



PanAfrican Agriculture

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ISSUE 14 | OCTOBER - DECEMBER 2023

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No one left behind

A movement for inclusive value chains takes root in Africa.

Food under siege

How Africa can navigate the Black Sea grain imports blockade.

Esta Kamau

Heifer Kenya boss leads support for youth-led agritech innovations.



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Editor's Note

Leave no one behind in the race to transform Africa's food systems

THE food crisis in Africa caused by the Covid-19 pandemic reminded the continent about the need to transform its food systems to enable it to feed itself.

Voices urging the continent to build back better food systems have got even louder in the wake of the current food shortages and high food prices related to the disruption of global supply chains by the Russia-Ukraine war, climate change, inflation and weakening currencies.

Resolutions at Africa's Food Systems Forum 2023 Summit in Dar es Salaam in September urged urgent action to accelerate food systems transformation through better policies, practices and investments.

But experts have warned that the dream transformation won't be realised unless the agricultural value chains are made more inclusive for smallholder farmers, including critical groups such as women, youth and agri-SMEs.

Despite accounting for more than 70 percent of the food production in the sub-Saharan Africa, for example, the smallholders who typically farm on less than two hectares, have been condemned to low productivity and low incomes because they often lack access to farm inputs, finance and markets for their products.

To keep this important conversation on the need to leave no one behind going, our special report in this edition of *PanAfrican Agriculture* focuses on building inclusive value chains.

Our writers in different parts of the continent visited the fields to watch the struggles of smallholder farmers up close, but they also found quite a number of champions for inclusive value chains out there.

In Senegal, for example, a FAO-backed digital inclusion project is providing farmers with real-time information on weather forecasts, best agricultural practices, livestock care, market prices, health and nutrition directly from specially developed applications on their cell phones.

From neighbouring Cameroon, we bring you the story of a loan assistance programme by a local NGO that has enabled a group of fruit farmers, who were evicted from their land to give way for a private plantation, to undertake value addition and supply branded dried fruits to the supermarkets.

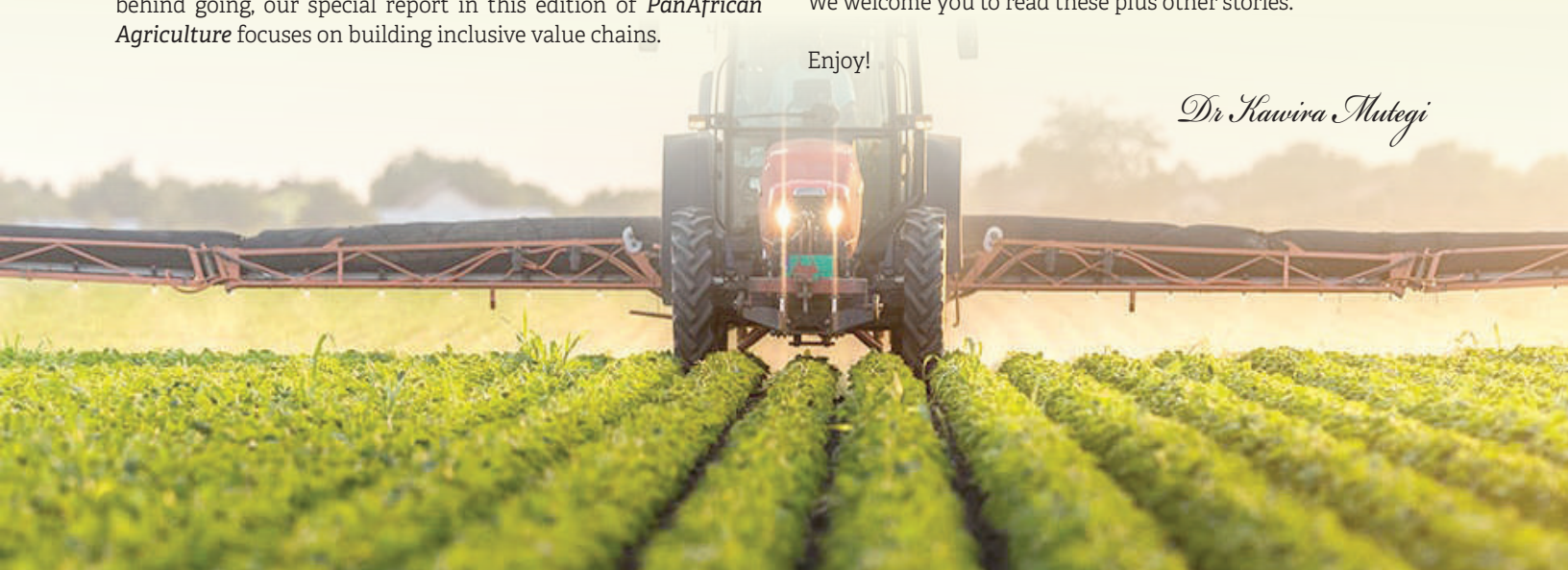
In Kenya, Keitt Exporters, a fresh produce export company, has signed contracts with about 7,000 smallholder avocado farmers under which it collects the produce and pays for deliveries within 48 hours, reducing post-harvest losses and sparing them from exploitation by middlemen.

For our Q&A section, we sat down with Esta Kamau, the Heifer Kenya Country Director, to discuss the organisation's programme that is helping youth-led agritech enterprises to access the capital they need to scale up their innovations and grow their businesses.

We welcome you to read these plus other stories.

Enjoy!

Dr Kawira Mutegei





Esta Kamau, the Heifer Kenya Country Director, discusses the organisation's programme that is helping youth-led agritech enterprises to access the capital they need to scale up their innovations and grow their businesses.

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Russian Ships in Black Sea. Photo Credit: Wiki Commonsx

Breaking the Black Sea food siege

By Prof Arun Tiwari

A LONG view of history reveals an interesting cyclic trend of certain events. Empires are created when local warlords create anarchy, disrupting the lives of people, who end up welcoming outsiders to restore normalcy. And what is that normalcy – of the safety of life from starvation and violence, and the assurance of livelihood and honour? It is very difficult to take sides in a bullfight, but the blame squarely rests with the organiser of the fight, the emperor who created the Colosseum, and the crowds who gather to “enjoy” the “sport.” Misery and violence initiated and perpetuated by whoever it may be, can never be a sport, and eventually, it comes to an end.

Russia and Ukraine contribute more than a quarter of the world's wheat, supplying billions of people with roti, bread, pasta, and a variety of pastry

products. The countries are also key suppliers of barley, sunflower seed oil, and corn, among other products. Ships sail through the Black Sea carrying grains and oil seeds to the world markets – wheat for Middle Eastern and African countries and oilseeds for India especially. With a military conflict that blockaded the ports, trade halted.

Commodities are a live trade and material movement, and prices are directly linked. Even a few days of disruption in the supply chain creates a supply deficit, raising the price. In July 2022, the collective effort of the United Nations and the local power, Turkey, ensured a safe corridor for ships carrying agro-produce from three Ukrainian ports – Odesa, Yuzhny and Chornomorsk. Safe sailing of ships in the Black Sea also benefitted Russia in exporting food and fertilisers to foreign markets.

For one full year, it proved a good deal. As the staple food from Ukrainian ports reached markets in developing countries, prices stabilised and the World Food Programme could send supplies to Afghanistan, Ethiopia, Kenya, Somalia, Sudan, and Yemen. In India, edible oil prices did not shoot up to the great comfort of both consumers and traders as beyond a point price increase leads to shrinkage in supply. But then on July 17 this year, Russia walked out of the arrangements – called the Black Sea Grain Initiative in diplomatic parlance – and no one knows when normalcy would return. It appears a long-drawn Sumo-wrestling bout. Could the Ukraine War be prolonged if European countries really stop buying Russian oil?

Is the passage of food-carrying ships called normal? The world is a constant flux of interrelated events. A thick and active web of causes and effects keeps creating events and resolving them, thereby creating new events. It is foolish as well as myopic to consider the safe passage of food ships over the Black Sea as an event of historic importance. Why the Black Sea is unsafe is the issue! Or is it really the issue? Or is the perennial dependence of African nations on the import of their grains the issue? The failure of Indians to grow sufficient oilseeds in their vast country is the issue.

Do diplomats decide the fate of the millions of hungry poor or do their leaders? Who is running this world? The Russia-Ukraine problem is a European problem. Why should it affect people living in Africa and Asia by increasing the prices of their food? But this again is not a new phenomenon. The two World Wars in the 20th century were born in Europe before dragging the entire world into turmoil. Even the Covid-19 pandemic had a strikingly similar pattern to the Spanish Flu pandemic of 1918. So, where are we and what next?

There is a pattern in which events happen but every time, there is also change. The world is changing. It is now connected. And this is not because of some faith, or creed, or empire, but due to technology. The Internet available on mobile phones has transformed the way people live, work, earn their livelihoods, and organise themselves. Money flows over mobile phones and people can work at distant locations and transact business without physically travelling or meeting each other. This is one transformation. It has happened, it is palpable, and no one will eventually be able to escape it.

The second transformation is the convergence of biotechnology and information technology. It is now possible to see what is happening at a very small scale, a billionth of a metre, called nanoscale. Our fingernails grow about a nanometre every second. That means they grow 86,400 nanometres

per day, but even less than a millimetre is too little for us to detect. Of course, over a week we must trim them. So, a new understanding is gained of how plants absorb nutrients from the ground, consume water, and convert energy into material, which eventually becomes fodder and food.

Materials display different properties at the nanoscale – a few atoms together in proximity. It is now understood how seed sprouts and plants grow using energy from water, air, and sunshine. And this understanding has led to control over the phenomena. It is now possible to grow watermelons in deserts by deploying precision irrigation by providing only the needed quantity of water to the plant. Paddy can be grown without flooding the fields. Sugarcane can be grown using less than half the water now used.

The siege of food in the Black Sea is only a symptom. It is a man-made crisis and like every other man-made thing it will be over by a set of events that would emerge out of this impasse. The real siege of food is by climate change and the iron grip of trade over agriculture. Large areas of arable lands in Africa were not cultivated so that the food grown in Europe can be sold to African people and their resources could be taken in exchange. But even this had consequences and industrialisation pushed the planet into irreversible climate change. Now, we can see floods in great cities

wreaking havoc. The rains are short and torrential. The cycle of water delivered by clouds has been skewed, becoming both unpredictable as well as erratic.

So, how do we handle this siege of food? More than three-quarters of the global population – and that means six billion people – are at risk from crop failures and hunger from climate change. They inhabit the global south, spanning sub-Saharan Africa, South Asia, and Southeast Asia. It is the world of smallholder farmers who have been poor and vulnerable and aloof from the swipe of the magic wand of the technology that swept through the developed world bringing prosperity and comfort. It is time to take technology where it is needed the most. If timely actions are not taken, which means now, even the people who have relatively high incomes would slide into poverty as food prices increase.

It is ludicrous when policymakers sitting in their modern ivory towers give a call for a switch to less-thirsty crops and ask rice farmers to grow crops that require less water such as maize or legumes while they would not even change the brand of the biscuit they savour. So, rise Africa, rise Asia, rise southern hemisphere, and embrace technology into your livelihoods. If there is a real siege, it is in the minds of the people. Rest all is temporary. Like passing clouds, as it has gathered, so will it disperse.

Prof Arun Kumar Tiwari is an Indian missile scientist and author.

Wheat fields in Ukraine. Photo Credit: Wiki Commons



Cereal crop farmers in Sudan. Photo Credit: FAO

FAO rallies emergency livelihoods support for war-ravaged Sudan

\$123 million needed for urgent support to 10 million people in 17 most food-insecure states

By Murimi Gitari

THE Food and Agriculture Organisation of the United Nations (FAO) launched an Emergency Livelihood Response Plan to address growing food insecurity in Sudan, providing communities with emergency seeds, livestock treatment kits, veterinary and fisheries support and equipment.

The plan builds on FAO's work to address extreme vulnerabilities triggered by the ongoing conflict in small-scale farming, herding and fishing communities. It complements the UN agency's recently completed emergency seed distribution campaign.

The emergency seed distribution campaign helped farmers maximise cereal production, avoid depletion of assets and promote seed diversification. The expected production will contribute to meeting the cereal needs of at least 13 million and up to 19 million people for the upcoming 2023 harvest.

FAO Representative in Sudan, Hongjie Yang said millions of people across Sudan are facing a battle for survival as the food security crisis worsens.

"This emergency response plan aims to provide farming, herding and fishing families with the basics they need to keep production going and feed themselves and their communities," he said.

Seeds, animals and livestock vaccination campaigns

Under the plan, to support 10.1 million people, households most in need will receive certified quality seeds – cowpea, groundnut, millet, okra and sorghum for the 2024 summer season, and chickpea, cucumber, pigeon pea, tomato and watermelon for the 2023 winter season.

They will also receive training to adopt good agricultural practices, such as better handling of farm commodities after harvest.

Vulnerable people who have lost productive assets will be supported through the restocking of animals. This will immediately improve food security and nutrition, enabling herders to produce four to five litres of milk/day.

Crucially, in a context of conflict, FAO's plan will support the implementation of mass vaccination campaigns to protect six million sheep, goats and cattle against the most prevalent and devastating diseases, including peste des petit ruminants, sheep and goat pox and foot-and-mouth disease.

FAO also aims to assist 50,000 people (10,000 fishing households) with fishing inputs (such as fishing boats and gear) and related training to

ensure steady access to high-protein, quality foods and maintain functional local economies.

Much of the support to the most vulnerable farming and livestock herding households will be delivered using a combination of unconditional cash assistance and livelihood input packages (seeds, tools, etc.) combined with training. This will help address food shortages during the dry season from November to May among farmers practising rainfed agriculture who face a "hunger gap" while herding communities struggle with water scarcity, diminishing pastures and weakened animal health, leading to economic strain and a decline in food consumption patterns.

Funding needs for implementation

To implement the plan over the next 12 months and reach the targeted farmers, herders and fishers in 17 of Sudan's

most food-insecure states, FAO will require \$123 million.

FAO last month warned about the severity of the escalating food crisis in the Sudan. According to the latest Integrated Food Security Phase (IPC) projections, more than 20.3 million people, representing more than 42 per cent of the population in the country, are experiencing high levels of acute food insecurity (IPC Phase Three or above) between July and September 2023, nearly double the figure from May 2022. Nearly 14 million people are facing crisis (IPC Phase 3) and nearly 6.3 million people facing emergency (IPC Phase Four) levels of acute hunger. More information on the IPC hunger classification system can be found [here](#).

The ongoing violence has displaced over 3.8 million people across the country and forced more than 960,000 individuals to seek refuge in neighbouring countries.



Seed distribution in Sudan by FAO last year. Photo Credit: FAO



A National Biosafety Authority (NBA) officer at a Bt cotton farm in Nzangathi Village Kitui County. Photo Credit. NBA

Kenya's regulator NBA takes lead role in facilitating biotech

By Abook Brian

THE National Biosafety Authority (NBA) was established under the Biosafety Act No. 2 of 2009 to oversee and manage genetically modified organisms (GMOs) to ensure environmental and human health safety.

