a panel expert with IPES-Food and Senior Researcher at Third World Network.

A tiny proportion of climate finance is for diverse resilient food systems and small-holder farmers that really need support to adapt to climate chaos.

"The solutions being put forward by smallholder farmers, for diversified, agroecological systems, are some of the most cost-effective actions to tackle climate change - but they can't be left to bear all of the burden," said Li, noting that food insecurity is one of the first and most concerning impacts of the climate crisis.

More than 350 million family farmers in November 2022 petitioned world leaders to warn that global food security was at risk if they failed to get adaptation finance and promote a more resilient form of agriculture.

Small-scale producers produce as much as 80 percent of the food consumed in sub-Saharan Africa, but have accounted for only 1.7 percent of climate finance flows in 2018. This is just \$10 billion compared to the estimated \$240 billion a year needed for them to adapt to climate change, according to the United Nations' Food and Agriculture Organisation.

COP27 hosted the first ever Food Systems Pavilion and first ever Agriculture Day hosted by the COP Presidency, with food and agriculture featuring in the final cover text but with a narrow focus



**Zambian farmer, Esther Zulu, attended COP27. Photo Credit: Busani Bafana**



**Activists at COP27 made a clear call for the support for food security.**  
**Photo Credit: Busani Bafana.**

on agriculture rather than a food systems approach.

“Transforming food systems offers an opportunity to reverse the effects of climate change and build societies that are resilient to future shocks and stresses,” says Dr Tilahun Amede, Head of Resilience, Climate and Soils Unit at the Alliance for a Green Revolution in Africa (AGRA) in Nairobi, Kenya, adding that, “sustainable farming and consumption are critical to striking a balance between needs of people and the planet. These solutions offer us an opportunity to build food, social-economic and ecological resilience to negative effects of climate change.”

Dr Amede says that Africa’s food systems have become fragile because of the high vulnerability to climate change. This has reduced their resilience to all sorts of shocks, including the Covid-19 pandemic and conflict. There is growing food insecurity, with an estimated one in five people facing chronic hunger.

“Smallholder farmers, and especially women and other marginalized groups such as youth are the most vulnerable,” Dr Amede notes, adding that “smallholders’ low adaptation capacities reduce their resilience and coping strategies to climate change. Considering that smallholders produce the bulk of food in Africa, this threatens food security.”

“Cash crops will generally shift with climate patterns, and it is likely that in many cases, prices will increase. Extreme weather events can wipe out large areas of such crops, while moves towards a zero-carbon economy are likely to affect items that must be shipped over long distances. With a growing population, demand for food is projected to grow by more than 50 percent in the next 30 years. We will not be able to feed this growing population with the current focus on only a few staple crops. We must diversify our diets.”

Dr Amede says that currently the focus of research and development is mainly on three crops: maize, wheat and rice, which together account for about 50 percent of the global calorie supply. Crops like sorghum, millets, cassava, teff, fonio, which are adaptive to drought-prone and degraded soils of sub-Saharan Africa, rarely get attention in terms of technology development and have limited market incentives for farmers to grow them.

“There is a need to move towards indigenous, resilient and nutritious crops of Africa that minimize vulnerability to reduced production of the staple crops and farmers can still have yields,” he says.

IPCC warns that most African countries will enter unprecedented higher temperature climates earlier in this century than generally wealthier, higher latitude countries. There is also the risk of biodiversity loss. At above 1.5°C, half of assessed species in Africa are projected to lose over 30 percent of their population or area of suitable habitat. Then productivity loss. Agricultural productivity per capita has been reduced by 34 percent since 1961 due to climate change, more than any other region.

Future warming will negatively affect food systems in Africa by shortening growing seasons and increasing water stress – this is already happening in Eastern Africa – leading to famine.

A push is now needed for tangible and credible solutions for agriculture and sustainable food systems to be included in the outcome of COP28 but Andrew Giacalone, senior advisor for media relations at Fairtrade International, is optimistic about the future of the banana.

“There is definitely a future for a sustainable banana trade – but it means governments and businesses need to fast-track their support for smallholder farmers and agricultural workers now and focus on building and enhancing net-zero supply chains,” he added.





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*A smallholder farmer sprays pesticides, often with a lack of knowledge about how pesticides should be used. Photo Credit: Henry Owino.*

# Africa's pollinator decline puts pesticide imports in the spotlight

By Henry Owino

**H**IGH incidence of pests associated with the effects of climate change is prompting many farmers in Africa to resort to the use of pesticides to protect their crops.

Unfortunately, the practice is having unintended consequences, with the continuous use of pesticides threatening wild pollinators. It also compromises the health of consumers and livestock, and is hazardous to the environment and farmers themselves.

Pollinators include insects, especially bees, some species of flies, wasps, butterflies, moths, beetles, weevils, ants, midges, bats, birds, primates, marsupials, rodents and reptiles.

Joachim Paul, the director Heinrich Böll Stiftung Foundation (HBSF) Kenya Chapter, said excessive use of

toxic pesticides in Africa is eliminating wild pollinators, which play an important role in increasing crop yields and supporting food production.

Paul, a conservationist, also noted the decline of pollinators is jeopardizing their other important roles in the ecosystem, including ensuring ecosystem stability, habitat conservation, and creation of opportunities for income-generating activities.

The abundance and diversity of wild pollinators, he said, were declining, citing studies that warn that at least 17 percent of pollinators are at high risk of extinction.

Weak market regulation of the agrochemicals market in Africa is widely blamed for the threats caused by pesticide use to food production and public health.

The global pesticide market has almost doubled in the last 20 years and by 2023, the total value of all pesticides used is expected to reach nearly US\$130.7 billion.

The European Union (EU) is in the spotlight as the top exporting region, increasingly selling toxic pesticides to low- and middle-income countries where environmental, health and safety regulations are often the weakest.

The African agrochemical market accounts for only 2-4 percent of global usage, although pesticide imports into Africa have increased significantly over the past five years. South Africa's agrochemical market leads on the continent followed by Egypt, Cameroon, Ethiopia and Kenya.

The EU is the second-highest exporter of pesticides to Kenya. Many of the toxic pesticides exported are banned in the EU but are sold to Africa.



"Pesticides that are not allowed for use in countries such as Germany where they are produced are still exported to other countries. For example, in Kenya, 44 percent of the total volume of pesticides used are banned in Europe," said Paul.

The Pesticide Atlas Report shows that in 2020, a total of 25 different active ingredients were found in tomato and kale samples in Kenya.

At least 51 percent of the detected active ingredients were already withdrawn from circulation in the EU long ago. Of the total of 25 samples, 60 percent exceeded the EU maximum residue levels.

A total of 230 active ingredients are registered in Kenya, including 51 that are no longer permitted in the EU. Despite being banned in the EU, Kenyan imports in 2018 and 2019 included iprodione and acetochlorines from Belgium and 1,3-dichloro-propene from Spain.

Paul Ngaruiya, acting General Manager of Research, Strategy and Planning at Kenya's Pest Control Products Board

(PCPB), says the pesticide problem is partly linked to improper use, with some farmers often ignoring instructions on container labels.

PCPB is responsible for overseeing all pesticide-related matters, including but not limited to the regulation of pesticide importation and exportation, manufacturing, distribution, sale, and use, as well as mitigating their harmful effects on human health, animal health and the environment in Kenya.

According to a survey conducted by PCPB and the Agrochemicals Association of Kenya, one in two farmers does not wear full personal protective equipment because they are expensive. Only 11 percent understand the colour bands on labels, which represent varying degrees of danger.

Fields, schools, homes and other public amenities are normally situated close together and near waterways, which means that buffer zones cannot be observed, and pesticides can run off farms into nearby water bodies.

Dr Ngaruiya suggests the need to work closely with media and civil society organisations to sensitise and educate farmers on proper pesticide use.

"We as PCPB are calling upon all stakeholders, including the media, to work with us to ensure there is proper information reaching out there to farmers," he says.

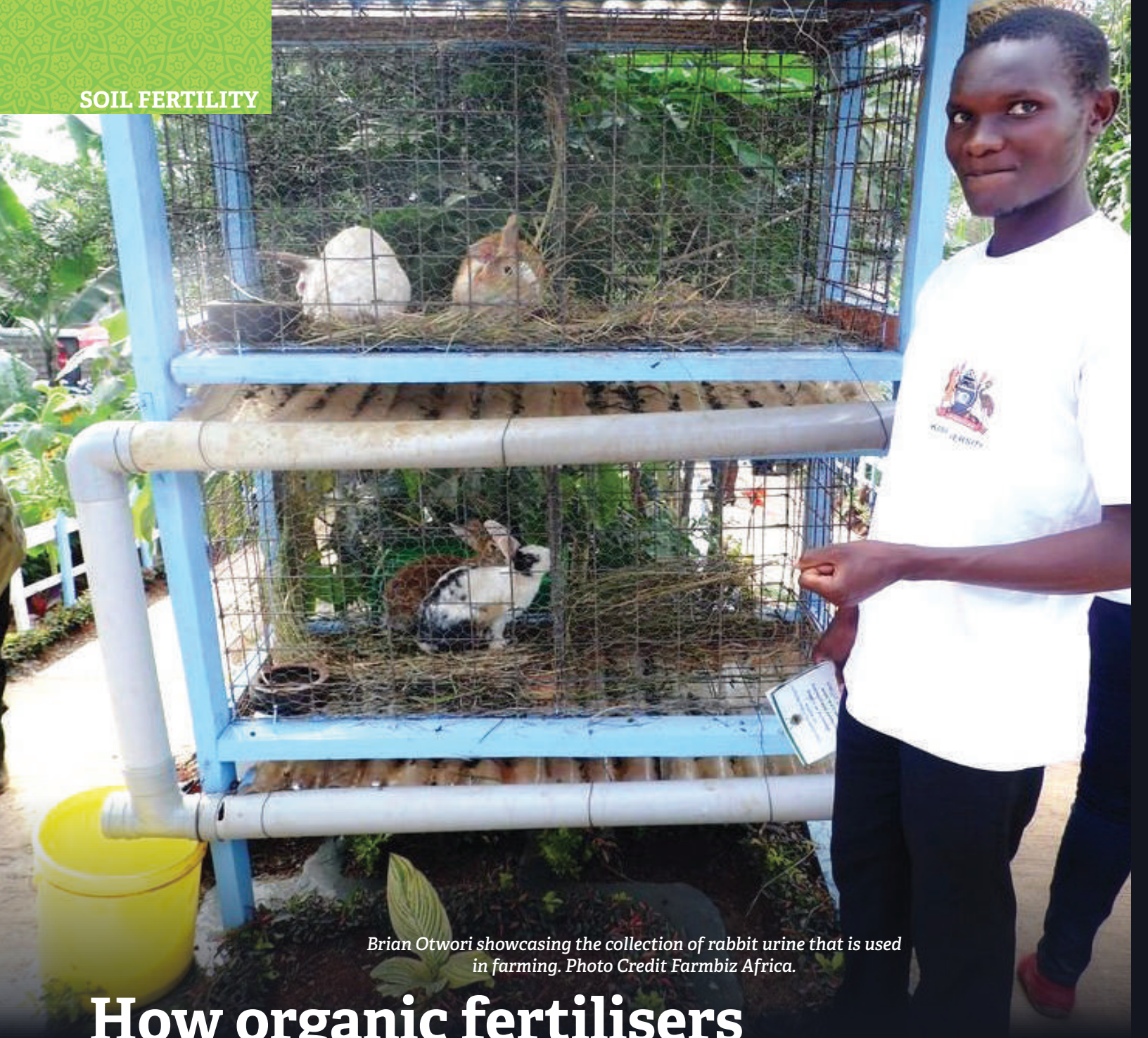
PCB was ordered by the parliamentary health committee to undertake an analysis and legal review of toxic pesticides to withdraw them from the Kenyan market. So far, the board has reviewed only four active ingredients.

