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## Editorial

### Simple steps to sustainable agriculture

*Since the industrial revolution in the 18th century we produce the majority of our foods through industrial agriculture which is characterized by large farms growing the same crops year after year, using large amounts of fertilizers and pesticides which not only damage the soil but also the climate. Although it may seem like a fairly new concept in Africa sustainability has been around as a concept since the early 90s. The goal of achieving sustainability is to be able to meet the basic needs of the current habitats while simultaneously conserving it for future generations.*



*So what exactly does sustainable agriculture mean? Simply put sustainable agriculture means to keep in existence practices that conserve our resources environmentally, economically and socially without compromising the quantity or quality of production. So what are some of these practices that we can incorporate that promotes ecological health?*

*Crop rotation: Planting a variety of crops has many benefits including healthier soil, improved pest control.*

*Planting cover crops: These are crops that are planted during off season when the land would otherwise have been left bare.*

*Integrated Pest Management (IPM): This includes using a range of mechanical and biological measures to control pests. This is done so as to minimise the use of chemical pesticides.*

*Unification of livestock and crop farming: Just like you saw your grandmother do when you were little using the excretion of the livestock as manure for her crops. This helps to minimize the use of chemical fertilizers which may be harmful to the environment.*

*Masila Kanyingi  
Editor*

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**Cereals**

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# NEW, SAFE & EFFECTIVE BIO-BASED SOLUTION TO CONTROL FALL ARMY WORM

## 100% bio-based solution

Compatible with IPM Program

## Highly efficacious

High level of control when used at the right stage

## Highly Specific

Targeted for Fall Armyworm and does not harm the beneficial insects

**Dose : 100 mL/ha**

**2-3 applications, 1 week interval**



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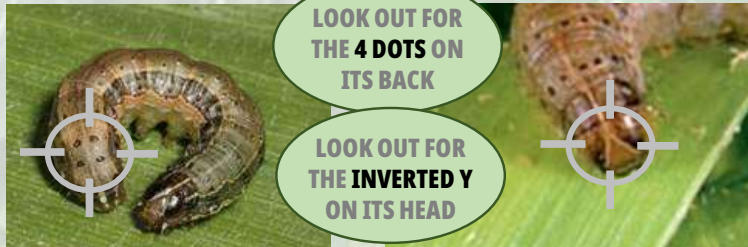
## WHAT IS FALL ARMYWORM?

Fall Armyworm (FAW) is a pest that is causing significant damage to maize and 80 crops. FAW can ruin 40% of farmer's harvests and threaten food security!

## WHAT IS FAWLIGEN?

Fawligen is a non-toxic, non-hazardous, and highly specific biological pest control product which delivers long-lasting control of FAW.

## WHAT DOES FALL ARMYWORM LOOK LIKE?



Damage caused on Maize by early-stage FAW



Do not wait for this stage ↓



Damage caused on Maize by advanced FAW

Instar	Age (days)	Size category	Length (mm)	Actual size	Fawligen timing
1st	0 - 1	Very Small	1 - 2 mm		✓✓
2nd	2 - 3	Small	3 - 4 mm		✓✓
3rd	4 - 5	Medium (small)	5 - 8 mm		✓
4th	6 - 7	Medium (large)	9 - 14 mm		✗
5th	8 - 9	Large	15 - 20 mm		✗
6th	10 - 14	Very Large	21 - 30+ mm		✗

1. Early scouting and spraying at the right larvae stage is critical for best product performance.
2. Spray late in the afternoon or early in the morning when the temperatures are between 20°C to 35 °C.



## HOW TO APPLY FAWLIGEN

Dose : 100 mL/ha

Crop: Maize

Application: 2-3 sprays – 1 week interval

Targeting application at 1st and 2nd Instar larval stages

Storage Requirements:

Store Fawligen in a cool place, avoid direct light

## WHY USE FAWLIGEN?

**Highly efficacious:** Dead caterpillars liquefy and spread the infection.

**Highly Specific:** Targeted for Fall Armyworm and does not harm beneficial insects.

**Biological:** Bio-based solution with equivalent efficacy to chemical product.

**Non-Toxic:** Safe for farmers and for the environment.

**Excellent cost/benefit ratio.**



# Lessons from India

## *Improving Agriculture Sector Productivity in Kenya through CBET*

I was privileged to participate in a technical and human resource training dubbed “Engaging Africa: Global Partners for Agricultural Development” which took place at Tamil Nadu Agricultural University, Coimbatore India in partnership with Dalhousie University, Halifax, Canada.

The project is supporting Uganda Skills Development Project (USDP), funded by World Bank and Agricultural Transformation through Stronger Vocational Education (ATTSVE) in Ethiopia, which is supported by Global Affairs Canada. The projects focus on transforming existing agricultural colleges into competency-based education and training (CBET) Centres of Excellence as part of the grand strategy to achieving food security. The choice of venue was informed by a lot of similarities in terms of development levels and environment between India and Africa.

During the training, relevant information on food security and employment situations in India was shared. While the population of India is currently estimated at 1.37 billion, the country is not only food secured, but also exporting various food stuffs that include rice, sugar, soya bean, corn, dry beans and wheat to over 163 countries all over the world. Presently, the country is the lead exporter of rice and dry beans and third exporter of coconut after Indonesia and the Philippines.

### Green Revolution

The success of agricultural sector in India is attributed to two critical policy documents namely green revolution and doubling farmers’ income. At the time of its independence, India was an agricultural dependent economy and yet the state of Indian agricultural sector was dismal.



Mr. Kipkirui Langat

From the lack of investment, a dearth of technology, low yield per acre and many such problems plagued the industry. The Indian government took steps to bring about the Green Revolution using High Yield Variety (HYV) seeds. The first introduction of HYV was done in 1965 coupled with better and efficient irrigation and the correct use of fertilizers to boost the crop with a view of making India food secured country.

## “Specialist institutions will help in establishing national centres of expertise”

The impact of the green revolution saw the production of wheat increased to 55 million tons in 1990 from just 11 million tons in 1960. Similar trends were also witnessed in other crops like rice and other cereals where there was generally increased yield per acreage. Increased agricultural productivity also led to creation of employment especially in rural areas due to supporting industries like irrigation, transportation, food processing and

marketing requiring workforce.

### Empty Pockets

However, the strategy did not explicitly recognize the need to raise farmers’ income and did not mention any direct measure to promote farmers’ welfare. The net result has been that farmers’ income remained low, which is evident from the incidence of poverty among farm households. The low and highly fluctuating farm income was causing detrimental effect on the interest in farming and farm investments, and forcing more farmers, particularly younger age group, to leave farming. This caused serious adverse effect on the future of agriculture because the income earned by a farmer from agriculture is crucial to address agrarian distress and promote farmers’ welfare.

With this in mind, the government set a goal to double farmers’ income by 2023 as central to promote farmers’ welfare, reduce agrarian distress and bring parity between income of farmers and those working in non-agricultural professions.

### Emphasis On Research & Training

For this to succeed research and training institutions were required to come up with technological breakthroughs for shifting production frontiers and raising efficiency in use of inputs. This included expanding the scope of agronomic practices like precision farming to raise production and income of farmers substantially. Similarly, modern machinery such as laser land leveller, precision seeder and planter, and practices like System of Rice Intensification (SRI), direct seeded rice, zero tillage, raised bed plantation and ridge plantation allow technically highly efficient farming.

### Doubling Farmer's Income

However, these technologies developed by the public sector have very poor marketability. They require strong extension for the adoption by farmers. R&D institutions were tasked to include in their packages for grassroots level innovations and traditional practices which are resilient, sustainable and income enhancing. They were also to develop models of farming system for different types of socioeconomic and bio physical settings combining all their technologies in a package with focus on farm income. This would involve combining technology and best practices covering production, protection and post-harvest value addition for each sub systems with other sub systems like crop sequences, crop mix, livestock, horticulture, forestry. This is complemented by better price realisation, efficient post-harvest management, competitive value chains and adoption of allied activities. Such shift requires interdisciplinary approach to develop on knowledge of all disciplines.

### Devolved Implementation

Most of the development initiatives and policies for agriculture are implemented by the States and therefore, development of competent workforce at all levels became the key priority area of concern of each State. India currently has a total of 63 agricultural universities and several colleges with at least a university in each of the 33 states. All the agricultural universities and colleges across the country implement a common curriculum developed by Indian Council of Agricultural Research (ICAR), however each university can make up to 20% changes to customize it to the requirements of each States.

For example, at Tamil Nadu Agricultural University is the state university for Tamil Nadu and currently collaborating with

14 public and 32 private colleges to implement a common CBET programmes in agriculture. The training and assessments of the students are jointly conducted by the university and the colleges, and qualifications offered by the university. The university is working very closely with all stakeholders in the agricultural sector to develop market driven programmes right from certificates to postgraduate. Graduate from the university and the colleges provide services to farmers, agro-processing industries, logistics and distribution, and cooperative societies, while a number of them also go to self-employment.



### Employment Availability

Each campus has a placement officer to assist students in securing jobs. The university collects information about availability of opportunities and share the same with students and more often organisations are invited to conduct interviews on campus. The university also has a directorate of Agribusiness which provides incubation facilities to nurture and commercialise student's business

ideas. The success of job placement is also attributed to very strong and active alumni linkage.

### University Led Government Policies

The university is also involved in various aspects of research in agriculture geared towards supporting the government and farmers. Some of their research outcomes have informed evident driven policies especially land use policy, mapping of the country for crop suitability, market accessibility, agro-processing and reduced cost of production. Other include access to clean planting materials, fertilizers, agro-chemicals, animal feeds and other animal health services.