The NBA aligns with the Cartagena Protocol on Biosafety and has enacted four key biosafety regulations: the Biosafety Environmental Release Regulations 2011 designed to safeguard the environment from potential adverse effects of GMOs; the Biosafety Import, Export, and Transit Regulations 2011 govern the safe movement of GMOs into, across, and out of Kenya while prioritising human health and environmental protection; the Biosafety Contained Use Regulations 2011 guide activities involving

GMOs in controlled environments like laboratories, greenhouses, and confined field trials during research; the Biosafety Labeling Regulations 2012 ensure that consumers are informed when food, feed, or products are genetically modified, facilitating informed choices and product traceability.

The government's commitment to developing the biotechnology industry is outlined in the Biotechnology Development Policy. This policy promotes indigenous research and development activities, emphasising sustainable exploitation of bio-resources for agriculture, environment, health, and industry.

Before conducting any work with GMOs, individuals or organisations must submit an application to the NBA, fulfilling

the requirements in the Biosafety Act of 2009. Guidelines and checklists are available to support this process, such as those for risk assessment and certification of facilities, environmental risk assessment, food/feed safety, genome editing, and sampling. These measures collectively contribute to the responsible management and regulation of GMOs in Kenya, ensuring safety and sustainability.

The NBA is pivotal in facilitating trade by ensuring streamlined cargo clearing processes, particularly in the context of GMOs. Through the issuance of GMO-Free and Non-GMO-Free certificates, the authority ensures that products adhere to strict biosafety standards, allowing for the smooth flow of goods across borders. Rigorous lab tests encompassing human and animal health are conducted to verify compliance.

These tests are essential to protect consumers from potential health risks associated with GMOs and safeguard the well-being of animals that may come into contact with these products. Additionally, by maintaining stringent biosafety measures, the NBA preserves the environment's integrity, ensuring that GMOs do not threaten ecosystems or biodiversity. This comprehensive approach promotes international trade and underscores the commitment to safety and transparency in the global marketplace.

As a regulatory agency dealing with GMOs and all activities around them, the authority actively participates in all matters regarding capacity building and public awareness. The authority has participated in and organised training for their stakeholders, such as expert reviewers on risk assessment, risk management, and socio-economic impact assessment of GMOs.

Additionally, the NBA has been sensitising the public and other stakeholder members on all activities involving GMOs. The authority has also participated in numerous exhibitions held by the Agricultural Society of Kenya (ASK), where members of the public have gained knowledge and information on biosafety of GMOs.

Brian Abook is the Corporate Communications & Customer Relations head, National Biosafety Authority, Kenya.

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Scientists involved in research on stingless bees at Uganda's National Livestock Resources Research Institute. Photo Credit: Lominda Afedraru

Ugandan scientists push for commercial stingless beekeeping

By Lominda Afedraru

AGRICULTURAL scientists under the National Agricultural Research Organisation have embarked on showcasing the technologies they have applied in research and developed products for farmers.

One such group of scientists from the National Livestock Resources Research Institute are engaging stakeholders in the apiary farming drive.

The scientists breed stingless bees to process honey and propolis.

Experts say stingless bees are important in the pollination of crops and, the production of medicinal honey and other products.

However, throughout the developing countries in Africa, meliponiculture has received less attention in beekeeping in development programmes.

Past studies indicate that stingless beekeeping is in its early stages of development.

There are about four species of stingless bee species that are of good economic benefit and these include *Meliponula bocandei*, *Meliponula nebulata*, *Meliponula ferruginea* and *Plebeina hildebranditi*.

Scientists say farmers can use these bee species for profitable honey, propolis and pollen production.

Dr Patrice Katangaki, who heads the project, said that in 2018 his team jointly with scientists at Makerere University embarked on collecting stingless bee species around the Lake Victoria crescent and in the western highlands.

After studying their characteristics they realised the species collected from central Uganda could be domesticated in any part of the country. Out of the three species, the team realised *Meriponula verugemia* and *Meriponula bingadeado* do bite but they cannot sting and they produce good amounts of propolis and honey.

Domesticating stingless bees

At the institute, the scientists established an eco-friendly beekeeping area with different types of hives. Some have pot-like shapes because from the wild they can produce propolis and honey when in such pot-shaped hives, some are made of boxes.

The team has also planted calliandra and avocado trees for the flowers to provide nectar.

However, the bees can fly as far as three to five kilometres looking for nectar.

Stingless versus stinging bees

Scientists believe that the original habitats of the honeybee are forested areas and tropical climates.

They probably originated in Africa and from there spread to China, the Americas, India and Europe. However, since honeybees have been domesticated to produce honey for human consumption, they can be found all over the world.

Honeybees prefer to live in orchards, gardens and other areas with flowering plants. They have stings in their abdomen.

Stingless bees can be found in most tropical and subtropical regions. They start a new nest with a large number of worker bees, but they cannot be considered a swarm.

Since stingless bees cannot use their stinger for defence, they had to develop different ways to defend the hive. Their defence system involves guard bees, which can be separated into two groups – hovering guards and soldier guards.

Due to nonaggressive behaviour and the lack of a functional stinger, the bees can be reared in densely populated areas such as community settings as long as there is a flower in existence.

Benefits of stingless bee honey and propolis

Dr Katangaki said that honey produced by stingless bees has good health benefits the reason it is expensive with a liter sold at USD 200, making it commercially viable. It is used as medicine to cure cough, measles, and wounds and this was proved with experiments done at Ambrosoli Hospital in Kitgum, northern Uganda.

It also cures fungal bacterial infections and is used as a sweetener and food. It is a good pollinator for wild and planted plants. Its sedpropolis acts as antimicrobial, antioxidant, anti-inflammatory, and anti-cancer properties. The processed propolis once taken improves immunity, lowers blood pressure, and treats allergies and skin conditions.



Scientists at Uganda's National Livestock Resources Research Institute showcasing research on stingless bees. Photo Credit: Lominda Afedraru

AATF hosted a workshop where participants shared experiences and discussed ideas on advancing biosafety regulation in selected African countries. Photo Credit: CIO Look

Taking agricultural biotech regulation to the next level

By Verenardo Meeme

THE AATF in collaboration with Agricultural Research Council (ARC), African Biosafety Network of Expertise (ABNE) and Gauteng Department of Agriculture, Rural Development and Environment (GDARDE) recently organised agricultural biotechnology regulators retreat for 10 African countries in Pretoria, South Africa.

During the workshop hosted by AATF's Open Forum on Agricultural Biotechnology in Africa (OFAB), participants shared experiences and ideas to advance biosafety regulation in selected African countries.

The meeting took place against the backdrop of various African countries being at different stages when it comes to regulating biotechnology.

For instance, Nigeria's National Biosafety Management Agency (NBMA) was established in 2015 to oversee biosafety regulations. The country has approved some genetically modified (GM) crops for cultivation, such as Bt cotton and pod borer-resistant (PBR) cowpea.

Kenya has a well-established biosafety regulatory system. The National Biosafety Authority (NBA) was established through the Biosafety Act, 2009 to regulate all activities involving GMOs in food, feed, research, industry, trade and environmental release.

The authority ensures safe development, transfer, handling and use of GMOs in the country.

Ghana established its National Biosafety Authority (NBA) to regulate biotechnology and biosafety. The country has conducted field trials of GM crops, including Bt cotton and PBR cowpea, while Ethiopia signed the Convention on Biological Diversity 1993. In 2000, Ethiopia signed the Cartagena Protocol on Biosafety and ratified it in 2003.

OFAB is a partnership platform that contributes to the creation of an enabling environment for biotechnology research, development, and deployment for the benefit of smallholder farmers in Africa. OFAB operates in Burkina Faso, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Uganda and Tanzania.



TELA project seeks to enhance food security and improve rural livelihood of smallholder farmers in Africa through the development, deregulation, and deployment of drought-tolerant and insect-protected GMO maize Photo credit: New Food

Dr Litha Maginqxa, the ARC, South Africa chief executive officer, said recommendations from the retreat would help enhance agricultural biosafety regulatory frameworks in the continent.

He commended ARC's long-standing partnership with OFAB, noting that earlier this year ARC welcomed a group of legal professionals from OFAB countries for training workshops.

Through knowledge and awareness, OFAB aims at building understanding of agricultural biotechnology to inform decision making.

The retreat encompassed interactive sessions, including plenary and biosafety clinics. During the plenary sessions, experts presented the current state of biosafety systems in different participating countries.

AATF Head of Policy and Regulatory Affairs, Dr Francis Nang'ayo, spoke about the approaches to GM regulation on policy choices and African countries' endeavours to develop National Biosafety Frameworks (NBFs) over the last 30 years.

ARC is involved in several initiatives, including a private public partnership known as the TELA maize project, an extension of the WEMA project. The project partners with national research organisations in Ethiopia, Kenya, Mozambique, Nigeria, and South Africa.

The project seeks to enhance food security and improve rural livelihood of smallholder farmers in Africa through the development, deregulation, and deployment of drought-tolerant and insect-protected GMO maize. South Africa is the only TELA country where farmers are already growing GMO maize hybrids. Only a few countries have successfully commercialised GMO – Eswatini, Ethiopia, Kenya, Malawi, Nigeria, South Africa and Sudan, just 12 percent of the continent.

The workshop participants concurred that regulators should not operate in silos. They also considered the inclusion of lawyers and media house editors in the next engagement.

“Adoption of agricultural technologies is influenced by public perception, for instance, perception of risk, which transcends scientific facts.

Therefore, trust building is critical in communicating science for adoption – address fears while respecting deep seated values,” the OFAB project manager, Vitumbiko Chinoko, said.

Dr. Samuel E. Timpo, Head, Regional Office-Dakar Head, Biosafety Division/ABNE, made a presentation on Biosafety Regulatory Experiences in Africa. He observed that Africa's food systems and rural livelihoods were being negatively impacted by climate change and increasing climate variability and climate extremes hence the need to embrace call to action as envisioned in Agenda 2063 of the African Union.

Dr Timpo said that AUDA-NEPAD should work with regional economic communities (RECs) to build functional biosafety systems.

Verenardo Meeme is the Programme Officer, Open Forum on Agricultural Biotechnology in Africa (OFAB) at AATF.



Halima Nenkari, from the Department of Livestock Production, presents an award to the AYuTe Africa Challenge Kenya 2023 winner, Mutuma Muriuki from Eco Bristo. Photo Credit: Heifer Kenya

Agritech startups win cash grants, scholarships in Heifer's AYuTe Africa Challenge

By Murimi Gitari

HEIFER Kenya has announced the winners of the 2023 AYuTe Africa Challenge Kenya in a ceremony held in Nairobi on August 31, 2023. The global non-profit organisation working to end hunger and poverty in low- and middle-income countries awarded cash grants and scholarships to eight winners.

This year's winners were in two categories, namely ideation and product stage. In the product stage category, Eco Bristo won, taking home a cash prize of KSh1 million, followed

by Agritech Analytics as the first runner-up, receiving KSh400,000 and Grow Agric as the second runner-up bagging KSh200,000.

In the ideation stage category, VunaPay won a cash prize of KSh250,000 followed by Agronomy Plus, which received KSh150,000 and Silo Africa that took home KSh100,000. In addition, One Million Avocados and Agronomy Plus won a scholarship award from Astral Aerial.

Speaking during the awarding ceremony, Heifer Kenya Country Director Esta Kamau said this year's competition

had positive feedback from the competitors, partners and other organisations.

“The AYuTe challenge is a catalyst for growth, combining a cash incentive with business development initiatives to translate the energy and ideas of young Kenyan innovators into solution providers working with smallholder farmers in Kenya,” she said.

The organisation announced the second edition of the AYuTe Africa Challenge Kenya last February.

The competition drew 222 applications countrywide, of which 122 innovators were selected and underwent a meticulous pitching, mentorship, training and incubation process.

Eventually, 21 innovations emerged as the finalists including ByteAnza, Eco Bristo, GrowAgric, One Million Avocados, Harvest Care, Sbike Limited, Touche Kami, Sulma Agri Value, Vunapay, Zamil Farms Limited, BnB Electrix, E-Poultry, Vermi- Farm Initiative, AgriTech Analytics, Agronomy Plus, Eco Starch, Farmer Lifeline, Kilimo Mitaani, Mwani Africa, Royal Food Industries and Silo Africa.

Themed 'Identify, Elevate, Grow Together: Propelling Agriculture Transformation Through Youth-Led Innovations', the event emphasised the need for collaboration among agriculture stakeholders to support the application of innovation and modern technologies in the sector.

Ms Kamau thanked partners such as E4Impact Entrepreneurship Centre, Mastercard's Community Pass, Astral Aerial, and Advanta Seeds, among others, noting their contribution demonstrated commitment to supporting game-changing innovations transforming agriculture using modern technologies.

"We are keen on trusted partnerships in identifying game-changing youth-led innovations, elevating them through market-driven training, mentorship and connections, and growing together for the benefit of smallholder farmers," she said.

The country director added that the future of Africa's agriculture hinges on creating opportunities for young innovators to propel agriculture transformation, catalyse ground-up innovation from young Africans and make agriculture a desired career for the future.

Livestock PS John Mueke, who was represented during the ceremony, in his remarks, thanked Heifer Kenya for recognising innovations, noting that the challenge not only empowers young innovators but also spurs agricultural solutions geared towards accelerating economic growth.

Heifer has partnered with E4Impact Entrepreneurship Centre to offer technical assistance to accelerate local innovation's growth and sustainability.

"Our critical role as E4Impact is to work with the innovators to shape their innovations through training,

mentoring, and linking them to various coaches, early-stage investors, and sector experts throughout the competition," said David Cheboryot, the Director of E4Impact Entrepreneurship Centre.

Dr Benadette Mutinda, the Country Director of E4Impact, said the entrepreneurship spirit among the youth in all sectors, especially in innovation is a game-changer for economic development.

Mutuma Muriuki, Founder of Eco Bristo, who bagged the Ksh1 million as the overall winner thanked Heifer International Kenya for the initiative.

"The announcement came as a surprise, but I want to appreciate Heifer for recognising me and the efforts Eco Bristo is putting towards enabling the growth of food systems through agroecology," he said.

The AYuTe Africa Challenge Kenya is the local chapter of the continent-wide AYuTe Africa Challenge and one of the most ambitious agriculture competitions on the continent, combining the power of youth with the many possibilities of emerging technologies to support smallholder farmers across Africa to grow their businesses and incomes.



*Mutuma Muriuki from Eco Bristo (left) and Koya Matsuno from VunaPay (right), the top winners of the AYuTe Africa Challenge Kenya 2023, pose for a photo with Country Director, Heifer Kenya, Esta Kamau.
Photo Credit: Heifer Kenya*



Uganda Breweries Limited (UBL) has entered contract farming agreements with smallholders in Kigezi region in Western Uganda and the Sebei region in Eastern Uganda to grow barley. Photo Credit: Lominda Afedraru

Brewing industry demand grows barley, sorghum market in Uganda

By Lominda Afedraru

GROWING demand for sorghum and barley by the brewing industry has encouraged farmers in parts of Uganda to take up farming or expand their acreage under the two cereal crops.