"We are committed to providing professional, efficient and effective regulatory services. PCPB inspectors work very closely with law enforcement officers in curbing counterfeit pest control products. Several fake pesticides have been impounded across the country through such collaborations," Dr Ngaruiya says.



*Experienced farmer properly protected while spraying pesticides fruit trees.  
Photo Credit: Henry Owino*





*Brian Otwor showcasing the collection of rabbit urine that is used in farming. Photo Credit Farmbiz Africa.*

# How organic fertilisers regenerate soils

By Ruth Anita Vaughan

**N**ATURAL organic fertilisers are derived from animal or plant matter, manures, algal and seaweed products, and organic wastes from processing and food industries. They tend to have a high

carbon content and be more diverse in nutrient content, are slower acting and longer lasting. They benefit agriculture by not only adding important plant nutrients, but also building soil organic matter (SOM) and soil fertility.

**SOM is critical for soil function and soil quality.**

Soil quality is defined as the capacity of a soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance soil and water quality and support human health and habitation. Years of intensive farming using inorganic



fertilisers and aggressive tilling techniques have burnt off the SOM and damaged the structure of the soil and its capacity to function properly, which has left us relying more and more on chemicals to maintain our food production. Organic fertilisers are a part of the process required to regenerate our soils.

Climate change, global warming and carbon footprints are key words that we hear more and more. Climate change threatens our very existence on this earth. A move towards integrating organic fertiliser use into our farming systems has a huge positive capacity to alleviate climate change by reducing our carbon footprint, sequestering carbon into our soils, and creating living soils that are more resilient to climate change and more productive.

In the last few years, the cost of manufacturing and shipping inorganic fertilisers around the world has risen substantially, and this cost is being borne by our farmers and governments. This has created a positive shift in the economics of producing and using organic fertilisers. Many of the organic fertilisers available today are created from biproducts of animal farming or from organic waste products from households and industry. This goes a long way to reducing waste and environmental pollution and boosting a local circular economy.

#### **The importance of soil organic matter**

Organic fertilisers contribute to SOM which is essential for many soil functions as follows:-

- Direct supply of plant nutrients through recycling and decomposition.
- Stable humus compounds hold and release nutrients, making them more available to plants and reducing volatilising and leaching losses, increasing the efficiency of fertiliser use.
- Buffering high and low soil pH and high salinity effects.
- Providing a nutrient source for soil microbes thereby increasing microbial activity and biodiversity in the soil. This is not just important for plant nutrient uptake, it also reduces soil-borne pests and diseases, and is a natural bioremediation of pesticide residues, heavy metals, human

pathogens and other toxins.

- SOM promotes aggregate formation and soil structure stability. This in turn improves water infiltration, water holding capacity, resistance to compaction and erosion and better root penetration, nutrient uptake, yields and food nutrient density. In Africa one of the biggest yield limitations is water. The amount of water that a soil can hold is critical in successful cropping. The breakdown of this important soil function is a main contributor to the floods and droughts that we are seeing more and more of.
- SOM buffers heavy metals, toxins and pesticides, reducing uptake by plants and improving our food safety.

Soil organic matter levels sit between about 1-8 percent for mineral soils, and depend a great deal on soil texture, soil management, vegetative cover, moisture levels and temperatures. Low organic matter levels are found in hot areas, sandy soils, and intensively farmed soils. Higher organic matter levels are found in peaty soils, low-lying flooded valleys, high altitude cold soils and organic or regenerative agricultural systems. Soil organic matter consists of actively decaying organic material that is the energy source for microbes and is important for the release and recycling of plant nutrients – this breaks down to more stable humus compounds that are important for soil structure.

Many farming activities burn off the SOM, resulting in a decline in soil health and requiring an ever-increasing amount of inorganic farm inputs to maintain yields. This includes but is not limited to mono-cropping, soil cultivation and overuse of inorganic nitrogen fertilisers. A responsible GAP farmer will monitor both the SOM level and the C:N ratio of soil annually and prepare a soil health programme including organic fertiliser use to build up SOM and then maintain it at optimum levels for maximum fertiliser efficiency, moisture storage, plant health and yields.

#### **Organic fertilisers**

Natural organic fertilisers may be produced on the farm (composts, manures, green manure crops, vermiculture etc.) or purchased in.

One novel organic fertiliser that is gaining traction fast is rabbit urine. Rabbit urine

contains higher levels of nitrogen and potassium than most natural fertilisers as well as a good balance of other nutrients, in a soluble and readily available form. It is very versatile and can be used as a foliar spray or a nutrient drench. Rabbit urine and rabbit pellets contain high levels of beneficial microbes. Rabbit urine also has amazing fungicidal and insecticidal properties that can greatly reduce farmers' reliance on conventional pesticides.

Organic fertilisers vary a great deal in content, and it is important to test the exact elemental and organic composition to be able to balance nutrient applications to the soil. Organic fertilisers can contribute high levels of plant nutrients, allowing farmers to reduce their application of inorganic fertilisers and save money. One must test potential risk factors from organic fertilisers, for example: human pathogens, heavy metals, pesticide residues and toxic salts. These can be measured in the laboratory to reduce the risk attached to the using organic fertilisers. Commercial organic fertilisers in Kenya should comply to the KEBS Standard KS 2290:2018.

Humic and fulvic acids from organic fertilisers enhance plant growth positively and directly through physiological and nutritional effects. Some act as natural plant hormones and can improve seed germination, root initiation and nutrient uptake as well as being direct sources of nitrogen, phosphorus, and sulphur. One of the most striking characteristics of humus substances is their ability to interact to form complexes. By forming complexes humus can dissolve, mobilise and transport metals and pollutants in the soil and contribute to a reduction in toxicity of heavy metals and pollutants while improving the availability of essential plant micro-nutrients.

A listing of commercially available organic fertilisers in East Africa can be found on this link <https://shambaza.com/organic-fertilizers>.

# Climate-smart agriculture project calls it a day

By Murimi Gitari

**T**HE Kenya Climate-Smart Agriculture Project (KCSAP) has come to an end after its implementation for a period of five years.

KCSAP, which was started in 2017, focused on increasing agricultural productivity and enhancing resilience to impacts of climate change and reduction of greenhouse gas emissions.

With the support of the World Bank, the project has made tremendous efforts to address food insecurity challenges brought about by climate change risks in the targeted smallholder farming and pastoral communities in Kenya.

The project was meant to benefit about 522,000 households of smallholder farmers, agro-pastoralists, and pastoralists directly, 340,000 households benefiting from the county-level and public-private partnership investments and over 600 micro small and medium enterprises.

The total amount earmarked for the project was US\$279 million with US\$250million financing from the World Bank and a government contribution of US\$29 million.

“KCSAP was started to increase agricultural productivity and resilience of farmers in different counties by validating gender-responsive climate-smart water harvesting technologies, innovations and management practices, and strengthening innovation and knowledge exchange systems to increase access to information on the best fit climate-smart water harvesting technologies, innovations and management practices,” says

Fabian Kaburu Muraga, a research scientist at Kenya Agricultural and Livestock Research Organization (KALRO) department of irrigation, drainage and management of problems soils research programme.

Mr Muraga, who was one of the project implementers, says KCSAP boosted farm production and incomes and enabled many farmers to acquire climate-smart technologies such as the use of solar pumps, harvesting and storage of rainwater that contributed greatly to environmental conservation and building the farmers’ resilience against climate change.

“We supplied the farmers with drip irrigation kits and solar water pumps, among other farming tools. This helped the farmers adopt the most efficient irrigation method which helps conserve water that is slowly becoming a very scarce commodity,” he says.

The project, however, encountered challenges in its implementation such as the Covid-19 pandemic restrictions and the incongruent expectations of some farmers who wanted monetary benefits, whereas

the goal of the project was to empower them through knowledge and education.

A few farmer groups evaded manual work, especially in excavating the water harvesting structures, while the prolonged drought resulted in an insufficient supply of water for irrigation.

“Despite the fact that the priority for the farmers was to use the water for domestic use, some managed to do both and benefited greatly. In addition, we recommended the construction of more water pans since it was observed that with sufficient storage, the amount of water collected even after one day of very heavy rainfall would last up to four months,” he added.

With the county having experienced different rainfall patterns for the last few years with the situation not changing, KCSAP advised the farmers under the project to explore water harvesting and storage structures such as lined water pans. The structures will help collect rain water during the rainy seasons and store it for use during the dry seasons and when the rains delay.



*Fabian Kaburu Muraga, a research scientist at KALRO department of irrigation, drainage and management of problems soils research programme. Photo Credit: Murimi Gitari.*





*Farmers in Cameroon prefer to concentrate their efforts on Penja Pepper that thrives well in the region.*

*Photo Credit: Barzawire*

# Cameroon farmers dump cocoa, coffee for pepper in war on effects of climate change

By Elias Ngalame

**A**NDREW Kombe of Penja village, about 350 kilometres from Cameroon's capital, Yaoundé happily combs his four-hectare pepper farm, discarding unwanted weeds and clipping off parasitic plants. For the 49-year-old farmer, the health and quality of his new climate-friendly crop are of prime importance following a disappointing slump in prices of the traditional cash crops in the area – coffee and cocoa – blamed partly on extreme weather.

"I have to work hard to reap good yields and make maximum gains from my new crop," he says.

Farmers in Cameroon say torrential rains and biting drought have decimated these traditional cash crops and wiped out gains made since 2013.

In the past five years, Kombe and his family have suffered from dwindling

harvest and income from their coffee farm.

## Not anymore

The farmers say the unique white and black pepper dubbed Penja pepper, a more extreme climate-tolerant cash crop, is holding out the hope of much-needed relief for thousands of farmers in the region.

"We are left with no choice but to switch to Penja pepper. Now with the pepper farming, I can raise enough money to feed my family and send my kids to school," says Kombe.

In Southwest and Littoral regions of Cameroon, agriculture officials say, many farmers are increasingly switching to the more profitable, climate-friendly Penja pepper as a solution to poor harvests and paltry incomes from coffee and cocoa.

"The farmers now prefer to concentrate their efforts on

Penja Pepper that thrives well in the region," says Amos Ngolle, agriculture technician at the divisional delegation of agriculture in the Mounjo division.

Grown on the flanks of the Kupemuanenguba Mountain, the Penja pepper has since gained national and international fame after the Penja Pepper Farmers Association (PPFA), with support from French Development Agency, sought and obtained in 2013 the certification of their product from the African Intellectually Property Organisation.

Farmers of the association say the certification has significantly transformed their lives and the economy of the region, attracting other farmers whose cash crops are affected by extreme weather.

The farmers sell the pepper locally and in neighbouring countries, and 40 percent is exported to European



markets, according to Cameroon's Ministry of Trade. The Penja pepper is one of the only three African commodities, which include Oku honey and Ziam Macenta coffee from Guinea, to be given such a label, prohibiting the product's name from being used by producers outside of its original region.

With the label, adherence to strict guidelines by the farmers is ensured to maintain the highest standards.

"Guideline rules include ensuring farmers are situated within mapped out perimeters by the association, accepting the norms and code of conduct set out by the association, protecting the crop against extreme climate and regular inspection by a

team of PPFA members," explains the Executive Secretary of association defending the rights of farmers – Association Citoyenne de Défense des Intérêts Collectifs.

"This has contributed to the continuously improved quality of the product," he says.

Statistics from the Ministry of the Economy, Planning and Regional Development show that the product is today highly consumed in France, Switzerland, Germany and many other countries in Europe. It is also exported to the 16 member states of the African Intellectual Property Organisation, including Congo, Côte d'Ivoire, Equatorial Guinea, Gabon and Senegal.

