

# CEREALS

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**Climate Change Could  
Mean Beer Shortage**





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## Editorial



*We're all on a journey, and we've all been down in the dumps before, wondering if what we're doing is really worth it. Wondering if what we're doing is really making an impact.*

*But, it's important that we're always moving forward. This is a lesson that I learned early in life.*

*I remember I was around 4 years old, and I was learning to ride my bike with my uncle and my father.*

*Of course, I fell off multiple times while I was learning to cycle, and I remember I one time I cut my knee pretty badly.*

*At that point I really just wanted to quit and go home. But, my family told me: "you can't quit now, you're almost there. Just try it once more!"*

*2018 was not the best for any farmer, but you can't quit, Just try it once more!"*

*Masila Kanyingi  
Editor*

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## Is Agriculture Kenya's Golden-egg Layer WHY ARE FARMERS POOR?

**K**enyan farmers produce enormous wealth for the country yet are largely poor. They must reject the farming model that keeps them perpetually poor, indebted, frustrated into alcoholism, domestic violence and seek trade justice. Crops grown on African farms are sold in retail outlets in Europe and the Middle East, while the aroma of coffee, tea and cocoa grown in her fields fills



## A new policy brief calls for action to reduce the loss and waste of high-nutrient foods

the air in most coffee and confectionery shops, outside of which the scent of flowers grown with her water fills the sidewalks.

Yet, the African small scale farmers that produce these valuable products of perpetual global demand are poor - food insecure, living in dilapidated dwellings without adequate water or sanitation, unable to pay for health care or education and unable to retire from farming as they lack a pension and other social protections. While Kenya exports coffee, tea, flowers and other horticultural produce, many Kenyan households, including those of small scale farmers are food insecure – cannot afford three meals a day. 30 percent of Kenya’s children are malnourished and Kenya is a net importer of good crops, mainly grains such as maize, rice and wheat.

Most of Kenya’s adult population has grown up being taught that agriculture is the backbone of Kenya’s economy. The fact that agriculture employs three in every five people in Kenya (60 percent); accounts for 27 percent of Kenya’s GDP and contributes more than 50 percent of the export earnings means that the importance of agriculture to Kenya’s economy cannot be overemphasize. It is what it is; a particularly important aspect in the lives of every Kenyan.

So why are small-scale farmers, the majority of Kenya’s farmers, poor and one in three of her children malnourished? Why has the agriculture budget been consistently below 5 percent despite government’s commitment in the 2003 Maputo declaration to raise its allocation to 10 percent? Who is growing the cash crops that make up 50 percent of Kenya’s earnings? If it is the small-scale farmer that is growing these agricultural exports why don’t the livelihoods of small-scale farmers reflect having earned 50 percent of Kenya’s export earnings?

### High Produce Prices in the Local and International Markets Still Leave Farmers Poor

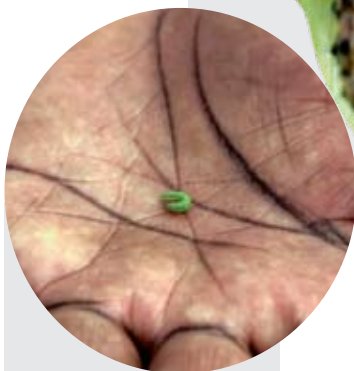
A study titled “Global Financial Markets and the Right to Food: A Focus on Small and Marginal Coffee Producers in Kenya” found that even in times of highest coffee prices in the global market, small-scale farmers get no significant improvements in their livelihoods. This begs the question – where is the money from the sales of Kenya’s coffee going if livelihoods of small-scale farmers are not improving?

The report says that this contradiction of farmers that grow a globally valuable product being poor is explained by price volatility; farmers limited understanding of global supply chains; lack of information on pricing; increasing costs of inputs;

delays in payments and the huge number of players (read brokers) between the farmer and the retailer who must ‘eat’ before farmers eat; the soaring food prices, all of which result in high levels of debt among small scale farmers. So why are farmers in debt – at the schools their children attend; unable to pay hospital bills for family members that fall sick and with huge chunks of their coffee bonuses being hived off to offset debts? There are various ways in which small scale farmers lose their money.

Small scale farmers of the various cash crops grown in Kenya – coffee, sugarcane, vegetables, rice, etc receive seeds from millers, the cooperative or the exporting company. They must later pay for them at prices they did not negotiate as there appears to be no standard price for the research that goes into developing the right seed. So farmers pay what is charged as the seeds are advanced to them at the start of the season, and the un-negotiated seed price deducted months later (often at an interest) from the money that should have been paid to each farmer. They have to pay for the seeds whether or not they produce the expected yield. Low productivity is blamed on the farmer’s laziness or careless agricultural practices rather than on the seed quality. Even the most diligent of small scale farmers cannot win this argument as s/he cannot adduce the evidence to show that she





“The destructive nature of the caterpillar has been all too evident in the shrivelled maize fields of Africa over the past two years.”



“It attacks several crop species, not just maize.”

## High production costs: On the March to Europe, our crops remain uncompetitive and no one bothers

Small scale farmers must know the true value of their produce and learn to approach farming as a business that must break even – do the maths.

grew the seeds as directed.

Farmers, particularly those growing horticultural produce such as green beans, snow peas etc also receive soil testing and technical advice on which seed to grow; fertilizer or pesticide to use. However, this advice is often not from the Agriculture extension officer whose salary and benefits are paid for by tax payers, but in most cases from a technical adviser employed private companies that export the produce. It follows that the small-scale farmer is paying double for agricultural extension services. First, small scale farmers as taxpayers are paying Value added Tax (VAT) each time they buy seeds, fertilizer, pesticides, any food stuff or other commodity they use buy their homes. They are also paying for licenses and various services and are taxed before they are paid for their produce. So there is no doubt that small scale farmers make up the taxpayers that contribute to the GDP, which explains the statistic that says that over 45 percent of Kenya's Gross domestic product (GDP) is from agriculture. Despite having contributed close to half of their monthly pay, the agriculture extension officer doesn't show up to advise the farmer; granted that often it is due to lack of transport or poor supervision. Secondly, when a private company sends a technical adviser to the farmer to offer the same advice that an agricultural extension officer should

have given, the cost of this advice is hived off before the farmer is paid for her produce.

So it would be interesting to know how much of the budget allocated to agriculture is intended to go into counties for the purchase of vehicles to take agricultural extension officers to the farms of individual and groups of small-scale farmers; or to set up demonstration farms in one of their farms. Interestingly, none! The expectation is that agricultural extension officers together with doctors, nurses, water engineers and all public officers delivering services that have been assigned to County governments will be paid from the meagre 21 percent of the budget that is shared by all 47 Counties, which is also expected to buy vehicles for the extension officers and fuel them. The Ksh59.3b will go into national government projects on agriculture – such as the Galana project, improving irrigation, coordinating the agriculture sector etc.

The story is the same even for small scale farmers that grow produce for the local market. Kenya only grows half of the sugar and one third of the rice that it requires to satisfy the local demand. One would expect from the laws of supply and demand that farmers who grow a commodity that is in low supply and high demand to be rich, but this is not the case. Even sugarcane and rice farmers are poor; unable to build permanent houses or install piped water or electrify and improved pit latrines on their farms; with children that are frequently chased out of school for parents' inability to pay the levies charged even in public schools or pay medical bills for family members hospitalized.





### Cost of Marketing Agricultural Produce

Small-scale farmers do not know who in Europe or the Middle East eats their vegetables or drinks their tea or coffee; or who sells it there and how it gets there. What is clear, though hardly ever discussed is that by the time the farmer is paid Ksh70 - 140 for a kilo of coffee delivered; or Ksh 35-100 for a kilo vegetables, the petrol or jet fuel cost of transporting the produce has already been deducted; the drivers paid and workers who pack the produce for the retail market paid; the packaging material paid for; export taxes in Kenya paid and tariffs or taxes charged by Countries that import Kenya's produce and the shareholders of the private company with which they have a farming contracts paid their profits. All these are costs that are paid for before the small scale farmer is paid. Should all the produce transported not be purchased or its quality drop due to delays in transit, the value of this loss is first deducted as a cost of doing business before the farmer is told how much s/he will get for a kilo of her produce.

This explains the statistics say that two in every three people in Kenya (over 60 percent) are employed by agriculture. It is in reference to the self-employed small scale farmer that owns the land and grows the produce, the extension workers – private or public that give technical advice, the drivers or pilots that transport it, packaging materials and workers, produce inspectors, the brokers or shareholders of the companies that export the produce, government officers employed both at national and county level etc. all of whom

“

County governments must motivate and supervise agricultural extension officers to ensure that they actually show up on farmers and advise farmers.”

are paid with the small scale farmers sweat. The only problem is that the farmer earns the least – less than the driver or even the security officers that guards the brokering companies' premises.



### Cooperatives Respite For Members?

Where her produce is sold by a produce marketing cooperative in which s/he is a member, instead of by a private company with which s/he has a farming contract, the produce price paid to the farmer is not any higher. Members of agricultural produce marketing cooperatives appear to be getting poorer not richer; losing assets bought jointly rather than gaining profits; members being indebted rather than receiving dividends.

Kenyans must ask themselves the difficult question of why private and public companies appear to deliver more profits for shareholders than cooperatives and out grower institutions involved in exactly the same business. It would appear like the definition the term 'cooperative has slipped to mean 'a badly run company that takes from shareholders rather than generates profits for them; the opposite of a company'.

Even after doing it many times with the same result, government continues to 'rescue' farmers from debt bondage by using public funds to pay 'cooperatives' and other shylocks in the name of offsetting debts owed by farmers. This is almost always done just before elections. On receiving the funds, the money lenders release peasant farmers' national identification documents so that they can register as voters. The payment is almost always followed by the head of the cooperative, broker or money lender resigning to 'enter into politics'. It is time to admit that all the 'rescue' and 'reform' initiatives done in this sector decades are not working. Since government has always had its hand in the cooperatives, maybe it is time to try a different model; get government out of the cooperative and instead leave it to play a regulatory role. Or better yet, convert all cooperatives into companies, and apply the same stringent governance requirements in the hope of a different and better result.

### Seeing the Big Picture of Agriculture As the Golden-Egg Laying Goose

Agriculture and specifically, coffee and all the crops for the local and export market are the golden-egg-laying-goose for Kenya. Too many people in the economy earn from it. For national government agricultural exports improve the balance of trade and generate foreign exchange.

By supplying local retail markets, small-scale farmers improve the national statistics on food security and employment by simply ensuring that supply is high enough for food prices to be within the reach of all. Small-scale

farmers thus give Kenya higher ratings on human rights indices such as the MDGs as performance on Goal1 (reduce poverty by half the rate it was in 2000) uses employment and food security as indicators and most of the other seven goals rate access to the very things (human rights) that small-scale farmers would be able to pay for and access if they were justly remunerated for their produce.