The major markets for barley in Uganda are the brewing companies, which take up 90% of barley grown by farmers.

Other consumers of barley are fish farms, which use barley as an algacide to naturally reduce algae growth in fish ponds.

To a small extent the livestock industry is also using barley as supplement to their animal feeds.

Uganda Breweries Limited (UBL) has entered contract farming agreements with smallholders in Kigezi region in Western Uganda and the Sebei region in Eastern Uganda to grow barley.

Sorghum is grown in most parts of Northern and Western Uganda. The agriculture manager at UBL, Joseph Kawuki, said that the collaboration with farmers in the Kigezi region was benefitting both parties.

A company called Solidaridad provides advisory service to the farmers on best agronomy practices in order to get better yields, including post-harvest handling.

Solidaridad has deployed agronomists in all the barley growing areas in Kigezi to sensitise farmers to adopt the best agronomy practices.

As a result of the collaboration, farmers in Kigezi improved the yield capacity from 400 kg per hectare in 2020 to 1,200 kg per hectare in 2022. This means more money in the pocket for the farmers.

Best practice to adopt Gerald Assimwe, the Coordinator Solidaridad Kigezi region, says that barley farmers have a unique challenge of maximising grain yield while maintaining certain quality standards to receive premium prices by the malting industry.



UBL managers on a tour of a barley-growing area in Uganda. Photos Credit: Lomida Afedraru

Yields depend on variety, but in general barley grain should have high germination rate of 95%.

There are a number of barley varieties grown by farmers in Uganda and these include the hybrid Nguzo and local varieties such as Sabini and Karen. UBL recommends hybrid varieties Cocktail, with yield capacity of 800kg per hectare, and Gracie variety which yields between 1,000kg to 1,200 kg per hectare.

Diseases are a challenge for barley producers because they lead to yield loss as well quality reductions.

The common foliar diseases of malting barley are fusarium head blight, net blotch and spot blotch.

The common pests are birds and rats, which cut off the stems. Farmers are advised to clear the surroundings of their fields to avoid harbouring of rats.

Barley is harvested when fully mature. Green seeds lower malting quality. Once the grain has dried to having 13.5% or less seed moisture content, it can be harvested.

Erasmus Twesigye is the founder member of Mukaadamo Kawungye Barley Farmers Association, which has over 500 members, in Kabale district.

Farmers from this area began engaging in barley farming in 2017 when a UBL team went around sensitising them about the benefits of growing the crop.

The association has a joint store where farmers bulk their produce. The association is able to bulk 500 tons of barley in a good season and most farmers own between 1-3 acres of land.

Kanyagabo Basigaba Farmers Association in Kisoro district with 35 members produces between 120-130 bags per season.

In Eastern Uganda the farmers are linked to the industry by agents who are selected farmers growing barley. Alex Chele from Kapchorwa is in charge of mobilising farmers from the region and there are over 200 farmers engaged in growing the crop. Each farmer is able to harvest 70 bags of unshelled grain.

Contract farming the case of sorghum UBL has also contracted sorghum farmers across Northern and Eastern regions. One prominent farm owned by Rigil Agrotech Company produces 7,000 tons of sorghum for the industry.

The farm obtains sorghum seed from UBL which is purchased at Shs11, 000 per kg. Its workers carry out seed dressing to avoid seed damage by soil-borne diseases and to ensure sufficient germination. In an acre seed ratio of 4 kg is required.

The high-yield Chromatin hybrid variety is particularly grown to meet the demand by UBL.

The industry buys part of sorghum bulked by Abur Lango Cooperative Society in Northern Uganda owned by a group of youth.

They are able to purchase sorghum grain from farmer fields which is processed and bulked ready for uptake by the UBL.

They sell each Kg at Shs1, 200 per kg.

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Sanjay Rajaram Karale
Farmer from India



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*Keitt Exporters sources avocados for exports and for value addition from smallholder farmers in different parts of Kenya.
Photo Credit: Murimi*

Fresh produce firm unlocks avocado export market for smallholders

By Murimi Gitari

KENYAN smallholder avocado farmers are often subjected to exploitation by middlemen, and have to choose between seeing their produce go to waste or selling at a 'throwaway' price.

However, Keitt Exporters, a fresh produce exporting company, has come to the rescue of the farmers by offering them a market for avocados.

The company sources avocados for exports and for value addition from smallholder farmers across the country.

Dipesh Devraj, the operations and commercial director, says under their Home of Avocado Farmers programme,

the company aggregates produce from farmers so as to meet the market demand for avocados.

Currently the programme started in 2009 has over 7,000 farmers.

"The programme has mostly smallholder farmers mostly across the country. We enter into contracts with these farmers and start training them on avocado growing so as to get quality fruits for the market," Dipesh says.

"Keitt Exporters is a grower and an exporting company predominantly in the value chains of fruits and conventional vegetables. We have been in business for over two

decades. Avocados are our signature crops followed by mangos. In the sub-Saharan Africa we are the largest exporter of avocados."

Once the company enters into contracts with farmers, it assigns its agronomists to them for advisory services.

Dipesh likens avocado farming to raising a child that needs care, attention and feeding so as to have better results at the end.

Dipesh and other directors of the company also participate in field days organised by the company for farmers and take time to listen to the challenges they face and their needs for avocado farming.

This way, they are able to receive the right feedback needed to design appropriate training for the farmers on nurturing their avocado trees so as to improve production.

The company discourages the farmers from buying seedlings on the roadsides and instead procure from certified nurseries or its own nurseries where it sells the seedlings at subsidised rates.

A common challenge the smallholder farmers face is lack of knowledge in crop management and nutrition.

Some of the fruits supplied to them come deformed due to lack of calcium, zinc, boron and other nutrients for avocados.

However, Dipesh says that when they get such fruits from the farmers or any other fruit that does not meet the export market requirement, they still buy them and do value addition at the company's oil processing plant located in Kenol, Murang'a County where they also have a state of the art packhouse.

The company has three commercial farms with an average of 750 hectares and handles more than 600 containers of avocados in a season by sea and a similar number by air for the export market.

The three farms are located in Embu, Meru and Subukia in Nakuru. Small-scale producers are advised to form groups with a minimum membership of 30 growers who cumulatively can put 50 acres under the fruit.

"We have expanded to Tanzania where we are putting up a belt of avocado farms, almost 2,000 acres. Basically, what has led us to the expansion is the need to strategise for the future so as to meet the demand," Dipesh says.

"Once these farmers supply avocado to us, they get their payment within 48 hours through mobile money transfer."

The smallholder farmers who purchase seedlings from the company's nurseries are also encouraged to join the firm's outgrowers club to benefit from a guaranteed market and technical support. The agronomists from Keitt work with the farmers through the journey till harvest, providing regular guidance and support every step of the way to maximise production.

The fruits that they get from the farmers do not mature at the same time being an advantage for them as they are able to get avocados at different seasons for the market.

When a Chinese delegation toured Kenya to access the country's capacity to supply avocados, Keitt Exporters was among the nurseries, farms and packhouses identified by the Kenya Plant Health Inspectorate Service (KEPHIS) to host the delegation, attesting the firm's leading position in the sector. After the assessment, the company was certified by KEPHIS to export avocados to the Asian market.

Currently the firm has an exclusive market with various partners and customers in Europe where they are selling the Kenya avocados. Other markets are Middle East, Russia, Turkey and Asia.

Keitt's confidence in the future of the avocado is informed by reports the market is growing globally for the fresh market and processing into oil. Statistics in Europe show consumers have moved from eating 400g per person to 7kg.



Farmers sorting avocados after harvesting. Photo Credit: Murimi



A farmer grafting seedlings. The lack of high-quality and certified planting materials is a setback in the horticulture sector. Photo Credit: MARKUP

EU, EAC market access project lifts horticulture farmers

By Murimi Gitari

AGRICULTURE is the source of livelihood for most of the rural population and is inevitably the key to food security, reduction of poverty and spurs economic growth in Kenya.

In these rural communities, smallholder farmers account for 75 per cent of the agricultural output yet they have been largely neglected in the five decades of post-colonial agricultural policy-making in Kenya.

A report by the World Bank shows that small-scale production accounts for 70 per cent of the marketed agrarian

produce compared to large-scale farming, which mainly involves growing commercial crops, such as tea, coffee, maize, sugarcane, and wheat.

The European Union-East African Community Market Access Upgrade Programme (MARKUP) has seen a transformation of the agricultural sector in Kenya.

The 35-million euro programme ended this year after four years and aimed to enhance competitiveness and market access for select Kenyan produce.

The main objective of the programme was to increase exports of agribusiness and horticultural products for small and medium-sized enterprises while promoting regional integration and access to the European market across 12 counties in Kenya namely Makueni, Machakos, Embu, Uasin Gishu, Trans Nzoia, Kajiado, Nakuru, Busia, Taita Taveta, Bungoma, Siaya and Homa Bay counties.

The United Nations Industrial Development Organisation (UNIDO) partnered with Kenya and the EU to implement the project through various State agencies in the agricultural sector.

Stefano Sedola, the Chief Technical Adviser at UNIDO said: "We did this in two ways by strengthening the institutional regulatory framework for safety and working with producers and exporters through increasing revenue to the smallholder farmers, reducing the cost of technical assistance required. We also supported exporters to go and identify market opportunities in market linkages like Europe, Middle East and others."

"With the closure of the programme, we have witnessed an increase in revenues to farmers at a rate of 60 per cent. There was also an increase in market access by 45 per cent. We worked with a community of 1,500 farmers and exporters with an ambition to scale up this initiative to improve productivity and increase revenues in the horticulture sector in the country,

which had been dominated for years by low productivity and post-harvest losses."

Bernard Kiio, one of the beneficiaries of the project and a mango farmer from Makueni County, said the project had boosted income for farmers in Makueni.

"From this project, we have been trained in taking care of our mango trees in terms of pruning, pesticide application and market accessibility. We have been taken through the process of getting certified by relevant bodies for the export markets," said the farmer, adding that he used to harvest two tonnes of mangoes compared to 11 tonnes currently.

Dr Lusike Wasilwa, the Director of Crop Systems at KALRO, while speaking during the closing event of the programme, said a lack of high-quality and certified planting materials is a setback in the horticulture sector.

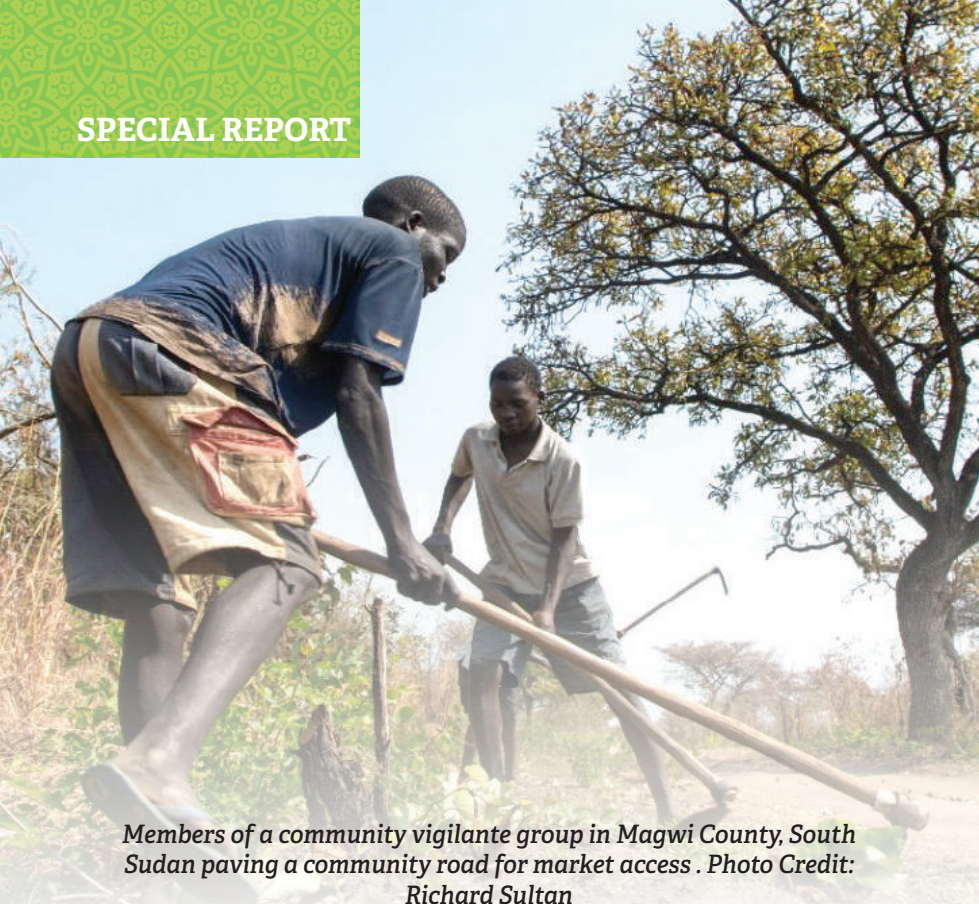
"Certified seeds guarantee higher germination percentage and yields. Uncertified seeds are often prone to stunted growth, leading to poor production and plunging farmers into heavy losses," said Dr. Lusike.

The MARKUP programme has increased the value and market penetration of the supply chain of more than 1,500 farmers, according to Mr Sedola. He added that the number could increase to 100,000 with proper strategies and expanded market access at an estimated growth of 40 per cent.

UNIDO Country Representative Kawira Bucyana said the programme worked on improving market linkages like establishing a challenge fund for exporters, with some participating in the Berlin Horticulture Expo 2023.



A farmer harvesting French beans. Photo Credit: MARKUP



Members of a community vigilante group in Magwi County, South Sudan paving a community road for market access. Photo Credit: Richard Sultan

Volunteers pave a community road to ease farm produce market access

By Richard Sultan

AWI Michael stood at the edge of his cassava and groundnuts farms, pondering his next move. A year ago, the 51-year-old farmer and a veteran of the South Sudanese liberation war, promised himself to find a solution to his produce that went to waste due to lack of access to the market.

For Awi and his village mates, every year comes with new challenges. In the past, they had to deal with the challenge of an elephant destroying their crops until they formed a local vigilante group and hang an alarm bell made from an old metallic wheel to alert the residents in case the wild animal was spotted in the vicinity.

Magwi, a rural county about 120 km South East of the capital Juba, borders Uganda to the north and it is one of those places that has suffered the brunt of the recent civil wars in the country in 2013 and 2018. Its proximity to the Fulla National Game Park also makes it prone to human-conflict.

As a respected elder, Awi feels it's his responsibility to figure out a solution. Burdened by the thoughts of how a man can work so hard and reap nothing out of it due to inaccessibility of the market, he woke up one morning and headed for the chief's house.

After a 30-minute discussion, the chief agreed to his suggestion and tasked him to mobilise all the farmers for a meeting in five days. The meeting supported the chief's suggestion that everyone spare two days a week to pave a 9km earth road connecting their village to the main tarmacked road to ease transportation of their farm produce to the markets.