In a desperate move to encourage farmers to stay on in coffee and cocoa production, the government has decided to half its levy on cocoa exports to boost revenues for farmers and exporters.

The government reduced the cocoa export charge rate by 50 percent per kilogramme as of August 1, 2017, Cameroon's Minister of Trade, Luc Magloire Mbarga Atangana, announced.

"This decision is a change in government policy to encourage farmers and avoid a drastic decline in cocoa and coffee," says the minister.



*The farmers say the unique white and black pepper dubbed Penja pepper, a more extreme climate-tolerant cash crop, is holding out the hope of much-needed relief for thousands of farmers in the region. Photo Credit: InfoCongo.*





Mary Nasimiyu is a champion farmer and intercroops maize and beans. Photo Credit: ACRE AFRICA.

# Farmers embrace smart insurance to guard against climate shocks

By Murimi Gitari

**D**ESPITE the critical role smallholder farmers in Kenya play in providing food for the nation, they face numerous challenges. Their crop yields are quite low and climate change is not only increasing the incidence of pests and diseases, but heightening the risk of more frequent extreme weather events, including drought and flooding.

Reports show that farmers lose up to 90 percent of their expected yield due to climate risks.

Faced with such losses, many smallholder farmers are reluctant to invest in their farms and instead engage in unsustainable practices to try to save money, “such as keeping their children out of school, selling off productive assets, and reducing the quality of their diets,” says Lilian Waithaka of ACRE Africa, a social enterprise that provides farmers in a number of African countries with integrated risk management solutions to increase their productivity and enhance livelihoods.

## Hurdles to overcome

Insurance can help cushion smallholder farmers from crop and financial losses that occur as a result of climate change, yet many are reluctant to invest in such schemes. Waithaka attributes the reluctance to three main factors, including affordability, with traditional insurance schemes too costly for smallholder farmers.

A lack of trust in insurance products among farmers prevents them from



securing insurance premiums while farmers often do not engage with other technologies and practices that can support resilience, such as the planting of stress-tolerant crop varieties, adherence to advisories, and implementing good agronomic practices.

ACRE Africa is linking smallholder farmers to risk mitigation and climate adaptation solutions so they can comfortably invest in their farms through its picture-based insurance (PBI) project – an innovative insurance scheme supported by the International Development Centre (IDRC) in partnership with the Australian Centre for International Agricultural Research (ACIAR).

### Counting the payoffs

“The PBI project offers farmers an affordable, innovative, inclusive, climate-smart agriculture solution,” says Waithaka. “It’s also easy to join – farmers simply dial a USSD code and choose the type of crop they want to cover, after which they are automatically enrolled on the scheme.”

To support PBI uptake and enhance trust levels around insurance, ACRE Africa has also established a network of ‘champion farmers’ in Kenya.

These individuals are key opinion shapers in the villages in which they reside. Two-thirds of champions are women – and it has been observed that female champions are more likely to successfully recruit new women farmers to the PBI scheme.

At the heart of the PBI approach lies imagery, with photographs taken of farmers’ crops collected using satellites and smartphones.

The champion farmers use an app called SeeItGrow to take images of registered farmers’ crops throughout the season, which are then used in the evaluation process at the end of the season.

The project has developed three different machine learning models to help process the images collected, classifying crops according to their growth stage, type of damage, and extent of damage. At the end of the season, a panel of experts – comprising insurance companies and agronomists – evaluate the images to give them a ‘score’, which forms the basis on which farmers can make claims.

### Building resilience

Farmers who take out PBI are also supported in other climate-related

aspects. For instance, ACRE Africa continually provides farmers with training on how to protect their crops against climate shocks, connects them to companies that sell stress-tolerant seed varieties, and use information services to encourage them to adhere to good agronomic practices and advisories.

“By helping build the resilience of smallholder farmers,” says Waithaka, “we’re supporting individuals but also trying to foster economic growth and food security.”

So far, the champion farmers have collected over 60,000 field images from over 7,300 farmers signed up to the PBI scheme. Of women farmers offered PBI, over half take it up. They include Elizabeth, a 42-year-old mother of three living in Machakos County, who in 2021, took out insurance cover by paying a premium of US\$2. Following a drought later that year, which saw many farmers lose their crops, Elizabeth was able to get US\$15 in compensation through her insurance – which she used to buy three bags of seeds to plant the following season.

Less than 20 percent of smallholder farmers globally have crop insurance, with sub-Saharan Africa’s general insurance penetration and uptake being at three percent while the uptake of agricultural insurance is less than one percent.



*John Poi applies fertilizer to his insured crops. Photo Credit: Georgina Smith*





*Roseline Odhiambo during the interview as she supervised a tractor servicing her farm in Ahero, Kisumu County. Photo Credit: Francis Mwangi.*

# Pay-As-You-Go financing drives access to tractors by Africa's unbanked

*How Hello Tractor and Heifer International are promoting access to farm mechanisation for smallholder farmers through affordable tractor financing*

By Francis Mwangi and Murimi Gitari

**I**N sub-Saharan Africa, low level of mechanisation and the use of outdated farm equipment have been partly blamed for the low production, especially among smallholder farmers. Even where farm equipment is available, the high costs put the equipment beyond the reach of a majority of small-scale farmers.

However, development actors like Heifer International are partnering with innovators like Hello Tractor to promote access to modern farm equipment for smallholder farmers.

Evalyne Awendo from Kamunda village, Nyando Sub-County, Kisumu County, is one of the beneficiaries of this tractor financing initiative.

The mother of four says that she heard about the programme on the radio and she immediately applied to enrol. She says that her quest to become a tractor owner previously encountered several landmines, including an ordeal that led to her losing KSh900,000 and hospitalisation in 2016.

"I informed my husband that I was going to withdraw my money and get a loan to get the tractor, unfortunately, I did not succeed and I lost my KSh900,000," she recalls.

Accessing a bank loan to acquire a tractor was difficult as the interest rates offered were high.

But Awendo did not give up. After attending a Pay-As-You-Go (PAYG) tractor financing onboarding training by Hello Tractor and Heifer International, she got a call from Hello Tractor informing her that she had been shortlisted as a potential tractor recipient.

"Something interesting was that I had no single coin to facilitate my transport to the Hello Tractor training. But I eventually managed to receive the training and I now own a tractor that I am using to service the farms," she says.

"For Hello Tractor and Heifer International, their core aim is to help the farmers and not structure their project like a business. With banks, it is a business and that is the difference.





*Evalyne Awendo from Kamunda village, Nyando Sub-County, Kisumu County, posing with her tractor she acquired through the Pay-As-You-Go (PAYG) programme by Hello Tractor and Heifer International. Photo Credit: Francis Mwangi.*

As a woman, I am proud, and I tell fellow women not to be afraid. What a man can do, a woman will do better. A fellow woman encouraged me to strive to acquire my own tractor after using other people's for years. It is a miracle in our village for a woman to own a tractor."

Rosemary Odhiambo, who started rice farming in 2010, uses the little income she gets to educate and feed her children. Before the tractor project, she would spend a minimum of KSh10,000 to get her land prepared for planting.

"We used to prepare our land using oxen or jembe, which was labour-intensive and costly. I would spend like KSh10,000 but right now the cost has gone down due to KSh5,000-6,000," she says.

Land preparation would take them a maximum of three months towards the planting season. But with adoption of farm mechanisation, it only takes a maximum of one month.

Booking agents are always available help farmers like Odhiambo with accessing tractor services on time

while measurement of their farms is easier through the Hello Tractor mobile app unlike in the past when middlemen and brokers manipulated the measurements.

Andrew Abongo, who also owns a tractor, says he can testify to the benefits of the tractor project to his business.

"It has reduced a lot of work for us. You don't have to follow your operator where he goes, unlike before, when they would do 10 acres, and come in the evening and tell you that they did three acres, the engine is hot, and the tractor was overworked. You couldn't even get the value for your investment. For this one you are assured that wherever there is a breakdown you will see the tractor stop at specific hours," he notes.

Charles Ogola, a resident of Sidindi Ward, Siaya County is also one of the beneficiaries. He thanks Heifer International and Hello Tractor for introducing an entrepreneur-friendly tractor financing model.

"What has made me extremely happy is the payment terms. I was informed that I can pay as per the acreages serviced by the tractor. Whenever I plough one acre, I deposit some amount. So, per day I multiply the amount by the number of acreages. I found this arrangement quite good. When you look at the way I make my payments, I usually exceed the expected amount so that they can understand that I can do the job as required," says Ogola.

Jehiel Oliver, Founder and CEO of Hello Tractor, says that the PAYG financing model is designed to ensure that borrowers repay their loans based on work done.

The product, he says, is meant to unlock an entirely new class of entrepreneurs working hard to service the farmers in their community without basing the credit facility on collateral.





**Andrew Abongo servicing a client's farm in Siaya County. Photo Credit: Francis Mwangi**

"If you look at the way commercial banks lend today and across the African market, they look at your credit history, they look at how much cash you have in the bank, how much collateral you have. So, you immediately lock out the vast majority of potential borrowers because most do not meet those criteria," notes Jehiel.

PAYG, he says, focuses on unlocking opportunities for the so-called 'the unbankable' who possesses entrepreneurial grit.

"We came into the market with a different hypothesis. We are betting on people, not their financial profiles, because most of our customers do not have bank relationships. What we're saying is we understand the tractor business. We understand that business can

be profitable, but we have to select the right entrepreneur," he says.

Agnes Kavatha, the Digitization Manager at Heifer International Kenya, says the project was informed by the realisation that smallholder farmers often face challenges in accessing farm equipment to prepare their land for production while putting into consideration that Africa has arable land that is largely underutilised due to the unavailability of enough tractors.

Kavatha says the initiative is also an innovative way of promoting financial inclusion.

"The most interesting bit of this innovation is that the women who are in most cases denied access to loans or taking financing have come forth and benefited and that shows that this is a product, and this is inclusive," she says.

After winning the inaugural AYuTe Africa challenge by Heifer International, a global non-profit organization in 2021, the two organisations partnered to promote access to farm mechanisation in Kenya, Uganda and Nigeria.

Under the Tractors for Africa initiative, Heifer aims to finance 75 tractors across three countries and provide affordable access to tractor services to 872,250 smallholder farmers by investing over \$3.5 million. The investment aims to boost farm productivity, employment, food security and farmer livelihoods over the next 10 years. It will also create 6,979 new jobs as booking agents, tractor operators, technicians, and tractor owners over 10 years. The project aims to deploy 50,000 tractors servicing more than 90 million smallholder farmers across Africa, improving their incomes, while creating more than 500,000 jobs.

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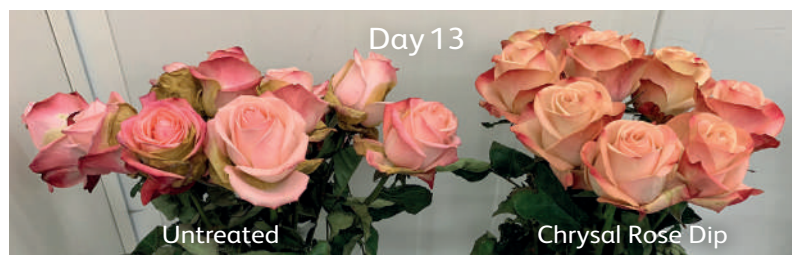
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**CHRYSAL**

A portrait of Dr. David Gikungu, a man with a dark beard and glasses, wearing a suit and tie, against a light blue background.