If small-scale farmers do not make enough money to meet their basic needs and live in dignity, they will be forced to abandon farming and look for other jobs, thereby increasing the rate of unemployment. Kenya will continue to import maize, rice and sugar. Food prices will continue to rise, decreasing the number of people that can afford 3meals a day. They will assert more pressure on public amenities. Inflation will rise as Kenya spends its meagre foreign exchange on importing foodstuff that can grow locally rather than on equipment and services that create new jobs. It is therefore in government's best interests (both national and county governments) to look out for the best interests of small-scale farmers.

While government has spent large sums of money to train youth as entrepreneurs, the training does not effectively focus on encouraging youth to venture into agribusiness. Even when training is offered to farmers, it is rarely transformative because it does not comprehensively cover content that would support small-scale farmers to deal with their real challenges namely – their limited understanding of global value chains, lack of pricing information and ICT services, lack of skills to help them organise and govern cooperatives and other farmer organisations better. The result is always the same; – farmers' inability to cut out the middleman or reform their cooperatives. If anything, by paying off cooperatives and shylocks and coming up licensing procedures (e.g. under coffee) that widen the gap between the farmer and the produce retailer, government is complicit in the disenfranchisement of small-scale farmers.

### A Budget Policy to Keep Kenya's Commitments

A decade ago, Kenya was part of many African governments that made the Maputo Declaration and its platform for action. In it African Governments committed to spend 10 percent of their GDP on improving agriculture. The Ksh 59.3billion allocation to agriculture is only half of what was Kenya for its part committed to spend on this sector. Unless Kenya develops a budget law and policy that compels it to adhere to such commitments, the funds allocated to agriculture will fluctuate from year to year and never achieve the grand plan that was intended.

Under devolution's subsidiarity principle funds must follow functions. It follows then that having the agriculture function under county governments' means that requisite funds ought to be allocated to county governments for service delivery. This service delivery money is intended for buying



equipment (e.g. vehicles for the agriculture or livestock extension officer to access farmers) or supplies (e.g. gloves or syringes for the local dispensary); and for paying technical staff performing all the functions devolved to counties i.e. agriculture, livestock and fisheries officers, environment, water and sanitation engineers, soil scientists, veterinary officers and other public officers. Small-scale farmers also pay CESS and other service charges. Essentially, the only reason why County Governments get fund allocations from national government and are allowed in law to collect revenue is because they deliver a service. If agricultural extension officers are not visiting and advising farmers, and there are complaints on service delivery in health and water sector, it defeats the purpose or rationale of having devolved government. County Governments must be careful not to make themselves irrelevant by not delivering the services they were created to deliver. All in all, it is the best interests of County Governments to promote the service delivery - best interests of small-scale farmers. County governments must motivate and supervise agricultural extension officers to ensure that they actually show up on farmers and advise farmers.

the Nairobi Coffee Exchange is Ksh 6-800 per kg, while still largely unprocessed. A cup of good coffee, hence one teaspoon (5gms) of coffee goes for Ksh2-300 in Nairobi. Yet the International Coffee Organization (ICO) and many other websites publish the weekly and even daily prices of coffee in the international market. Farmers, including those with internet enabled mobile phones do not have this information. Farmers' trainings, the digital villages and M-FARM concepts appear not to be telling farmers what they need to transform their lives.

### Farming As A Lifestyle Not A Business

Finally, small scale farmers must also begin to see farming as a job – employment that must be gainful for all those it employs. In most of the households of small scale farmers, land is owned by the male head of the household, who often does very little or no actual farm work. The day to day crop production work is done by women and their post teenage children, many of whom have dropped out of school, or by hired casual labourers under the supervision of women.

If a sugarcane farmer receives a cheque of Ksh 300,000 for cane that has taken 2 years to grow and be harvested, it means that s/he has been paid

While government has spent large sums of money to train youth as entrepreneurs, the training does not effectively focus on encouraging youth to venture into agribusiness.

### No Fertilizer Made in Kenya 50 Years After Independence

Five decades after independence, Kenya still imports fertilizer and pesticides despite the phrase 'Agriculture is the backbone of Kenya's economy' being in each year's Madaraka and Jamuhuri Day speeches and more recently in the state of the Nation and State of the County address. None of the Ksh 59.3 billion allocated to agriculture in the 2014-5 budget appears to be for the building of a fertilizer processing plant in Kenya. No one has been prosecuted for 2-3decade old corruption scandals for misappropriation of funds intended for this purpose at the time. So far, none of the 47 County governments have in their first two years' budgets or strategic plans included proposals to establish a waste treatment mechanism that can generate fertilizer or offered incentives to private corporations to do so.

### ICT Challenge

One of the reasons why there is such a huge disconnect between small scale farmers and those who retail their produce in local or international retail outlets is their lack of access to market information and particularly pricing information. Farmers receive less than 20 percent of the price of their produce – Ksh 140 per kg of coffee is paid to farmers, yet its price at

a monthly salary of Ksh12,500 per month in those 24months. If he and his wife and two other unemployed adult in the family worked on the cane, it means these four adults are each earning about Ksh 4,000 a month. This barely puts such a family above the poverty line pegged at USD 1.25 per day (about Ksh 3250 per month) and less so if any of these adult children are married and have children too.

Small scale farmers must know the true value of their produce and learn to approach farming as a business that must break even – do the maths. Hopefully doing such maths will result them getting angry enough to bother to learn about global value chains, track produce prices on their phones, demand better governance from the cooperatives, build warehouses, cooling plants and local jaggeries to either store or mill their own produce until they can get a better price for it from the broker.

However, even before it becomes unacceptable to government for its producers to pull down Kenya's poverty ratings, farmers themselves must reject this business or farming model that keeps them perpetually poor, indebted and frustrated into alcoholism, domestic violence and other ills through which producers' poverty is manifesting in Kenya today.



# Climate Change Could Mean Beer

## Shortages On Tap

As the impact of climate change on food staples becomes more apparent, scientists with the International Maize and Wheat Improvement Center (CIMMYT) are beginning to study how increasing temperatures will affect other contributors to the human diet. A new study indicates that the global beer supply will be hard hit. Given how seemingly plentiful beer is, this is difficult news to hear.

The study, “Decreases in global beer supply due to extreme drought and heat,” was simply “born out of a love for beer and the fear of its potential scarcity,” says Wei Xiong, a senior scientist at the CIMMYT and a key contributor to the research.

Two years ago, Xiong and the other scientists began to design the study to learn more about extreme drought and heat patterns adversely affecting crops around the world. Barley, the primary cereal grain from which beer is brewed, is one of the most

heat-sensitive crops, meaning that even short periods of high temperatures can affect grain quality and grain yield.

Despite a number of studies published assessing yield loss of barley and other crops due to global warming, there were no previous studies published connecting the price of beer to barley yield. The study, which the scientists refer to as the “drinking security” project, has garnered world-wide interest from various media outlets given the popularity of beer.

Wanting to connect their research with an interest of the general public, or the price of beer, the study’s authors saw value in researching the intersection of barley, beer and climate change. As a cross-culturally shared beverage, beer — to some extent — is more popular than rice, wheat and maize as it is recognized as a lifestyle staple. “This is the reason why we chose barley and beer as the case crop, to raise awareness of climate change and its



impacts. The wide interest in the study proved we succeed,” says Xiong.

The study also points out an alternative way to raise the public awareness of climate change for the future, or presenting an issue that has tangible realities for the average person.

“Consuming less beer thanks to climate change won’t necessarily affect global health, but having no beer will definitely add insult to injury, particularly when we’re watching sports matches,” says Xiong. “If you still want a few pints of beer, then the only way to do so is to mitigate climate change.”

In the process of conducting climate and crop model simulations for the study, Xiong improved available data on global barley supply through the introduction of the Decision Support System for Agrotechnology Transfer (DSSAT), a program used for simulating crop growth, to develop a global calibration algorithm to allow the model to reproduce historical and projected future barley production.

This was the first endeavor to date using the DSSAT model for single crop analysis on a global scale — a total of 38 barley producing regions were analyzed. Xiong also assisted in the designing of the study’s extreme warm weather index to identify extreme drought and heat years from climate simulation outputs. Following the use of DSSAT, CIMMYT-led High Performance Computing (HPC) allowed for the calculation of barely grain yield change due to extreme drought and heat, a fundamental component of the study.

CIMMYT is currently establishing the modeling capacity to be able to cover 30 more crops worldwide in addition to barley with multiple HPC models. This will ultimately aid CIMMYT in analyzing agricultural and economic risks associated with maize and wheat.

The study acknowledges its limitations as a result of factors that were kept constant such as the behaviors of barley producers and beer drinkers, global food stock and population growth. “One shortcoming of the paper that could be improved in cooperation with CIMMYT is looking at the spatial shift of crop area under a warming climate,” Xiong says. “This area shift, or cultivar shift between regions, has already happened in many countries to help cope with a warming climate, but we are not clear how it happens and its resulting consequences.”

Despite the study’s findings, there is still space to develop the



analysis by further considering the implications of future climate change forecasts. While the fate of beer seems bleak, there is still hope for the beverage in that the study did not consider the world’s progress in developing heat and drought resistant barley varieties and their adoption by farmers.

However, Xiong particularly believes that the study signals the butterfly effect in climate change impacts, meaning that everyone will eventually suffer from the effects of climate change if no action is taken to fight it.

With news of a potential decrease in the world’s beer supply, climate change seems to have abruptly arrived on beer lovers’ doorsteps.



# Barley: A Major Cereal Grain

By David Mulandi

## Ideal Growing conditions

Compared to wheat, barley has a better drought, salt and cold tolerance and grows well in temperate and semiarid subtropical climates. Soils with a pH of 6.5-8.0 and of medium texture are ideal for the cultivation of barley.

The crop requires well-drained loam soils with moderate rainfall of between 400-800 mm or irrigated and with a moderate temperature of between 15-30°C. Anaerobism (lack of oxygen in the soil), low or high temperatures and drought lead to severe grain losses.

## Growing areas in Kenya

Barley is majorly grown in Mt Kenya Region, Narok, North Rift and Naivasha

## Agronomic Practices

**propagation:** Barley is propagated by seeds. It is highly advisable to use certified seeds for the following reasons:

- Certified seed does not contain weed seeds such as wild oats, *Setaria* spp., Rye, Browe, Beckeropsis and grasses.
- It has good germination because it contains sound kernels - neither broken nor cracked.
- Are of one variety to ensure even ripening and uniformity of the crop.

**Fertilization:** Owing to the greater tendency of barley to lodge, as compared with wheat, stem stabilizers are being used in intensive growing systems. Potassium silicate is recommended to prevent lodging of the crop.

The use of fertilizer in barley farming depends on the soil use practices used by the grower and the previous fertilizer use on the same piece of land. Soil tests are highly recommended for accurate fertilizer application.

**Establishment:** Nitrogen is required for rapid early growth. Phosphate is needed to supply energy for early growth and development especially for gaining significant root mass.

**Tillering:** Nitrogen is important for leaf development and size and for increasing the number of tillers per plant. Manganese is essential for the structure of proteins and enzymes that help in the photosynthesis.