"We are well aware that some of you might have pressing issues like sicknesses and family commitments that will prevent you from taking part. In that case, we advise you to contribute anything in kind to support the work," Chief Amoyi Kalisto said.

Unlike in other areas in the country where farmers form cooperatives to collectively market and sell their produce those in Magwi prefer to sell theirs directly at local markets in towns and villages. This allows them to connect with nearby consumers and avoid the complexities of long-distance transportation.

Today, the road leading to Magwi is busy with human and motor traffic heading there for farm produce and the villagers are reaping the benefits of their hard work.

Charles Onen, a local government official, said insecurity has prevented the local farmers from organising themselves into a proper cooperative despite the potential benefits.

"These farmers receive some agricultural extension services support provided by government agencies, NGOs, and international organisations. These services offer training, market information, and technical assistance to help farmers improve their production practices and market access without factoring in the major obstacles of roads and insecurity that has plagued the community for ages," Onen said. Onen said that with just a little bit of government intervention, community farmers can explore value addition and processing techniques such as drying and packaging to increase the shelf life and market value of their products.

"In Yei and Juba, there are lots of locally packaged honey and other farm produce in the supermarkets and market stalls as a result of value addition," Onen said.

However, all is not lost, with this newly paved road, comes access to the market and extra income in the pockets of the farmers.



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The quality of ICT infrastructure has improved dramatically in the region, with many having already adopted mobile technologies. Photo Credit: AUDA-NEPAD

Digitalising agriculture in rural Senegal

By Murimi Gitari

IN Nioro, Senegal, Mamadou Drame, a father of four children, nowadays looks down at a screen instead of up at the skies to understand the weather and know what to plant. Historical rain cycles have become increasingly unreliable because of climate change, upsetting patterns of planting and harvesting. Thankfully, digital innovations have emerged, assisting him to boost his rice, maize, millet and vegetable production. These tools are also helping in finding buyers and receiving payments on his phone.

In November 2016, the Food and Agriculture Organization of the United Nations (FAO) launched the Agricultural Services and Digital Inclusion in Africa (ASDIA) project, with flexible voluntary contribution funding.

The project's main objective was to provide farmers with real-time information on weather forecasts, best agricultural practices, livestock care, market prices, health and nutrition directly from specially developed applications on their cell phones.

With the "Weather and Crop Calendar" app, farmers have a new ability to predict the start and end of the rainy season accurately, as well as the frequency and expected amount of rain. This information allows them to choose the right type of seeds and timing for production cycles, avoiding the catastrophic losses that often occur in dry years.

"We have never had this kind of information or access to markets. It has completely changed how we think about this business.

Now we can plan, plant, harvest, sell and earn with a security we have never had," says Mamadou.

Over the past 20 years, a cell phone, one little item that fits in a pocket, has provided humans with all the data and information needed to make informed decisions in almost all walks of life.

The quality of ICT infrastructure has improved dramatically in the region, with many having already adopted mobile technologies. However, these tools are not yet commonly used by farmers as part of their production.

The opportunities for use in agriculture abound, such as maximising the impact of existing rural advisory services, financial services, social protection programmes and market access directly from individual cell phones.

In Senegal, FAO has deployed the ASDIA project to help support the implementation of the digital agriculture strategy of the country's

National Agency for Agricultural and Rural Council (ANCAR), a body under the Ministry of Agriculture. The objective of the programme is to leverage digital tools to modernise local agriculture and help extension agents reach more farmers and cover larger territories.

FAO's ASDIA programme has trained more than 1 000 ANCAR extension agents and local organisation leaders on the five phone applications related to agriculture and livestock production. These agents and leaders then pass this knowledge onto the farmers.

"We now know when to plant. With the information from ASDIA, we're able to adapt our planting schedule to ensure that we get optimal rain," says Mamadou.

Seven years since launching ASDIA, farmers are seeing the benefit of this programme on their agricultural activities and lives with improved yields, fewer expenses on inputs and fewer post-harvest losses.

In mid-2020, FAO additionally helped ANCAR build an e-commerce platform, senlouma.org, to assist approximately 500 Senegalese small-scale farmers to sell their products during the COVID-19 crisis. This was part of the rapid response to the devastating marketing problems and widespread rotting of agricultural products caused by the pandemic's disruptions to the value chain.

"The platform was a lifesaver. It allowed us to sell our produce at the height of the pandemic, without breaking COVID-19 protocols," remembers Mamadou.

The platform now boasts over 45 farmer organisations registered, with almost 4,000 people able to sell their produce online. ANCAR plans to use senlouma.org to connect producers in rural areas with seed traders, input suppliers, food processing specialists, insurance traders, wholesalers and financial institutions.

So far, beneficiaries from the Saloum and Niaye regions have discovered new markets and developed partnerships especially in eastern regions like Tambacounda and Kedougou where vegetable production is relatively underdeveloped.

The senlouma.org platform was also selected to receive additional funds through an initiative by the Francophone University Agency in partnership with the National Agency for Applied Scientific Research in Senegal. This will assist beneficiaries to obtain commercial patents and scale up their initiatives in Benin, Burkina Faso, Senegal and Togo.

As of August 2022, Mamadou was one of over 300 000 Senegalese farmers registered with ASDIA to receive these advisory messages in their local language. The African Development Bank (AfDB) also mobilised USD 1 million in 2022 to deploy ASDIA and other FAO digitalisation initiatives to the Casamance region in southern Senegal, financing the development of new apps.

With the use of this technology, Mamadou has regained trust in his agricultural production. "I feel confident when I plant and set my prices. I know that I can earn enough to feed my family, take my children to school and grow my business," he said.

ASDIA is one part of the wider Senegalese model of the 1,000 Digital Villages Initiative (DVI) led by FAO. The DVI promotes rural transformation through digitalisation of agriculture, addressing agricultural and non-agricultural bottlenecks and leveraging greater innovation for better production. The DVI places small-scale farmers at the centre of the fight against hunger, poverty and inequality. Senegal is among the nine African countries and multitude of countries worldwide participating in the DVI.



ASDIA is part of the Senegalese model of the 1 000 Digital Villages Initiative (DVI) led by FAO. The DVI promotes rural transformation through digitalization of agriculture, leveraging greater innovation for better production.

Photo Credit: eVuna

Digital and precision technologies emerge as potential game-changers, offering innovative solutions to address the global food problem. Photo Credit: GEP

Can digital and precision technologies solve the global food problem?

By Sanjay Borkar

AS the global population continues to soar, the challenge of ensuring food security has become increasingly complex. Climate change, depleting natural resources, and growing demand for food pose significant threats to the stability of food systems worldwide. In this context, digital and precision technologies emerge as potential game-changers, offering innovative solutions to address the global food problem. By leveraging the three Ps – Profitability, Productivity, and Predictability – these technologies have the potential to revolutionise the farming business and propel us towards a sustainable and food-secure future.

Profitability is a crucial aspect of the farming business, as farmers need viable economic incentives to invest their time and resources. Digital and precision technologies provide new avenues to boost profitability in agriculture. One such innovation is data-driven decision-making. By collecting and analysing vast amounts of data, including weather patterns, market

trends, and consumer preferences, farmers can make informed choices about their crop choices and production strategies. This enables them to align their offerings with the demands of the market, ultimately leading to better prices for their produce and increased revenue.

Additionally, digitalisation has opened doors for farmers to access global markets directly. E-commerce platforms and mobile applications allow farmers to showcase their products to a wider audience, eliminating the need for intermediaries. By connecting directly with consumers, farmers can receive fair prices for their produce, enabling them to reap higher profits.

Moving on to productivity, digital and precision technologies offer a range of tools to optimise farming practices and maximise yields. Precision agriculture, for instance, involves the use of GPS technology and sensors to monitor and manage crops with unparalleled precision. Soil sensors provide real-time data on soil health, allowing farmers to tailor their fertiliser and irrigation

practices, leading to more efficient resource use and reduced environmental impact.

Similarly, drones equipped with advanced imaging technologies can perform crop monitoring and early pest detection. By identifying potential threats at an early stage, farmers can take timely action, preventing extensive crop losses and enhancing overall productivity. Furthermore, autonomous machinery, driven by AI algorithms, can perform tasks with unmatched accuracy and efficiency, reducing labour costs and increasing productivity.

Predictability is a critical factor in ensuring food security, and digital and precision technologies play a crucial role in this regard. By harnessing the power of big data and artificial intelligence, farmers can generate accurate forecasts for crop performance, market trends, and weather patterns. This empowers them to anticipate potential challenges

and plan pre-emptive measures. For instance, farmers can adjust their planting schedules based on weather predictions, ensuring they optimise their crop yields. Predictive analytics can also assist in supply chain management, facilitating timely delivery of produce and reducing food wastage.

Furthermore, digital technologies enable improved traceability throughout the food supply chain, ensuring transparency and quality control. This is particularly crucial in cases of food-borne illnesses or contamination, as it allows for swift identification and isolation of affected products, safeguarding public health.

While digital and precision technologies hold immense promise in addressing the global food problem, challenges remain. Access to these technologies can be limited in certain regions, particularly in developing countries, where small-scale farmers dominate. Moreover, the initial costs of adopting these technologies can be prohibitive for some farmers, making it essential for governments and stakeholders to provide support and incentives to promote widespread adoption.

Digital and precision technologies have the potential to significantly contribute to solving the global food problem. From precision agriculture to AI-powered

analytics, the tools available today can transform the farming business and drive us towards a sustainable and food-secure future. However, realising this potential requires collective efforts from governments, businesses, and society at large to ensure these technologies are accessible and affordable to farmers worldwide. By embracing innovation and fostering collaboration, we can pave the way for a resilient and prosperous global food system that can sustainably feed the growing population.

Mr. Sanjay Borkar is the Chief Executive Officer & Co-Founder, FarmERP

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The dried fruit product is labelled 'Fair Fruit'. Photo Credit: Elias Ngalame

Dried fruits processing gives evicted Cameroon farmers hope

By Elias Ngalame

A GROUP of fruit farmers in Njombe in Cameroon's Littoral region suffered a setback after the government took their land and leased it to the local subsidiary of the French company Compagnie Fruitiere to grow bananas 10 years ago.

Their 70 hectares were part of the total 4,500 hectares leased to the plantation firm.

But the 34 members of the Njombe Fruit Farmers Association are finding their feet again with the assistance of the Network for the Fight against Hunger (RELUFA), a local NGO.

RELUFA has since 2018 been giving the farmers loans to enable them to acquire new land and buy farm inputs like fertilisers and has organised them in a cooperative called the Common Initiative Group (CIG) Esperance.

The farmers today grow a variety of fruits, bananas, pineapples and papaya and sell the produce to a dried fruit processor that RELUFA set up in 2018.

The farmers say apart from the loan and fertiliser support the new RELUFA fruit processing scheme has provided a steady year-round market for their business.

"We supply our products at set prices to the dried fruit project. A kilogramme of fresh papaya is sold at less than 500 FCFA on the local market, but the project buys it at 750 FCFA. And a kilogramme of fresh banana and pineapple sell for 300FCFA on the local market but the project buys them for 550 FCFA," Philip Elong, one of the fruit farmers, says.

The RELUFA initiative, dubbed 'Fair Fruit project' installed ovens to enable farmers dry their fruit and reduce post-harvest losses.

Today they are able to supply oven-dried pineapples, mangoes, bananas and papaya to various urban markets, including Yaounde and Douala.

Their dried fruit product is labelled 'Fair Fruit'.

"The fruits are cultivated and harvested in a just and environmentally friendly manner and traded under fair terms, reason why we labelled them 'Fair Fruits'," says Akim Leonard, the leader of the group.

The project today employs over 1,000 youth and women working in the plantations and dried fruit packaging.

"The workers in this plant earn 3000frs a day for five hours of work, which is a modest income for a youth who has the rest of the day for other activities," says the group's commercial head, Alice Kom.

The dried fruit is packaged and then distributed to supermarkets, hotels and airports.

“We also sell the product to potential buyers through trade fairs and agro-pastoral shows,” she explains. The profits is then ploughed back into the project and helps to fund a new phase.

In a country where an increasing number of smallholders have been forced off their land, the replication of the project in other parts of the country could help many more farmers, experts say.

“The Fair Fruit initiative could also help other marginalised farmers all over Cameroon,” Jaff Bamenjo, the assistant coordinator for RELUFA, said.

“We are concerned about the new wave of investments in land and the negative impact on local food production and rural communities,” he added.

According to a 2019 Food and Agricultural Organization report titled “Investment Policy Support, Foreign Agricultural Investment Profile Cameroon”, the general foreign direct investment inflow into Cameroon was less than USD 113 million in the 2013, but reached USD 337 million in 2018.

There are no official figures on foreign agricultural investment in Cameroon.

But the Ministry of Agriculture and Rural Development says it is concerned about the number of large agricultural plantations in the country that have pushed smallholders off their land.

“Large plantations have a negative effect not only on local food production and supply, but they also affect the economy of the locality where they exist. Added to the fact that most local farmers are usually evicted from farm lands, the farmers in most cases are restricted from farming close to the boundaries of plantations for fear that they might steal from the plantation farms,” Collette Ekobo, the agriculture inspector of the Ministry of Agriculture and Rural Development, says.

The land tenure system in Cameroon makes it difficult for private individuals to acquire title deeds. The 1974 Ordinance No. 74/1 on land tenure stipulates that private land must be titled and registered. All remaining land is classified as national land, which includes most unoccupied land, unregistered land, communal land held under customary law, informal settlements and grazing land.

However, obtaining a land right certificate is costly and involves a long administrative procedure.

Samuel Nguiffo, CEO of the Centre for Environment and Development (CED Cameroon), says as a result most villagers had no formal land titles to their customary agricultural land.

“Land agreements given to large companies do not respect customary land rights or informal

land holdings. The laws and the institutions in place do not protect their interests,” he said.

An inter-ministerial committee from the Ministry of State Property and Land Tenure is currently revising the land tenure law, and a bill will be introduced in parliament. But civil society groups complain that the process has not been participatory.

Nguiffo added that there was an assumption that foreign investors created more jobs than local smallholders, but said it was not a proven fact.

“If communities are given support through access to land, capital and technical assistance you will see them create jobs and wealth and contribute to national development more sustainably than large companies,” he said.



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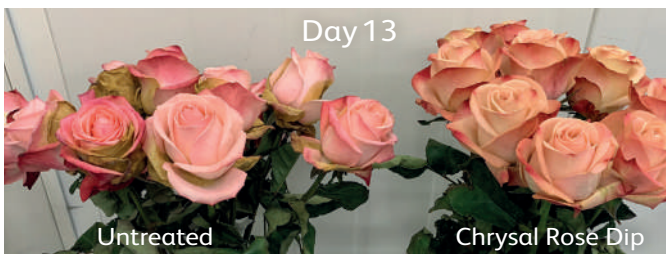


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MSEs have a significant contribution to shaping food access and consumption. Photo Credit: B. Koigi

Small businesses hold the key to affordable, healthy foods – report

By Murimi Gitari

AN ESTIMATED 60 percent of rural and urban Kenyan households access their daily meals from micro and small enterprises (MSEs) at local markets.