The university also collaborate with Agricultural Skills Council of India (ASCI) to support capacity building by bridging gaps and upgrading skills of farmers, wage workers, self-employed & extension workers engaged in organized / unorganized segments of Agriculture & Allied Sectors.

### Specialist Universities Way to go for Kenya

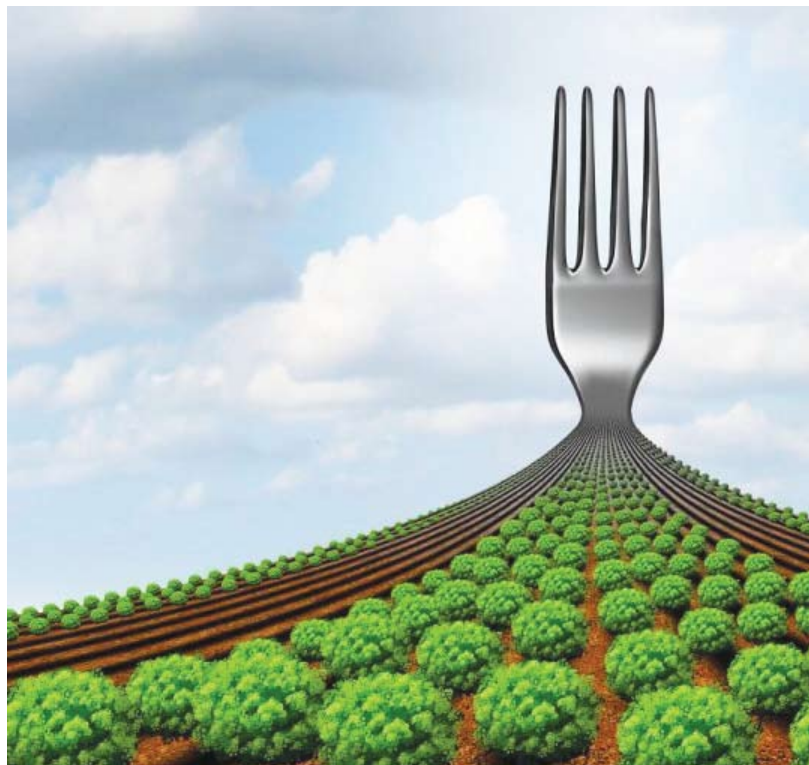
The Indian experience of Specialist University is a good example that institutions of higher learning in Kenya may need to consider. Specialist institutions will help in establishing national centres of expertise in key areas of the economy as key to economic growth is both research and knowledge transfer. The institutions will also be employer-focused and combine academic knowledge with practical application. This will also provide a perfect opportunity for universities and colleges to collaborate in addressing knowledge and skills requirements for a specific sector as a value chain.

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*Kenya's second budget under the shadow of the COVID-19 pandemic has prioritised a stimulus for economic recovery and the implementation of President Uhuru Kenyatta's legacy projects. In the ast full financial year, the emphasis is clearly on finalising ongoing investments and creating a suitable environment for economic recovery to safeguard livelihoods.*

*The agriculture sector, which contributes 34% of GDP has received a slightly bigger share of the budget and remains vital to the country's economic recovery strategy.*

*However, challenges exist within the sector that call for increased investments by both the public and private sectors. In 2020, widespread flooding damaged cropland and increased post-harvest losses. Desert locust infestations in arid and semi-arid areas also destroyed about 175,000 hectares of crop and pastureland affecting the livelihoods of nearly 164,000 households.*



Mr. Ukur Yatani, CS Finance

## Budget Allocates Billions to Agriculture

The budget has allocated 2.4% to agriculture to be administered by the central government, an increase on last year's 2.2% allocation.

Finally, the COVID-19 pandemic disrupted the formal and informal food supply chains at the onset of the pandemic. However, the sector was able to provide livelihoods to more people who joined it from other sectors such as services and industry as the income opportunities declined due to the effects of the pandemic.

Although the budget addresses these issues, there are likely to

be challenges in implementing the promises. On one hand, the government is battling to raise adequate revenue to support expenditure and on the other it is also hard pressed to keep spending in check and borrowing within acceptable limits.

Furthermore, Kenya needs to address inefficiencies in spending to attain the goals outlined in the budget. These include enhancing effectiveness of public expenditure





to agriculture. Therefore, the combined investment by the government in the sector is expected to be about 3.2% of the total budget if county governments maintain the same pattern as in the past. This means that the total funding to the sector is still way off Kenya's international commitment of 10%.

On the plus side, this year's agriculture budget has allocated funds more equitably across sub-sectors. Money will be provided for programmes that promote resilience against climate change and variability. There's also funding to enhance productivity and incomes for smallholder farmers through provision of subsidised inputs for example.

Kenya's livestock sub-sector has been constrained by low productivity, climate change, high costs of production and poor access to markets. Farmers also face inadequate access to quality improvement assistance such as extension services, artificial

insemination, and veterinary services. In light of this, the allocations to a national stock insurance programme are in line with the risk mitigation and resilience measures.

There are also some tax measures, which include the waiver of import duty on inputs for the textile and apparel industry.



This is an intended boost for the revival of cotton-growing areas. Another is the introduction of import duty on leather products geared to improve the fortunes of a flagging leather industry.

Furthermore, there is an allocation of Ksh 1 billion (about US\$10 million) for a new fish processing plant near the new port of Lamu on the coastline. The government also plans to complete another processing plant in Mombasa, the

**TO PAGE 8**

by allocating finances to programmes that have the greatest impact, making project funding available when required and reining in wasteful expenditure.

#### **Allocations to agriculture**

The budget has allocated 2.4% to agriculture to be administered by the central government, an increase on last year's 2.2% allocation. In addition, due to the devolved governance system in Kenya, further public investments in the sector will be made by county governments.

The budget allocated to county governments is 12% of the total budget. In the past, they have been allocated an average of 6% of their budget





CS Finance, Mr. UKur Yatani with Budget and Aproprition Committee Members

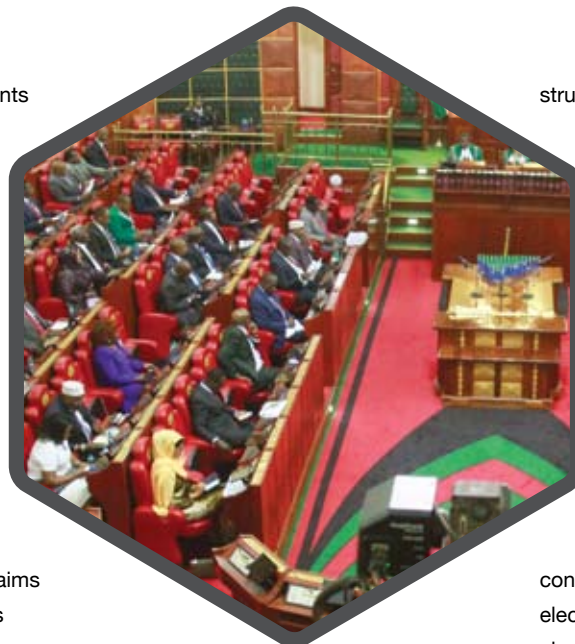
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country's major port. Further investments in the blue economy will be made to triple the current contribution to GDP by exploiting its untapped maritime resources.

**The challenges**

Overall, the budget outlay confirms that the key priorities revolve around the president's Big Four Agenda, which includes food security. They are also in line with the objectives outlined in the government's 10-year agricultural growth strategy. The plan aims at increasing productivity and incomes for smallholder farmers, improve value addition for agricultural output and increase households' food security.

It remains to be seen whether government can shake off the worst of the 2020/21 financial year that is, the challenge of raising adequate revenue to finance its



programmes. This had a knock-on effect on timely disbursement of funding to spending centres.

The 2020/21 budget was constrained by a lack of liquidity as the government

struggled to raise revenue amid the pandemic. The government then borrowed heavily, and the increase in the consolidated funds suggests that debt servicing will be a big drain. Rising debt threatens macroeconomic stability and may scare investors, or make it difficult to attract investments especially if the government is in risk of default on repayment.

The government must also maintain political stability amid the push for a constitutional referendum before general elections in August 2022. In the past, electioneering – and the threat of instability – have been associated with economic slowdown.

This would greatly constrain progress on the transformation agenda, due to under-investment, both public and private, in the sector.





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# Wheat farming: Costs and profits per acre in Kenya

Farmers in Kenya are very enterprising and hardworking people. This explains why there are numerous different projects that people are willing to try out.

*Wheat farming in Kenya is one of the most lucrative farming ventures that any farmer can undertake especially if they have large tracks of land. The question remains; how can you engage in wheat farming and make profits out of it. After all, wheat is the second cereal crop that is most consumed in Kenya after maize. Its economic significance can therefore not be ignored. With proper management, it is possible to reap great benefits from the wheat farming business in Kenya.*

## Understanding wheat production in Kenya per acre

For optimal production, you need to understand the conditions that promote growth. Those doing large scale wheat farming in Kenya have understood what it takes to be a success.

## Favourable wheat growing conditions in Kenya

Gently **sloping land** that allows for mechanization. Wheat requires a lot of machine farming to be successful

The **right altitude** for growing wheat ranges from 1500 -2900mm. This is a perfect altitude especially because it helps in disease reduction

Wheat requires **moderate rainfall** which should be from 500mm to 1270mm.

The **temperatures** should be between 15 degrees to 20 degrees especially for the first

three months which will promote growth and maturity.