**Stem extension:** Nitrogen for rapid growth and germination and large leaves. Phosphate for energy needed for growth and development Potassium is needed for structural strength and water regulation. Sulfur is a vital part of plant proteins, and certain plant hormones. Zinc for internode elongation, formation of enzymes and hormones.

**Flag leaf and grain filling:** Nitrogen for higher yields through green leaf duration, grain site survival, grain size and protein levels. Magnesium for green leaf duration. Phosphate for dry for yield improvements through remobilization of dry matter Boron improves pollen viability for better fertilization.

## Pests and diseases

Notable insect pests affecting barley include: Barley Thrips. Cereal leaf beetle, Grasshoppers, Wheat stem sawfly and Wireworms. Main diseases are, Stripe rust, Smut, Septoria, Ergot, Fusarium Head Blight and Leaf Rust

## Weed control

Like all cereals, barley requires a weed free growing environment. Use of pre-emergence and post-emergence herbicides is very important in the cultivation of the crop because it is extensively affected by broadleaved weeds and annual grasses.

**David Mulandi**  
**Agronomist Amiran Kenya Ltd.**

**B**arley, *Hordeum vulgare* L is a major cereal grain and a member of the grass family. It is among the major grains by quantity produced behind corn, Rice and wheat. Barley is mainly used in malting, Animal feed and food for human consumption

## Background

In the grasslands where people liked to live, barley grew wild, and people gathered it to eat boiled or ground into flour and baked when it came ripe every spring. People first began to farm barley (instead of picking it wild) around 11,000 BC in West Asia, possibly because of a climate change that made the world hotter and drier.

Barley farming spread south from West Asia to Egypt and North Africa around 8500 BC and to Sudan by about 5000 BC. Barley also spread to Greece and Italy about 7000 BC, and reached northern Europe about 5000 BC, travelling along the Danube and Volga rivers. Barley reached India by about 6000 BC, and got to China about 3000 BC. By about 1000 BC, people were farming barley in Korea, and by 500 AD Tibetan people were also eating a lot of barley. Barley reached Ethiopia about 500 BC, and West Africa in the Middle Ages. The Dutch brought barley to South Africa in the late 1650s.

British settlers brought barley to the Americas in the 1600s AD in order to make beer, but they ate mostly wheat and oats. Spanish traders brought barley to South America, Mexico, and California. Settlers introduced barley to the rest of the world.





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## Existing Soil Constraints VS Wheat/Barley in Narok

By Benson Kibiru

**H** *healthy soils help grow our food, clean our water, store carbon, and reduce risks of droughts and floods.*

Narok is one among the big grain baskets in Kenya. Wheat, maize and barley are among the major cash crops grown in the area. Production of the above mentioned crops is in medium to large scale and rainfed. However, over the years, yield realized in tonnes per hectare (t/ha or bags/ha) varies with farmers despite replication of similar practices. As per the farmers growing wheat and barley in the area, yield vary from one farmer to another which means existence of an imperative scenario. Some people have suggested that this may be attributed to different crop husbandry and soil fertility management practices. Most commonly mentioned factors include: land tenure system, type of seed, soil correction where

applicable and proper use of fertilizer in terms of composition, rates of application and timing.

In trying to understand factors causing dwindling/varying yields, farmers and other interested parties have employed tools to precisely identify the major contributing factors. Soil testing is the key to accurate and precise use of fertilizer. The tool seeks to reveal soil chemical, biological and physical characteristics from which useful information is deduced and the best management practices (BMPs) are recommended.

Soil testing results in some problematic pockets in Narok have exhibited the following soil related constraints: low soil pH/strongly acidic, nutrient imbalance and deficiency/low nutrient content. Wheat and barley are not particularly sensitive to soil acidity. However, when the soil is strongly acidic (pH<4.8) this affects nutrient availability most especially phosphorus (P) and cause toxicity of Manganese and Aluminum. In acidic soils, the applied P form in soluble complex compound with Fe & Al oxides/hydroxides making it unavailable for uptake by the crop. Solubility of Manganese (Mn) and Aluminum (Al) in the soil increase with





The FAO The Status of the World's Soil Resources report has identified 10 major threats to soil functions including soil erosion, soil nutrient imbalance, soil carbon and biodiversity losses, soil acidification, contamination, soil salinization, and soil compaction.

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decrease in soil pH. Thus, these elements eventually become toxic to the plant roots causing a decline in crop growth. Aluminum toxicity is a major limiting factor of barley production in acidic soils.

Continuous cropping with little or no replenishment of the removed nutrients lead to soil depletion. Worth noting, different crops remove different amounts of essential nutrients. This together with other unquantifiable loss of nutrients cause their imbalance in the soil system. Some of the established nutrient imbalance include: high percent exchangeable potassium and sodium in relation to other essential cations Calcium ( $\text{Ca}^{++}$ ) and Magnesium ( $\text{Mg}^{++}$ ). High percent exchangeable potassium (%EPP) induce deficiencies in Mg and Boron (B) while high percent sodium affects the integrity of soil aggregation.

The cumulative effect of the above mentioned has significant influence on crop growth. This is through developing the following attributes in our natural soil system: poor aeration in the root zone, water movement, moisture distribution in the ploughed soil layer, reduced microbial population among others. The result in the eyes of the farmer is reduced yield which has rendered production of these crops unprofitable and hence abandonment of the economic

activity.

Worth noting, most soil correction practices are expensive and the benefits are realised over a long period and therefore for the practices to be adopted land tenure system is a factor of vital importance. An irrevocable/binding land tenure system will enhance a sustainable use of land resource.

Is the situation remediable? The answer is yes, and how? Several practices are mandatory to enhance sustainability. They include: liming of acid soils, maintaining soil organic carbon levels at desired levels ( $\geq 2\%$ ) by returning crop residues and application of animal/compost manure in adequate amounts, crop rotation and above all farmers to make soil testing a routine practice to ensure there is early detection of existing or developing nutrient imbalance in our soil system and timely/proper correction measures are employed.

**Benson Kibiru-Lead Soil scientist/Agronomist**

## CIMMYT Trains Early Career Scientists on Wheat Rust Diagnosis and Management



NJORO, Kenya (CIMMYT)

**T**he International Maize and Wheat Improvement Center (CIMMYT), in collaboration with Kenya Agricultural & Livestock Research Organization (KALRO) and Cornell University, recently trained 29 scientists from 13 countries on wheat rust disease diagnosis and management techniques, as well as innovative wheat breeding practices. The training, part of the Delivering Genetic Gains in Wheat (DGGW) project, took place at the KALRO research station in Njoro, Kenya, where CIMMYT's wheat breeding and rust screening facility is located.

More than 200 scientists have increased their capacity at these annual trainings since CIMMYT started organizing them ten years ago. The trainings focus particularly on studying resistance

to black (stem) rust, yellow (stripe) rust and brown (leaf) rust. Future wheat champions in national agricultural research systems (NARS) get new skills on innovative and cost-effective wheat breeding. These trainings are also a chance for CIMMYT's Global Wheat Program to establish new partnerships and to collaborate on emerging challenges related to wheat breeding in different farming regions.

"The focus of this year's event was to train the scientists on how to identify and record notes for stem rust occurrences and how to evaluate wheat material in the field, to better understand how wheat rust pathogens keep evolving," said Mandeep Randhawa, wheat breeder and wheat rust pathologist at CIMMYT.

Despite its importance for global food security and nutrition, wheat remains susceptible to endemic and highly destructive rust diseases which can lead to 60-100 percent yield losses. Developing and distributing rust resistant wheat varieties is regarded as the most cost-effective and eco-friendly control measure, especially in developing countries, where the majority are resource-poor smallholder farmers with no access to fungicides to control the disease.

As a global leader in wheat and maize breeding systems, CIMMYT has sustained efforts to develop high-yielding, disease-resistant and stress-tolerant varieties. In partnership with KALRO, CIMMYT identified and released over 15 commercial wheat varieties since the establishment of the stem rust screening facility







in Njoro in 2008. Despite the appearance of new devastating strains of stem rust over the period, most of these released wheat varieties are high-yielding with stem rust resistance, according to Randhawa.

“Adequate management practices, including timely planting and application of right fungicides, have kept some of the high-yielding varieties such as Kenya Korongo and Eagle10 in production,” Randhawa explained.



**More than 200 scientists have increased their capacity at these annual trainings since CIMMYT started organizing them ten years ago. The trainings focus particularly on studying resistance to black (stem) rust, yellow (stripe) rust and brown (leaf) rust”.**



Several high-yielding rust resistant wheat lines are in pipeline for national evaluation to release as wheat varieties in Kenya, he said.

The development of a portable, real-time diagnostics tool for wheat yellow rust, namely the Mobile and Real-time Plant DisEase Diagnostics (MARPLE) was another breakthrough in identifying and combating wheat rust. This mobile plant health diagnosis tool helps identify rust strains in three days instead of months. This is a game changer for the wheat sector, as rust control measures could be deployed before new rust becomes a large-scale epidemic. Led by senior scientist David Hodson, MARPLE is the result of the collaboration between CIMMYT, the Ethiopian Institute of Agricultural Research (EIAR) and the John Innes Centre. There are plans to scale up this innovation in Ethiopia, where it is expected to provide five million wheat farmers a lifeline to control wheat yellow rust.

At the training, participants such as Zafar Ziyaev from Uzbekistan, were glad to gain deeper understanding on how to use modern tools for rust surveillance and the control measures. Others acknowledged the importance of sensitizing and supporting farmers to grow rust-resistant wheat varieties.

Emeritus Professor Robert McIntosh, one of the trainers from the Plant Breeding Institute at the University of Sydney, acknowledged the need for wheat scientists to remain vigilant on rust outbreaks globally and the evolving nature of the pathogens.

“As rust pathogens spread from country to country and region to region, such trainings allow national scientists to learn about the need for constant awareness, the basic principles of epidemiology and genetics that provide the basis of breeding for durable resistance, and what the Njoro rust testing platform can offer to the NARS,” McIntosh said.

# Maize

## Annual Report 2017

In 2017, 79 improved maize varieties were released by MAIZE partners worldwide, including 26 in Latin America, 44 in Sub-Saharan Africa and 9 in Asia. These varieties are based on use of CGIAR lines from the International Maize and Wheat Improvement Center (CIMMYT) and the International Institute of Tropical Agriculture (IITA). Some of the special traits stacked in these varieties include drought and heat tolerance, nitrogen use efficiency, enhanced protein quality, high kernel zinc and resistance to diseases of regional or global importance, such as maize lethal necrosis (MLN), tar spot complex (TSC), and resistance to the parasitic weed, *Striga*.

Elite maize varieties released by MAIZE CRP partners in 2017, with depiction of key traits.

The fall armyworm (FAW), a devastating insect-pest from the Americas, continues its march across sub-Saharan Africa. MAIZE has been working closely with international, regional and national partners to produce a comprehensive technical guide on the integrated FAW management.