This is according to a report by the Scaling Micro-Businesses for Healthy and Sustainable Food Systems in Kenya (SME4NutritionKE) project by Wasafiri Consulting Kenya, Village Enterprise, and Shack Dwellers International, between April 2021 and March 2023.

Despite MSEs' significant contribution to shaping food access and consumption, these enterprises have received little policy attention and support, with their role in the food systems not well understood.

As Kenya continues to face the triple burden of malnutrition – overnutrition (obesity), micronutrient deficiency, and undernutrition – the role of MSEs can no longer be overlooked.

The project, which was funded by the International Development Research Centre, sought to identify how best to support MSEs in contributing to food system transformation by providing affordable, healthy and sustainable food. It was implemented in Bungoma, Nairobi and West Pokot counties.

In most Kenyan households, the report notes, food consumption diversity is low, with people consuming just three types of foods

out of a possible 20. This is due to high food costs, low household incomes, highly seasonal availability, and weak preferences for some foods. A majority of the foods are directly related to the role of agri-food MSEs. Combined with a shift in Kenyan consumption patterns – away from traditional foods towards convenient, highly processed foods – these factors are exacerbating malnutrition. The report argues that policy support for the MSEs is key to encouraging diet diversity and healthier food choices.

Currently, MSEs face an unfavourable business environment and various challenges in sustaining their agri-enterprises and providing affordable food. Issues include a lack of funding, unreliable, high costs, as well as high rates of consumer credit defaults.



An open-air food market. Photo Credit: B. Koigi

“The government-led food and nutrition strategies in place have not been addressing the role of small businesses in the food system,” notes Dr. Hezekiah Agwara, Project Leader and Co-Principal Investigator at Wasafiri.

“We wanted to find out how these businesses influence food systems and identify the challenges they face, as well as the policies and interventions in place that can be adapted to help resolve those challenges.”

He explained that addressing MSE challenges requires proactive interventions such as reduction or tax waivers, or food market-targeted subsidies.

“Traditional foods like millet, sorghum, sweet potatoes and cassava are highly nutritious but we have neglected them. Working with various players, both in the national and county government, we are looking at how to enhance food system productivity to boost our country’s food security using these foods,” said Susan Mang’eni, the Principal Secretary, of the State Department for MSMEs Development, Ministry of Cooperatives, at the SME4Nutrition Forum.

“How well can we innovate traditional farming practices and incorporate small businesses in the food systems?” she asked while emphasising the need for small businesses to embrace traditional foods to boost diet diversification.

As a result of successful project stakeholder engagement meetings, program and policy interventions have been established for each county. For example, in Bungoma, the county and the Kenya National Chamber of Commerce and Industry - Bungoma Chapter – will continue convening with other actors to facilitate MSE advocacy policy, market linkages, access to training and advisory services, and information and practice sharing. In West Pokot, Equity Afia is working with local health and nutrition stakeholders to address low household dietary diversity through interactive educational programmes in local radio stations in local languages. In Nairobi, the county is setting up a Food Liaison Advisory Group.



A cocoa farm in Côte d'Ivoire. Use of improved varieties has increased yields in neighbouring Cameroon. Photo Credit: C. Adjehi (ICRAF)

Cameroon's research, extension programme boosts cocoa yields

By Elias Ngalame

CAMEROON'S cocoa production rose by 12 percent in the 2021-2022 season and 14 percent in 2022-2023 to about 300,000 tonnes, according to the National Cocoa and Coffee Board (NCCB).

Sector players attribute the performance, the best over the past six production seasons, partly to the impact of AGROPOLE, a government programme that supports research facilities and extension services to smallholder cocoa farmers.

Better research aligned with local farmers' needs has, for instance, yielded improved seeds, enabling Cameroonian growers to access quality cocoa shoots and have quick and abundant harvests.

"Research is like the engine of innovation and development, especially in agriculture. We are happy improvement in research through the AGROPOLE programme has boosted cocoa production," said Etone Martin, coordinator of Community Action for Development (CAD), an NGO that supports farmers in the Southwest Region.

"We now see an increase in the number of female cocoa farmers." Use of improved varieties developed by the research facilities and pesticide supply in the past five years has seen cocoa yields increase.

Evaluating the performance of the AGROPOLE programme March 12, 2023, the Secretary General of the Ministry

of Agriculture in March said the support to cash crop production had partly contributed to resilience of the economy, which is projected to grow at 4.0 percent in 2023 from 3.5 percent in 2022.

The UN Resident coordinator in Cameroon, Matthias Z Naab, lauded the progress made on food and cash crop production in the past few years. He reiterated their readiness to support the government in the implementation of the National Development Strategy 2030 and emphasised the role of agriculture in achieving the development drive.

During the season under review, local grinders processed 62,341 tonnes of cocoa, a slight increase of 3.3 percent compared with the volume of cocoa

processed during the 2019-2020 season. For the National Cocoa and Coffee Board, this increase was facilitated by the commissioning of a fifth processing plant (Atlantic Cocoa), which launched operations alongside traditional processing companies like Sic Cacao, Neo Industry, Chococam, and Ferrero.

"Thanks to effective internal organisation and a preventive export levy policy, the farm gate prices paid to Cameroonians have remained much higher than the prices applicable in other producing countries," the Minister of Commerce, Luc Magloire Mbarga Atangana, said.

Centre region benefited the most from those fair prices having accounted for 43.6 percent of the cocoa beans produced during the season under review.

The region confirmed its status of leader in cocoa production, ahead of the South West, which accounted for 31.6 percent of the cocoa produced during the season despite the socio-political crisis affecting its economy since late 2016. The Littoral region was third with 13.5 percent of the national production, followed by the South (5.2 percent), the East (3.1 percent), the West (2.9 percent), the North-West (0.1 percent) and Adamaoua (0.1 percent).



Abiam Delphine, a cocoa farmer in the East Region of Cameroon. Photo Credit: WWF

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Heifer Kenya Country Director Esta Kamau

Unlocking capital for youth-led agritech enterprises

Q&A: Heifer Kenya Country Director Esta Kamau discusses the organisation's work in financing and mentoring youth-led agritech enterprises to scale up their innovations for the benefit of smallholders

Briefly introduce yourself and your role at Heifer Kenya

I am Esta Kamau, serving as the Country Director at Heifer Kenya.

Tell us briefly about Heifer International and its presence in Kenya.

Heifer International invests in farmers and business owners because we know that having a secure source of income

can be transformational for families and their communities. With support from our teams and partners, we support project participants in building profitable businesses to attain a sustainable living income.

Heifer Kenya has worked with smallholder farmers since 1981 and has partnered with communities to end hunger and poverty. This partnership has enabled us to acquire deep insights into the immediate problems impeding enhanced productivity by smallholder farmers across various regions in Kenya; At present, Heifer Kenya's programming footprints cut across 26 counties.

In our early years, our work focused on increasing local farmers' standard of living through the livestock, dairy and poultry value chains. A large part of our work also involved strengthening access to local markets through business planning, marketing, and capacity building.

As we began the reimagination of agricultural transformation in Kenya, leaning on our multi-decade experiences and local knowledge, we mainstreamed a sustainable locally-led approach to our programming anchored on values-based holistic community development which enables all-inclusive empowerment of smallholder farmers, strengthening them to make transformative decisions as households and communities.

2023 AYUTE AFRICA CHALLENGE KENYA GALILEO AWARDS



The winners of the AYuTe Africa Challenge Kenya 2023 posing for a photo with Board Chairperson, Florence Kimata (third from left) and Country Director, Heifer Kenya, Esta Kamau (third from right). Photo Credit: Heifer Kenya.

We are integrating innovation to scale up agricultural transformation, what we are calling cows to capital. We are doing this through access to innovative finance, technology, and leveraging of partnerships.

What informs your special focus on youth-led enterprises or innovations?

Young people are leading our work in the agritech space because we see their energy fuse with the boundless potential of technology to drive innovative solutions that sustainably transform agriculture.

More importantly, Kenya is a country with a thriving young population, out of the total population of 47.6 million, about 35.7 million Kenyans (75.1%) are below 35 years old as per the 2019 census.

Kenyan youth have shown that they possess the grit, innovation, and skills to completely transform sectors and bring economic transformation to levels never seen before. We have channelled this energy and innovation to tackle challenges in the agriculture space, through the AYuTe Africa Challenge which combines the power and energy of the youth with the

limitless possibilities of technology to support smallholder farmers in growing their businesses and incomes. The programme is used by Heifer to engage and empower the youth as critical catalysts for unlocking commercial capital and opportunities.

It identifies agritech solutions that are highly scalable, sustainable, and impactful on smallholder farmers' incomes and output, and encourages the commercial growth of start-ups, entrepreneurs, and products that provide such solutions. We work with winners of the competition by co-creating more impactful solutions and providing innovative capital (funding, mentorship, networks) which enables them to scale their work. The ripple effects include more smallholder farmers being served, enhanced food systems, an increased number of businesses involved in the ecosystem and a bigger ecosystem of providers.

What are some of the programme's milestones?

Our experience of partnering with smallholder farmers and communities has provided us with a unique perspective – one that harnesses the innovation and energy of young innovators, alongside the limitless

potential of technology, to craft scalable and enduring agritech solutions tailored to the unique needs of smallholder farmers.

The impact has been transformative - driving heightened productivity, amplifying incomes for farmers, job creation, unlocking commercial capital fostering agripreneurs, and elevating the capabilities of our food systems.

We launched the AYuTe Africa Challenge on a continental scale and established local chapters across Heifer's host countries in Africa. At the end of August 2023, we concluded the second edition of the AYuTe Africa Challenge Kenya, where we awarded cash grants to seven young agritech innovators. We launched AYuTe in 2022 and so far, we have received over 400 applications, trained, and mentored over 230 innovations and awarded over \$40,000 in cash grants.

Are there some agritech innovations supported under the AYuTe Africa Challenge that stand out for you as having had a significant impact on smallholder farmers?

Our collaboration with Hello Tractor

is a prime example, we conceptualised the pioneering Pay-As-You-Go (P.A.Y.G) tractor financing service. This service facilitates affordable tractor rental services to smallholder farmers delivered via a tech platform that links equipment owners to booking agents to farmers' requests.

This innovative solution, co-designed with Heifer's \$4.5 million seed funding, cascaded into heightened productivity and incomes for over 21,000 smallholder farmers in three countries (Kenya, Uganda and Nigeria). A vibrant ecosystem emerged, featuring 100 tractor owners, 200 booking agents, and 150 tractor operators, collectively nurturing progress.

In Kenya, some impressive direct impact statistics include assistance to 34,396 smallholder farmers, emergence of 39 tractor owners, engagement of 78 booking agents, employment of 93 tractor operators, and the servicing of 11,444 hectares of agricultural land.

Based on your experience assisting young entrepreneurs, what are some of the challenges that they encounter in running businesses?

The youth represent a significant segment of the population and bring forth a multitude of innovative ideas and solutions that are truly inspiring. However, these young innovators face challenges ranging from limited access to finance, inadequate training, and insufficient infrastructure.

Traditional financing models often fail to meet their needs, stifling innovation, and growth. Moreover, the perception of agriculture as a low-income profession discourages many young minds from pursuing it as a viable career option. To empower these agripreneurs and create a thriving agribusiness ecosystem, a paradigm shift is imperative.

How can collaboration among public and private sectors, and development actors mitigate these challenges?

Partnerships and collaboration bring together diverse expertise, resources, and perspectives to help tackle complex challenges holistically. Our signature program in Kenya and across Africa is hinged on building strategic partnerships and co-creating inclusive and profitable business models that improve incomes for farmers and other actors across the value chain.

Collaboration among partners such as Governments, the private sector, smallholder farmers, innovators, women, youth, and development actors is a powerful solution for investing in youth enterprises as they can pool resources, expertise, and networks to create a more comprehensive and supportive ecosystem for young entrepreneurs. Partnerships with the youth are a key focus for Heifer, and this has led to several initiatives like our AYuTe Africa Challenge. We have seen that partnerships lead to increased women and youth participation in agriculture due to the reduced labour-intensive practices that innovative technologies provide, and the growth of agritech as a subset of a booming tech ecosystem that has attracted significant interest, investment, and job creation.

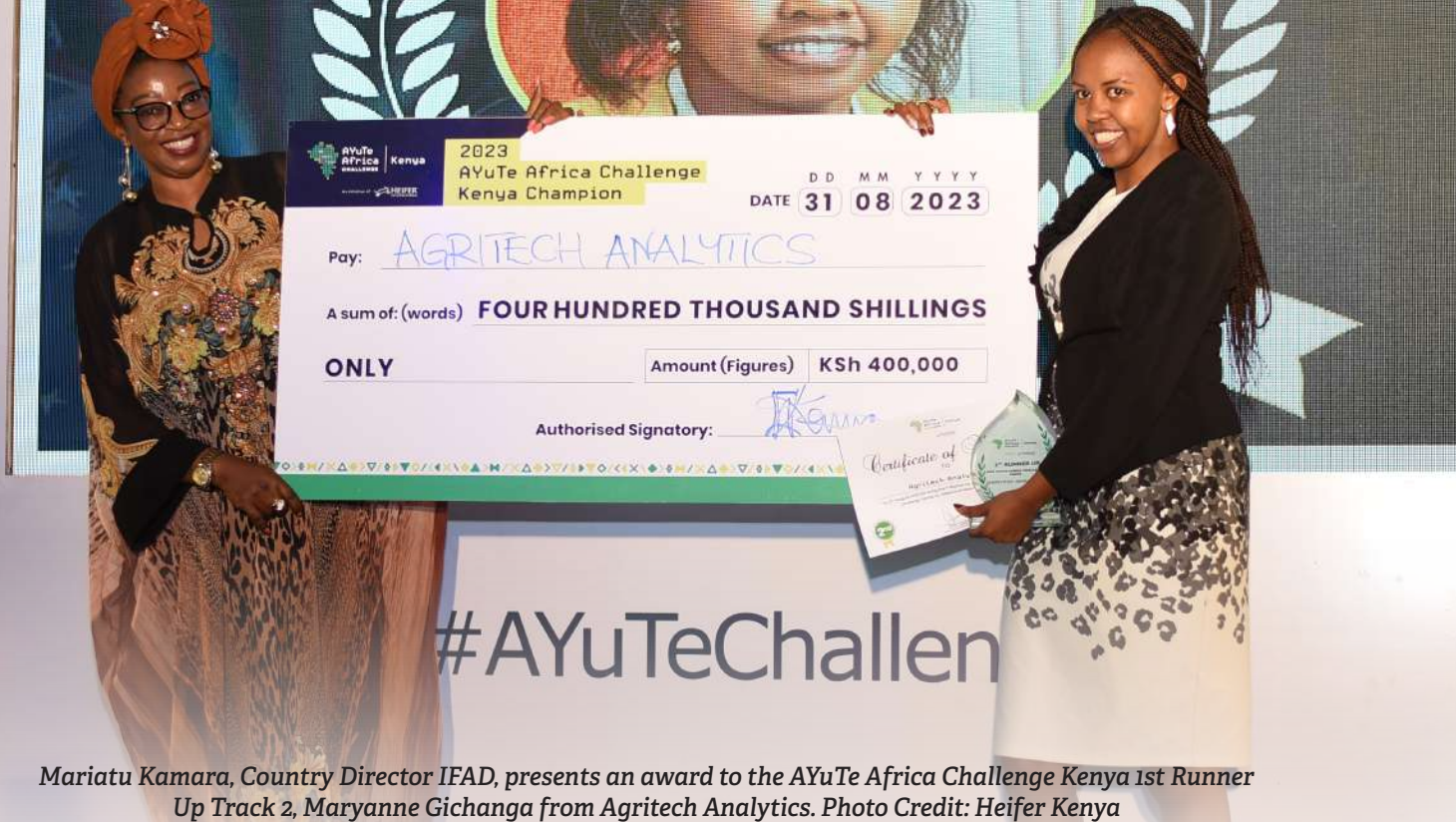
How important is mentorship and training for youth-led enterprises?