The soils that support wheat farming are deep **volcanic soils** that are well drained

After the first three months, wheat require dry, **sunny spells** that will promote ripening and harvesting

## Understanding the cost of wheat farming in Kenya

The fact that you are doing wheat farming as a commercial farmer means that you must put into consideration all the production costs involved from the time you plant to harvesting. It is crucial therefore to know how much you will need to make this project a success. You have to buy inputs and will incur other expenses. Land leasing, ploughing, harrowing, fertilizer, chemicals and harvesting.

Planning for such costs would work excellently for you. You do not have to worry about harvesting fees because this will be paid by the companies coming to buy the wheat while still on the farm. Wheat and barley farming in Kenya has grown because of the demand for these products. Companies are always on the lookout for farmers that have the products in bulk, therefore, the market will not be an issue. In fact, for wheat, the government buys from







disappoint. Farmers need to be well prepared with herbicides to curb any problem that could arise from attacks by pests and diseases. You need to constantly talk to agronomist and other experts to ensure that you have the right pesticides for your wheat at every stage

**Costly storage even after harvesting:** Sometimes farmers are forced to sell their wheat at a throwaway price because they lack sufficient storage.

Wheat farming is a very lucrative venture for Kenyan farmers, especially because there is enough demand for wheat both in the domestic market and also for export. If there is a way of curbing the challenges that farmers face and addressing the issues that affect production, then there is a chance that farmers could earn even more from this kind of farming.

Wheat farming can be very fruitful especially when done on a large scale because you are able to cut down on cost. With the support that the government is giving farmers for the same, this appears to be a line of farming that those in favorable climatic regions should consider seriously.



its farmers at a reasonable price per bag. With an estimate of 12 bags per acre, a farmer is able to calculate their potential profits before they can even decide to invest in this type of farming.

**Challenges in wheat farming**

There are certain problems facing wheat farming in Kenya just as is the case with other crops. The questions on how profitable is wheat farming in Kenya can only be answered after understanding the cost of the challenges and deciding if it is worth it. Wheat has a number of challenges including the following.

**Climatic challenges:** It can be a major issue when droughts set in at the time when the crop is still at the maturing stage. This is because wheat requires well-distributed rain to mature. Things can also go south very fast when dry season is needed for ripening and harvesting, and instead, heavy rain falls.

**Pests and diseases:** This is probably the major problem when climatic conditions do not





**The Kenya Agricultural and Livestock Research Organization has developed bread wheat varieties (hereafter wheat varieties) for various stresses and quality in a period spanning over 85 years. During this period, 180 wheat varieties have been released to farmers for use. The goal has been to contribute to enhanced food security as well as economic development at the farm, community, and national levels. Through strategic partnerships, the goal of the wheat breeding programme extends to regional and global frontiers.**

# Wheat Farming: Production and Maintenance of Quality Seed



By Macharia G. and Rukwaro G.

Seed is a primary input in crop production. For seed to play a catalytic role in crop production, it should be accessed by farmers in good quality and quantity. Good quality seed can be defined as seed of an adaptive variety with high varietal species and physical purity, high germination and vigour. The seed should be free from seed-borne pests and diseases and clean, treated and clearly labelled.

The availability, access to and use of quality seed of adaptable wheat varieties are important considerations in increasing wheat production and productivity. Seed quality comprises of many aspects, but four key attributes may be identified:

**1. Genetic quality:** This is the inherent genetic make-up of the variety contained in the seed, which provides potential for higher yield, better grain quality and better tolerance to abiotic and biotic stresses.

**2. Physiological quality:** This is the viability, germination and subsequent seedling emergence in the field.

**3. Physical quality:** This includes freedom from impurity (that is freedom from other crops as well as common and particularly harmful and parasitic weed seeds); seed size; seed weight; and seed lot uniformity.

**4. Health quality:** This includes the absence of infection or infestation with seed borne diseases and pests.

#### Seed maintenance and multiplication

The purpose of seed maintenance is to produce new lots of breeder seed with the same genetic composition. It is the task of breeder to maintain the variety once it has been released. For wheat, plants representing the variety are grown in ear-rows and carefully observed. Plants from selected rows are harvested and grown in small plots; row-plots. Breeder seed is produced from plots with the best wheat crop and highest crop purity. The initial small amount of breeder seed is initially multiplied to produce basic seed which is further multiplied to large quantities of certified seed or commercial seed to satisfy farmers' requirements.

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*The recommended seed rate should be used when a crop is sown at normal time to achieve the right plant population for adequate competition with weeds and for better yields.*

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#### Steps in Production of Quality Seed

##### *Selection of adapted varieties*

The variety is selected from a list of recommended varieties.

Apart from its adaptation, the variety should have high yield potential, tolerance to abiotic and biotic stresses and have good marketability and consumers preferences.

##### *Selection of seed source*

After selecting the variety, the seed for planting should be chosen from a good source. Good quality seed comes from a known source such as from the plant breeder at the agricultural research centre who provide Breeder seed. This class and subsequent classes of seed assures high varietal purity and germinability.

##### *Selection of production field*

The amount of Breeder seed normally used for seed production is of small quantity and hence has to be “increased” in large production fields to achieve the large amounts of “certified” seed that is required by farmers for commercial wheat production. Fields selected to ensure high quality seed production should have the right previous cropping history known to avoid genetic, mechanical and pathological contamination in seed

production. Land selected for seed production should be free from varieties of the same crop species for at least one year prior to planting.

In wheat seed production, other cereal crops such as oats, barley or rye should be avoided since it will be very difficult to purify by rouging if contaminated with these cereals. The field for seed production should also be free of harmful weeds and seed/soil borne diseases.

##### *Land and seedbed preparation*

Proper and timely tillage preparations are necessary to improve the soil moisture conservation and physical properties. It also reduces weed and volunteer plant population, reduces disease and pest inocula; and enhances germination, emergence and establishment.

##### *Sowing date, sowing rate and method*

The time of sowing depends on the variety and area

of adaptation. A seed crop must be planted at its recommended time. Late planting is not recommended. The optimum seed rates may vary with crop, variety, location and method of planting. The recommended seed rate should be used when a crop is sown at normal time to achieve the right plant population for adequate competition with weeds and for better yields.

##### *Weed control*

In seed production, contamination of the seed crop with other crops or weed seeds of similar physical characteristics must be



reduced to the minimum.

#### *Harvesting and Transporting seed*

It is critical that harvesting is done when the crop is dry enough and to avoid rainy days. Harvesting machinery should be thoroughly cleaned and checked for any potential contaminants. Moreover, harvested material should be placed in appropriate clean bags, labelled accordingly and immediately transported to the processing yard to avoid deterioration.

Transporting seed should ideally be done in water-proof but well aerated containers, and preferably seed for each variety transported separately to minimize unnecessary mixing.

#### *Seed processing*

Seed requires processing; the seed is dried, cleaned, graded, sized, treated with pesticides and finally packaged. Seed processing is the most capital intensive because it involves the use of various

sophisticated equipment and often expensive seed dressing chemicals.

#### **Seed quality control**

The Kenya Plant Health Inspectorate Services (KEPHIS) inspects the seed crop at most stages to ensure high quality seed. Seed quality parameters include purity, germination, health, weed seed content, moisture content, and characteristics.

#### **Seed certification**

Seed certification ensures that the seed sold to farmers conforms to the indicated variety. It should also be sufficiently pure, of good germination capacity and disease free.

#### **Seed certification involves the following steps:**

**Field inspections** - to verify seed source, varietal identity, previous cropping, isolation distance, impurities and diseases. It is done by an inspector from KEPHIS during the various stages of growth of the crop.

**Seed inspection** - done at the processing plant and in the seed store. Seed samples are taken and tested at the seed testing laboratory.

**Pre-control and post control plots** - these are carried out by the seed certification agency (KEPHIS) on its farm to allow further verification of varietal identity, varietal purity, and absence of seed borne diseases. Precontrol plots are grown in the same season as the seed crop and results are used for certification. Post-control plots are grown from seed that is already certified and function as checks on the effectiveness of field inspection.

*Adapted from KARLO guide*

## Boost for farmers as CS Munya sets wheat prices at Sh3,700

The State has ordered millers to pay a minimum of Sh3,700 per 90-kilogramme bag of wheat, handing a boost to farmers long aggrieved by poor pricing. Agriculture Cabinet secretary Peter Munya said the new rate is a compromise deal after the farmers demanded Sh4,000 a bag against the Sh3,600 that the millers had offered. "We have agreed that millers will have to mop up the local wheat first at Sh3,700 before they can be allowed to import," he said after a meeting of growers and millers in Nairobi on Monday.

Market data shows that the cost of production ranges between Sh2,000 and Sh2,500 per bag, according to farmers, implying that the growers will not only break-even but also make a profit selling their produce at Sh3,700.

Mr Munya said the wheat production has dropped over the years, forcing Kenya to import more than 80 percent of the grain to meet the local demand. Our annual consumption is 900,000 tonnes against local production of 350,000 tonnes.

“ Good quality seed can be defined as seed of an adaptive variety with high varietal species and physical purity, high germination and vigour. ”

# Fawligen Launch Which Took Place on 6th May 2021

Fall Army Worm (FAW) has been a huge menace to the maize growers in Kenya leading to great losses. Most farmers have used cultural methods as well as conventional pesticides to control the pest, some with a huge success and others still struggling to fully control the pest. Maize is the staple food in Kenya, hence the need to have an effective solution.

That is why the launch of Fawligen could not have happened at better time than now. Fawligen is a biological pesticide for the control of early instars of FAW. Regular scouting of the maize crop after emergence is crucial for the farmer to apply Fawligen at the correct instar stage of the FAW.



Fawligen launch in Eldoret



Fawligen launch in Kitale

Having done trials in the key maize growing areas in the country, it was time to pass over this excellent solution to the farmers for them to save their crop.