The MAIZE team is also working intensively to curb the spread and impact of maize lethal necrosis (MLN) in sub-Saharan Africa through the development and deployment of MLN-resistant maize hybrids, besides strengthening the capacities of national plant protection organizations across sub-Saharan Africa on MLN diagnostics and management. The rapid response to MLN and ongoing intensive efforts against FAW highlight MAIZE's expertise and partnerships to counter the present and future pest/disease challenges in the

tropics.

The release of second-generation tropicalized haploid inducers (CIM2GTAILS) and the use of over 93,000 doubled haploid (DH) lines in maize breeding programs in Latin America, Africa and South Asia have great potential to increase genetic gains for tropical breeding programs.

Sustainable intensification in maize based systems has yielded excellent results. MAIZE researchers found compelling research evidence on the multiple benefits of conservation agriculture and argued that it should be included as one of the major technology packages in Ethiopia's national agricultural extension system.

In "Gender and innovation processes in maize-based systems," a report from the GENNOVATE initiative to MAIZE, researchers found that improved maize seeds ranked as among the two most important agricultural innovations to have come into their communities for both women and men.

I wish to thank MAIZE partners, funders and stakeholders for their continued support and participation. Without the generous support of our funders, MAIZE could not tackle emerging challenges such as maize pests and diseases or climate variability.

The CGIAR Research Program on Maize (MAIZE) receives W1&W2 support from the Governments of Australia, Belgium, Canada, China, France, India, Japan, Korea, Mexico, Netherlands, New Zealand, Norway, Sweden, Switzerland, UK, US and the World Bank.







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# Boosting Farm Productivity in Africa Through the Sustainable Use of Machines

New African Union-FAO framework also aims to create new jobs while reducing reliance on manual labor

FAO and the African Union launched a new framework document that aims to increase agricultural efficiency and reduce drudgery by helping countries in Africa to develop strategies for sustainable farm mechanization.

The Sustainable Agricultural Mechanization: A Framework for Africa (SAMA) is the result of discussions with policy makers from AU member states, the AU Commission, FAO and key partners. It offers a detailed look at the history of machinery in Africa, and points the way towards addressing challenges and creating new opportunities to assure the successful adoption of mechanization.

“Doubling agricultural productivity and eliminating hunger and malnutrition in Africa by 2025 will be no more than a mirage unless mechanization is accorded utmost importance,” AU Commissioner for Rural Economy and Agriculture, Josefa Sacko, said at the launch of the framework at FAO.

Remarkably more than three-fourths of farmers in sub-Saharan Africa prepare their lands using only hand tools, a practice that entails poor productivity, repels youth and is incompatible with the continent’s Zero Hunger goal.

“Farmers in Africa should be able to use modern agricultural technology, both digital



and mechanical, to boost the agricultural sector in a sustainable way,” said FAO Deputy Director-General Maria Helena Semedo.

The new framework identifies 10 priorities for AU member states to include in their national plans, ranging from the need for a stable supply of machine spare parts and innovative financing mechanisms, and the importance of regional collaborations that allow for cross-border hiring services.

The framework notes that successful national mechanization strategies will address key sustainability issues including gender, youth, environmental protection and the overarching principle that farming must be profitable. It also emphasizes that these strategies should cover the entire agrifood value chain, including harvesting, handling, processing and food safety aspects, with an eye to reducing food losses, boosting rural employment and







bolstering the links between farmers and consumers.

#### Past, present and future

While tractors are used to prepare land on over 60 percent of cultivated lands in Asia, the corresponding figure for Sub-Saharan Africa is around 5 percent. Moreover, the use of draught animals in sub-Saharan Africa is minimal outside of Ethiopia - due in considerable measure to the tsetse fly - so almost all the work is done manually. One result is that many African farmers deploy low-yielding techniques and may prefer slash-and-burn methods.

Today smaller and more affordable machinery, such as two-wheel tractors, are available hiring services using digital technologies are proving popular around the continent, underscoring how the sharing of capital assets can be leveraged to achieve greater scale and access to modern tools.

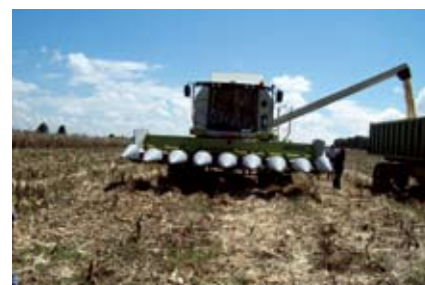
#### What is to be done?

The framework notes that cross-border initiatives - for dealers, supply networks and tractor operators - can allow for viable scale and greater utilization.

Another key consideration is farm profitability. This can be fostered by giving access to markets, credit and land tenure a visible role in mechanization policies. The framework has been designed to contribute to the pledges made in the African Union's Malabo Declaration and Agenda 2063, and to do so in a way that is private-sector driven, environmentally smart, affordable and friendly to smallholder farmers.

Its implementation will require significant contributions from other stakeholders, including public institutions and private actors such as the European Agricultural Machinery Industries Association (CEMA), which has just renewed its partnership with FAO to work on issues related to

“ Today smaller and more affordable machinery, such as two-wheel tractors, are available hiring services using digital technologies are proving popular around the continent, underscoring how the sharing of capital assets can be leveraged to achieve greater scale and access to modern tools.



sustainable mechanization strategies in developing countries.

FAO and the AU's strategy acknowledges that “there is great potential for innovation in African agriculture” - notably with the proliferation of mobile technologies and access to information and services - and that a significant effort in capacity development will have to be made to rise to related challenges.

To that end, FAO and the International Maize and Wheat Improvement Center (CIMMYT) have also published a training manual to help roll out more effective networks of access to small-scale mechanization services.

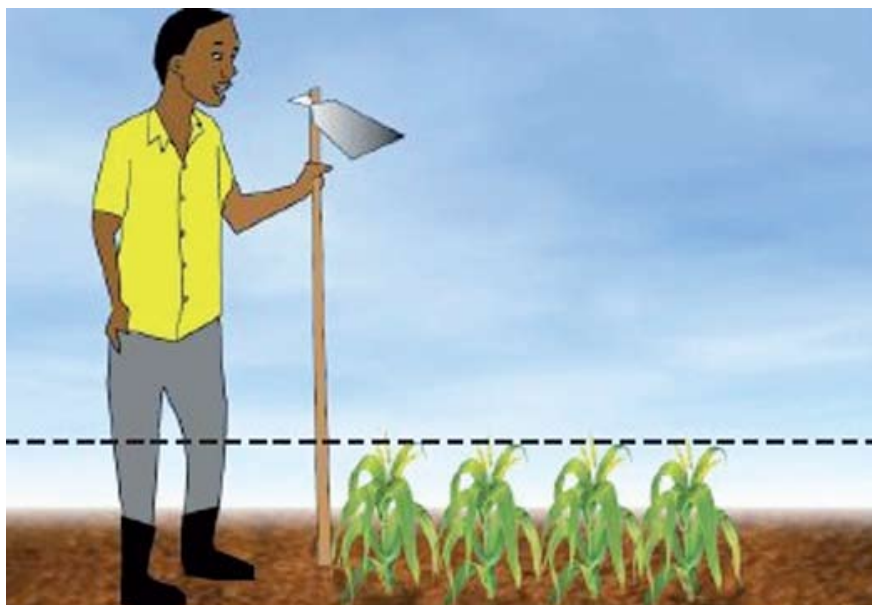
# Reaching Out to Millions of Smallholder Farmers: Exploring Collaboration with Shamba Shape-Up

**O**n October 22, David Campbell, CEO of Mediae, and his team presented their TV and digital education and development programs to International Maize and Wheat Improvement Center (CIMMYT) staff in Nairobi, Kenya. Mediae is a media company producing the iconic Shamba Shape Up, a weekly farming education TV series watched in Kenya, Uganda and Tanzania.

The purpose of the meeting was to explore the possibility of partnership between CIMMYT and Mediae. Farmer education programs like Shamba Shape Up can showcase CIMMYT's innovations to millions of farmers. Better awareness could lead to increased adoption of innovations and enhance household incomes, as well as food and nutritional security.

Other education and extension programs include Shamba Chef, which targets women with information about nutrition and family finance, and iShamba, an information service that provides over 350,000 farmers with information on market prices, the weather forecast and tips on crop and animal production.

Since 2013, Shamba Shape Up has run weekly episodes in English and Swahili on Kenya's Citizen TV, reaching an estimated at 3.5 million people, 70 percent of whom live in rural areas. This "edutainment" program highlights challenges smallholders face in their farming activities. Farm advisories range from crop production, animal husbandry and soil fertility, to seeds, pests and diseases, and climate change adaptation strategies. Usually, highlighted



**“ Usually, highlighted farmers narrate the issues on their farm to a TV presenter while an expert from the private or non-profit sector offers advice on remedial measures”.**

farmers narrate the issues on their farm to a TV presenter while an expert from the private or non-profit sector offers advice on remedial measures. This helps the farmer to improve their productivity and livelihood. Campbell believes that “a mix of entertainment and research elements have enabled the program to remain relevant and sustainably serve large, diverse audiences.”

In April 2014, CIMMYT and the African Agricultural Technology Foundation (AATF) were featured in a Shamba Shape Up

episode. The broadcast showcased a maize farmer whose crop production had been devastated by striga, a parasitic weed that had infested over 300,000 hectares of maize in western Kenya. Farmers were advised to plant IR maize, a new herbicide-coated seed variety that is immune to striga and can kill it, and this helped to stop the spread of striga in the region. A more recent episode featuring CIMMYT's efforts to instill sustainable intensification practices among farmers was aired in February 2018.

Campbell and his team have observed that while millions of farmers enjoy their education programs, many fail to continue applying expert advice on good agricultural practices, such as conservation farming, on their own farms. One particular challenge and area with scope for collaboration is to conduct proper impact evaluation of education programs on farming practices changes and livelihoods.





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**Stanley Kuria Benard**

**Planning well in advance is key to achieving a zero-hunger world**





*Countries which are highly developed started by developing Agricultural sectors, perhaps we should copy them*

**What is your personal back ground?**

Benard Kuria Stanley is a graduate of Nairobi university. After graduation, he joined the agriculture sector and has been working in the agrochemical industry for 20 years., of which 16 is in the cereals sector.

**Why did you choose to be an agronomist?**

I used to admire the way the Delmonte farm was being managed on the roadside way back in my high school days. I made up my mind that I would like to work and run such a farm way back when I was in form two.

**How long have you been working with Cereal growers?**

I have worked with cereal growers actively for the last sixteen years and I enjoy every bit of it.

**Briefly discuss the challenges you go through daily? What would you point out as your strongest attribute that has made you succeed?**

Cereal farming is the food basket of the country and majority of the growers are smallscale with minimum technical knowhow. This requires alot of input technically. Servicing all the cereal growers across the board is not easy. Each one needs some time and the day is limited to some 8-10 hrs...Any advice especially to smallscale growers is almost unquestionable. This means I have to take a lot of my time to understand their requirements and give the best advice.

Large scale growers are knowledgeable or employ technical managers. However, they still need a lot of my time to discuss crop

managment. There is no room for a mistake. I have to undestand our molecules and other molecules in our market.