We believe innovative capital is both tangible and intangible; it is the sum of access to finance, access to markets, knowledge-sharing, global networking, access to technology, and mentorship.

Through AYuTe we not only award winners but provide training and mentorship for a minimum of three months, so it is not just about grants but also providing a win-win ecosystem for most of these young enterprises.



Christabel Awuor, new tractor owner testing her tractor from the PAYG initiative a collaboration between Hello Tractor and Heifer International. Photo Credit: Heifer Kenya



Mariatu Kamara, Country Director IFAD, presents an award to the AYuTe Africa Challenge Kenya 1st Runner Up Track 2, Maryanne Gichanga from Agritech Analytics. Photo Credit: Heifer Kenya

By equipping these young people with the right skills, we enable them to drive innovation in agribusiness while integrating technology and finance as enablers, which then supports smallholder farmers to identify and exploit agribusiness opportunities.

Mentoring these innovators not only fosters their personal and professional growth but

also enhances the success and sustainability of their ventures, ultimately leading to more lucrative and impactful investments.

When you are not working, what is that one thing that you enjoy doing?

When I'm not working, one of my most enjoyable and fulfilling activities is supporting girls' football teams from less privileged

backgrounds through mentorship and providing academic scholarships.

I actively mentor a specific girls' football team that we built from the ground up, and through this initiative, we've successfully enabled some talented players to pursue further studies abroad. I strongly believe that there's an underrepresented voice in the sports sector, particularly in football – the voice of women. An example is the disparity in attention between the men's World Cup and the women's World Cup. My passion lies in empowering as many individuals as possible to become advocates for women's voices in sports and to champion equality and recognition for women in the field.

If you were to give young people just one piece of advice, what would that be?

I live by this mantra, "Believe Begin Become."
My message to the youth in all fields, not only agriculture, is to go for the available opportunities. Avoid self-doubt and the search for reasons why you can't chase your dreams, instead exhibit resilience and take action. You need to take that initial step to make it happen. You have to Begin to Become.



Esta Kamau, Country Director Heifer Kenya, addressing delegates at Kenya Innovation Week 2022. Photo Credit: Heifer Kenya



School of Agricultural Economics and Business Studies (COEBS) has been working on a collaborative project on Policy Prioritization through Value Chain (PPVC): Cassava and Sunflower with Bureau for Food and Agricultural Policy (BFAP). Photo Credit: Sokoine University of Agriculture

PPVC: A new tool for scanning value chains

By Dr Timothy Njagi

THE traditional approach to value chain development was centred on the farmer. The farmer-first approach initially prioritised raising productivity for resource-constrained farmers, then helping them overcome marketing constraints. Whereas the logic of this approach is sound, the dynamic environment within which food systems have evolved has made the approach less effective, and therefore value chains that are not fulfilling their potential. This approach resulted in a long list of unaffordable policy and investment recommendations, most of which are focused on production, and had limited focus on private sector needs, market dynamics and economy wide impacts.

Following the successful food systems dialogues held by the United Nations Food and Agriculture Organization (FAO), there is renewed focus to shift the traditional approach of value chain development to agricultural food systems transformation. The Bureau of Food and Agriculture Policy (BFAP) and the International Food Policy Research Institute (IFPRI) have developed a new approach for value chain analysis.

The Policy Prioritisation for Value Chains (PPVC) is a market-centred approach that is more inclusive and places more emphasis on the role of the private sector in value chain development. The PPVC approach first identifies market opportunities that

exist, then looks at what is required to take advantage of these market opportunities and finally looks at the capabilities of smallholder farmers to participate in these opportunities. This way, the PPVC approach focuses on identifying value chains that can make significant contributions to job creation and economic growth, then prioritises investments and policies that upgrade these selected value chains and what is required to unlock the potential for the value chains during implementation of selected actions in value chain development.

The focus on food systems transformation is different from the farmer-first approach in that the approach now looks at the



Dr. A. Akyoo, a researcher from COEBS having a group discussion with Namvua traders and Government officials in Singida region, Tanzania. Photo Credit: Sokoine University of Agriculture

entire system that includes farmers undertaking primary production, aggregators, transport and logistics suppliers, traders, processors, food services providers and inputs suppliers. Second, the investment and policy levers used to grow value chains are geared to ensuring a faster agri-food systems growth and overall agricultural transformation that seeks to grow farming household incomes, raise labour productivity, create jobs and alleviate poverty. This is achieved in a process that provides governments with evidence-based analysis and prioritises investments, policies and public investments that drive market-led, inclusive, agricultural transformation, with the private sector playing a central role in the drive toward transformation.

The PPVC process has two phases. The first phase analyses a list of prioritised value chains and ranks them according to their potential against a set of indicators. Then a deep dive analysis is undertaken on selected value chains to identify the actions that will be implemented to transform them. A quantitative selection of value chains

is undertaken to rank them across several indicators. The indicators are grouped as market-led indicators, inclusive and transformation indicators. Market-led indicators are the potential for intensification of production, which is calculated as the inverse of the ratio between local projected yields from the partial equilibrium model and a projected reference yield i.e., yields attained by commercial farmers. The second indicator is consumption growth, which measures the projected average annual growth in domestic consumption given the set of macro-economic assumptions introduced in the partial-equilibrium framework such as population growth and per capita income growth. The final indicator is the export potential, which is calculated as the average annual growth in import value in the potential neighbouring export markets over the past five years.

The indicators on competitiveness include the input cost efficiency ratio, which measures the relative

input costs per unit of production in the country versus the world. A higher value implies that production costs per unit of production in the country are higher compared to the rest of the world, which makes the value chain uncompetitive. The other indicator is the Relative Trade Advantage (RTA), which combines a nation's export and import share of a commodity in the international market as well as the nation's export and import share of all commodities. Value chains with increasing RTA over the past five years are regarded as increasingly competitive in the global market and are given a higher rating.

The final assessment before the ranking of value chains is a qualitative scan. The qualitative scan identifies the level of policy support such as value chains listed on investment plans for the sector, or have a clear post investment plan policy implementation and support. The current and potential investment levels are evaluated to establish whether evidence of investments either by the public or private sector exists, or whether commitments have been firm.

The value chains are also evaluated for scalability. This scan checks the potential to link with complementary value chains, opportunities for imports replacement, and export opportunities. The final qualitative scan ascertains the agro-ecological and natural resource constraints, including water, land and other natural resources. The scan establishes whether there is a binding constraint, whether there are opportunities to overcome the constraints.

The PPVC process utilises various tools to undertake deep-dive analysis on selected value chains, i.e., qualitative value chain scans where structural and economic assessment of value chains is undertaken, value chain actor identified, product transformation and marketing flows traced and mapped. Gross margins for the current and

potential scenarios are analysed at each node. A multi-market partial equilibrium analysis is undertaken for the major agricultural products and a dynamic assessment of market equilibrium undertaken looking at future demand and supply scenarios, traded volumes and domestic and parity prices. This analysis is useful in determining the market competitiveness and potential for value chains that can bring about the desired transformation. An economywide computable general equilibrium analysis is then undertaken in which a dynamic assessment of sectoral linkages and resource constraints are established. This is useful in tracking GDP growth, employment, poverty and dietary change outcomes. The final tool analyses the GIS and spatial context integrated with in-country data to access multi-dimensional value chain

impact and natural resource potential such as soils, temperature and rainfall.

The PPVC approach has already been implemented in countries such as Tanzania, Kenya, Ethiopia and Malawi. In Tanzania, the approach was used to analyse the sunflower value chain, in Kenya, the beef, coffee and fish value chains, in Ethiopia, the soya bean and sunflower value chains and in Malawi, the maize and soya bean value chains. Each of these studies have provided tangible recommendations to transform the value chains and make them more inclusive.

Dr Timothy Njagi is a Principal Researcher at the Tegemeo Institute of Agricultural Policy and Development

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Smallholder farmers in Tanzania grapple with low productivity

By Zuwena Shame

IN TANZANIA, agriculture contributes significantly to the economy. Small-scale farmers, including livestock and fishery, dominate production, with more than 90 percent of cultivated land. The sector provides about 77.5 per cent of employment and livelihood to more than 70 percent of the population, 29 per cent of gross domestic product (GDP), 30 per cent of exports and 65 per cent of inputs to the industrial sector.

However, smallholders face many challenges, including low productivity.

“Small-scale farmers don’t benefit from their farming-related activities, There are so many challenges we are facing, including low productivity and production being a major concern. As we all know the low productivity problem is compounded by the poor quality of seeds used, poor agronomical practices, as well as limited access to water resources which is also an important component of the farming business,” said Audax Rukonge,

a farmer based in Kimanzichana ward in Mkuranga district, Coastal region in Tanzania.

Mr Rukonge added that small-scale farmers also grapple with the effects of

climate change as well as pests and diseases.

The Agriculture and Trade ministries have been striving to integrate farmers with agro-industries to ensure that farmers have a market and earn better prices for their produce, cut back on post-harvest losses, develop their entrepreneurial capacities, and create viable livelihood options in rural areas. It is along this course that contract farming has come to be viewed as a magic wand.

“These four challenges are major ones facing small-scale farmers. As part of the solutions, at the farm level we need to have reliable information accessible by all farmers throughout the year, it’s very critical the usage of information either through the use of technology to access information through social media such as YouTube by experts and released in regular basis can help small farmers,” said Mr Rukonge.

The Tanzania Fertiliser Regulatory Authority plans to provide fertiliser subsidies to farmers to increase production.

Audax Rukonge, a farmer based in Kimanzichana ward in Mkuranga district, Coastal region in Tanzania.
Photo Credit: Zuwena Shame



Tanzanian Agriculture Minister Hussein Mohammed Bashe (MP), when presenting the agriculture budget for 2023/2024, said the government, through the Tanzania Fertiliser Regulatory Authority, would continue providing subsidies until 2023/26 to increase fertiliser usage from 19kg per acre up to the latest 50kg per acre. Reduce production expenses and increase the availability of fertiliser.

However, Mr Rukonge said fertiliser subsidies were a short-term solution.

The usage of fertilisers in Tanzania remains below recommended rates, and low-input and rain-fed subsistence farming dominates agriculture, contributing to poor crop yields, according to the AGRA Report 2016.

The government of Tanzania has made various efforts to address farmers' access to finance challenges by collaborating with various local and international partners such as the United States Agency for International Development through its \$6.5 million programme Farmer-to-Farmer Tanzania Access to Finance (2018-2023), implemented by the International Executive Service Corps.

Mr Rukonge said small-scale farmers have other challenges related to access to finance, which is one of the working resources apart from land and labour.

"I think it's also the role of actors, including the government and banks to provide reliable access to small-scale

farmers when it comes to financing with low-interest rates. We are happy that the interest rate is a single digit for agricultural-related credit facilities. It's something to applaud the government," he said.

Mr Rukonge also urged the Tanzanian government to consider the financial inclusion of the marginalised, especially the youth and women, to benefit from funding from microfinance institutions, banks and the government.



Audax Rukonge on his farm. Photo Credit: Zuwena Shame

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At the heart of Africa's agriculture are smallholder farmers, some 33 million hardworking individuals who typically farm on less than a hectare of land. Photo Credit: Wiki Common

Long live the smallholder

By Prof Arun Tiwari

SMALLHOLDER is a popular term in agriculture parlance and everyone – from leaders and scientists to planners – seems to be working for the farmers cultivating small tracts of land. Yet, it is a tragedy that the people who were originally self-sustaining have been reduced to fighting for their survival as capitalistic forces have turned their gaze on food and turned it into a commodity.

The history of mankind is not all that remote. Our hunter-gatherer ancestors settled down once they acquired the skills to cultivate their food and domesticate animals. Once the surpluses arrived, they began to trade and this manifested as human civilisation, which is not more than 10,000 years old on this planet where water formed four billion years ago, vegetation grew 470 million years ago, and humans appeared merely six million years ago.

As recently as 12,000 years ago, there were only four million people on planet Earth, and their numbers had not reached one billion until the early 1800s. It was only a century ago that there were two billion people, but now there are eight billion people and by the 2050s there will be 10 billion – 1.7 billion in India, 1.4 billion in China, and 2.5 billion in Africa, with half a billion in Nigeria alone.

So, where will the food come from? It will come from where land and water exist. And it does not exist where people live in high density – the cities. So, it is inevitable that those living on lands in villages – away from the hustle and bustle of the cities – must grow food for the city dwellers. As they don't have the resources to do that, they must be provided with funding, technology, and above all, agricultural and business practices.

This is fait accompli; there is a food deficit that has already happened and there is no option but to cultivate arable land, wherever one finds it. This is the future of mankind, for without food there is no other future possible.

Now, where is this arable land? Mostly in Africa. Who owns this land? The indigenous people, the original owners, the stewards of this planet, whom the rich and powerful call "smallholders," while feasting on global resources.

So, two roads diverge into the future from here. One, buy them off their lands, convert them into large farms, bring in heavy machinery, and make Africa the food factory of the world. Use money, military, and political power and do it. Then recover whatever has been expended to achieve this by selling food to the needy. That is how that world has been run so far.

But there is another way. Create cooperatives of the original owners and make them business partners in growing food for the global markets – wheat for the Europeans, sesame for China and Japan, pulses for India, and so on. Ask the users to invest in their future by empowering the original owners with amenities, education, connectivity, and whatever they need to grow food.

Who will do this? There is no governing body in the world. The United States adopted a hands-off approach when the pandemic rolled over the planet. The Russia-Ukraine war has been going on for over a year. Even the food blockade in the Black Sea could not be amicably resolved. So, who is in command?

India aspires to have a \$5 trillion economy. It is currently a \$3 trillion economy. But Apple Inc. itself is a \$3-trillion market value company. The figure for Microsoft is \$2.5 trillion, for Alphabet (Google) is over \$1.6 trillion, and for Amazon is \$1.25 trillion. These and several other technology companies are running the world. The richest one percent own almost half of the world's wealth, while the poorest half of the world owns less than one percent.