# What Kenya's worst drought in 40 years and Nairobi 'winter' say about climate change

*Kenya Meteorological Department (KMD) Director, Dr David Gikungu, explains the changing weather patterns in different part of the country and what needs to be done to combat climate change.*

By Murimi Gitari

## **Briefly introduce yourself.**

I am Dr. David Gikungu, currently serving as the Head of the Kenya Meteorological Services. That means performing the role of director of meteorological services, and oversight of the Institute for Meteorological Training and Research, which is also

headed by a Director. This is in line with the new establishment that recognizes the position of Secretary of meteorological services, who will be in charge of the overall Service. I am combining both roles for now.

## **Tell us more about KMD, its mandate.**

Our mandate is to provide accurate and timely weather and climate information and services for the safety of life, protection of property and conservation of the natural environment for sustainable development.



Along with that, it is important to note that our responsibilities, and that of any National and Meteorological and Hydrological Service, are defined by the World Meteorological Organization. We provide crucial information for aviation and shipping operations as no airplane or ship can take off without relevant weather information.

The Meteorological Service also provides the science that underpins climate change discussions and much more.

**Kenya has been experiencing different rainfall patterns every year. In layman's language, what has been the cause of this?**

The general characteristic of equatorial climate is all-year round high temperatures. East Africa has a modified equatorial climate, owing to the highlands that characterize the region. Rainfall in East Africa is associated with the Inter-tropical Convergence Zone (ITCZ). The ITCZ is a band of low pressure around the Earth which generally lies near the equator, and tends to follow the migration of the overhead sun. The trade winds of the northern and southern hemispheres come together here, leading to the development of frequent thunderstorms and heavy rain. These thunderstorms can reach, and sometimes exceed, 16 kilometres in height above the surface.

The ITCZ moves throughout the year and follows the migration of the Sun's overhead position typically with a delay of one to two months. The most important consequence of this shifting is the annual alteration of wet and dry seasons in tropical Africa. As the ocean heats up more slowly than land, the ITCZ tends to move further north and south over land areas than that over water. During the months of July and August, the ITCZ lies well to the north of the equator, creating favourable conditions for the October-December "Short

Rains" before moving south by January and February, facilitating the March-May "Long Rains". The two rainfall seasons are characteristic of East Africa (Southern Ethiopia to Central Tanzania), compared to western and southern Africa, which have a single intense rainfall season.

Anything that interferes with the huge water bodies or air masses and pressure systems that determine the weather patterns is likely to influence rainfall performance. The observed climate variability could be attributed to such interference.

**Even with the different rainfall patterns, there are regions where it rains heavily followed by floods with other areas experiencing total dry spells. Explain.**

We have different climatic zones across Kenya that determine the kind of rainfall patterns that are experienced. For instance, there are arid and semi arid regions, mountain areas, coastal areas and the savanna. All these determine the kind of rainfall regime that a region receives.

A good example is Lake Victoria, where the dynamics are such that rainfall and thunderstorms are largely experienced in the afternoons, following sunny mornings with high temperatures while at the coast, rainfall is largely a morning feature. There are reasons for this difference. Afternoon thunderstorms around Lake Victoria cool the land surface, creating a large temperature gradient, and make way for land breezes at night. At the coastal area, the moisture levels may be different because of the

vastness of the water body, the Indian Ocean, which cannot be compared with Lake Victoria as what surrounds Lake Victoria is not the same as what surrounds the Indian Ocean. That is just to paint a picture on how different physical features influence the rainfall and other weather patterns in various parts of the country per season.

**Kenya is currently enduring the worst drought in about 40 years, with wildlife being affected. What needs to be done so as to tackle this kind of situation in future?**

This is a good question especially in view of the times we are in. As a start, early warnings provide a good starting point for preparing for the intensifying extreme events we are seeing, as a result of climate change. WMO is currently spearheading the global initiative on early warnings for all. This is the way that we all need to go. As KMD, we provide the early warning information and relevant government agencies and ministries develop the plans to mitigate or adapt to the events expected. In the long term, utilization of climate change projections enable countries to plan for the future along both adaptation and mitigation responses. For example, the current Head of State is leading the nation in such an initiative; that is, spearheading afforestation to stem the effects of deforestation and increase carbon sinks. Use of solar power or clean energy is another example that is being promoted in order to ensure clean sustainable development.

**The government rolled out a plan to plant over 15 billion trees in 10 years to combat climate change. In your own opinion, has deforestation been a cause of climate change and the different weather patterns in the country?**

The interference with our major forest systems has been part of the contributors to the features of climate changes that we are seeing. There are other factors. If you replace a natural system with an artificial one, such as buildings, then the difference is certainly going to be felt.

**Many smallholder farmers in the country depend on rain-fed farming and the results at the end of farming seasons are unbearable to them. Is it time these farmers embraced irrigation?**

There is no shortage of knowledge in regard to what to sow, where to sow and when to sow. Many of these farmers know their soils as well as crop suitability with respect to seasons. This means they are aware of the variety of crops that do well and the period they will take to grow and mature.

They are assured of a harvest that will keep them going till the next harvest. There are other places where rainfall is never enough at any given season.

Studies have been done to determine the type of crops that favor those particular areas; for some locations, farmers are guided on when to grow fast maturing crops, especially when the climate outlook does not promise sufficient rain. Our situation here in Kenya is such that where, for example, those ones who have to do short maturing crops, sometimes face repeatedly failed rains year in year out. There is a balance because a vast part of the Western zone of the country regularly receives sufficient amounts of rainfall. Although the

crop (maize) takes long to mature, farmers are almost always assured of a harvest. In places where rainfall is insufficient, exploring the irrigation option may be advisable.

**Egypt hosted the COP27 where climate change and agriculture were among topics of discussion. What were the outcomes from the conference? Is Africa benefitting in a big way this time round?**

These were discussions that have been going on for a long time and with varying results. I personally think the main issue that everybody is talking about as having been a big win is the acceptance by the big forces on the whole issue of loss and damage. Because what that means is the development of a scheme for compensation for what is lost and/or damaged as a result of anthropogenic climate change. That is, as a result of the activities of developed countries that bear the historical responsibility for where we are in terms of climate change. However, even after welcoming the whole issue of loss and damage, many are afraid of the implementation as this is another big issue; but the fact that they have accepted, the modalities will follow, and it's still a big win. Those are discussions that have been going on and I do not know how long this will take. According to the Paris agreement, collectively we should strive to keep warming from exceeding 20C and staying even lower at 1.5 degrees Celsius. It is noteworthy that, as Africa and even more so Kenya, we are not among the key contributors to climate change; but we do our part in contributing to the global goals.



**KMD Director, Dr David Gikungu during a tree planting exercise. Photo Credit. KMD**





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*A scientist explaining some of the wild crop species at Entebbe Botanical Garden and Gene Bank. Photo Credit: Lominda Afedraru*

# Plant extinction: Sustainable conservation mechanism for posterity

By Lominda Afedraru

**T**HE world we live in is ever-changing, growing and facing new challenges daily, including threats to the plants that sustain our existence as a result of climate change.

Scientists say 20 percent of plant species face extinction, including wild plants closely related to our crops. This is a result of climate change challenges, which cause pests and diseases as well as crop failures due to prolonged drought and erratic rains.

Most food the world population consumes comes from about three crop species namely wheat, rice and maize.

That's a very limited and narrow diet, considering the vast numbers of plant species available to provide food to people or diversity to crop breeding programmes.

As such, there is a deliberate effort by agricultural scientists at the Plant Genetic Resources Centre (PGRC) in Entebbe, Uganda, to collect plant species across the country, which are preserved for scientific use and regeneration in case of extinction.

Therefore, the talk by the public that indigenous plants in Uganda are not protected from climate change challenges is not true. Once you step into the botanical garden, you may think the plants are there to provide fresh air for a tourist attraction, which is not the case.

## **Background**

The Plant Genetic Resources Centre is an institution under the National Agricultural Research Laboratories (NARL) of the National Agricultural Research Organisation (NARO).



It comprises the historical *Entebbe Botanic* Gardens and the Uganda National Gene Bank, located 34km north of Kampala and 5km from Entebbe International airport.

The gardens were established by the British Protectorate in 1890 to conduct agricultural research on plants with commercial interest for the industrial revolution in Europe as well as conserve crop resources that can be kept for future generations.

Long before agricultural research institutes such as Makerere University College of Agriculture and Environmental Sciences and the NARL Kawanda, among others, were established, Botanical Gardens in Entebbe was in place to help in research.

The facility was solely established for the examination and development of agricultural resources in Uganda, which is now used to address climate change effects among other aspects.

*PanAfrican Agriculture* had the chance of interacting with scientists at the centre who gave details about the agricultural conservation at the botanical gardens including the gene bank.

#### **What constitutes the botanical gardens and gene bank?**

According to Dr Catherine Kiwanuka, a senior officer at the PGRC, the gardens contain semi-domesticated plants, wild relatives of crops such as rice, sorghum, coffee, millet, tomatoes, and beans as well as exotic plants such as rubber trees.

Other tree species are mvule, mahogany, eucalyptus and ornamentals such as cedars, Mediterranean cypress, cannonball tree, coconut, Indian lilac, *Borassus eaethiopum* and oil palm, among others.

The gardens also have wild plants for food and medicine, grasses and legume forage for livestock.

In total there are more than 500 plant species, which are conserved in the gardens and the gene bank in form of seeds for breeding purposes to address challenges of pests and diseases arising from the effects of climate change.

#### **Conservation strategies**

Dr Kiwanuka noted that her team uses two methods of conserving the plants, one includes ex-situ, meaning the plants are collected from the wild and planted in selected protected farms owned by farmer associations or individual growers in various locations across the country.

The other method is in situ, which involves conserving seeds mainly in the gene bank, which was established in 2004 where seeds are kept in coolers and plant collection from across the country is conserved at the protected botanical gardens.

Dr Kiwanuka said Uganda has more than 603 plant species but only 11.15 percent is conserved, hence the need for more funding for the centres conserving activities.

Ms Joyce Adokorach, a research officer at the centre, says the botanical garden and the gene bank require about US\$75 billion (USD 20,353.37) to run the activities of the centre for the next five years, including setting up a modern computerised centre.

The team obtains less than one percent of the money and in most cases, they are running short-lived projects on donor-funded activities.

#### **Land use at the botanical garden**

At the botanical garden, the land is divided into sections that include the rubber tree corridor where some of the exotic plants from other countries are preserved at the request of those countries' agricultural sectors. This is to meet their needs in case the tree gets extinct as a result of climate change.

There is the medicinal plant corridor, which includes plants such as *Wambugia Ugandensis*, *Peppermint*, *Henna*, *Neem*, *Cinnamon*, *Lavender*, *Marigold* and *Solanum aculeastrum* shrub.



*Guava plant, one of the wild species used by scientists to extract genes to boost resistance against pest, diseases and draught. Photo Credit: Lominda Afedraru*



Others are *Bidens pilosa*, *Helichrysum odoratissimum*, *Vernonia amygdalina*, *Hoslundia opposita*, *Ocimum gratissimum*, *Cymbopogon citratus*, *Cymbopogon nardus*, *Teclea nobilis*, *Zanthoxylum chalybeum* and *Lantana trifolia*, which are mostly used traditionally in the management of oral diseases.

The other section is for fruits, which include mangoes of various species, guava, pawpaw, oranges and lemons, pineapple, jackfruit, star fruit, avocado and mustaferi (Graviola), among others.

The last section composes traditionally introduced plants, which include four varieties of coffee namely Arabica, Robusta, Liberica and Excelsa. Liberica is mainly grown in Zirombe in the Luwero district. Liberica is high yielding compared to the rest of the varieties. The vast majority associate Uganda with Arabica and Robusta varieties.

Other plants are banana varieties including wild relatives, wild rice varieties, cocoa, cassava and sweet potatoes.

Scientists contend that most of these plants have their wild relatives, and some of them are planted in the garden. In most cases, scientists use the wild species to extract genes, which are used to boost resistance against pests, diseases and drought in specific crops during breeding.