My strongest attribute is desire to succeed and the passion of my job.

**In your experience, discuss some of the challenges cereals farmers are facing?**

There are several. However, marketing of their crops for better prices and uncertain weather conditions are their main challenges. These in turn trigger low yields and income which affect the cash flow of the farmers. As such the farmers have a very low buying power.

**How do you rise up to the greatest challenge that your job presents?**

By continuously training and teaching the farmers on modern farming techniques.

Several techniques-eg conservation technology, crop rotations, Yield enhancement products which add value to the farmers yields etc. I naturally focus on the farmers issues of production. I also plan well in advance how to visit the farmers.

**Point out the solutions Syngenta EA Ltd has for the Cereals sector?**

Syngenta East Africa Ltd is a global leader in crop protection and a strong partner to the farming industry providing well established and innovative products namely:

**Crop burndown** we have –touchdown and gramoxone

**Seedcare**-Celestop,cruiser+dividend,Maxi

**Herbicides**-topik,axial,traxos,servian

**Fungicides**-Amistar extra,Artea,Cherokee

**Insecticides**-Engeo,match,ampligo

**What is the role of the agrochemical**

role since we are not only an R&D but also a key sales and marketing organisation. We are high-tech solution providers of the latest farming technologies. The company has invested alot in technology becoming a leading company in digital agriculture which will be the game changer of modern farming. The current farmer needs to use the resources efficiently.

**Growing up, who was your inspiration?**

My inspiration was the desire to raise a good family

**What decisions have you made in your career that looking back you feel were mistakes and you learned from them?**

Recommending farmers for credit without evaluating them and having a thorough background check. This was my turning point.



**Give your final comments**

Cereal farming forms the backbone of the country's economy. Our country solely

**I used to admire the way the Delmonte farm was being managed on the roadside way back in my high school days. I had already made up my mind that I would like to be such a person. By then I was in form 2.**

**sector to the development of the Cereals Sector?**

Major role is food security in addition to providing employment. A nation needs to feed its population and without that there can be no substantial development.

**How do you see Syngenta EA Ltd contributing to the future of the Cereals sector?**

Cereal sector space is diminishing due to exponential population growth rate which reduces production land for settlement purposes. At syngenta East Africa Ltd, we combine economic success with environmental protection and social responsibility. This ensures we develop products which can maximise production while caring for man and environment. In addition, we are going to play a pivotal

**Describe your ordinary day? Do you have enough personal time?**

I am an early riser. Am up by 5 a.m. for my prayers. Thereafter, i go through my diary and confirm any unfinished business of the previous day, reply my mails and then am set for the days activities whether in the field or office.

During the peak season my farmer's visits start at 6am and join farmers who are busy spraying if need be train on spraying techniques. I then proceed to normal meetings that early. Weekends are set for my family.

**What legacy do you want to leave behind in the cereal sector?**

Farmers achieving high crop yields while using the most friendly production methods.

depends on it. Many times when there is shortage of maize the government reacts very fast. We need to stabilise the maize and wheat prices so that we have a stable economy.

Countries which are highly developed started by developing Agricultural sectors –e.g. in the USA the most valued person is the farmer. The most valued professional in the US is the Agricultural Engineer. Perhaps we should copy from them because they cannot be wrong for 200 yrs ....and is a land of opportunities.

Why do we have to be a net importer of food if Israel the size of RIFT VALLEY is a net Exporter?

**Thanks for your time**

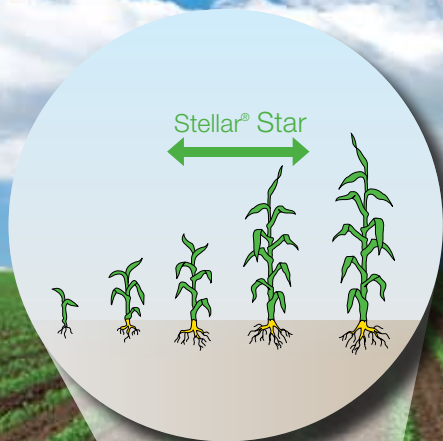


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# To Feed the World, Take the Science to the Farmer

*Mr. Yariv Kedar, an agronomist  
discussing with farmers-File Copy*

**H**undreds of food and agriculture leaders from around the world gathered in Iowa, USA, for the 2018 edition of the Borlaug Dialogue. Much of the conversation this year was centered on how to “take it to the farmer,” as Norman Borlaug famously said. Experts discussed how to build sustainable seed systems, grounded on solid science, so improved varieties reach smallholder farmers.

Louise Sperling, senior technical advisor at Catholic Relief Services, presented a study on the sources of seed for smallholder farmers in Africa. She explained that 52.2 percent of households receive new varieties, but only 2.8 percent of the seed comes through agro-dealers. The biggest source is local markets and own stock, the so-called informal channels.

Quality and variety of seed should be the focus, emphasized Jean Claude Rubyogo, seed systems specialist at CIAT. In his view, we need to integrate formal and informal seed distribution channels, using the competitive advantages of each.

“When we take good seed, we address all African soil,” said Ruth Oniang’o, board chair at the Sasakawa Africa Foundation. Oniang’o explained access to financing is a major hurdle for smallholders to access better seed and other innovations. In her view, current financial products are inadequate. “Why should we get a farmer to pay 20 percent interest rates on a small loan?”

B.J. Marttin, member of the managing board of Rabobank Group, recommended financial institutions to partner with farmers through every stage, from production to sale, so they better understand risk and the whole value chain. Simon Winter, executive director of the

Syngenta Foundation for Sustainable Agriculture, captured the main points from the session on financing for agricultural entrepreneurs. “We have to have the farmer at the center. The farmer is the ultimate customer,” Winter said. “If we are not serving farmer needs, we are not really solving the problems.”

### **Research to feed the world**

The 2018 Global Agricultural Productivity (GAP) Report, presented at the Borlaug Dialogue, shows the growing gap between future food supply needs and agricultural production, particularly in low-income countries. To meet the projected food needs of nearly 10 billion people in 2050, global agricultural productivity must increase by 1.75 percent annually, the report states, but has only increased 1.51 percent annually since 2010.

A plenary session led by CGIAR explored the role of research in tackling this and other complex challenges. “We have to talk about food and agriculture research,” said former U.S. Secretary of Agriculture Dan Glickman. People need to understand research is not abstract academic knowledge, but rather useful innovation that goes “from the farm, to the table and to the stomach,” he explained.

“Innovation, no matter where you are in the world, is key to moving forward,” said Patience Koku, a farmer from Nigeria part of the Global Farmer Network. “I don’t think the farmers in Africa or in Nigeria need a lot of convincing” to adopt innovation, Koku noted. If someone is able to explain what a new technology can do, “farmers see that science can make their life better and embrace it.”

### **Rising to the challenge**

Agricultural research is also crucial to confront global threats like pests,



conflict and climate change.

Two separate sessions, hosted by Corteva Agriscience and CIMMYT, shared the latest approaches in the fight against fall armyworm and other pests and diseases. The Director General of the International Maize and Wheat Improvement Center (CIMMYT), Martin Kropff, explained how organizations are working together to respond to the rapid spread of fall armyworm in Africa and Asia. “We have to solve the problem based on science, and then develop, validate and deploy integrated pest management approaches,” Kropff said.

As part of the World Food Prize outreach program, Bram Govaerts, director of innovative business strategies at CIMMYT, gave a lecture to students at Brody Middle School about the importance of agriculture and food. “When people can’t grow crops or pay for food to feed their families, desperation turns to conflict.”

At a side event, the Economist Intelligence Unit presented the Global Food Security Index 2018, which ranks food systems in 113 countries based on affordability, availability, and quality and safety. Senior consultant Robert Powell explained that the index now includes an adjustment factor based on each country’s natural resource risks and resilience to the impacts of a changing climate. “All countries will experience the impact of climate change,” Powell said.

The pernicious effects of climate change were also evident to the 2018 World Food Prize winners, David Nabarro and Lawrence Haddad, who have led global efforts to curb child malnutrition. “There is no evidence to me that [this] crisis is going to stop, because climate change is here,” Nabarro declared. “The foods we choose to grow and eat have a large impact on emissions,” Haddad said. “Food has a lot to offer” on climate mitigation and “diversity is the secret sauce” for climate adaptation. “We

need food systems that are diverse: in crops, locations, organizations involved in them...”

Less biodiversity translates into “less resilience and worse nutrition,” according to the Vice President of Peru, Mercedes Aráoz. Through improved health and nutrition services, the country more than halved malnutrition among children under five, from 28 percent in 2008 to 13.1 percent in 2016.

#### **A rallying cry for nutrition**

The impact of nutrition on the first 1,000 days of life lasts a lifetime, explained Haddad. “For young kids, these are permanent shocks.”

“If a person is not nourished in those very important weeks and months of life, the long-term consequences are likely to be irreversible,” Nabarro added. According to him, nutrition needs to be the target in the 2030 agenda, not only hunger.

“Nutrition-based interventions present us a new lens through which to create and assess impact as agricultural researchers,” said Elwyn Grainger-Jones, the executive director of the CGIAR System Organization. “Our future success must come not only from ensuring an adequate supply of calories for the global population, but also the right quality and diversity of foods to tackle hidden hunger as well.”

“We are not going to resolve the challenges of undernutrition without the ag sector stepping up in a big way and differently,” argued Shawn Baker, director of nutrition at the Bill & Melinda Gates Foundation. “Nutrition needs you,” Baker told other participants. “Welcome to the nutrition family.”



# Affordable Grain Drying And Storage



Smallholder farmers in sub-Saharan Africa lose up to a third of their grain after harvest because they often use poor grain storage technologies and ineffective drying practices. Staples like maize stored on-farm are exposed to infestation by insects and fungi. These can lead to contamination with mycotoxins, in particular aflatoxins, poisonous food toxins produced by *Aspergillus* fungi.

At high doses, aflatoxins can kill. Prolonged exposure to aflatoxins can impact consumers' health, suppressing immune systems, hindering child growth and even causing liver cancer. Kenya is a particular

hotspot for aflatoxins, as regular studies show widespread contamination along the food chain, from maize grain to milk and meat.

Preliminary findings of a study by USAID-funded Feed the Future Innovation Lab for Food Processing and Post-Harvest Handling (FPL) suggest that innovative low-cost grain drying and storage technologies such as hermetic bags and hygrometers could prevent post-harvest crop losses and harmful aflatoxin contamination.

The initial results were shared at a workshop in Nairobi as part of the FPL project, which aims to develop and disseminate affordable and effective post-harvest technologies suited to the African smallholder farmer. This project is a collaboration between the International Maize and Wheat Improvement Center (CIMMYT), Kenya Agricultural & Livestock Research Organization (KALRO) and Purdue University.

A study conducted in Kiboko, Kenya,

compared the performance of various hermetic storage containers and bags by different manufacturers with farmers' usual storage practices. Researchers measured maize grain quality parameters such as grain damage, weight loss in storage, fungal growth and mycotoxins, food quality and seed germination. The results showed hermetic bags were highly effective in averting grain loss for up to one year.