So, should not these technology corporations invest in food? They are knowledge powerhouses. Instead of parking their wealth in tax havens, why not invest with the original owners of the arable land by developing just and fair technology systems that work on algorithms, and not on the whims and fancies of political leaders and casino-mentality traders? Why does not blockchain technology secure the rights of indigenous people on their lands and make them business partners rather than belittling them as smallholders today and squatters tomorrow?

Religion has been relegated to people managing their hardships in good faith and living as consumers by working for corporations and using their incomes to consume more. But this arrangement will not last long. However much one wishes, food can never become a commodity. A hungry man can be the most dangerous animal on earth. No one would, therefore, be safe amongst hungry people.

Human history has reached a point of inflection. What is considered right and good will soon become wrong and harmful. The pursuit of wealth thus far worked well, information technology as the new way of life has been amusing, even wonderful, but it must now pause for its good lest the reality of hunger bites and breaks its virtual wonderland.

Reach the original owners of the land with technology. Secure their ownership of land and water and make them partners in a global food system. If this is not done, a dark future already looms large on the horizon. Staying in bed can never delay a morning. The sun rises and stars disappear at their predetermined time. Don't demean small farmers by defining them as those managing areas varying from less than one hectare to 10 hectares. Hold their hands and make them your partners in the future of mankind.

Prof Arun Kumar Tiwari is an Indian missile scientist and author.



Smallholder farmers produce relatively small food volumes on small plots of land compared to large or commercial-scale farmers. Photo Credit: Wiki Common



Farmers in Uganda can use their smartphones to download the app which has a provision for smallscale farmers and other users to upload their agricultural products, including the prices. Photo Credit: AUDA -NEPAD

Smartphone apps link farmers to agricultural markets

By Lominda Afedraru

UGANDA'S agricultural sector is massive, producing a range of commodities for local markets and the entire Great Lakes region, including Kenya.

As such investors consider Uganda's agricultural potential to be among the best in Africa, with low temperature variability and two rainy seasons leading to multiple crop harvests per year.

Background

According to the 2019 publication by Export.Gov based in the US about Uganda's agricultural sector potential in food production, quoting figures from the Food and Agriculture Organisation, the country's fertile land can feed 200 million people.

The Uganda Bureau of Statistics estimates that agriculture employs about 72 per cent of Uganda's working population.

Maize production

National Crops Resources Research Institute Director Geoffrey Asea says Uganda has solid research systems, which work with partners to deliver technologies to farmers at the grassroots coupled with vibrant private sector-led initiatives.

The seed systems of all crops are well catered for by more than 40 certified seed companies most of them grow maize and process seed for farmer use including processing maize flour for export. Some of the maize grains and processed flour are exported as relief food by the World Food Programme to various countries in the region.

Several farmers are based in the Amuru district in northern Uganda where the land is fertile.

According to Dr Asea, most farmers engaged in maize growing have embraced the best agronomical practices, right from land tilling, and seed prioritisation to weeding.

However, despite the success, there are still challenges of pests and diseases, especially maize stalk borer destroying the cobs.

Other farmers have failed to embrace standard post-harvest handling, especially when there is an abrupt change in the climate with rains dropping during the dry season. Others are a lack of high-quality packaging capabilities, poor storage facilities and high freight costs for exports that go beyond Kenya.



There are still challenges of pests and diseases, especially maize stalk borer destroying the cobs. Photo Credit: Lominda Afedraru

There is also very limited use of fertiliser use by farmers in semi-arid areas.

Market access technologies

Experts in information technology (IT) have developed apps to help farmers share knowledge about their produce in a bid to access the market for their products

One such platform is by experts from the Eastern and Southern Africa Small-Scale Farmers (ESAF) Forum Uganda, which has developed the KilimoMart App, which provides farmers and those engaged in the agricultural value chain information about best farming practices and markets in the country and the entire East African region.

Oming David, the programmes assistant at ESAF and the lead KilimoMart designer, said the main aim for developing the app was to tackle challenges around agronomy practices and market access by farmers in East Africa.

“What prompted my team to develop this app is that many small-scale farmers, especially women are not benefiting from the EAC integration. During the harvest season, many brokers invade farming communities and buy off their produce cheaply. Many small-scale farmers, he adds, also lack information to help them in their production process. There was, therefore, the need for access to the market that led to the development of the KilimoMart App and website,” he said.

Small-scale farmers and other users are able to visit the Googleplay store and install the app which they can instal on their smartphones. It has a provision for small-scale farmers and other users to upload their agricultural products, including the prices.

There are a number of such apps and farmers can choose which one to utilise as long as they have the knowledge about it. This enables them tap into regional markets.

Other technologies include radio talk shows, use of instant mobile phone messages and WhatsApp groups that link farmers to available markets.



Inequalities in food security and nutrition exist in all regions of the world, with the key drivers of disparities varying. Photo Credit: Busani Bafana

Reducing food security and nutrition inequalities in Africa

By Busani Bafana

THE world continues to grapple with an alarming increase in hunger, the High-Level Panel of Experts on Food Security and Nutrition (HLPE-FSN) of the Committee on World Food Security (CFS) found in a groundbreaking report on “Reducing inequalities for food security and nutrition”.

The panel, an inclusive and evidence-based international and intergovernmental platform for food security and nutrition, observed that the consequences of food inequalities are far-reaching, diminishing people's life chances, hampering productivity, perpetuating poverty, and impeding economic growth.

The report highlights huge disparities in access to food security and nutrition around the world, calling for a change in food systems.

Olanike Adeyemo, the distinguished Nigerian professor of veterinary public health and preventive medicine and a member of the High-Level Panel of Experts on Food Security and Nutrition, notes that although inequalities in food security and nutrition exist in all regions of the world, the key drivers of disparities vary.

For example, some over-arching drivers are diverse from climate change, violence and armed conflicts to emerging and re-emerging infectious diseases such as Covid-19. She further says that, in a developing

country, market access drivers, infrastructural and technology deficiencies would be of a more immediate urgency because these exacerbate the existing global drivers of insecurity of food and nutrition.

Within the Global North, the generalisation of data masks the food and nutrition insecurity of the most vulnerable or minority groups because of unequal power dynamics. Within each society, inequality will also affect individuals differently based on cross-cutting issues like gender, education, economic and social status, according to Adeyemo.

Regionally and internationally, some policies, legal and practical frameworks aimed at addressing the identified global drivers would have to be re-visited and or

enacted. Each country will have to contextualise the report, identify the most pressing issues and prioritise interventions. So, the approach will vary from country to country, She adds.

"The African continent has abundant resources. However, food insecurity is a vicious circle. Food production is seen as a job for the poorest in society and as such is mainly at subsistence and small-scale production level.

The drawing example from Nigeria, the nonexistent governmental backing, middlemen undercutting farmers, poor access to markets, lack of infrastructural and technology support, among others, lead to food loss along the value chain, while stringent international trade means most farmers do not meet the requirements to export," Adeyemo says.

The recognition that food security and nutrition intercepts with other systems, for example, health system, means a change to food systems cannot be in a silo. Any change that will be sustainable requires that there must be greater multisectoral, multiagency and cross-system collaborations. Also, the change must take on board the six dimensions of food security and nutrition (food availability, access, utilisation, stability, sustainability, and agency), being intentional about addressing the often-neglected dimension of "agency", which is particularly important in reducing inequalities in food security and nutrition. For context, agency is defined as the capacity of individuals or groups to make their own decisions about what foods they eat, what foods they produce, how that food is produced, processed and distributed within food systems, and their ability to engage in processes that shape food system policies and governance.

On policy actions required to eliminate disparities in food security, Adeyemo says, "I would like to imagine this outcome as "closing the inequality gap", instead of total elimination, which requires a longer-term process. My first thought is that sincerity is required to enact policies and enforce practices targeted at dismantling global, regional, and local inequities. For clarification, inequity in food security and nutrition are the systematic social, economic and political reasons why disparities and inequalities exist in food system opportunities or the distribution of food security and nutrition outcomes. So those policies are applicable at every level and require deep, sincere introspection if the gap of disparities in food security and nutrition is to be closed."



Food production is seen as a job for the poorest in society and as such is mainly at subsistence and small-scale production level. Photo Credit: Busani Bafana

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Enteric methane emissions can vary substantially between animals of the same species, opening a role for genetic selection as well as dietary innovation in livestock feed. Photo Credit: Pexels/Mark Stebnicki

Mapping ways to reduce methane emissions from livestock and rice

New FAO report offers comprehensive assessment of options to pursue efficient, resilient and environmentally sustainable agrifood systems

By Murimi Gitari

METHANE emissions are increasingly identified as a turbocharged driver of the climate crisis, catalysing interest in how they can be mitigated in key agricultural sectors.

To bolster awareness of possible actions that can be taken and support members with a menu of solutions, the Food and Agriculture Organization of the United Nations (FAO) has published “Methane emissions in livestock and rice systems. Sources, quantification, mitigation and metrics”.

The report was put together by a multidisciplinary team composed of 54 international scientists and experts of the Livestock Environmental Assessment and Performance (LEAP) Partnership hosted at FAO since 2012. It offers a comprehensive overview and robust analysis of methane emissions in livestock and rice systems. It focuses on both the sources and sinks of methane gas, outlines how emissions can be measured, describes a broad sampling of mitigation strategies, and evaluates the kind of metrics that can be used to measure both emissions and their mitigation on the climate system.

“The results and recommendations of this report bolster the efforts of countries and stakeholders committed to reducing methane emissions and, in so doing, move us towards more efficient, inclusive, resilient, low-emission and sustainable agrifood systems,” said FAO Deputy Director-General Maria Helena Semedo in the report’s foreword.

Methane accounts for about 20 percent of global greenhouse gas emissions and is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere.

Methane emissions from anthropogenic activities currently contribute about 0.5 degrees Celsius to observed global warming, making their reduction an important pathway to achieve the Paris Agreement. The report aims to help enable agrifood systems to contribute their share to the Global Methane Pledge, a non-binding initiative endorsed by more than 150 countries to decrease methane emissions by 30 percent from 2020 levels by 2030, which would avoid more than 0.2 degrees Celsius of average global temperature increase by 2050.

The work is strongly in line with the FAO Strategy on Climate Change and the Strategic Framework 2022-2031, both of which aspire to reducing greenhouse gas emissions through a holistic mix of better production, better nutrition, a better environment and a better life – the Four Betters.

Besides agrifood systems, human activities that generate methane emissions include landfills, oil and natural gas systems, and coal mines. About 32 percent of global anthropogenic methane emissions result from microbial processes that occur during the enteric fermentation of ruminant livestock and manure management systems, while another 8.0 percent comes from rice paddies.

Measurement issues

One of the trickiest issues with methane is how its emissions and inventories are measured, evidently a critical factor in determining the best mitigation pathways.

Precise methods have been developed, often involving placing animals in respiration chambers, but they are expensive, labour-intensive, and difficult to apply to grazing animals. Sophisticated use of drones and satellites has been deployed, but this approach entails much modelling and research is lagging behind in validating these methods, the publication notes.

Moreover, enteric methane emissions can vary substantially between animals of the same species, opening a role for genetic selection as well as dietary innovation in livestock feed.

Another key environmental factor is how local soils serve as a methane sink. Research summarised in the report indicates that upland forest soils are the most efficient at this, especially in temperate biomes, with storage rates four times as great as that of cropland, and that dry grazing lands have a notably higher uptake rate than moist grazing

lands. Those findings could point to the merits of sylvopastoral approaches such as that deployed in a Globally Important Agricultural Heritage System in Portugal.

More empirical data and systematic measurement standards will help craft better tailored local mitigation approaches.

Mitigation issues

Research in the mitigation of enteric methane has grown exponentially, especially in the area of feed mixes, livestock breeding and rumen manipulation.

The report discusses a host of currently available strategies, with a special focus on the opportunities and barriers to their implementation in confined and partial grazing production systems, as well as in extensive and fully grazing production systems. To sharpen the use value of the review, FAO assessed the strategies in terms of their impact on the reduction of methane production or emissions per animal product unit as well as in terms of safety aspects, interaction with other greenhouse gases, and other economic, regulatory, and societal issues on which successful implementation depends.

A similar analysis is done for rice paddy production systems, with an emphasis on bolstering buy-in at all levels of the supply chain so that the burden does not fall only on the primary producer.

Sustainable livestock transformation

The global ruminant population increased by almost twofold from 1960 to 2017, whereas that of non-ruminants increased by more than fourfold. Both are projected to grow further, with global demand for animal products projected to increase by up to 70 percent by 2050, thus would exacerbate methane and greenhouse gas emissions from livestock systems.

By compiling the new report, FAO is helping chart the way that members can develop low-emission and climate-resilient livestock systems allowing them to integrate commitments to reduce methane into their nationally determined contributions and climate policies – ultimately bolstering progress towards the Sustainable Development Goals.



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Three high-level roundtables on the theme of water were held during the 43rd FAO Ministerial Conference. Photo Credit: FAO

Search for water solutions takes centre stage at FAO conference

By Murimi Gitari

THE search for best ways of tackling the problem of water scarcity and shortages, as well as frequent, widespread and catastrophic floods, which affect more than five billion people worldwide, took centre stage at the 43rd session of the FAO Ministerial Conference in July.

More than three billion people live in agricultural areas with high - or very high - levels of water shortages or scarcity, and it is estimated that by 2050, 57 per cent of the global population will live in areas that suffer from water scarcity for at least one month each year.

The increased pressure on water resources and related stress can deepen already severely unequal access to water, increasing existing social disparities, and particularly affecting vulnerable groups such as women, small-scale farmers and indigenous people.

With agriculture accounting for the consumption of 70 per cent of the world's freshwater resources, agri-food systems are therefore central to addressing the scarcity we are facing.

The newly re-elected FAO Director-General QU Dongyu opened the first roundtable, entitled Water Scarcity: Making Water Flow for People and Planet.

In his opening remarks, the FAO Director-General said while there may not be simple solutions to complex problems, there are "smart choices" to be made. He urged the panel to focus on better governance, more integrated water resources, and more investments.

The roundtable, which was moderated by FAO Chief Economist Maximo Torero Cullen, also saw contributions from a high-level ministerial panel that included representatives from Brazil, Cabo Verde, China, Jordan, the Netherlands, Tajikistan, and the United States.



A woman draws water from a well to water her crops in Keita, Niger. Photo Credit: FAO

Among the attendees, the representative from Namibia, which is highly impacted by the climate crisis, said the main message from the debate was the need to “act now.” Gambia’s representative said the issue disproportionately affects women, who play a leading role in the country’s agricultural sector, while Argentina’s representative pointed to the difficulties involved in finding global solutions when countries have different types of governance within their national borders.

Flood management

Floods have affected more than two billion people worldwide over the past decades and caused global losses worth around \$20 billion in 2021. In Africa, more than 2,000 people died last year alone in floods that hit around a dozen countries. In Pakistan, that same year, a flood put one-third of the country under water, leading to eight million displaced persons and more than 1,700 lives lost – one-third of them children.