UPL has been working in collaboration with other partners; CABI (a not-for-profit inter-governmental development and information organization)



UPL Team training farmers on how to scout for FAW

and Agbitech (a company focused on manufacturing baculovirus-based bioinsecticides for caterpillar pest control) for grower trainings on Fawligen. Go Micro offers artificial intelligence which helps the farmer identify FAW from other caterpillars on the maize crop and at the same time know the larval instar of the FAW.

As a team we also did an online launch where in attendance



were the large-scale farmers that we could not reach during the launch as well as the key stakeholders in the industry. We believe Fawligen will be the game changer in the control of Fall Armyworm in Kenya.

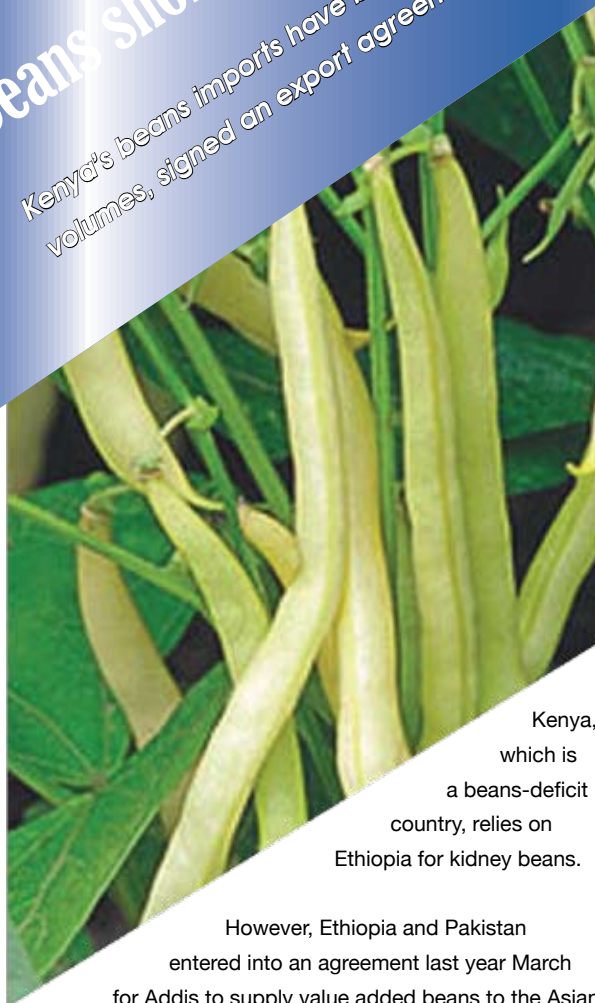


Fawligen webinar invitation



# Beans shortage looms as Ethiopia imports dry up

Kenya's beans imports have been hit after Ethiopia, which supplies the country with significant volumes, signed an export agreement with Pakistan that has reduced the stock coming into Kenya.



Kenya, which is a beans-deficit country, relies on Ethiopia for kidney beans.

However, Ethiopia and Pakistan entered into an agreement last year March for Addis to supply value added beans to the Asian country.

This has seen Kenya locked out of imports from Ethiopia, with no beans crossing at the Moyale border in recent months, according to the crops agency.

“There have been no beans crossing to Kenya from

Ethiopia because of the agreement that Addis Ababa entered into with Pakistan,” said an official from the Kenya Health Inspectorate Service (Kephis).

Data from Kephis indicate the volumes of beans that crossed through the Moyale border dropped to 1.4 million kilogrammes in March last year from a high of eight million kilos in August 2019.

Kenya is expected to record poor harvest of beans this year as the crop has been hit by lack of rain, with 50 percent of the produce having been lost due to moisture stress.

“The effects on beans is devastating. The crop has been placed under watch in terms of early warning because of poor rains,” said Mary Nzomo, county executive member for Agriculture in Trans Nzoia, one of the main bean producing areas of Kenya.

The county has indicated that its yields will drop by 20 percent in this year’s main season that starts in October.

Officials from the Directorate of Horticulture also disclosed that there has been minimal movement of other foods from Ethiopia into Kenya, including tomatoes and onions.

“There has been a decline on tomatoes and onions from Ethiopia, this could be the effect of elections held..we are waiting to see if things will return back to normal,” said the directorate.

The directorate, which also confirmed that beans are not coming from Ethiopia, arranged a fact-finding mission to the border.

# Analysis of Millers in Kenya's Rice Value Chain

Rice is the third most important cereal crop in Kenya after Maize and wheat. The annual consumption of rice is increasing at a rate of 12% making the production to continually reduce below 30% of demand.

A holistic approach to rice production needs to be employed to bridge this gap. One key area along the rice value chain is the post-harvest management sub-chain that includes milling and related activities. In Kenya, most of the paddy rice is processed within the regions where it is produced. Efficiency of the milling industry is important in realisation of improved

such as; further located mills could discourage production through high cost incurred in transportation, high cost of milling could lead to farmers not recovering their costs, and transportation of paddy which is normally 35% – 40% heavier than milled rice to the milling location is expensive. All these would discourage production.

Technology influences

from China is also available. Value chain study show that, 62.2 % and 12.5% of the milling technologies used in Kenya has been imported from China and Germany respectively. However, a few mills

“Efficiency of the milling industry is important in realisation of improved rice supply; this efficiency may be gauged in terms of three factors; degree of competition, technology, and capacity utilization.”

rice supply; this efficiency may be gauged in terms of three factors; *degree of competition, technology, and capacity utilization.*

## The Roles of Rice Millers

Improving the milling value chain can go a long way in improving rice production and food security. A study noted that in Rwanda, the existing system for processing most rice in small hullers is not contributing to the objective of increasing supplies of domestic rice. It therefore does not reduce dependency on rice imports because of the poor quality of the hulled rice is reflected by the 30% lower price compared to imported rice. Improved incomes through employment and entrepreneurship from such mills would support food security and it would also create competition and ensure that costs to consumers are minimized. In a general, other factors within the miller's activities can influence rice production,

efficiency of milling through its effect on costs of conversion, quantity and quality of rice, while by-products produced affect the margin between paddy and rice prices. Less than full capacity utilisation raises costs and may widen margins. Degree of competition affects margin substantially through prices realised and volumes absorbed amongst other effects. Managing these three aspects that are not mutually exclusive ensures a competitive rice industry through better rice margins and an effect on production, incomes, employment and food security

## SWOT Analysis of the Rice Millers' Chain Strengths

There exists idle capacity, of about 76%, that can support expanded rice production. There also exist skills in operation and maintenance of mills in the rice growing areas. The margins realized in milling are good. Affordable technology of rice hulling





have technology from India and Brazil. This compares well with other countries in the region.

According to the study, China dominates as the supplier of rice milling machines to Uganda (78%), others are Japan (4%) and India/England/Brazil (3%). In Kenya the main source of power for rice milling machines is electricity and this is readily available; this compares well with Uganda where 70% of mills were electricity operated, while the rest used fossil fuels.

The government of Kenya, through National Rice Development Strategy (NRDS) 2014-2018, and other supportive policies, has continuously supported the milling sub-sector.



Rice Milling Machine



Rice Harvesting

**Weaknesses**

There is low supply of paddy due to low production to support the mills establishment, despite the high demand for milled rice. The production is lower than in a number of countries in the region. One study indicates that when Kenya produced 100,000 tonnes of rice against a demand of 370,000 tonnes, in Tanzania it was 1.0 million and 1.18 million tonnes respectively, while in Uganda it was 130,000 and 167,000 tonnes respectively. In Kenya this has led to lower capacity utilization and higher cost due to idle and depreciating systems. The causes of low supply are diverse but include; *limited supply due to lack of water and drought; low yielding rice varieties; poor agronomical practices, poor postharvest practices and birds damage amongst other reasons.* Inter border paddy flight in Western Kenya is currently a major issue, which has rendered Lake Basin and WKM mills largely un-operational. The biggest

challenge for Kenyan food processing is the high production costs resulting from the relatively high cost of labour, unstable electric power supply, poor transportation infrastructure, inefficient logistics and high raw material import costs.

Kenya is barely competitive in rice production given the high milling costs. The usage of poor milling technologies that are not cost effective and are inefficient, is high in Kenya. This is due to the predominant use of single pass mills with lower recovery rates. There are limitations of consistent and accurate data on capacities, capacity utilizations, performance, losses, volumes milled, number of mills which limits planning for the milling sub-sector.

The sub sector is characterized by high postharvest losses which add to 15 to 50%

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## AGRO-PROCESSING

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of the market value of production. These figures are however estimations with little studies in support. The problem of losses is compounded by the fact that some of the harvesting is done in April and May during the rainy season. Poor grain drying systems lead to losses through sprouting, and the drying is often done in unhygienic conditions such as on roads, play grounds and walking paths.

There are also insufficient storage facilities (especially among the small farmers) and limited value addition technologies such as good quality milling, parboiling, beverages and cookies.

The high cost of electricity and fuels, high cost of maintenance due to breakdown arising from aging mills and lack of spare parts make Kenyan millers inefficient. This makes locally grown rice not competitive with imports thus lowering

farmers and traders' incomes. The situation is compounded by the low investment in modern mills, stiff competition from cheap rice imports and lack of a reliable source of energy for mill operation. Most operations in the rice sub-sector are also manual and labour-intensive with a consequently low productivity and high operation costs.