"If these bags are sealed properly, oxygen cannot get in or out. This creates an anaerobic environment that suffocates grain-damaging insects and prevents fungi from growing" says CIMMYT economist Hugo De Groot.

Making hermetic storage more accessible The Africa Technical Research Center (ATRC) is involved in the development of some of the hermetic bags that were tested during the study. ATRC director Johnson Odera noted that most of the insect infestations start in the field. "When the farmer harvests and transports the maize home, the grain is already infested," Odera explained. "The damage can be extensive depending on the level of infestation. One of the ways to minimize the losses, while keeping the food safe for consumption is to use hermetic bags".





# Technologies Cut Down Aflatoxins



These bags, however, remain largely unavailable to smallholder farmers, according to the study. This is mainly due to farmers' low awareness levels and the high cost of hermetic bags. Unlike normal storage bags that cost slightly lower, hermetic bags retail at high prices. A second study, conducted with maize producers and traders in Kakamega, western Kenya, suggests that dropping prices by 20 percent had the potential to increase sales by 88 percent.

This study further suggested that farmers can benefit a lot from using low-cost hygrometers to accurately measure moisture content in maize. Grain is quickly spoiled by fungi contamination if it is not dry enough when stored. One or two percent lower moisture levels can make a big difference in reducing aflatoxin contamination.

"Farmers could put maize grain samples in a plastic bag and insert low-cost hygrometers to read moisture content after temperature is stabilized in 15 minutes," says Purdue University professor Jacob Ricker-Gilbert. "They then know if their grain is safe enough for storage or not.



However, standard hygrometers cost around \$100, which is out of reach for many small farmers."

Purdue University, CIMMYT and KALRO conducted a market survey in 2017 among maize farmers and traders in Kenya to assess their willingness to buy low-cost hygrometers. The survey found that farmers were willing to pay an average price of \$1.21 for a hygrometer, while traders said they would buy at \$1.16 each. The project was able to get cheap and reliable hygrometers at less than one dollar, opening the door for possible commercialization. One company, Bell Industries, has started to market the devices as a pilot.

Raising farmers and policymakers' awareness on appropriate storage and drying technologies is now a priority for scientists working on the FPL project, which will hopefully lead to less maize spoiled and better food safety.



"If these bags are sealed properly, oxygen cannot get in or out. This creates an anaerobic environment that suffocates grain-damaging insects and prevents fungi from growing"

# International Research For Development Coalition Against Fall Armyworm, The Not-so-Nice, Very Hungry Caterpillar

African farmers have lost millions of dollars in earnings since 2016 due to the loss of crops to the voracious fall armyworm.

Since the initial shock, farmers, researchers, extension officers, agribusinesses, governments and donors have reacted quickly to fight the invasive pest in various ways, including with pesticides, agroecological approaches and new seeds.

Yet the situation is far from under control. A more coordinated research-for-development (R4D) action plan is urgently needed to ensure that effective and affordable solutions reach smallholder farmers in sub-Saharan Africa so they can sustainably combat the devastating pest.

Smallholder farm socioeconomics are highly complex, which makes adoption of any new technology or practice a challenge. “We must look at the big picture to design safer, accessible, effective and sustainable solutions against fall armyworm,” said Martin Kropff, director general of the International Maize and Wheat Improvement Center (CIMMYT), which jointly coordinated “Fall Armyworm Research for Development: Status and priorities for Africa,” an international conference held from Oct. 29 to 31 at the African Union Commission in Addis Ababa, Ethiopia.

Hosted by the Fall Armyworm R4D International Consortium, the conference was

aimed at drawing a science-based roadmap to combat the hungry caterpillar. The partners organizing the conference were the African Union Commission (AUC), the Alliance for a Green Revolution in Africa (AGRA), the Centre for Agriculture and Biosciences International (CABI), CIMMYT, the Food and Agriculture Organization of the United Nations (FAO), the International Centre of Insect Physiology and Ecology (icipe), the International Institute of Tropical Agriculture (IITA), and the United States Agency for International Development (USAID).

#### **Vulnerable smallholder farmers**

African leaders consider the invasive fall armyworm “a big threat for African food security,” said Amira Elfadil, African Union Commissioner for Social Affairs, at the opening of the conference.

The caterpillar has munched through thousands of hectares of maize, sorghum and a few other commercial crops across Africa and is causing severe concerns among food and agriculture experts and policymakers. Since it was first detected in Nigeria and São Tomé, the moth has spread across more than 40 African countries and has been seen in India since July 2018. It could also invade Europe and other continents.

“Fall armyworm has been the fastest pest to expand across the continent,” said Eyasu Abraha, Ethiopia’s state minister for agriculture

development.

The pest is a familiar foe to agricultural experts and farmers in the Americas who have fought against it for several decades. However, the pest has found an ideal environment to flourish in Africa, with diverse agro-ecologies and a warmer climate all year round amplifying its persistent threat.

It has a host range of more than 80 plant species, including maize, a staple food on which millions of people throughout sub-Saharan Africa depend for food and income security. It can cause total crop losses, and at advanced larval development stages can be difficult to control even with synthetic pesticides. The female fall armyworm can lay up to a thousand eggs at a time and produce multiple generations very quickly without pause in tropical environments.

The moth can fly 100 km (62 miles) a night, and some moth populations have even been reported to fly distances of up to 1,600 kilometers in 30 hours, according to experts.

Entomologists are trying to fill a knowledge gap on how the fall armyworm behaves and migrates throughout Africa.

Solutions that may work to combat the pest in Brazil or North America may not be applicable for the agricultural context in Africa where most farmers are low-resource smallholders, struggling to access new knowledge and



technologies.

### High cost of ineffective collaboration

Hans Dreyer, director of FAO's plant protection division, listed many collaborative initiatives, including national task forces and expert working groups, which contributed to document and inform the current state of knowledge.

There are still many knowledge and technical gaps. Some resourceful information platforms are already available for the farmers and extension workers, including the fall armyworm web portal created by CABI, the mobile farmer Q&A service PlantVillage, or Precision Agriculture for Development's text messaging advisory service MoA-Info.

"The cost of not collaborating is pretty severe," said Regina Eddy, who leads the Fall Armyworm Task Force at the USAID Bureau for Food Security. The real gamechanger will be that "all experts in the room agree on a common and concrete research-for-development agenda and how to organize ourselves to implement it effectively," she added.

During the conference, the experts debated intensely on the technical gaps and the best ways to combat the pest through an integrated pest management strategy, including how to scout the caterpillar in the crop field, establish monitoring and surveillance systems, pest control innovations and appropriate policy support to accelerate introduction of relevant innovations.



Safe, sustainable, farmer-centered solutions Short-term responses to the pest at present include synthetic pesticide use. However, there are public health and environment concerns over some of the toxic pesticides being used in Africa to control the fall armyworm.

Brian Sobel from Catholic Relief Services recalled witnessing a woman in Malawi who, in an effort to combat the pest, sprayed much more chemical pesticide on her maize than necessary.

The rapid increase of the pesticide market in Africa has led to the circulation of plenty of banned or counterfeit products, some very toxic for the farmer, said Steven Haggblade, a professor in the Department of Agricultural, Food and Resource Economics at Michigan State University in the United States. Farmers are often not well trained in the use of such chemicals and do not protect themselves during application, he said.

Pesticide use has many negative trade-offs, said Paul Jepson, a professor of environmental and molecular toxicology in the College of Agricultural Sciences at Oregon State University. Natural enemies like parasitic wasps are also often far more vulnerable to pesticides than fall armyworm larvae, which are hard to reach and hide themselves in the maize whorls for instance.

### Continental action plan

A key recommendation made by the Fall

Armyworm R4D International Consortium is to develop common methodologies and research protocols to ensure data from various studies across the continent are better used and compared. For example, how best could the true impacts of the fall armyworm on food and seed security, public health and environment be measured? Collaborative research could include multilocation assessment of the relationship between observed crop damages and yield losses, which is key to determine the efficacy of a pest control innovation.

Conference participants also agreed to work on defining economic and action thresholds for fall armyworm interventions, to ensure better recommendations to the farming communities.

Because no one solution can fit all farmers and socioeconomic contexts, advice must include use of environmentally safer pesticides, low-cost agronomic practices and landscape management and fall armyworm-resistant varieties, among other integrated pest management tools.

Enhanced cooperation between countries to access new technologies and manage the transboundary pest is a priority. Consortium experts also urge an integrated pest management approach, initiated based on farmers' needs. Controlling the fall armyworm in the long run will require important investments into research-for-development for generating and sharing knowledge and addressing technical gaps with farmers.





## The 3 Most Important Factors for a Profitable Farm

Regardless of how you grow, the profitability of your farm will depend on three main factors: demand, viability, and profit margin. Lots of new farmers focus the majority of their efforts on their ability to grow a single crop and forget to do research on the other factors.

**I**n this decade, farmers should learn how to appropriately address questions:

1. What can you sell a lot of? What does your market want?
2. What are you good at growing?
3. What has a good profit margin?

For a profitable farm, you must consider all three. Let's start with how you know you can sell something well.

### What can you sell a lot of?

This is the most important thing: if people don't want it, you won't make money off of it. It may seem obvious, but it's easy to get excited and overlook the importance of demand.

Imagine that you've just invested a lot of money in starting up a farm. You've tried a few different crops but discovered that you've been able to grow maize especially well. Since you can grow it so successfully, you decided to overhaul your whole farm and plant tons of maize. Then you discover that your market does not want to buy maize. Now, your whole farm is taken up by rows and rows of maize, and you've got nothing to do with it. You're out of money and have no way to make it back.

This is why market research is so crucial. You need to know what people will buy from you not just once, but many times. You also need to know how much they want to consume on a regular basis so you don't end up with a lot of wasted produce. This is called market volume. Aim for high market volume—lots of people want to consume lots of what you're growing.

But market research isn't just looking at numbers. Spend a little bit of time talking to buyers and looking at what other people are growing. Is there a gap you could fill with your unique product? Could you alleviate customers' pain points by offering a better product at a better price? Take the Market Research for Farmers course to learn more about effective strategies.

In addition to high market volume, you want to choose a product that has low supply competition. If everybody grows maize and sells it at the market, you probably don't want to depend on maize for the success of your farm, even if you can grow it well.

Insider tip: Wholesale retailers—think grocery stores and restaurants—are great places to find information on demand because they'll have consistent records where you can get an





idea of what they've had success with in the past. This information is slightly more difficult to find in something like a farmers' market, where different vendors will have different experiences based on a variety of factors.

Low supply competition means that there are fewer people in your area growing it. This leads us to what you can grow well.

**What can you grow well?**

In your particular climate, with your particular capabilities, what grows best? Are you good at it? Do you understand it well? Are you excited about it?

Now that you know what people want, you'll need to successfully execute production. Say you find out that the market in your area has a high demand for beans. You figure it's a pretty good bet, and throw everything you've got into growing beans but you just cannot get the little buggers to grow. You are not going to make money.