#### **The seed bank**

The gene bank manager, Ms Eva Zaake, says the garden and gene bank has conserved seeds of most crops consumed in Uganda.

These include various varieties of beans, sim sim, millet, sorghum, groundnuts, Bambara nut, which is mainly grown in the West Nile region, rice, maize barley, soybean, lentil, common pea, sunflower and green gram.

The team also preserves seeds of forage crops used as animal feed such as *Chloris*, *brachiaria*, *Cenchrus*, *panicum* and the legumes *Clitoria ternatea*, *desmodium* and *cenrosema*.

#### **Processing seed for preservation**

Gordon Nsamba a laboratory technician at the gene bank, explains that once the scientists sample seeds of the various crops of interest for

preservation, the first step is to test their viability using soil mixed with water in a bowl.

The viable seed is then multiplied by allowing it to grow and selection is done after harvesting and drying.

The moisture rate is tested using a moisture meter. Its germination rate is tested again with samples of seeds in the germination chamber.

After this process, the seed is waxed and kept either in glass boxes or in paper boxes, which are also waxed to avoid moisture penetration. The seeds are refrigerated and can last more than 50 years.

Dr Kiwanuka contends that there is need to intensify the process of setting up regional gene banks and botanical gardens to increase the rate of plant conservation.

The team has established community seed banks in most regions across the country, which farmer groups manage.



*Liberica coffee. agricultural scientists at the Plant Genetic Resources Centre (PGRC) in Entebbe, Uganda, collect plant species across the country, which are preserved for scientific use and regeneration in case of extinction.*

*Photo Credit: Lominda Afedraru*





*Adhiew\* (8) at her temporary home in Mangala after fleeing floods in Bor in August 2020.  
Photo Credit: Save the Children*

# South Sudan floods leave farming families in despair

By Richard Sultan

**I**T'S mid-morning, and children at Mangala displaced persons camp in Juba are playing the "no-no & a yees" game where you close your eyes and jump in rows of different square sizes inside a column of rectangles marked on the ground. All of a sudden, Deng John a 51-year-old farmer displaced from the town of Bor in Jonglei State (111 km from Juba), screams to Chol, one of his children, "stop playing that your nonsense and go to the roadside to see if there are signs of lorries coming".

Deng is one of the hundreds displaced in South Sudan's worst flooding on record in 2021, which displaced over 200,000 households and affected nearly a million people, according to the UN office for Humanitarian Affairs.

Mangala camp residents largely depend on relief supplies delivered by humanitarian trucks.

Despite the humanitarian support, Deng says his wish is to return to his hometown because they've become beggars in the camp.

"What we are given is not enough to sustain us, and in most cases, we have to rely on help from relatives in Juba," he says.

The World Food Programme (WFP) reduced humanitarian aid to some parts of South Sudan last April due to a lack of funding resulting from the Covid-19 pandemic and the Russian invasion of Ukraine.

"It is a difficult decision to take from the hungry to give to the starving, but this is the reality; because of the alarming rise of food insecurity in remote locations. WFP has to reduce the size of its rations in some communities, including refugees and internally displaced people, who are in a less precarious situation," said Matthew Hollingworth, WFP Representative and Country Director in South Sudan.

But Deng's hope of going back to Bor is likely to remain a dream after the government shelved its plan to dredge the river to prevent it from flooding following resistance by conservation activists. The activists warned dredging it would cause the Sudd Wetlands, the largest of its kind in the world and home to various wildlife and bird species, to dry up.

According to Save the Children, another humanitarian agency in the country, the widespread flooding has driven South Sudan into its worst hunger crisis since independence in 2011. In a report released ahead of the World Food Day in 2022 titled 'Leave No One Behind', Save the Children urged the international community not to overlook South Sudan or to divert funding to other crises. The UN estimated that nearly nine million or 71 percent of the population, need humanitarian assistance. This includes 1.4 million children under five suffering from malnutrition.

"The situation has deteriorated in recent months with more than 600,000 people impacted by an unprecedented fourth consecutive year of large-scale flooding, destroying homes, crops, and leading to a spike in malaria and snakebites, particularly among women and children.

This has combined with thousands being displaced by the ongoing conflict that has plagued Africa's newest country since 2013 with slow progress in implementing a 2018 peace agreement. A melting economy

has seen the currency fall by nearly 40 percent and food prices surge, exacerbated by higher import prices linked to the war in Ukraine," says the report.

South Sudan is one of many countries crippled by the worst global hunger crisis this century, fuelled by a deadly mix of poverty, conflict, climate change, and economic shocks, with the lingering impacts of the Covid-19 pandemic and the crisis in Ukraine further driving up food prices and the cost of living.

"South Sudan's farming families saw little hope of an end to the flooding caused by late and heavy seasonal rains that has left their houses and land up to two feet (0.6 metres) underwater, a breeding ground for snakes," says the report.

Jib Rabiltoosaporn, Save the Children's South Sudan Country Director, said South Sudan is now facing one of the worst food insecurity emergencies in the world.

"South Sudan is among five of the most vulnerable countries in the world to climate change, with drought and devastating floods a common feature. With nearly a decade of conflict, frequent displacements, the impact of the COVID-19 pandemic, food insecurity and multiple disease outbreaks, families and children here are on the brink. We must not leave anyone behind," he said.

Save the Children is calling for increased investments to build on successful efforts around flood mitigation that saved lives previously and in flood prevention infrastructures to protect lives, livelihoods, and assets in the long run.

Back in Mangala, Deng's anxiety finally stops as the queue of lorries start to make their way under the big distribution tent.

"Like it or hate it, I will be the one opening the sacks today," he screams upon arrival at the tent. His plan is to secure enough empty sacks to use for packaging charcoal.



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*Lydia Kiriimi, a nutritionist working in Kieni West, Muguda ward in Lamuria location together with Dr. Beatrice Kiage, a Nutrition Associate with the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) during a farmers field day and teaching them on new bean recipes. Photo Credit: Marion Wagaki*

# Kenyans told to eat more beans rich in iron and zinc

By Marion Wagaki

**A** DIET lacking zinc and iron minerals is to blame for stunted growth, impaired physical and cognitive development and anaemia, among other infections affecting a section of the Kenyan population, experts warn.

Five organisations have partnered under the Ziron-Pulse programme to address food security and nutrition as well as push for the consumption of bean varieties rich in iron and zinc.

The project which is implemented in partnership with the James Hutton Institute, the University of

Birmingham, Kenya Agricultural Livestock Research Organization (KALRO) and the University of Nairobi has urged Kenyans to eat more beans rich in iron and zinc not only to address malnutrition but also encourage value-addition to make it attractive to the children.

Dr Beatrice Kiage, a nutrition associate at the Food, Agriculture and Natural Resources Policy Analysis Network (FANERAN) said experts are concerned about the zinc and iron deficiency that is contributing to the high level of stunting in Kenya.

"We have produced more than 40 bean recipes to be able to reach more consumers, especially children and pregnant mothers who are affected by malnutrition", she said.

The latest Kenya Demographic and Health Survey shows that 26 per cent of children under the age of five are so malnourished that they have become stunted or too short for their age with the rate of stunting being as high as 46 per cent in some counties more than one in 10 children which is 11 per cent are underweight.





**Beans on the farm, farmers have been encouraged to plant new bean varieties rich in iron and zinc. Photo Credit: Marion Wagaki.**

According to Dr Kiage, introducing appealing bean recipes to entice children is one of the ways to boost the uptake of beans.

She said they carried out research in Kiambu, Meru and Nyeri counties to find out some of the barriers and gaps in bean consumption.

“Our research found out that one of the things that make consumers shun beans was because of flatulence, but also because it was becoming boring, especially for children as they either consumed *githeri* (Maize and beans) or just beans,” she said.

“One can make foods such as kebabs, doughnuts, cakes and biscuits out of beans and this will not only be embraced by children but will also ensure the adoption and consumption of beans. We are promoting these recipes among the rural population where the beans are normally consumed and also grown.”

Dr Kiage said their research shows that many people only know beans to be rich in protein but are not aware of other benefits.

She said the project is also introducing high-yielding varieties such as the nyota beans that are resistant to pests and mature within three months.

“We are killing many birds with one stone while addressing food insecurity and nutrition,” said Dr Kiage, adding that the national annual consumption of beans is at 700,000 metric tonnes against the production of 600,000 metric tonnes.

Globally, Kenya is the seventh-highest producer of beans and second in Africa after Rwanda.

Dr Kiage said the deficit of 100,000 metric tonnes could be bridged if people are encouraged to consume more beans, which will motivate farmers to increase production.

“These bean varieties are good for our health. By consuming beans, we will be able to address issues of non-communicable diseases such as diabetes, obesity and overweight, which are big problems in the country. The beans have high fibre content and can lower cholesterol levels in our bodies,” she said.

Lydia Kirimi, a nutritionist working in Kieni West, said they have been training farmers on the new recipes, which the farmers are adopting and testing.

“We have today introduced nine different recipes, three types of chapatis, doughnuts, kebabs – all made from the high-yielding types of beans,” she said.

The farmers, Ms Kirimi said, had realised they could do a lot with the beans, and some even want to venture into business with the new recipes.

She said cooking using the various recipes is easy and it involves precooking the beans and drying them at home or milling on a larger scale by commercial processors.

Caroline Mwenze, an agronomist and the Kieni East sub-county agriculture officer, said the area receives low rainfall so they promote the cultivation of drought-tolerant crops like beans.

Ms Mwenze notes that farmers can harvest between six to eight 90-kg bags of beans per acre. The varieties are currently supported by KALRO.



*Dr Martin Mwirigi, acting Institute Director of the Biotechnology Research Institute at KALRO said that the government has since the 1990s been utilising biotech to boost agricultural production. Photo Credit: Marion Wagaki.*

# GMO maize farming gets Kenya government nod, set for early 2023

By Marion Wagaki

**T**HE National Biosafety Authority (NBA) has authorised the release of genetically modified organism (GMO) seeds to the farmers ahead of the long rains season in 2023 for cultivation.

The NBA is a State agency in Kenya mandated to ensure the safety of human and animal health and provide adequate protection of the environment from harmful effects that may result from GMOs.

The approval of the release of seeds through a letter dated October 19, 2022, to the Kenya Agriculture and Livestock Research Organization (KALRO), which has been undertaking biotechnology (BT) trials in Kenya could see farmers start growing GM maize after all the

necessary modalities are in place. The move follows the lifting of the ban on GMO maize, sparking mixed reactions from stakeholders.

President William Ruto said approval of GMO maize imports could be the solution to the costly staple food, which is also in short supply.

The President, on October 3, 2022, lifted the 10-year ban on the importation and cultivation of GMO maize, saying the move would help feed the drought-stricken counties where more than four million people are on the brink of starvation.

The President further said the move was part of the government's response to the biting drought in Kenya and a progressive step towards redefining

agriculture in Kenya by adopting crops that are resistant to pests and diseases.

The approval by the NBA will prompt the National Variety Release Committee (NVRC) to fast-track the modalities to gazette the BT maize seeds.

Speaking to journalists during a media engagement at the KALRO Kiboko Centre where the confined field trials of the GM maize have been taking place, Principal Biosafety Officer Erick Korir said with the recent lifting of the ban, the developers of the technology (KALRO) would now seek approval from the Kenya Plant Health Inspectorate Service (KEPHIS) for bulk seed production for the distribution to farmers.





**James Karanja, a maize breeder at KALRO, taking journalists through the process of coming up with the GM trials and what it took to reach at the level where now the ban was lifted. Photo Credit: Marion Wagaki.**

“As NBA we have a role to play and we are required by law and will continue to monitor the GM crop for the next 20 years to check on any advanced effects on its cultivation,” he said.