Mr Dongyu kick-started the debate by calling for the need to work “with natural water processes, rather than against them.”

Government ministers from several countries, including Finland, Thailand and Zimbabwe, took to the floor to share their experiences during the roundtable, which was moderated by FAO Deputy Director-General Maria Helena Semedo.

South African Agriculture minister Angela Thoko Didiza stressed the importance of civic education, early warning systems and rural and urban planning. Her Yemeni counterpart Salem Abdullah Eissa Salem Al-Socatri noted the limited availability of early warning systems in his country. Zimbabwean Agriculture and Lands minister Anxious Jongwe Masuka said his country was working on better alerts to the population, while Finnish Agriculture and Forestry PS Jaana Husu-Kallio said her country was piloting digital flood management plans.

Water infrastructure

The roundtable on Water Infrastructure provided FAO members with an

opportunity to build a shared understanding of the importance of water infrastructure in achieving the Sustainable Development Goals, share their experiences, needs and challenges in developing and managing water infrastructure, and discuss strategies, financing, investment and governance of water infrastructure for meeting current and future needs and adapting to climate change.

Reliable water supply infrastructure enables farmers to diversify their agricultural practices and crop varieties and increase resilience. Effective water storage infrastructure can help manage water resources during periods of excess and scarcity and enables farmers to cultivate crops throughout the year, mitigating the impact of seasonal variations and climate hazards.

With water infrastructure critical to efforts to make agri-food systems more efficient, inclusive, resilient and sustainable, “we need to invest in infrastructure that is better suited to the water challenges we face today,” said Mr QU Dongyu.



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In agriculture, pests are managed by cultural, chemical and biological means. Photo Credit: USDA NIFA

From weaver ants to GMOs: how pest control has changed

By Titus Kinoti

PEST control is the regulation or management of a species defined as a pest that impacts human activities adversely. The world population is beyond seven billion and this has increased the demand for food hence increased monoculture that has given pests a conducive environment for fast multiplication. The pest menace in the modern farming and habitat has led to innovative ways of combating them.

In agriculture, pests are managed by cultural, chemical and biological means. Ploughing and cultivation of the soil before sowing reduce the pest burden. Monitoring the crop

before applying insecticides and growing crop varieties which are resistant to pests are necessary to keep out the unwanted organisms on the farm. Where possible, biological means are used, encouraging the natural enemies of the pests and introducing suitable predators or parasites.

In homes and urban environments, the pests are the rodents, birds, insects and other organisms that share the environment with humans, and that feed on grains and other foods. Control of these pests is through exclusion, repulsion, physical removal or chemical application means.

As long ago as 3000 BC in Egypt, cats were used to control pests of grain stores such as rodents. The conventional weed control methods included destroying weeds by burning them or ploughing them under. Techniques such as crop rotation, intercropping and the selective breeding of pest-resistant cultivars have been practised for a long time.

Modern pest control was stimulated by the spread across the United States of the Colorado potato beetle. After much discussion, arsenical compounds were used to control the beetle and the predicted poisoning of the human population did not occur. This led to a widespread acceptance of insecticides across the continent. With the

industrialisation and mechanisation of agriculture in the 18th and 19th centuries, and the introduction of the insecticides pyrethrum and chemical pest control became a common practice.

Biological pest control is a method of controlling pests such as insects and mites by using other organisms. It was first recorded around 300 AD in China, when colonies of weaver ants were intentionally placed in citrus plantations to control beetles and caterpillars. In the 1880s, ladybirds were used in citrus plantations in California to control scale insects.

The efficacy of chemical pesticides tends to diminish over time. This is because any organism that manages to survive the initial application will pass on its genes to its offspring and a resistant strain will be developed therefore developing resistance.

The earliest documented chemical pesticide compounds were elements such as sulfur, heavy metals and salt. The use of elemental compounds for pest control started at the dawn of agriculture and has continued, in some cases, to the present day. The heavy metal compounds were probably first employed as pesticides because of

their high toxicity. Arsenic compounds (particularly Arsenic (III) oxides) were found to be highly toxic to insects, bacteria and fungi.

The benefit of these inorganic pesticides, at the time, was that they lasted a long time and were not easily degraded. Unfortunately, they often leached into the ecosystem, wreaking havoc on local wildlife and posing a health threat to its human inhabitants.

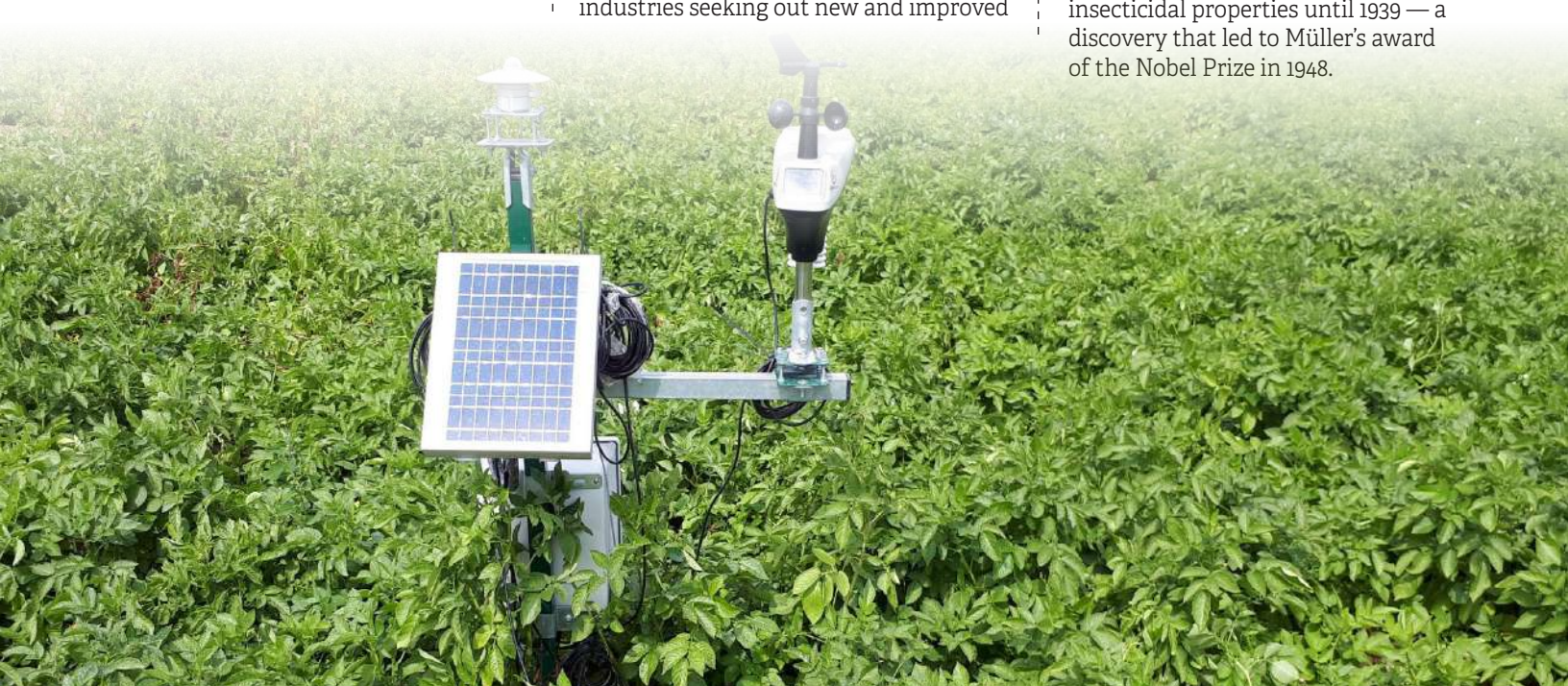
The 19th century marked the dawn of manufactured chemical pesticides, when chemicals began to be extracted from their botanical sources and were purified in laboratories. It was at this time that nicotine compounds were purified from tobacco, pyrethrums were extracted from flowers, and rotenone isolated from roots.

During this era, chemical compounds were blended and produced for the purpose of pest control. In 1814, an inorganic compound of copper (II) acetoarsenite called "Paris Green" was introduced as a pigment. By 1867, Paris Green was widely sold as an insecticide and rodenticide.

The humble beginnings of simple, natural repellents and physical pest controls grew into chemical and agricultural industries seeking out new and improved

methods. The primitive tools now had scientific reasoning to explain their efficacy and identify their chemical formulations, moving them from the realm of natural extracts to synthesised pesticides, and signalling the rise of the chemical pesticide revolution. Pest control, which had begun with simple tools and methods, was refined over centuries and completely reborn during World War II. The late 19th and early 20th century world of the first synthetic organic chemicals gave rise to the first modern synthetic pesticides in the form of organochloride compounds.

Many organochloride compounds, such as BHC and DDT, were first synthesised in the 1800s, but their properties as insecticides were not fully discovered and exploited until the late 1930s. BHC (Benzene hexachloride) was first produced by the English scientist Michael Faraday in 1825, but its properties as an insecticide were not identified until 1944. DDT (dichlorodiphenyltrichloroethane) was first prepared by Othmar Ziedler, an Austrian chemist, in 1825, but the Swiss chemist Paul Hermann Müller did not discover DDT's insecticidal properties until 1939 — a discovery that led to Müller's award of the Nobel Prize in 1948.



Monitoring the crop before applying insecticides and growing crop varieties which are resistant to pests are necessary to keep out the unwanted organisms on the farm.

Photo Credit: Open Access Government



Biological pest control is a method of controlling pests such as insects and mites by using other organisms. Photo Credit :Esiro

DDT's use as a pesticide proved to be a huge boon to war efforts. Prior to the discovery of DDT, pyrethrins were among the major insecticides in use. But pyrethrins were extracted from natural sources, primarily from flowers of the genus *Chrysanthemum* (pyrethrum), supplies of which were limited and insufficient to meet the demands of wartime use. It was due to this shortage that DDT, instead, became the Allied Forces' insecticide of choice to control insects that were vectors for typhus, malaria and dengue fever.

At the time, DDT was seen as a broad-spectrum insecticide with low toxicity to mammals. It was inexpensive to produce, easy to apply to large areas, and was persistent, so that reapplication was generally not needed; DDT is insoluble in water and therefore not washed away by weather. The compound also appeared, at first, to be incredibly effective at eliminating the insect vectors of disease, which led it to be hailed as a wonder insecticide.

By 1945, DDT was made available for agricultural applications. But the first signs of insect resistance to DDT began to appear in the 1950s. In 1962 Rachel Carson, a marine biologist and

conservationist, published *Silent Spring*, a book that highlighted the detrimental effects of pesticides on the environment. The widespread popularity of Carson's book led to the establishment of influential grassroots organisations that called for greater environmental protections and stricter controls on pesticide use. Part of that call to change was the reduction or elimination of DDT and many other pesticides developed from the 1940s through the 1960s from the pest-fighting arsenal.

DDT remained in widespread use around the world until the 1980s, but its decline hastened once the US Environmental Protection Agency (EPA) cancelled most uses of DDT by 1972. Many other countries followed suit shortly thereafter by removing DDT from lists of approved agricultural applications. In 2004, the Stockholm Convention outlawed many persistent organic pollutants (POPs) and restricted the use of DDT to vector control (primarily for malaria). Despite increasing worldwide restrictions and bans on DDT, as of 2008, India and North Korea were still using DDT in agricultural applications.

Since the start of the production boom in the 1940s to present day, a huge catalogue of thousands of insecticides, herbicides, and general pesticides was developed, including organochlorides (DDT, BHC), organophosphates (Parathion, Malathion, Azinophos Methyl), phenoxyacetic acids (2,4-D, MCPA, 2,4,5-T), Captan, Carbamates (Aldicarb, Carbofuran, Oxamyl, Methomyl), neonicotinoids (Imidacloprid, Acetamiprid, Clothianidin, Nitenpyram), and Glysothates.

The neonicotinoids are neuro-active insecticides, similar to nicotine compounds that were developed in the 1980s and 1990s. Of all the neonicotinoids, Imidacloprid has become one of the most abundantly used insecticides in the world. Patented in 1988 and registered in 1994 by Bayer Crop Science, Imidacloprid works by disrupting the transmission of nerve impulses in insects by binding to an insect's nicotinic acetylcholine receptors, resulting in paralysis and death. Imidacloprid is highly toxic to insects and other arthropods, including marine invertebrates.

Imidacloprid is the most widely used insecticide in the world, glyphosate is the most widely used herbicide on Earth. Glyphosate was developed by a Monsanto chemist, John E. Franz, in 1970. Roundup, as it was trademarked, quickly became one of the most popular herbicides in the world among both agricultural enterprises and home users.

In 1994, the Roundup Ready Soybean was commercially approved in the United States. This genetically engineered soybean was created to be resistant to glyphosate. These types of crops allowed for the use of glyphosate to control other pest plants without endangering the crop. The list of glyphosate-resistant crops has grown since the introduction of the Roundup Ready Soybean to include corn, canola, alfalfa, cotton, and wheat (Wikipedia).

GMOs:

Genetically modified organisms (GMOs) have become widely used in the United States since their initial introduction in the 1990s. The GMOs are grown by millions of farmers and the common modified crops are soybeans, corn or maize, cotton, and canola. The United States accounts for 59 percent of the world's GMO crops.

Many European nations have experienced protests over GMOs and their safety and the controversy surrounds the actual process of altering the genetic structure of plants and whether or not those modified plants should require labelling. The truth is that genetic modification is already well established as the newest tool in the arsenal of pest management.

Kenya has given a nod to the GMOs and this will help us to step up efforts in food security especially where climate change is becoming a threat to human survival. Part of the old chemistry has been discontinued in the last decades due to high toxicity in the environment. However, few other banned pesticides in EU are still being used in Kenya. Recently, the authorities in Kenya gave notice of withdrawal of hazardous products like Chlorothalonil and restricting others in vegetables in a bid to reduce the exposure and risk to humans and the environment.

Titus Kinoti is an agricultural expert. (kamataimpulse@gmail.com).



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TOP QUEST CONSULTANTS LTD

"Your Partner in Business Excellence"



Top Quest Consultants is a company that has specialized in training, consultancy and audits in food safety, quality and ISO standards.

We provide consultancy services in the following standards:

- FSSC 22000 Food Safety System Certification
- BRC Global Standard For Food Safety
- HACCP
- US FDA Preventive Controls For Human Food
- Global G.A.P
- Organic Certification
- Kosher
- Fair Trade
- ISO 9001 Quality Management Systems
- ISO 45001 Occupational Health And Safety Management System
- ISO 17025 Laboratory Management Systems
- ISO 22000 Food Safety Management Systems
- ISO 14001 Environmental Management Systems
- ISO 27001 Information Security Management System
- ISO 50001 Energy Management System

Contact us today and take advantage of our monthly offers!

A photograph of two women in a field. The woman on the left is wearing a teal lab coat and is pointing at a tablet held by the woman on the right. The woman on the right is wearing a purple patterned top and a red patterned skirt. They are standing in a field with tall green plants in the background.

Improving the food security and livelihoods of smallholder communities