You won't know what you're good at growing—or even if you like it—until you give it a try. You will likely experience some error, so when you're starting out keep it fairly small in order to minimize cost and risk. That said, this type of success isn't just dependent on your personal farming abilities. It will largely be influenced by where you farm, what type of

farm environment you have, and what type of system you're growing in.

Additional factors to consider are the costs and resources that are available to you. Do you have affordable access to the resources you need to build a successful farm? Unreliable or inconsistent availability of resources—like nutrients, plugs, and system repair parts—can throw a wrench in your production as well as your relationships with your customers.

Even if you can get reliable access, think about the total cost. Whether or not you have great profitability, you'll still need to make sure your costs are as low as possible. Finally, if you don't like doing it, even if all the other factors are there, it's possible that you won't do it well. Find something that you enjoy!

**What has a good profit margin? First of all, what is profit margin?**

Profit margin is the money you have left over after you pay to cover all of your costs. Some crops can provide better profit margins than others.

**Think of it this way:**

When you set up a farm, you pay capital expenses (CapEx) to acquire all of your system components, like media, lights, and structural components. Then, when your farm is running, you have operating expenses (OpEx) like water, electricity, and nutrients. The CapEx plus the OpEx is what you pay to create your product (the plants). You then sell the product, and the money you receive in return should be a larger amount than what you originally paid. The difference (what you sold your product for minus what you paid to create it) is your profit margin. Ideally, you have a positive profit margin.

During your market research process, you should also consider discovering what the possible profit margins are for a variety of crops. Research the nutrient and water demand of the crop in addition to the market demand.

Essentially, you want a crop that is cheap to produce, but that people will pay more for. Fortunately, being a digifarmer grower gives you a unique advantage because your product is likely higher in quality than what your customers have had previously.

All of your profit margins contribute to your net profit, which is the total amount of money you'll keep as a result of your sales. Much of the profit you make from selling your produce will need to be put back into your farm to keep it running and producing.

Business is about trade-offs and compromises, and you get to play the exciting game of finding the most profitable compromise for your business. For example, you could grow and sell a high volume of produce at a lower price, or more specialized produce at lower volumes and higher prices.

There are ways to make all of these cases work, and it will depend on your business model.

Decide based on your business model. Different markets and market types will provide different pros and cons when it comes to profit margin. Think carefully about the trade-offs between high volume versus high prices, and do your research—which works best for you?

**Making decisions**

If you do decide to focus your farming efforts on a single crop, ensure that:

- your market wants it,
- that you can grow it well,
- and that you can make money off it.

Say you discover that you are really good at growing irrigation maize, for example, and you have a lot of market demand for them. You may be able to get away with only growing and selling maize. While these are three critical decisions that can lead your farm to profitable success, there are other factors you'll need to consider as well, such as inputs, seasons, and environmental controls.



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Heaps of cow dung drawn from cattle ranches and farms in parts of Laikipia County is what hit you as you enter Mr Kuria Kiboi's farm. There are also mountains of chicken, goat and rabbit waste.

Mr Kiboi's business is to turn the waste into manure. He is the founder of Agri-Flora Organic Fertiliser Company in Nyahururu town.

"I have been doing research about the idea of transforming manure into a more efficient commodity for the last 15 years. My idea initially was just to crush the manure and pack it as powder but with time I realised I could pack it into a fully processed product, and therefore I set up the company early last year," Mr Kiboi told Enterprise at his factory.

Kenya has been seeking to boost crop production to achieve food security. Experts say the current low farm production is due to massive degradation of the soil.

Mr Kiboi says his aim is to help address this problem. "We employ natural raw materials in the manufacture of the fertilisers," he says. He plans to roll out high scale commercial production to meet the increasing demand. So how does the manufacturing process go?

Manure is kept for a period of six months to ensure it fully decomposes. It is then mixed with baked bones and ash which are rich in minerals like calcium and potassium.

"The bones are rich in phosphorus and calcium. All we do is to burn them up to break down the enamel, before we crash them into powder for easier absorption into the soil," narrates Mr Kiboi.

He says that a fortified foliar made from fruits refuses, milk and other products is added to the crushed powder to add nutrients.

"The mixture is then crushed and put in a granulator machine which converts it into

## Small Fertiliser Factory Takes On The Big Boys



granules," he adds. The granules, Mr Kiboi notes are then fed into a drier or left to dry naturally for two weeks after which they are fed into a screener that grades it into the standard fertiliser size.

Finally it is weighed and packed into 50kg bags which goes for Sh2,500 each. This is cheaper compared to the normal fertiliser in agro vets. "We are in the business of producing 100 percent organic fertilisers. This venture hopes to help farmers increase their yields while providing safe foods," notes Mr Kiboi. The enterprise also produces liquid fertiliser (foliar) which a farmer dilutes one litre with 40 litres of water during top dressing. "This year we experienced high demand from referrals by farmers who used our fertiliser last year and were impressed by the production," he says.

The journey to starting the company and working to have it well-grounded has not been easy, Mr Kinoti says. First, he needed a capital of about Sh10 million to procure the machines, install them and employ workers. Getting the funds was no easy task.

Another setback is the high cost of power, which is also unreliable.

"Challenges are there in any upcoming company and ours is not an exception. The main one include power availability and back-up as some time we have huge bills," he says. "Marketing of our products has also been a challenge to us."

The company has more than ten employees. He however regrets that the youth are few among the staff. "I have not been able to employ young people since they don't want technical jobs. These jobs are good yet the youth keep complaining there are no jobs," he says.

He encourages the youth not to discriminate against technical jobs as they can learn a lot of skills, which they can apply in their own businesses. He also wants young people to be creative and implement their ideas in order to improve their lifestyle and create employment for others.

Mr Kiboi is looking to expand his business, and has set sights on being a key supplier of the country's fertiliser in the next decade. He notes that the company has also ventured in other areas of business such as production of farm machinery, drilling boreholes and motor vehicle maintenance.

**R**ural women can help one another grow more and better food by pooling their cash and sharing new farming methods

This month's report from the United Nations' scientific panel on climate change highlights worsening food shortages as one of the key impacts of global warming.

Tackling the monumental challenges set out in the report may seem like a mountain to climb, given the policy changes and rapid government action required. Yet, on her 4-acre farm on the foothills of Mount Kenya in Embu county, 65-year-old Purity Gachanga proves it is possible to fight eroding soils, enrich farmland, and increase and diversify food production.

What's more, she shares her methods with 60 women making up a 'merry-go-round' group that meet regularly in her front garden. They each contribute a small sum of money which forms their communal savings system. "Many have put the money towards their farms but we also use it for other things we want like blankets, utensils or chairs," explains Gachanga.

The group also helps the women share new methods, she adds. "I have learnt many techniques from scientists during training days and I am always one of the first to try these out on my farm. So when we get together for the merry-go-round meetings, I show the others what I am doing and how well it works. They then want to try on their own farms."

Gachanga points to neat rows of fodder plants on the edges of her farm. "Before I would lose all this topsoil when it rained heavily. I learnt that planting certain varieties of fodder plants with deep roots holds the soil together. The plants also add fertility to the soil and give me good feed for my goats."

Her goats are very precious as besides providing milk and meat, they helped her pay the school fees for nine of her children. The animals are an essential part of her sustainable farming system as they provide fertilizer for her fields.

The farm is flourishing with beans, kale, amaranth, tomatoes and pumpkins. Gachanga rotates the crops so the soil is never left exposed. "I get a profit from each patch so it makes sense to plan how to use it. I make money, keep my soil and animals in good health and we have a varied diet ourselves." The training she has received is part of an initiative called the Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA), whose goal is to scale up proven soil conservation and food production techniques. Its







*A group of women from Kajiado who have also benefited from merry-go-round. - File Photo*

## ‘Merry-Go-Round’ Groups Spin Kenyan Women Farmers To Success

demonstration sessions bring researchers, extension agents, the private sector, and farmers together to discuss and share expertise, and Gachanga is a keen learner.

### RICHER SOILS, MORE FOOD

Continual farming and mono-cropping of maize along with minimal fertilizer and manure use has rapidly depleted African soil nutrients and resulting yields. Farmers are also used to feeding their livestock with crop remnants from their fields which leaves the soils exposed, further worsening erosion and soil fertility. To address this, farmers are encouraged to leave either all or some crop residues on the field and add nitrogen-fixing legume crops in rotations with cereal crops and forages.

SIMLESA is on target to achieve its overall goal of reaching 650,000 farmers and increasing farm productivity in Eastern and Southern Africa by 30 percent by 2023.

Rahma Adam, gender specialist at the International Maize and Wheat Improvement Center (CIMMYT) which is leading SIMLESA, said rural women can

access better opportunities by being part of a farming innovation group.

The Liganwa women farmers group in Siaya County in Kenya’s Nyanza Province, started in 2007 to help widows in the community get capital to start micro-businesses, and also uses the rotating ‘merry-go-round’ credit and savings system.

After initial challenges in raising capital, as some members were unable to pay their contribution, they joined SIMLESA as part of an agriculture innovation platform. “By experimenting with the demonstrated conservation agriculture techniques, the Liganwa women have since transformed their farming and incomes,” says Adams.

The platform has also enabled women as a group to negotiate better prices to buy inputs and sell produce. Better yields and markets mean members bring money to the group from the surplus maize they sell. So, the merry-go-round now turns with 3 to 5 times more borrowing capacity and 100 percent repayment rates.

One priority of the United Nations’ International Day of Rural Women on October 15 each year is to foster women’s empowerment through climate-resilient agriculture, as with Gachanga and the merry-go-round farmers groups. The challenge is making sure governments put policies and systems in place to ensure other farmers can, and want to, follow suit. The Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) is an eight-year food security programme supported by the Australian Centre for International Agricultural Research (ACIAR).

Launched in 2010, the programme is managed by the International Maize and Wheat Improvement Center (CIMMYT) and implemented by national agricultural research systems in Ethiopia, Kenya, Malawi, Mozambique and Tanzania. In Kenya, CIMMYT is working closely with the Kenya Agriculture and Livestock Research Organisation.

# Africa Needs its Young People To Modernize its Agricultural Sectors

We need to stress on the importance of creating jobs in rural areas

Migration, both to urban areas and abroad, risks depriving Kenya of the young people they need to modernize their agriculture sectors, which are key to achieving growth and prosperity.

It is crucial that Kenya also look at rural areas for agro-industrialization that can provide more opportunities for young people to find employment and remain in small villages and rural areas. Those who migrate from rural to urban areas are five times more likely to move abroad.

Economic growth has slowed down in recent years and the impacts of climate extremes have intensified, while conflicts continue to cause social disruption in some areas.

It is important to define joint strategies and implement common actions, such as the recently approved African Continental Free Trade Area. In particular, agro-industrialization can contribute to addressing historical dependency on food imports.

#### Investing in infrastructure

Paving the way for agro-industrialization

requires that we “urbanize rural areas,” and this means providing small villages with basic services, such as education, health, electricity, and internet access, which is “one of the main attractions for youth nowadays”.