#### Opportunities

There is an opportunity to learn from other countries in the region and others, like Rwanda whose Government, through the National Rice Program, modernized hullers/mills followed by privatization of the same when the mills aged. They

support to develop it, these has helped the sector to grow. Efforts have also been there to modernize and improve the milling sub sector. There is need to promote use of automatic and multi pass mills with higher overall recovery of white rice, higher percentage of head rice and lower percentage of broken rice. A multi-pass rice mill has a 65%-70% recovery rate of un-husked rice, as

opposed to single pass mills which have a 50%-57% recovery rate.

were sold to the cooperatives and private actors.

Comparatively, single pass mills have about 27.4% broken rice for two stage mills and 45.5% for the Engelberg type. Automatic mills however have a lower percentage of only 14.7% broken rice.

The rice sector in the region and in the East African countries have received stakeholders

**possible approaches that can be adopted;** supplying multi stage village-level rice mills to farmer cooperatives; supplying village-level mills or mobile mills







through rural social entrepreneur; supplying

processing equipment; with private sector participation in technology development and transfer. Improving capacity utilizations; particularly for large mills, in order to reduce on depreciation costs through increased production and productivity in respective areas.

rice mills through an organizations working with millers to set up out-grower agreements with embedded services; partnership with a corporate using an out-grower scheme for rice sourcing to develop model to upgrade centralized or decentralized (local) milling technologies; supplying component technologies for automatic mills to large rice milling companies/exporters and development of appropriate decentralized power solutions. Carrying out an inventory study of processing-milling, storage and other postharvest facilities for rice, assessment of losses.

Development and promotion of better storage facilities (including hermetic systems) and appropriate models for warehouse and stores management and maintenance is required.

To there is also the need to enhance knowledge and skills on agronomic practices, postharvest technologies- including agro-processing and value addition in order to reduce losses. Need to promote irrigation practices that change the management of plants, soil, water and nutrients such as System of Rice Intensification (SRI), and which gives rice that is heavier, more yielding and with higher recovery rate. Coupled with this, is the need for identifying, developing and introducing appropriate harvesting and

Additionally, there is need for introduction of alternative energy and drying technologies; such as solar drying systems, especially hybrids that use rice straw/husks and solar, portable thermal dryers, collapsible dryer cases; and other technologies that utilise other renewable technologies.

There should also be efforts towards installation of new, improved rice mills, mobile mills for out-grower rice areas, as well as processing the by-products of rice production. Another way to reduce cost is through utilizing by-products, particularly rice husks (which account for about 20% of rice produced), for production of briquettes, bio-fertilizers, and animal feeds. Fabricators who are able to produce low cost equipment at affordable prices, and their willingness and capability to copy machines that have a proven record of technical and financial success.

**Threats**

The milling sector faces threats from lower milling cost in other countries. Others threats include increased cost of electricity, reduced irrigation water supply due to climate change and increased pests and diseases that lower production, milling capacity utilization and hence leads to higher costs of operation



The rice sector in the region and in the East African countries have received stakeholders support to develop it, these has helped the sector to grow. Efforts have also been there to modernize and improve the milling sub sector.

# Agri-lending: The Dynamics of the Agricultural Warrantage System

By Mary Mwendu

Generally, access to loans and credit facilities prompts one to present chattels, pawn, warranty, surety and guaranty among other means of collateral. This translates to anything of significance, equivalent or of a higher value than the loan one intends to secure. In most cases there has been pre-existing mistrust between a lender and a borrower.

This has been occasioned by numerous instances where a borrower fails to honor his/her credit dues, with some defaulting loans thus making them unfit for further credit services. In a reciprocal manner, the lender is pushed to take tough measures once a default in loan repayment occurs. Therefore, this leads to confiscation of a borrower's property or what was given as collateral.

Agriculture is the backbone of Kenya's economy employing more than 80% of the country's population. It generates about 50% of the country's export income and about 30% GDP. About 70% of livestock and crop production is by the small scale farmers.

Credit facilities have long been availed for the business sector as well as the agriculture sector. Nonetheless, agriculture sector has been subjected to scanty access of credit services. Most smallholder farmers' lack eligibility to secure loans due

to the stiff terms and conditions set by lenders

One of the reports accessible to the public shows that the small scale farmers lack collateral to secure loans, they also lack data that can be used to track their transactional history as well as unavailability of financial services in remote areas.

Most lending institutions charge interest rates between 8% p.a and 18% p.a. In most cases farmers are made to sell their produce at very low prices in order to get other resources to sustain themselves as well as their farms with others having minimal credit knowledge.

An agriculture loan can be used to buy farm machinery and equipment, land, farm supplies among others. Farmers can also use the loans to expand their farms, revamp their ranches, or other agricultural purposes. Farm loans provide liquid cash at beginner's phase as well as assist established farms with a cash crunch during uncertainties. They vary depending on the size of the farm, financial history or any farm program designed by a lender.

According to a report, a farmer's farm produce such as well-stored, quality grain can be used as collateral or a warrantage to access loans.



The report educates farmers about warehousing their agricultural yield. It is purposed to assist farmers in understanding that well-stored, quality grain can be used as collateral for loans. A campaign needs to be carried out to help the farmers to start putting their cereals in warehouses and encourage financial institutions to consider the produce as collateral. This will lead to access to credit for income-generating activities. They will also repay their loans on time, and plough back the profits into agriculture.

By the end of the campaigns and training the first credits should be given. Farmers need to understand that the warrantage system is designed to help them avoid selling off their farm produce at a low price. They should understand that their cereals stock is more valuable if well-maintained and properly stored.





is need to sensitize the role that quality produce stored in good conditions can play as a guarantee for credit and loans.

Consequently, with all standards set, both storage and quality, the lending organization can give loans to farmers in regards to their needs and the quantity of goods left behind into warrantage stores as assurance.

This is the way forward for most small scale farmers in Kenya who cannot afford the other forms of collateral.

It will also hep fight poverty and food insecurity as well as empower the small holder farmers to expand on their agricultural dreams.

According to the report, in the last two years, this has been practiced immensely and changed grain producers' opinions on micro-lending services in other parts of the world. The farmers have even gone further to establish innovation platforms in other townlets acquainting stakeholders on inventory credit system standards.

Bank credits and loans are subject to requirements and conditions that most farmers are not able to meet. With the warrantage system organized by farmers unions within the innovation platforms, a conducive environment is created for them to keep their grain stock safely.

When farmers' unions gather sufficient grain as guarantee for micro-lending facilities, they can allocate them to agricultural credit for fanancial growth or to buy inputs. During the trainings with the members, there



# Millets and Sorghum: Forgotten Foods for the Future

Millets and sorghum are grains that are nutrient-rich and drought-tolerant. They allow multiple farm-revenue streams as they can be food and source of sugar production. Their stalks can be used not only as grains for human consumption, but also as animal fodder, as a biofuel, and in brewing

Millets are gluten-free, high in protein and antioxidants, have a low glycaemic index, which can help prevent or manage diabetes. Pearl millet, in particular, is very high in iron, one of the most common micronutrient deficiencies worldwide and has twice the protein of milk. Finger millet has three times more calcium than milk. Kodo millet includes three times the dietary fibre of wheat and maize, and ten times that of rice.

Sorghum, also used as sweetener syrup, is rich in vitamin B, minerals (calcium, iron, and zinc), protein, and fibre, and is also gluten-free. It can help reduce the risk of certain cancers, as well as aid in diabetes control and prevention.

Despite being highly nutritious, these crops have suffered a loss of popularity and poorly developed value chains, according to Joanna Kane-Potaka, the Director of Strategic Marketing and Communication at ICRISAT. Millets and sorghum were the traditional crops across many parts of Africa and India, but

“are now seen as old fashioned or food for the poor,” says Kane-Potaka. “There has been much less investment in these foods. The value chain is less developed, from the seed system being set up through to modern convenience products being developed.” In the past 50 years, these grains have largely been abandoned in favour of developing more popular crops like maize, wheat, rice, and soybeans.

The current lack of development of millets and sorghum crops allows for substantial potential in growth and innovation. ICRISAT hopes to develop the crops’ value chains from farming to food products. “We are working with food processors to incorporate millets in ready-to-eat snacks and foods such as breakfast cereals, malt drinks, etc.” says Dr. David Bergvinson.

The Smart Food initiative at ICRISAT, in partnership with Feed the Future’s Accelerated Value Chain Development (AVCD) Program, is developing innovative methods to make these grains attractive again in the semi-arid tropics of Africa and India. At the same time, the project is hoping to educate consumers, farmers, food processors, health workers, and government leaders about the various benefits and uses of millets, sorghum, and grain legumes.

Building awareness of these grains can support the diet diversity, well-being, and livelihoods of rural communities and farmers in Africa and India, where under nutrition, malnutrition, obesity, stunting, diabetes and anaemia are common.

Some of ICRISAT’s other Smart Food projects include healthy cooking demonstrations and training programs for Kenyan women and families; a Smart Food reality TV show, which challenges contestants to incorporate millets, sorghum, and grain legumes into meals; and a program that adds millets into mid-day school meals in India.

ICRISAT reports that some millets and sorghum varieties could increase their





yields up to three times their current potential. They have found that millets and sorghum can be more reliable crops for farmers in spite of dry, hot conditions because they are usually the last crops standing in droughts. Not only can millets grow in about half the time of wheat, using few or no fertilizers and pesticides, but they also require 30% less water than maize and 70 % less water than rice.

In the face of global climate change, water scarcity, and longer periods of drought, millets and sorghum may be valuable, nutritious, and hardy alternatives to provide sustainable food security for people living in increasingly dry climates.

According to Kane-Potaka, a return to millets and sorghum means a return to food that is good for you, good for the planet, and good for the farmer.

### Requirements for planting sorghum

#### Soils

Sorghum is produced in a wide range of soil types and agro-climatic zones. It does well in heavy clay soils (vertisols) and light sandy soils with a pH ranging from 5.0-8.5.