Mr Korir said the GMO food on sale would be clearly labelled.

“Labelling is for consumer choice. It is to inform the public and it is mandatory for the GM packaging just like any others that are normally labelled,” he said.

Mr Korir assured Kenyans of the safety of GM products and equated to conventional variety of the same crop.

James Karanja, a maize breeder at KALRO who has been working on the commercialisation of transgenic drought and pest-tolerant maize, said the technology would protect maize crops from insect pests such as the stem borer and the fall armyworm.

“This technology is here to help save the farmer shillings that they have been using to buy chemicals and guaranteeing them quality in terms of yield as well as their health”, he said.

According to Mr Karanja, GM maize can double maize productivity from eight-17 bags of 90-kilogramme bags per acre to 28-35 bags per acre, reducing imports.

Dr Martin Mwirigi, acting Institute Director of the Biotechnology Research Institute at KALRO dismissed the various myths about GM crops, saying more than 70 countries had approved GMOs.

“The use of technology has been there for over 25 years with no adverse effects shown and therefore we are coming out with confidence that the technology is safe and institutions such as NBA can assess

what the scientists have done and ensure what is going to the market is safe for consumers,” said Dr Mwirigi.

The KALRO Director-General, Dr Eliud Kireger, noted that about 500,000 acres of land would serve as demonstration plots next year from March pending the full commercialisation of BT maize by private companies.

Once the BT maize is gazetted, he said, KALRO would import 11 metric tonnes from South Africa under the TELA project for planting on the 500,000 acres in time for the 2023 long rainy season.

According to Dr Kireger, Kenya has a fully functional and robust policy, legal and institutional framework for governing the use of GMOs. KEPHIS recommended the release of three BT maize varieties – WE1259B, WE3205B and WE5206B – after a decade of successful research. The final release and placement of the varieties to the market are still pending Cabinet approval.





Farmers on a maize plantation Photo Credit: Source IFDC

# South Sudan eyes wealth in agriculture as oil wells run dry

By Richard Sultan

**I**N August, Ijjo Justin, quit work with a private security company that deployed him at a Juba hotel. He bought a used motorbike for US\$400 and planned to ride to Arinya, more than 100 miles from South Sudan's capital city. Ijjo planned to ferry anything he could salvage from a family plantation, abandoned when communal fights displaced thousands of families, including his.

"It is not safe," Amoyi Mathew, an elderly foreman who leads weekly harvest treks to Arinya warned him. "We all live here in Upari, but go there two days before the market day on Saturday. We organise and go in

groups, sleep in one place, and come back together on Saturday morning."

Heeding Amoyi's caution, Ijjo rather than proceed to Arinya bought cassava and tomatoes at Upari and rode back to Juba to resell. "My mum was still worried for my safety after I explained everything to her, but deep down, I had made up my mind on my next move," says Ijjo.

The mother lives with Ijjo in Juba, where Ijjo relocated her, alongside his six-year-old son, whom he withdrew from school, and his wife.

The following Wednesday, Ijjo left Juba in the morning, reaching Upari in the afternoon. He spent the night at Amoyi's homestead.

On Thursday, Amoyi led a group of eight men trekking to Ijjo's village where they converged under a leafy tree near a stream, their home for the next two nights. Here, Amoyi issued orders, such as when they would converge for lunch, before each man headed to his garden. Ijjo ran straight to his farm and uprooted cassava until lunch time. Then he peeled the cassava and spread it on the ground for sun drying over the coming days. The group trekked back to Upari Saturday morning, where Ijjo bought tomatoes and peas for re-sale in Juba.



Like Ijjo and his group, many displaced farmers are braving the security risks caused by communal conflicts to eke out a living from agriculture.

To inspire the citizens, South Sudan's President Salva Kiir is leading by example and encouraging everyone to engage in agricultural activities. On a recent routine visit to inspect his vast rice and maize plantation farm in Luri in the city's outskirts, the President appreciated the efforts of people like Ijjo who are heeding his call.

"This is the rice plantation; some plantations are ready for harvest. If every household across the country does this, we would have sufficient food and not be complaining of food shortage and hunger. I encourage every household to do something productive and innovative for themselves," said the President.

The World Bank in its latest economic analysis for South Sudan highlights the need for the country to leverage its natural capital in the agriculture and oil sectors to support recovery and resilience.

"South Sudan's chronic food insecurity could be reversed with targeted investments to improve the resilience of the agricultural sector," said Joseph Mawejje, World Bank Country Economist for South Sudan.

The World Bank report comes against the backdrop of a new reality that is starting to dawn on the country's leaders; some of the oil wells are expected to run dry in a few years. Barring the discovery of new wells, the country could also start to invest in the most likely alternative industry – agriculture – given its massive land mass.

"There are several factors as to why the production levels keep reducing, but the most serious one is the natural decline at an annual rate of 20% in Block 1, 2, and 4, where production started in 1997 and 1999, respectively. This means if these

blocks produce 100,000 barrels a day this year, next year it will reduce to 80,000 simply because the reserves get depleted," former Petroleum Minister and undersecretary Awou Daniel Chuang said.

Deputy minister for agriculture and food security, Lily Albino Akol Akol, said there are several constraints to South Sudan's agriculture, notably a shortage of seeds, erratic rainfall and lack of agricultural tools.

"Despite all these challenges, the most urgent need to transform the agricultural sector is access to finance. None of the banking institutions in the country give out loans for agricultural purposes and this is what needs to be fixed," she told a recent forum organised by the World Bank.

South Sudan's minister of agriculture and food security, Josephine Lagu, believes the key to agricultural transformation is fully implementing the country's revitalised peace agreement. Easing conflict, she says, will enable more money to be diverted from security to agriculture.

"We want farmers, families, organised groups, and churches to get involved in food production so we can stop importing food."

Policy analyst James Boboya agrees with the World Bank on the proposal to channelling oil profits to support agriculture.

"The way to go," he said, "is for the government of South Sudan to tarmac the road to agriculture-producing areas such as Yei, Yambio, and Eastern Equatoria so that farmers can bring products to market."

However, all stakeholders agree that lasting peace remains key to transforming agriculture in a country where civil strife keeps recurring since independence in 2011.

### Agricultural Fact

In spite of having 50% of its arable land mass as prime agricultural land only 4.0% of this area is cultivated continuously or periodically. The very low ratio of cultivated to total land compares with 28% in Kenya and 8.0% in Uganda. Most of this land use in South Sudan is accounted for by smallholder subsistence farmers that, in the absence of fertilisers, pesticides and herbicides, practise some form of shifting cultivation

### Ongoing donor funded Agriculture, Forestry and Fisheries Projects pre-conflict. Source - Ministry of Finance & Economic Planning AIMS Database

|                 | Budget allocation |        |        |       |         | Disbursement |        |        |       |         |
|-----------------|-------------------|--------|--------|-------|---------|--------------|--------|--------|-------|---------|
|                 | 2010              | 2011   | 2012   | 2013  | Total   | 2010         | 2011   | 2012   | 2013  | Total   |
| Livestock       | 8 294             | 2 809  | 1 647  | 420   | 13 170  | 6 423        | 3 509  | 2 113  | 1 124 | 13 169  |
| Fisheries       | 9 628             | 1 277  | 1 753  | 400   | 13 057  | 9 390        | 1 438  | 1 737  | 491   | 13 057  |
| Forestry        | 5 984             | 400    | 800    |       | 7 184   | 4 197        | 2 187  | 800    |       | 7 184   |
| Crops and other | 77 056            | 61 738 | 13 708 | 6 334 | 158 836 | 52 872       | 58 427 | 41 203 | 6 334 | 158 836 |
| Total           | 100 962           | 66 223 | 17 908 | 7 154 | 192 247 | 72 882       | 65 562 | 45 853 | 7 949 | 192 246 |

### Land use in South Sudan. Source: World Bank

| Category         | Area       | Share (%) |
|------------------|------------|-----------|
| Cultivated Trees | 2,760,131  | 4.3       |
| Shrubs           | 20,742,243 | 32.6      |
| Heraceous        | 25,032,308 | 39.3      |
| Urban/Industrial | 14,522,385 | 22.8      |
| Bare rock & soil | 34,188     | 0.1       |





On the left ; KALRO lead agricultural Entomologist Paddy Likhayo and Dr Prassana Boddupalli, Director Global Maize Program at International Maize and Wheat Improvement Center (CIMMYT) at Kiboko explaining to farmers about the intergrated Pest Management project . Photo Credit: Marion Wagaki

# Scientists push for joint efforts in war on transboundary pests

By Marion Wagaki

**E**AST and southern African scientists have called for a partnership to address the challenge pests and diseases pose in the region.

The scientists working on integrated pest and disease management solutions to address the fall armyworms menace say there is a need to develop and scale up proper technologies to help farmers fight the insects.

The scientists under the Plant Health Initiative (PHI) have been working on eco-friendly pest management techniques such as the use of resistant varieties, biopesticides and related biological control methods to contain the spread of fall armyworm.

During a workshop on Integrated Pest and Disease Management (IPDM) held at the UN Complex in Kenya, Dr Prassana Boddupalli, PHI lead for the Consultative Group on International Agricultural Research, said a variety of technologies are often applied and disseminated only to farmers singly, limiting pest control.

“Countries cannot work in isolation. There is need for partnerships to come up with different combinations of pest management control for hundreds of farmers to be able to benefit,” he said.

Dr Prassana said most technologies fail to scale up because of bottlenecks such as farming communities not knowing about their existence.

“There is still the gap of access to information when it comes to input and plant health innovation and services, which are critical for scaling up technologies to the farmers, especially the rural women and marginalised communities,” he said.

Dr Prassana, who is also Director of, the Global Maize Programme at the International Maize and Wheat Improvement Centre (CIMMYT) said there is a need to develop the technology but once it is done, farmer involvement during the testing was crucial.

| Plant Health Innovation Platform  |                        |             |  |
|---|------------------------|-------------|--|
| Integrated Pest Management of Fall Armyworm   |                        |             |  |
| Introduction  |                        |             |  |
| The Fall Armyworm (FAW) has become a big threat to food security in Africa since 2016. To reduce its impact, integrated pest management (IPM) approaches are needed to control FAW.   |                        |             |  |
| Objective   |                        |             |  |
| <ul style="list-style-type: none"> <li>Validate various FAW control technologies developed by different institutions through demonstrations</li> <li>Integrate technology contributions in appropriate packages</li> <li>Determine the most cost-effective, eco-friendly and easily scalable IPM package</li> </ul>   |                        |             |  |
| Methodology   |                        |             |  |
| <ul style="list-style-type: none"> <li>Five demos started on 15/09/2022</li> <li>10 eggs of FAW per plant released on 15/10/2022</li> <li>8 eggs per plant released on 15/10/2022</li> <li>8 eggs per plant released on 15/10/2022</li> <li>Chemical/pesticide (200g/ha) sprayed on 4/11/2022</li> <li>Biopesticides (100ml/ha) sprayed on 21/10/2022 and 28/10/2022</li> </ul>   |                        |             |  |
| Treatment combinations  |                        |             |  |
| <ul style="list-style-type: none"> <li>T1: FAW susceptible maize variety + Biological control</li> <li>T2: FAW susceptible maize variety + Pesticide + Biological control</li> <li>T3: FAW tolerant maize variety + Biological control</li> <li>T4: FAW tolerant maize variety + Farmer biopesticide + Biological control</li> <li>T5: FAW tolerant maize variety + Biopesticide + Biological control</li> <li>T6: FAW tolerant maize variety + Pesticide + Biological control</li> </ul> |                        |             |  |
| Treatments  | Name                   | Provider    |  |
| 1. FAW tolerant maize variety   | FAW-T001               | CIMMYT      |  |
| 2. FAW susceptible maize variety  | PHB223                 | ICRISAT     |  |
| 3. Bean variety   | Rezon                  | KALRO       |  |
| 4. Push-pull technology   | Desmodium + Brachiaria | KALRO       |  |
| 5. Biopesticide   | Twilio                 | AgriTECH    |  |
| 6. Farmer biopesticide  | IPM                    | CABI        |  |
| 7. Pesticide  | Avigad                 | Exim Africa |  |
| 8. Biological control   | Trichogramma           | ICRISAT     |  |



"In the East and southern African region, we are working with more than 700 on-farm locations where farmers test our seeds and we ensure that 30 per cent of them are women," he said.