“Small villages should be the place where farmers buy seeds, send their children to school, and turn to medical care and other services when necessary. It is very important to revitalize small villages through small agro-industries and cooperatives of family farmers.

More investment in infrastructure is also





important to connect producers, processors and other segments of the food value chains. This includes roads, transportation, storage capacity, energy, as well as water management.

These measures are key to creating job opportunities not only in agriculture production, but especially in various non-farm activities, such as services provision in general and rural tourism.

**The private sector, a crucial partner**

The private sector is a crucial partner, particularly in building the necessary infrastructure for economic growth and development. FAO has established more than 150 strategic partnerships with non-state actors, 50 percent of which are with private sector companies.

Through its relation with the private sector,



*A youthful winner of the Elgon Awards - File Photo*

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and other resources, mainly in support of the poorest countries and communities.

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# CEREAL FARMERS IN KENYA

FARM NAME	LOCATION	CONTACT PERSON	EMAIL	TELEPHONE	CROP MIX	ROTATION CROP
Chemusian ltd		Too	chemusian@gmail.com	0722209754	Wheat / Barley	
Kikwai farm		Patrick	padykikwai@gmail.com	0731817804	Wheat / Barley	
-	<b>ELDORET</b>	-	-	-	-	
Sergoit farm		Yani/ Kruger	tingaspik@gmail.com	0718338099	Wheat / Barley	Maize
Komol farm		George Killi		0722732757	Wheat	Maize
Mohammed		Kaittany		053-2062234	Wheat	Maize
Elfam ltd		Ngetich		0721517701	Wheat	Maize
Mace foods		Margret Komen		0722840799	Wheat	Maize
Kuinet Tarus		Tarus		0721934176	Wheat	Maize
Moiben Chepkener		Chepkener		0719506980	Wheat	Maize
Chepkorio		Jelimo		0722571355	Wheat	Maize
Kenya ordnance		Chirchir		0721851931	Wheat	Maize
Kandelo		Kandelo		0720305041	Wheat	Maize
Kimoso		Kimoso		0734858619	Wheat	Maize
Silas Tiren		Tiren	skktiren@africaonline.co.ke	0725792463	Wheat	Maize
Shiv enterprises		Albert Kimwatan		0722652300	Wheat	Maize
Timothy Busienei		Busienei		0727085756	Wheat	Maize
Plateau Ngeria		Sile		0724752143	Wheat	Maize
Victoria Chebet		Chebet		0753466025	Wheat	Maize
Maji Mazuri		Ziwa		0723024971	Wheat	Maize
Kibogy Moiben		Kibet		0728706668	Wheat	Maize
Kapkabai Farm		John	wilchem@africaonline.co.ke	0722724990	Wheat	Maize
-	<b>ATHI RIVER</b>	-	-	-	-	-
Ausquest ltd		Stuart Barden	stuartbarden70@gmail.com	0703119444	Barley/ Wheat	Sorghum
-	<b>KITALE</b>	-	-	-	-	-
Bubayi		Jonathan Mayer		0735488001	Wheat	Maize
Panocal		Chris Carpenter	cereals@panocal.co.ke	0719505785	Wheat	Maize
Murmet		Chelimo		0722571355	Wheat	Maize
Cheptembe farm		Robin		0722817638	Wheat	Maize
Robert		Tuitoek		0722813381	Wheat	Maize
Biwott		Biwott		0720955748	Wheat	Maize
Express Farm		Mbugua		0722766176	Wheat	Maize
Western seed company		Harry		0720897860	Maize/ Wheat	
Kenya seed company		Mwarei		0722614639	Maize/ Wheat	Barley
ADC Farms Edward			edwardmwando@gmail.com	0728453942	Maize	Sunflower/ Pasture
-	<b>MOLO</b>	-	-	-	-	-
EAML		Gacheru		0722791563	Contracted farmers	Barley
-	<b>KISUMU</b>	-	-	-	-	-
Dominion farms ltd		Okoth		27494585	Rice, Maize, Sugarcane	



# CEREAL FARMERS IN KENYA

FARM NAME	LOCATION	CONTACT PERSON	EMAIL	TELEPHONE	CROP MIX	ROTATION CROP
-	<b>MT. KENYA</b>	-	-	-	-	-
Oldonyo ltd		Brynn	brynn@oldonyo.co.ke	0722817163	Wheat/ Barley	Peas, Canola
Kisima ltd		Shaun	shaun@kisima.co.ke	0729924353	Wheat/ Barley	Peas, Canola
Wangu Investment		Ben	ben@wanguembori.co.ke	0724545475	Wheat/ Barley	
Marania ltd		Jamie	marania@maraniafarm.com	0721573634	Wheat/ Barley	Peas, Canola
Lengetia ltd		Sessions	Lengetiafarm@gmail.com	0722332647	Wheat/ Barley	Peas, Canola
Mastermind ltd		Gitonga	dgitonga@mastermindkenya.com	0722751488	Wheat	
Tumili ltd		David Beak	tumili@wananchi.com	0722823543	Wheat/ Barley	Peas, Canola
Thamba Ngombe		Thamba	thamba@gmail.com	0724927351	Wheat/ Barley	
Mt Kenya saw mill		shah	nainhshah@gmail.com	0722511691	Wheat	
-	<b>NAROK</b>	-	-	-	-	-
Simba Estate		SS. Dhillon	simbaestate@simbaestate.com	0722511460	Wheat	Maize
Farm Africa ltd		Raghu	raghu.penmetsa@farm-africa.com	0788299442	Wheat	
Lalela ltd		Neylan	neylan@macc.com	0722385329	Wheat	Sorghum
Mann Wheat ltd		Magal		0722518964	Wheat	
Green Farms		Wambugu		0722287337	Wheat	
South Sioux Farm		Guri	gurbir@southsiouxfarms.com	0722676878	Wheat	
Olerai ltd		Alistair	alandbill@olerai.co.ke	0728484659	Wheat	Seed Maize
Talent Farm		Paul	sarpau@internode.on.net	0729846736	Wheat	
Rm Farms		Amit and Sanju	rishi-amit2007@yahoo.com	0722225330	Wheat	Maize
Ndovu estate		Viney		0722824793	Wheat	Maize
Country motors		Singh	country@africaonline.co.ke	0722764763	Wheat	
Oldonyo Nairasha Estate		Karan	ssdhillon@africamail.com	0722323296	Wheat	Maize
Development Trust		David		0724741718	Wheat	Canola
Oratili ltd		Mahesh	farmpartsltd@africaonline.co.ke	0722848474	Wheat	Canola
Upland crops		Koos	fm@uplandcrops.com	0704681651	Wheat	Maize
-	<b>NAIVASHA</b>	-	-	-	-	-
Kijabe ltd		David Cullen	ndabibi@gmail.com	0729950910	Wheat/ Barley	
Soyonin ltd		Benjamin Kipkulei		0733605071	Wheat	
Livewire Ltd		Goddy Millar	info@livewire.co.ke	0722205992	Wheat / Barley	
-	<b>NAKURU</b>	-	-	-	-	-
Lesiolo ltd		Tundo Franco	frtundo@gmail.com	0724333322	Wheat / Barley	
Madrugada		Jonti	jonti@madrugada.co.ke	0722734179	Wheat / Barley	Maize, Peas, Canola, Sunflower
Tony		Hughes	hoozie@swiftkenya.com	0722808058		
Chepkonga		Andrew	andychep@yahoo.com	0710308917	Wheat / Barley	
Siruai		Rose	skvarose@gmail.com	0722865892	Wheat / Barley	Maize
Sasumua Agriculture		Luke	luke@sasumua-agriculture.com	0722779618	Wheat / Barley	Canola, Peas, Sunflower, Maize
Kenana Farm		Oliver	pkenana@africaonline.co.ke	0722725002	Wheat / Barley	Canola, Peas, Sunflower, Maize
Remsons Ltd		Mugambi	remsons.ltd@gmail.com	0722807773	Wheat / Barley	
Molodowns		Chris Foot	ckfoot@gmail.com	0722717130	Wheat / Barley	
Gogar Farm		Simon	md@gogar.co.ke	0722327718	Wheat	Maize
Kinoru Farm		Barlow	barlow@africaonline.co.ke	0725777479	Wheat / Barley	canola, Peas, Sunflower
Comply industries		Sandhu	sckihumba@complyindustries.com	0729870025	Wheat / Barley	

## New Initiative to Improve Access to High Quality Maize Seed for African Farmers

Research partners to develop new maize hybrid seed production system to help smallholder farmers access modern, high quality maize hybrid seed.

An initiative launched in 2016 seeks to provide African smallholder farmers with better quality and high yielding hybrid maize seed. The Seed Production Technology for Africa (SPTA) initiative strives to improve seed production systems to ensure that high-quality hybrid maize seed is available to smallholder farmers, as well as to deliver new hybrids with a high yield potential adapted for low fertility areas common in sub-Saharan Africa (SSA).

SPTA will utilize a technology provided by Corteva Agriscience, and implemented by the Agricultural Research Council of South Africa (ARC) alongside the International Maize and Wheat Improvement Center (CIMMYT), and the Kenya Agricultural and Livestock Research Organization (KALRO). Funded by the Bill & Melinda Gates Foundation, the four-year initiative will cost US\$ 6.4 million.

“As Africa faces significant challenges of low maize yields, climatic extremes and variability, costly farm inputs, threats due to pests and diseases, and growing demand for food, it is critical to provide smallholder farmers with access to high quality and stress resilient modern maize hybrids to allow them to increase yields and incomes,” said Kingstone Mashingaidze, Senior Research Manager at ARC.

The SPTA process will address pressing seed production concerns in the region that include insufficient genetic purity due to pollen contamination resulting from improper or incomplete detasseling practices. As a result, small and medium seed companies are expected to produce greater volume of hybrid maize seed at lower cost. Partner seed companies in the region will access the technology royalty free.

Maize productivity in Africa lags behind other maize producing regions, and through SPTA more smallholders will improve their yield. Average maize yield in much of Africa is approximately 2 metric tons per hectare, which is less than 20 percent of the yield level in more productive parts of the world.

Farmers cannot access or afford high quality seed. Only 57 percent of the SSA maize growing area is planted with recently purchased seed; a lot of hybrids grown in the region are obsolete – 15 years or older compared to an average of less than 5 years in highly productive regions. In many



situations, seeds of these older varieties are no longer suited for the climate and cropping environments that exist today.

Hybrid maize seed delivered through SPTA will have higher yield in low fertility environments. This will enable resource-constrained farmers to harvest more despite limited inputs like fertilizer. This means stronger livelihoods coupled with improved professionalism in the maize seed value chain for farmers, seed companies, consumers, and governments to deliver a more food-secure future.

SPTA originated from the Improved Maize for African Soils (IMAS) project that concluded in 2015. IMAS focused on developing maize hybrids that could use nitrogen fertilizer more efficiently to deliver higher yields under low fertility conditions prevalent in Africa. The IMAS project was funded by the Bill & Melinda Gates Foundation together with the United States Agency for International Development.



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