#### Yield

The yield of sorghum depends on the variety. While talking about yield, you should also consider if you plan on harvesting fodder for animal feed. Some varieties are more suitable for both grain and fodder. Yields from rain-fed sorghum farms range from 0.3-1 tonnes. In farms that use hybrid sorghum seeds, yields of up to 12 tonnes per hectare under ideal inputs, soil and water conditions can be achieved. Though the hybrid seeds produce more harvests, you cannot reuse the grain

as seeds during the next planting season. Also, the traditional varieties are more drought and disease resistant than their hybrid counterparts.

#### Land preparation

You should begin land preparation promptly after the previous crop is harvested. This allows adequate time for; infiltration and storage of soil moisture, the decay of crop residue and soil firming.

For optimum production, the row spacing for sorghum is between 60-75cm by 20cm between plants depending on the variety. In places where an ox is used to plough the land and the row spacing is fixed at 90cm,



the recommended plant spacing is 15cm.

#### Fertilizer

It is important for you to conduct soil tests to know the kind of nutrient deficiencies your soil has to know what nutrients your soil needs for optimum production.

To maximise yields, use NPK (Nitrogen, Phosphorus, and Potassium) of ratio 90:45:45. Apply the fertiliser on two thirds top sides of the ridges at 5cm depth and cover the soil.

#### Weed control

There are several ways weed control can

be done while farming sorghum. Common weeds that grow alongside sorghum are Striga and couch grass. Some of the methods include:

**Hand pulling** - to manually extract the weeds by pulling them by hand and burning them before they flower.

**Intercropping** - planting it alongside cowpeas, groundnuts or cotton to reduce space that weeds can utilize to grow.

**Weeding** -use of a hoe to dig out weeds three weeks after crop emergence.

**Use of herbicides** - Where manual pulling cannot be done, you can use of herbicides to control weeds.

#### Sorghum harvesting

This should be done early to avoid losses from birds, insects, mould and bad weather. The ideal time to harvest sorghum is when the moisture content is below 20% as the seeds will have hardened enough to withstand threshing action. You can harvest by cutting the head using a knife.

You can alternatively use a combined harvester if a large tract of land is to be harvested. However, this can only be done on the dwarf sorghum variety. After harvesting and threshing sorghum, you should dry the grain to achieve a 12% moisture content before storing it in gunny bags or a silo.

**Authors: Ms Joanna Kane-Potaka, Assistant Director General-External Relations, and Executive Director, Smart Food, ICRISAT and Shabibah Nakirigya**

# Consumers Must Demand Food Produced in Sustainable Ways

Unless consumers demand food produced in ways good for the environment, farmers have little incentive to adopt technologies'



## How will agriculture change in the post-Covid world?

Covid-19 has highlighted opportunities for improved agri-food systems – digital extension systems, increased farm mechanization, decentralized markets and improved farmgate procurement in addition to improved farmer-consumer connect and more efficient value chains. Without protection against the virus, agriculture will continue with less face to face contact. I

hope the changes in agriculture will focus on areas exposed by the pandemic as these will also contribute to the long-term goals of sustainable development.

## How can farming be made profitable?

Farming is a complex and high-risk activity; the risk is higher in smallholder rain-fed systems. There is no single answer as

farming is profitable for a variety of reasons and unprofitable for just as many reasons. Better pest and disease management, soil fertility and good agronomic practices, increased resilience to climate change, availability of quality seed of improved varieties, better access to markets, addressing workforce shortages through mechanization, improved post-harvest practices and processing options, strengthened value chains and a supportive policy environment can

make farming profitable.

## How can farmers gear up for climate change?

Agriculture is affected by climate change and also contributes to it. In India, where more than 65% of farms are small and rain-fed, climate change is felt most prominently in variations in rainfall intensity, the duration of intra-seasonal dry days during



monsoon, and the occurrence of extreme weather events. Agriculture must both adapt to, and contribute to mitigating climate change. Agriculture must minimize the contribution made to greenhouse gas emissions and increase carbon sequestration, and must be climate-smart.

The threat of climate change to our food systems, and the threat caused by our current food systems, must be highlighted to consumers. Unless consumers demand food produced in ways that are good for the environment, farmers have little incentive to adopt appropriate farming technologies.

**How is digitization impacting agriculture?**

Digital technology has the potential to make agriculture significantly more productive, reduce drudgery, and make agriculture more profitable. Due to the digital lag, the latest, most appropriate and most efficient technology may not always be available to smallholder farmers in the drylands of Asia and Africa. That said, there is a large ecosystem of startups and entrepreneurs, including many collaborating with us, working to make the benefits of digital technology available to smallholder farmers through the widespread availability of smartphones and internet connectivity.

**In what ways is ICRISAT working towards reducing malnutrition?**

The organization is geared towards improving nutrition in the drylands of Asia and Africa where these crops are grown and consumed. The development of India's first naturally-bred biofortified pearl millet at ICRISAT led to minimum iron levels being defined for pearl millet



breeding. Through our agri-business incubator we support startups to develop value-added food products that combine dryland cereals and legumes in healthy, delicious and easy to consume ways. The Smart Food campaign works to diversify consumption through an approach which is 'good for you, good for the planet and good for the farmer'. In India, we work in a focused manner in predominantly tribal districts to combat malnutrition and improve livelihoods.

**How are you maintaining genetic diversity of seeds?**

Genetic diversity minimizes risk to farmers; genetic diversity is one of the building blocks of new, adapted varieties. Our Genebank, located in India and Africa, holds over 153,000 accessions of dryland crops that support breeding programs around the globe. Genes have been identified for resistance to pests and diseases; tolerance to high temperatures, less moisture, poor soils; and to confer high levels of iron, zinc and other essential elements in the consumed parts of crop plants. Of the total accessions in the Genebank, 1,13,653 have been safety duplicated in the Svalbard

Global Seed Vault to ensure their safety and availability for future generations.

**How can women in agriculture be empowered?**

Women are more than half the agriculture workforce and yet are often marginalized. In agricultural research for development, we must empower women, but as a part of the total



agricultural workforce and not in isolation. We need to look at gender equity as a precursor to gender equality. Ensuring equitable access to information and appropriate policies would be a good start.

**What are the new areas that you will be focusing on in the next decade?**

We will validate and use technologies such as AI and ML [machine learning], gene editing, seed science and remote sensing, as well as technologies yet to be imagined, to minimize the risk to farmers and ensure that consumer demand for a readily available, affordable and diverse diet comprising nutritious and climate-adapted foods in the semi-regions is supported and championed.

# Buying into new seed

By Joshua Masinde



Pieter Rutsaert explains the study setup at a mock agrodealer - Photo by Joshua Masinde

***A mock shop helps researchers understand how Kenyan farmers choose maize seed when their preferred varieties are out of stock.***

Mary Nzau enters a mock agrodealer shop set up on a field on the outskirts of Tala town in Machakos County, Kenya. On display are nine 2kg bags of hybrid maize seed. She picks one. By the look of it, her mind is made up. After a quick scan of the shelf, she has in her hand the variety that she has been purchasing for years.

Regina Mbaika Mutua is less lucky. The variety she always buys is not on display in the mock shop. As part of the experiment, the research team has removed from the shelf the variety she indicated she usually buys. The team's goal is to observe what factors influence her seed purchase decision in the absence of the

variety she was expecting to purchase.

"Although I did not find the variety I was looking for, I picked an alternative as I have seen it perform well on a neighbouring farm," Mutua says, adding that she will plant it this season alongside recycled (farm-saved) seed on her one-acre farm.

Michael Mutua passes up the popular variety he has been planting for the previous two years. He picks one that has been advertised extensively. "I have heard about it severally on radio. I would like to experiment with this new seed and see how it performs on my farm. Should I like the results, I will give it a chance in ensuing seasons," he says.

## **The big adoption conundrum**

The goal of the out-of-stock study is to improve an understanding of how farmers

“

It is better to have a diversity of product profiles as different market niches are captured within a particular agroecological zones. This is such that farmers may not just benefit from the minimum traits like drought tolerance, but also more specific traits they are looking

for”



“This information is generally already available on seed packets, but we live in a world of information overload. Promoting certain attributes through in-store signage is an approach that is widely used to help consumers make more healthier food choices. Doing the same for new seed varieties makes a lot of sense.”



Muindi ( Left ), gender research associate with CIMMYT, acts as a mock agrodealer clerk and attends a farmer - Photo by Joshua Masinde

make their maize seed choices, says Pieter Rutsaert, Markets and Value Chain Specialist at the International Maize and Wheat Improvement Center (CIMMYT).

“We do this by inviting farmers to a mock agrodealer store that we set up in their villages and give them a small budget to purchase a bag of seed. However, not all farmers walk into the same store: some will find their preferred variety, others won’t. Some will have access to additional trait information or see some varieties with price promotions while others don’t.”

Rutsaert acknowledges that breeding programs and their partner seed companies have done a great job at giving farmers access to maize hybrids with priority traits such as drought tolerance and high yield. CIMMYT then works closely with local seed companies to get varieties into the hands of farmers. “We want to extend that support by providing insights to companies and public breeding programs on how to get new varieties more quickly into the hands of farmers,” he says.

The hybrid maize seed sector in Kenya is highly competitive. Amid intensifying competition, new varieties face a daunting task breaking into the market, independent of their quality. While farmers now have more options to pick from, a major challenge has been how to get them to adopt new varieties.

“Moving farmers from something they know to something they don’t is not easy. They tend to stick with what they know and have been growing for years,” Rutsaert says.