The IPDM project fronted by CIMMYT, Kenya Agricultural and Livestock Research Organization (KALRO), International Centre of Insect Physiology and Ecology (ICIPE) and Centre for Agriculture and Bioscience International is currently in the trial phase at Kiboko field station in Makueni County and is expected to be concluded by next February.

"We want to encourage farmers in sub-Saharan Africa and Asia where the outbreak of the fall armyworm devastated their yields to adopt less toxic and affordable ways of containing the invasive pests. We want them to dissociate from the application of synthetic toxic pesticides and chemicals but revert to combined approaches like the use of resistant varieties, biopesticides and related biological control methods that are environmentally friendly," said Dr Prasanna after hosting more than 80 farmers at the Kiboko site.

Dr Godfrey Aseya, a breeder and Director of Research at the National Agricultural Research Organisation (NARO) in Uganda said they are working as a region to identify common challenges of pests and develop IPDM.

This, he said, comes in the backdrop of efforts by each country in the region to validate technologies that address the fall armyworm in the East African region.

In Africa, fall armyworm is estimated to cause 8 to 20 million tonnes of maize losses yearly because of little knowledge of the pest and ways of managing it.

"We are in the process of identifying varieties that are promising and will soon be released as well as recommending some chemicals for farmers in combination such as bio-pesticides and bio-control," said Dr Aseya.

"We see light at the end of the tunnel. Our work is showing some promising results and scores on integrated pest management."

Dr Aseya, however, said farmers are key to the success of the efforts and are working with them to win the battle against the pests.

He added that they have also integrated indigenous farming practices in pest control through the agroecological management of fall armyworms such as early planting, cultural and mechanical control, weed manipulation and push-pull technology.

KALRO lead agricultural entomologist Dr Paddy Likhayo said since the outbreak of fall armyworms was reported in Kenya in 2016, the maize yields dropped by between 30-50 per cent, aggravating the already fragile food security.

He added that at least 80 farmers were enlisted in the validation of the project to scale up extension services and ensure that agronomic practices, including the new integrated pest control technology, were adopted within one year.

CABI has also introduced a naturally occurring virus that once extracted and formulated could control the worms.

CABI scientist Duncan Chacha said the viral formula was cost-effective because the farmers could use worms killed in the initial spraying to develop more pesticides.

The participating scientists were from Kenya, Uganda, Ethiopia, Zambia, Zimbabwe and Malawi.



**Maize at Kiboko farm where integrated Pest Management technologies Project is being undertaken by scientists. Photo Credit: Marion Wagaki.**





An agricultural engineer at AEATREC displays some of the agricultural engineering technologies and innovations that enable farmers, cottage processors and value chain actors to meet the production, processing and agro-industrial market demand. Photo Credit: Lominda Afedraru.

## Uganda research institute tackles farmers' agro-processing woes

By Panagri Media Correspondent

**I**T is early morning and all roads lead to Jinja for the agricultural show.

On arrival, we notice relatively larger traffic to an area where farm machinery is on display, marking it out as a major attraction.

We learn it is the exhibition stand for the Agricultural Engineering and

Appropriate Technology Research Center (AEATREC), one of the institutes of Uganda's National Agricultural Research Organisation (Naro).

Administered under the National Agricultural Research Laboratories (NaRL) in Kawanda, the institute is mandated to generate and disseminate agricultural engineering technologies and innovations that

enable farmers, cottage processors and value chain actors meet the production, processing and market demand.

The centre also provides testing, evaluation, standardisation and certification services of agricultural machines and equipment developed or imported by other players in the value chain.



At the Jinja showground, Ronald Walozi, an agricultural engineer and a research officer at AEATREC, is the one tasked with showing eager visitors to the exhibition stand, mostly small-scale farmers, some of agro-processing machinery recently produced by a team of scientists at the institute.

These include rice and soy threshers, maize shellers and a chipping machine for tuber crops such as cassava.

These innovations, Walozi says, were inspired by challenges farmers faced with harvesting and drying their farm produce using the traditional method of cracking and putting out to dry under the sun.

The ordinary way of processing these products is labour-intensive, uniformity of the end product cannot be guaranteed and quality is a challenge.

“Usually before we develop a farm machinery in our workshop at Namalere, we do it according to farmers’ needs. This requires us to go the ground to interact with farmers in the various regions across the country to establish farmers’ needs and demands,” says Walozi.

The AEATREC machinery are sold under different Naro brand names linked to the different crops they are designed to process.

#### **NARO CAS-CHIP**

This is a food grade fresh cassava chipping machine designed to produce high quality cassava chips for human consumption and industrial use. Farmers usually place their order and in one week the machine is developed.

The machine produces uniform chips and is good for youth and women group enterprises engaged in cassava flour processing in the rural farming communities.

It takes about 1-2 days for chips to dry ready for grinding to process pure cassava flour as opposed to



*One of the processing machine developed by AEATREC engineers.  
Photo Credit: Lominda Afedraru.*

ordinary cassava processing that may build mould leading to poor quality flour.

It has capacity to process 450-600kg of chips per hour using one litre of petrol and farmers are able to add value from pure cassava flour, including for baking confectionary products such as biscuits, cakes, bread and cookies.

Machine components include a petrol engine, inlet to receive peeled and fleshly washed cassava tubers, and the chipping unit which picks small chips. The frame belt allows and transmits power from the engine.

One machine is sold at Shs4.5million and farmers are required to make

50 percent payments before the experts embark on developing the machine.

#### **NARO-SOY Thresher**

This is a motorised thresher for threshing soybean developed to avoid challenges faced when threshing manually, leading to scattering of seed in untidy places.

It is a recent machine, with the first developed in 2020 after demand was established among farmers growing soybean in Northern Uganda mainly in Acholi and Lango sub-regions.

The machine has capacity to thresh whole dried soybean plant between 100-120kg per hour with one litre diesel.





*University students having hands on training on fabrication of different agricultural engineering technologies at ACTREC-workshop. Photo Credit: ACTREC*

It is normally operated by three people -- one feeding the plant into the inlet, another operating the engine and the third collecting the dust and husks blown in an opposite direction.

The components include engine belt, threshing unit, input jute, dust/ husk jute, fan for blowing off the husks and the frame. It costs UGShs6 million (USD1,637.14) and the payments terms are the same with the cassava chip.

#### **NARO Light Weight Rice Thresher**

It is a motorised rice thresher specifically designed for women and youth groups involved in rice production.

The output is 650-750kg per hour using one litre of petrol and it reduces physical grain loss during threshing from 4.5 percent to 0.1 percent.

It weighs 138-150kg, making for easy hand pushing within the rice field. When using it, the economic gain

from using the machine is estimated to be US\$138 per hectare.

The components include the engine threshing unit, tyres used for rolling it on farm since it is mobile

It costs UGShs5 million (USD1,364.28) and is mostly used by farmers at Doho Irrigation Scheme in Butaleja District and those growing upland rice in Acholi and Lango sub-regions.

#### **ASI Rice Thresher**

This is a machine specifically designed for rice farms of at least 20 hectares or farmers growing rice in groups on large scale.

The threshing output is 1,500-2,000 kg per hour. Since it is slightly heavy, most farmers prefer to use oxen, power tiller or tractor to pull it on the farm.

#### **NARO Hand Cranked Maize Sheller**

It is a simple maize sheller designed for youth groups, those with vision impairment and physical disability and the elderly. It has a seat for

someone to use while pushing the maize into the shelling unit one by one. Its output is 60-80kg of cleaned maize grain per hour.

#### **NARO FOR A-CHOP**

This is a motorised machine designed to chop fodder for livestock. The chopped fodder can either be fed fresh or preserved as silage for future feeding.

The machine has two models. The Naro Fora- Chop-1 partially shreds forage into smaller pieces. The second model is Naro Fora-Chop-G, which performs both duties of chopping and grinding grain for livestock.

It is mainly placed on wheels for ease of movement on the farm.

Its output is 500-600kg of fresh chopped forage for light duty and 1,500-1,600kg of fresh chopped forage for heavy duty per hour. The chopped fodder length varies from 25-50mm.





Fortified maize flour that is commonly consumed by Kenyans.  
Photo Credit: Henry Owino



# African countries back biofortified foods to fight hidden hunger

By Henry Owino

**R**ISING cases of diseases and conditions related to micronutrient deficiencies, dubbed 'hidden hunger', have seen promotion of biofortified foods intensify globally.

In Africa where two billion people suffer from micronutrient deficiencies such as stunted growth and anaemia, governments and non-governmental organisations say fortification of foods is a cost-effective public health intervention in reducing micronutrient deficiencies among the poorest and most vulnerable people.

"Fortification of foods is increasingly being promoted as a promising solution that can easily involve private sector companies in the fight against hunger as well as malnutrition.

It encourages private stakeholders to be involved in agriculture and nutrition and has potential to improve the diets of the populations that are vulnerable to micronutrient deficiencies," says Mary Nzomo, a former agriculture minister in Kenya's Transnzoia county government.

According to the guidelines on food fortification by both World Health Organization (WHO) Food and Agriculture Organization (FAO), defines food fortification as "the practice of deliberately increasing the content of an essential micronutrient such as vitamins and minerals (including trace elements) in a food, so as to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health."

Global Alliance for Improved Nutrition & Food Fortification Initiative (GAIN) explains food fortification as the practice of adding essential micronutrients to foods that are widely consumed by the general population or a target group.

Leah Kaguara, Country Director for GAIN, says that micronutrient malnutrition (MNM) is a major public health issue and that adding vitamins and minerals to staple foods is now international policy although the rate of adoption in most developing countries is slow.

"This is as per the WHO recommendation to fortify foods in third world countries where diseases due to lack of pertinent nutrients are high compared to industrialised nations.



Lack of sufficient amount of vitamin A and iron has the greatest impact on public health according to the global health body," Ms Kaguara says.

The most common forms of MNM include vitamin A, iron or iodine deficiency. Folic acid, vitamin D, selenium and zinc deficiencies, although less recognised are important.

"Lack of those micronutrients represents a major threat to the health and development of populations, particularly children and pregnant women. They account for 7.3 percent of the global burden of disease," says Ms Kaguara.

In sub-Saharan Africa where the prevalence of malaria, HIV, diarrhoeal diseases and other infectious conditions is high, MNM increases their severity and has a high health impact on children and pregnant women.

Providing the nutrients needed for growth, development, and the maintenance of healthy life has enormous, long-term positive impacts. For example, it offers protection against anaemia, stunting, and a whole host of other medical issues and enables proper physical and cognitive development among children and adolescents.

Universal salt iodization is often cited as a fortification success providing iodine to vast numbers of people



*Iodised salt is one of the major success stories of fortification.*  
*Photo Credit: Greenspoon.*

around the world, including here in Africa. Some African countries have made progress in the implementation of various fortification programmes over the last 20 years such as enriching widely-consumed foods like wheat, maize, salt and edible oils with essential micronutrients such as iron, iodine, vitamin A, folate (vitamin B9) and zinc.