Pauline Muindi, gender research associate with CIMMYT, acted as the stand-in clerk at the mock store. She noticed that farmers tend to spend very little time in the shop when their preferred variety is available. However, this all changes in the out-of-stock situation, pushing farmers to step out of their comfort zone and explore new options.

The first step to overcoming this challenge is to entice maize farmers to try a new seed variety, even just once, Rutsaert observes. If it is a good variety, farmers will see that and then the market will work in its favour: farmers will come back to that variety in subsequent years and tell others about it.

“The good news is that many of the varieties we are currently seeing on the market have performed well — that’s why they’re popular. But there are newer varieties that are even better, especially in terms of attributes like drought tolerance. We would like to understand how farmers can be convinced to try out these newer varieties. Is it about the need for more awareness on varietal traits? Can we use price promotions? Or are there other factors?” he says.

#### Does seed price matter?

“With today’s climate uncertainty, it is better to stick to a variety that is adapted to such climate rather than banking on a variety one is oblivious of. The risk is not worth it,” Nzau says. She adds that she would rather buy a higher-priced seed packet she knows and trusts than a lower-priced one that she has not used in the past. Radio promotions of new or other varieties have limited sway over her decision to make the switch.

Faith Voni, another farmer, agrees. “It is better to purchase a higher-priced variety whose

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**A researcher interviews Mary Nzau a farmer from Tala in Machackos County after her mock purchase - Photo by Joshua Masinde**

quality I can vouch for than risk purchasing a lower-priced one that I know little about. I do not wish to take such a risk.” Voni says she would also be more inclined to experiment with another variety that she had seen perform well on a neighbour’s farm.

Michael Mutua holds a different view. “If there is an option of an equally good but new variety that is lower-priced than the variety I prefer, my wallet decides,” he says.

Vivian Hoffmann, an economist at the International Food Policy Research Institute (IFPRI) and collaborator on the study, says price can be key for convincing consumers to try a new product. “Our previous research on maize flour choice found that a provisional 10 percent discount boosted sales tremendously,” Hoffmann says. “Of course, that only gets your foot in the door; after that, a new variety will need to win farmers over based on its merits.”

Hoffmann is interested in the extent to which drawing farmers’ attention to key varietal attributes influences their seed choice. “This information is generally already available on seed packets, but we live in a world of information overload. Promoting certain attributes through in-store signage is an approach that is widely used to help consumers make more healthier food choices. Doing the same for new seed varieties makes a lot of sense.”

### **The value of drought tolerance**

Situated on Kenya’s eastern region, Machakos is characterized by persistent water stress. Climate change induced erratic rainfall has pushed traits that can tolerate the unfavourable weather conditions in the favourite’s corner. While other traits such as high yield and disease resistance are equally important, the seed, when planted, must first withstand the effects of droughts or water stress in some seasons and germinate. This is the most crucial step in the long journey to either a decent, bare minimum or no yield. A lot of farmers still plant recycled seed alongside hybrid varieties. But these are no match to water stress conditions, which decimate fields planted with farmer-saved seed.

“If a variety is not climate resilient, I will likely not harvest anything at all,” says Nzau. She has planted a drought-tolerant variety for ten

years now. Prior to that, she had planted about three other varieties as well as recycled seed. “The only advantage with recycled seed is that given the right amount of rainfall, they mature fast — typically within two months. This provides my family with an opportunity to eat boiled or roast maize,” she notes.

However, varieties need to do more than just survive harsh weather conditions. Breeders face a daunting task of incorporating as many traits as possible to cater to the overarching and the specific interests of multiple farmers. As Murenga Mwimali, a maize breeder at the Kenya Agricultural and Livestock Research Organization (KALRO) and collaborator in this research says, innovations in breeding technologies are making breeding more efficient.

“It is better to have a diversity of product profiles as different market niches are captured within a particular agroecological zones. This is such that farmers may not just benefit from the minimum traits like drought tolerance, but also more specific traits they are looking for,” Mwimali says.

Smallholder farmers continue to play a central role in the seed development process. Capturing what happens at the point of purchase, for instance, at the agrodealer, and understanding how they purchase seed offers valuable insights on the traits that are deemed essential in the breeding process. This work contributes to CIMMYT’s focus on fast-tracking varietal turnover by turning the levers towards a demand-driven seed system.

*Courtesy CIMMYT Newsletter*



Photo by Joshua Masinde



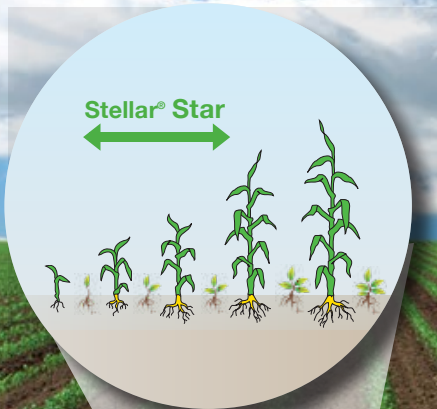
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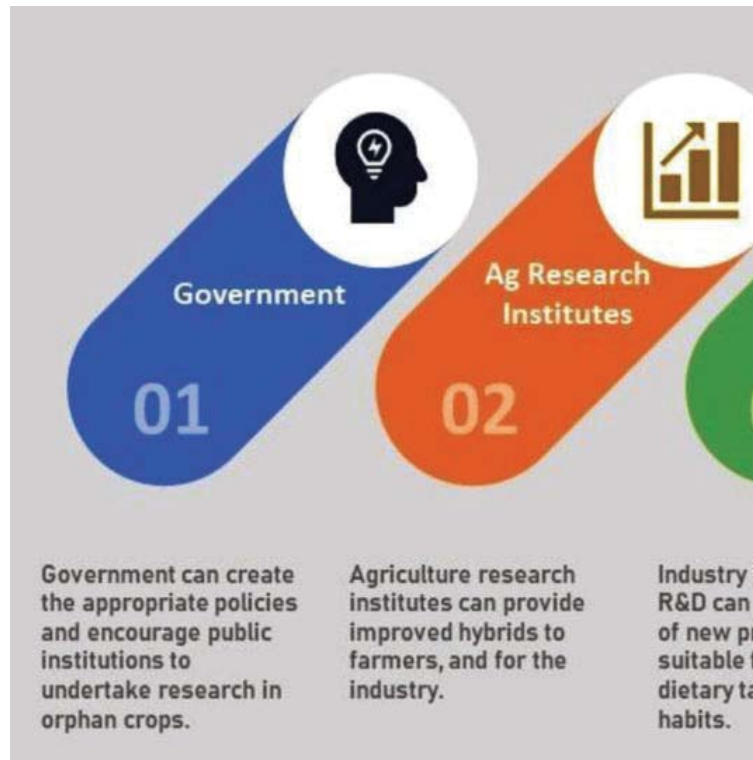
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“Orphan crops are not forgotten by the peoples who subsist on them. However, they have never received global importance, they have never (or rarely) been the focus of concerted efforts to improve productivity or quality, nor have they been the focus of global value chains.

## Is there a Future for Orphan Crops?



**Dr Jacqueline d’Arros Hughes, Director General, ICRISAT**

According to FAO about 95% of the world’s food needs are provided for by just 30 species of plants. In stark contrast 30,000 plant species are edible of which over 7,000 species, such as millets, fonio, tef, yam, cassava, Bambara groundnut, jackfruit, mangosteen, sesame, okra and minor cucurbits, and many more were, or still are, a part of the diets of many communities around the world. However, with the rise of industrialized agriculture, the crop diversity on our plates has reduced and only the crops amenable to large-scale industrialized farming have come to dominate our diets.

“Orphan crops are not forgotten by the peoples who subsist on them. However, they have never received global importance, they have never (or rarely) been the focus of concerted efforts to improve productivity or quality, nor have they been the focus of global value chains. They are adapted to often very challenging environments – which resonates well with our current climatic challenges.”

Orphan crops, also known in agricultural literature as neglected and underutilized (NUS) crops cover the entire spectrum of food and industrial uses – cereals, fruits and nuts, vegetable and pulse crops, root and

tuber crops, oilseeds, starch and sugar, fiber, latex, and dyes. These crops were cultivated or collected from the wild over centuries across all regions of the world. In large parts of India and sub-Saharan Africa millets were, and continue to be, a dietary staple in addition to crops such as cassava, yam, sweet potato, Bambara groundnut, etc. Millets are high in nutritional value and grow in adverse conditions (poor soils, scanty rainfall, high temperatures) while contributing to food security in a sustainable manner. They make use of local agricultural biodiversity to provide nutritious and sustainable diets. Moreover, they contribute to biodiversity and help mitigate the problems of monoculture – soil degradation, high water use leading to depletion of ground water sources, overuse of chemical inputs leading to soil and water pollution, and higher susceptibility to pests and diseases.

Orphan crops are characterized by underfunding for research and development, very little attention from agriculture extension services, weak and underdeveloped value chains, lack of awareness about their nutritional value, a perception that they are a ‘poor farmer’s crop’ and low interest among farmers and industry due to lack of demand.





The neglect of orphan crops continues in today's landscape where millions of dollars in venture capital funding are pouring into agri-tech start-ups.

However, the situation is gradually changing. There is a growing recognition of the role of orphan crops in maintaining biodiversity, contributing to improved nutrition and local incomes in rural communities, serving as an important safety net for resource-poor smallholder farmers as these crops need fewer inputs and are often naturally resistant to the pests and diseases of the local agro-ecology as they are uniquely adapted to the environment they grow in. There is also an increasing awareness among consumers about the nutritional benefits of these crops.