In Kenya, a national fortification programme has been implemented with support from various partners including Nutrition International, to improve fortification capacity of small- and medium-size maize

millers, and increase coverage and reach of fortified maize flour.

The Tanzanian government passed mandatory food fortification legislation in July 2011, providing a tax exemption for imported premix for its national fortification programme.

The Ethiopian Standard Council on June 10, 2022, endorsed the mandatory fortification of edible oil and wheat flour, a decision that aimed to save millions of lives and prevent the country's high burden of neutral tube defects (NTDs).

Ethiopia is one of the countries with a great burden of micronutrient deficiencies. According to the Ethiopian Public Health Institute Micronutrient Survey report (2016), the prevalence of anaemia adjusted for altitude among pre-school children, school age children and non-pregnant women of reproductive age was 34.4 percent, 25.6 percent and 17.7 percent respectively.

In South Africa, national fortification of salt with iodine, and wheat bread flour and maize meal with multiple micronutrients has been mandated by law since 1998 and 2003, respectively.

In 2002, Nigeria successfully mandated a salt iodization programme and the fortification of maize and cooking oil with vitamin A, and sugar and flour with iron.



*Fortified maize flour in Kenya supermarkets. Photo Credit: Henry Owino*



# Top African institutions sign agricultural knowledge management partnership

By Panagri Media Reporter

**K**EY African institutions and CGIAR have drafted a new agriculture-for development knowledge management (KM4AgD) framework for Africa to enhance research (and extension) collaboration that transforms and sustains food, land and water systems.

The framework was co-designed by staff from the CAADP-X4P partnership including African Forum for Agricultural Advisory Services, Association for Strengthening Agricultural Research in Eastern and Central Africa, Centre for Coordination of Agricultural Research and Development for Southern Africa, West and Central African Council for Agricultural Research and Development, Forum for Agricultural Research in Africa (FARA) and Africa Union Commission's Agriculture and Food Security Division. They worked alongside CGIAR communications and outreach staff from the Africa Rice Centre, Alliance of Bioversity International & CIAT, International Institute of Tropical Agriculture and International Livestock Research Institute.

This framework was part of the Forum for Agricultural Research in Africa Knowledge Management for Agricultural Development challenge, which brings together communication and knowledge management staff from across Africa to reflect and co-design knowledge management strategies and good practices. The aim is to enable agricultural research and innovation, including extension services, to contribute effectively to food and nutrition security,



*Patricia Onyango (PABRA) and Tsehay Gashaw of ILRI discussing.  
Photo Credit. FARA.*

economic development and climate mitigation in Africa. The programme's three-month course, in collaboration with the Knowledge for Development Partnership, builds the individual and collective capacities of the critical supra-national agricultural research and innovation institutions.

The new framework was shared and endorsed at the FARA-led Science and Partnerships for Agriculture Conference held in Accra, Ghana, on September 14–16, 2022.

In his opening remarks, Simplice Noulou Fonkou, head of the Agriculture and Food Security Division at the African Union Commission, noted: "We realise that our lack of appreciation of knowledge management over time has kept us

back. FARA's knowledge management initiative, under the CAADP-XP4 action, is helping to up the game of African institutions to ensure that knowledge is packaged, archived, disseminated, and utilised properly."

Given the recent consultations between FARA, the Africa Union, African Development Bank (AfDB) and CGIAR regarding how best to work together to strengthen African agricultural development, the challenge for the group was to co-design a joint framework for collective action around knowledge management.

As Aggrey Agumya, FARA's director of research and innovation mentioned, "FARA and CAADP-XP4 institutions have had a strong collaboration with individual CGIAR Research Centres.





*Staff from the CAADP-XP4 partnership. Photo Credit. FARA.*

This group has made an important step forward to establish a framework on how we work together in a more seamless way.”

After a SWOT analysis of the situation and an initial knowledge café within the context of the KM4AgD challenge, the group used a knowledge management framework within the Akosombo Integration Agenda to develop priority work areas. These priorities are around knowledge partnership, leadership, and governance, knowledge processes, knowledge products and services as well as monitoring and evaluation.

The framework is underpinned by the guiding principles of the joint communique on “The High-Level Consultative Forum on Strengthening Africa’s Agricultural Research and Innovation in the Context of the One CGIAR Reforms.” Some of the key challenges it expects to tackle include:

Establishing more systematic linkages between CGIAR and CAADP-XP4 partners: The partnership will look to establish formal and informal working ties between CGIAR centres and CAADP-

XP4 partners. It will also emphasise learning as well as mechanisms such as use of the FARA Africa Dgroups Community in advancing knowledge sharing and learning.

#### **Getting technologies to the field:**

The joint communique explicitly mentions the need to improve delivery of technologies to farmers “at the scale of millions of farmers and in particular, working through AfDB’s Technologies for African Agricultural Transformation (TAAT) to get to farmers at scale”. The joint framework builds upon this by including actions to support countries’ design strategies and policies. It also advocates for investment in digital extension and decentralising information at extension level, thus bringing it closer to the farmers. Much of this work will be done through the African Forum for Agricultural Advisory Services (AFAAS) and its partners in the context of the Research to Extension Agenda (R2E Agenda).

#### **Developing open and interoperable systems:**

Ensuring that data is shared and used openly between CGIAR centres and national and supra-national organisations is critical.

The framework lays out critical actions to ensure greater openness between institutions, and development of standardised data and information-sharing protocols. One immediate action will be the development of a network of DSpace users for sharing research outputs. In the short to medium term, the development of a continental knowledge graph for AR4D has been proposed.

#### **Making research processes more inclusive:**

A key priority for CGIAR and CAADP-XP4 partners is to improve priority setting in addition to instituting and ensuring a mechanism for effectively representing Africa’s priorities and research delivery.

Knowledge sharing and management can support this effort through improved sharing and exchange, and a joint culture of working together on specific activities. This collaboration will particularly focus around knowledge management products, events and resource mobilisation as well as joint awards to recognise contributions on specific topics. The partners will also work to acknowledge the need to “decolonise” the research effort to make sure a diversity of knowledge systems and perspectives are recognised.





*Equipping smallholder farmers with tools to improve animal management and biosecurity, will boost the production of safe, healthy food that improves nutrition, while preventing the spread of pathogens that threaten global human health.*

*Photo Credit: Marion Wagaki.*

# Reducing financing, market risks for livestock farmers

By Murimi Gitari

**A** **NEW** study has identified poor animal health, biosecurity and transboundary animal disease management among the reasons for low credit and market access by Kenyan smallholder livestock farmers.

The study conducted for the Transformational Strategies for Farm Output Risk Mitigation (TRANSFORM) programme found that most financial institutions consider lending to livestock farming a risky affair.

TRANSFORM seeks to strengthen the animal-sourced food system and enhance global health security by preventing emerging zoonoses, transboundary animal diseases (TADs), and antimicrobial resistance (AMR) in major animal agriculture value chains.

It is a partnership involving the Global Health Security Agenda (GHSA), Cargill, Ausvet, Heifer Project International, and the International Poultry Council (IPC).

The aversion to lending towards livestock initiatives, says the study, is partly informed by limited

knowledge of the livestock value chain and the link between biosecurity and productivity by the financial institutions, low adoption of livestock insurance as well strict terms for commercial bank loans that most farmers are unable to meet.

The study findings also show lack of awareness of financing facilities and processes by smallholder farmers and communal fear of losing personal assets given as collateral.

The study observed that while the government had set quality standards on livestock management there was minimal enforcement effort leading to lower adherence by farmers and providers of necessary services.

The report recommends the need for all value chain actors to be trained on biosecurity to facilitate compliance, enforcement and certification of farms to help them access more markets and credit from financial institutions.

It also proposes that financial institutions study the agricultural sector with aim of better understanding it, increase their risk appetite for agri lending and accelerate

the use of technology to help access data and measure impact to help them make decisions.

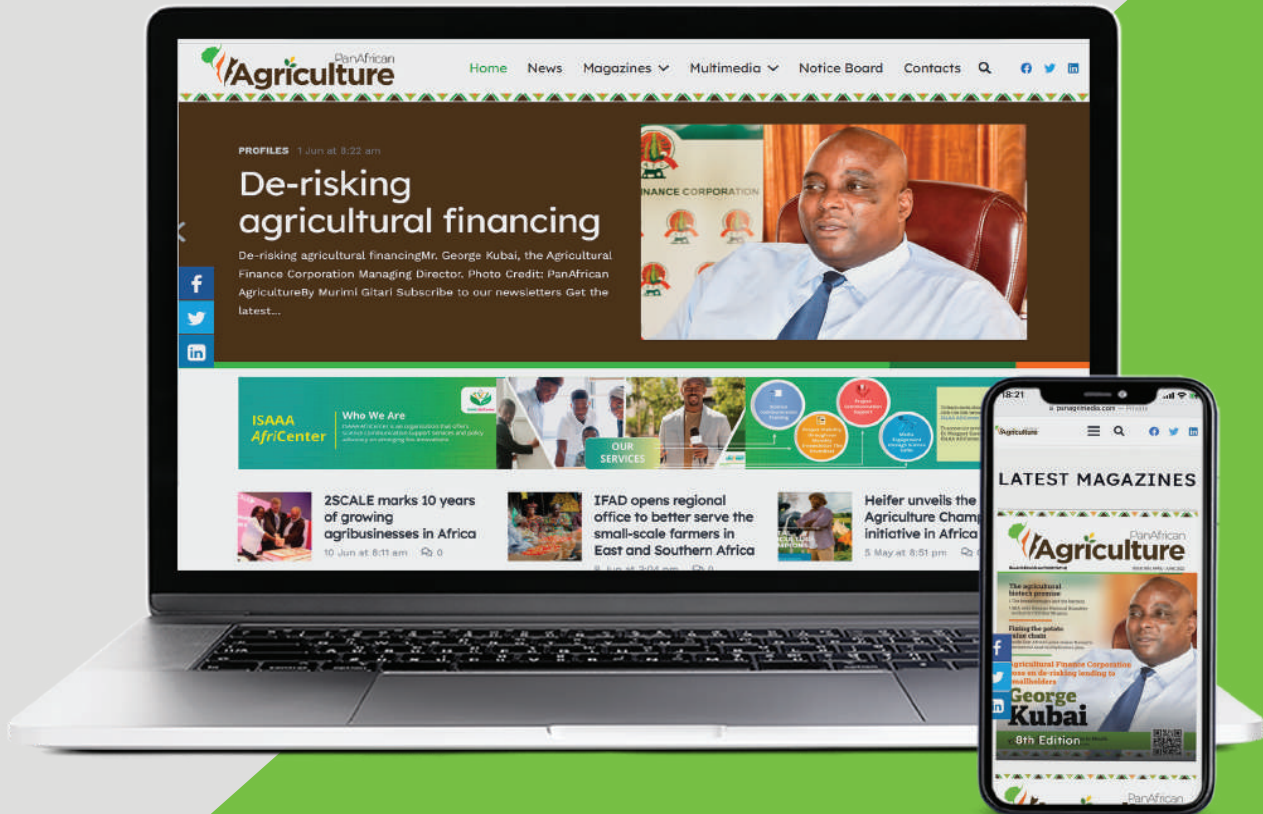
"This project has enabled us reach many farmers not only here in Kenya but other countries as well that are beneficiaries of TRANSFORM programme which has made a difference to the livelihood of these smallholder farmers," said Heifer International Kenya Country Representative Esta Kamau during a recent report validation workshop in Nairobi.

The forum brought together different market systems actors, including financial intermediaries and guarantors, to discuss how best to design interventions and access to finance that will improve animal health, biosecurity for smallholder farmers and farmer producer organisations (FPOs).

Participants also gained insights into the Development Fund Corporation guarantee mechanism and examples of previous success in facilitating access to finance in agriculture and smallholder farmers.



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