For orphan crops to see a resurgence in demand, action is required at different levels. It requires a simultaneous top-down and bottom-up approach. Specific policies by national governments are required to mainstream these crops as an integral part of the national food and nutrition security strategy. Policies could also include subsidies for farmers (stimulate supply side) and for the agri-food industry (stimulate demand side). Agricultural research institutes can play a role

in genetic improvement of these crops and to develop varieties and hybrids that give higher yield, greater resistance to pests and diseases which may be spreading due to climate change, and that have market and consumer preferred traits such as increased shelf life and suitable for machine processing, among others.

Agri-food processors can work with research institutes to develop the varieties they need and invest in the research and development of ready-to-cook and

ready-to-eat products suitable to changing lifestyles. Entrepreneurs can be encouraged, with technical backstopping and venture capital financial support, to improve the value chains of the orphan crops. With positioning and information, the demand will come from consumers who are aware of the nutritional benefits and incorporate orphan crops into their diets.

Agricultural research organizations, such as ICRISAT, are working with millets, primarily pearl millet, and the minor millets such as finger millet, foxtail millet, kodo millet, proso millet, little millet and barnyard millet. The major growing region for millets is the dry regions of India and sub-Saharan Africa. ICRISAT is working to develop millets that

- (i) are resistant to the major insect pests and diseases that limit production, as well as with improved tolerance to abiotic stresses, including drought, poor soils and high temperatures;
- (ii) are high yielding, early maturing hybrids;
- (iii) have higher levels of mineral micronutrients (iron and zinc) naturally found in pearl millet; and

(iv) have appropriate traits for increased use as feed and fodder. Lack of genetic material is also a concern for orphan crops as genetic diversity holds the key to development of new varieties and hybrids to meet the needs of farmers, consumers and the food processing industry. The ICRISAT Genebank conserves 24,373 accessions of pearl millet and 11,797 accessions of other millets.

ICRISAT's agri-business incubator works with entrepreneurs to improve the value chain and develop value added ready-to-eat products like crisps, bakery products, and high energy density snack foods. Many entrepreneurs have been supported from idea to commercialization to bring millet-based snacks to supermarket shelves. Supplementary nutrition projects being carried out in tribal areas in India have shown marked improvement in the nutritional status of those communities.

The Smart Food initiative of ICRISAT raises awareness among consumers and also brings together entrepreneurs, researchers and policy makers on a common platform to discuss issues around millets and sorghum (ICRISAT's mandate crops) and ways to increase consumption and production in ways that are good for you, the planet and the farmer. Smart Food works across the value chain with private and government research institutes, farmer producer organizations, agri-food producers, entrepreneurs, non-government organizations and policy makers.

The narrative of food and nutrition security must be expanded to include the role orphan crops can play to move towards more nutritious and sustainable diets and agriculture. This calls for fresh thinking around transforming our current food systems towards more healthy, sustainable and diverse food systems. A multi-sectoral dialogue at the upcoming 2021 Food Systems Summit with all stakeholders of orphan crops will provide impetus to mainstream these orphan crops.

# Importance of Soil Fungi on the Health of Crops

**Mycorrhizal fungi** are beneficial organisms that have a symbiotic relationship with plants, growing in association with their roots and helping them to thrive. Also known as obligate biotrophs. Their name is derived from the Greek words *mycos* (fungus), and *rhiza* (root).

There are two main types: **Endomycorrhizal**, which has part of its hyphae inside the plant cell, and on the outside of the plant cells.

**Arbuscular mycorrhizal fungi**, which penetrate the root from highly branched structures for nutrient exchange—are most commonly found, and are associated with most plant species.

A key component of any balanced farming system, these naturally occurring underground fungi undergo a complex biological interaction with the roots of most plants, allowing them to cycle organic matter and release nutrients.

In what sounds like the perfect arrangement, special two-way feeding arrangements are created within the plant roots by the fungi. Through this, the plant receives moisture and vital nutrients and, in return, the fungi gets the sugar and carbon it needs.

Where these fungi are present and there are good levels of root colonisation, plants become healthier and less susceptible to



tissues internally, the fungi develop hyphae or root-like structures that grow outside the root, forming a network of fine filaments in the soil.

“This hyphal network acts like a secondary root system, allowing it to explore a far greater soil area than the plant roots alone can,” she says.

stress, with yields responding accordingly, enthusiasts claim.

As a result, farmers following a regenerative agriculture approach and those looking to reduce their reliance on artificial inputs are increasingly tapping into the benefits that soil fungi can provide, with efforts being made to encourage their abundance and understand more about what they have to offer.

## How do mycorrhizal fungi work?

Originally attracted by “signals” produced by the plant’s hormones, the fungi penetrate a plant’s roots and make themselves at home. Once there, they get to work – setting in motion a mutually beneficial trading of resources which continues throughout the crop’s life, explains agronomist Alice Montrose at crop consultant Ceres Rural.

As well as colonising the host plant’s root

Given that nutrients, such as phosphorous, are relatively immobile in the soil, it helps with their uptake, as well as ensuring access to water.

Mycorrhizal fungi are also instrumental in building soil structure, through their excretion of glomalin. A glue-like compound, glomalin helps to aggregate soil particles and, along with the hyphae, hold



these aggregates together.

## Additional benefits

As well as being able to mine the soil effectively, their other beneficial effect is to make plants more stress tolerant.

“The greater scavenging ability of a bigger





Where these fungi are present and there are good levels of root colonisation, plants become healthier and less susceptible to stress, with yields responding accordingly

root network means that crops become more drought tolerant and more resilient, which helps when environmental conditions are against them,” says Miss Montrose.

“They can also cope with any soil compaction issues – the very fine hyphae produced by the fungi can penetrate soils which aren’t in the best condition.”

Mycorrhizal fungi are also very competitive, which is why they are also understood to protect the host plants from other fungi and bacteria that may be detrimental.

“We hear a great deal about healthier plants coming from biological soils which are functioning well and this explains why. “They have an effect on both biotic and abiotic stresses. Where soils are in the right condition and full of microbial life, they provide nutrition and other services to the plant at the time it is required,” she says.

**How to build soil biology**

There are several things that growers can do to increase soil biology and get microbes working well . But don’t expect to see changes occur overnight.

**Reduce tillage**

Soil disturbance should be reduced as much as possible. Cultivations destroy the hyphal networks that the fungi create in the soil. If growers want to benefit from them, they need to leave them as intact as possible.

**Target fertiliser**

Don’t over-apply nutrients, especially P and N, where you are trying to encourage soil life. High rates of fertiliser make roots lazy. This weakens the relationship between the fungi and plant, and means they can miss out on “free” micronutrients and water. Target the use of fertilisers to avoid this happening and keep the roots active.

**Fungicides**

Be careful with seed treatments, early season sprays and any other disease control treatments that hit the soil. Fungicides are effective against fungi, but use them sparingly and only when required – especially when crops are small. Applications will always affect soil biology, so the key is to keep any detrimental effect to a minimum.

**Organic matter**

Increasing soil organic matter through the use of farmyard manure and other soil amendments provides a better habitat for soil microbes, as well as giving them an alternative food source. Organic matter also holds nutrients and retains water, improving the soil’s health and structure. Aim to build it back up and develop a productive system.

**Living roots**

Keeping plants growing is important for mycorrhizal fungi levels, as the fungus can’t complete its life cycle without a suitable host. Try to have a living root in the soil for as long as possible, so the soil retains its microbial life and continues to function.

**Diversity**

A diverse crop rotation helps with soil biology, as different plant species promote different types of fungi. Mycorrhizal fungi form associations with most crops, but a notable exception is oilseed rape. Brassica crops don’t form associations with mycorrhizal fungi, which is where techniques such as companion cropping can help.

# Charming Kenya's youthful agri-entrepreneurs to agriculture: make it sexy!

By Dr. Murenga Mwimali



Dr. Murenga Mwimali mentoring one of the youths under him

**K**enya's vibrant youth are critical to developing a successful agricultural sector. This means shaking off out-of-date insights and providing young people with the right motivations.

## Encouraging the seeds of motivation for the youthful agricultural entrepreneurs

Most leadership in many African countries reckon the huge potential of the agriculture sector. The potential is available for not only feeding the growing populations but also to support the export market for most of the foods items. These happening will ignite growth in most economies. The economic growth due to agriculture sector is not going to be unique but it is

applicable to Kenya too. However, the sector's potential can only be realized if it can harness the strength and new thinking of Kenya's fast-growing youth population. The youth need to be encouraged to embrace agriculture through the new technologies, digitization of applications in irrigation, fertigation, greenhouse technologies, and horticulture. Enabling decent agriculture and agri-business jobs programme will support in harnessing its huge demographic dividend, while contributing to the rejuvenation of the aging farming population that is average of 60 years in Kenya.

## Removing the negative perceptions about agriculture

When and not if young people want money and employment, they should take up agriculture. It will require greater efforts to make agriculture sexier to young people. My concern as a scientist in the agriculture sector is that 'the advertisements on TVs, agrochemical companies, billboards, radio, make it worse by creating an impression that agriculture is for the old people, and not the youth of Kenya'. There is a need to change these archaic perceptions that agriculture involves very hard-work, is unprofitable and for the old folks after retirement from formal employment. There is a need to overhaul negative perceptions that farming is for the aged, the poor and the retired folks. It's about tapping into new innovations and technologies in farming namely; crop development software, computer modelling, ideotype farming to develop disease-resistant varieties, digital soil mapping, digitization of applications





in irrigation, and fertigation. All these technological innovations will make farming smarter, slicker and more profitable. It's about viewing that farming is interesting educated, entrepreneurial youthful persons who perceive a financially worthwhile future in farming: it's about making agriculture sexy. I am confident that there is money to be made in agriculture. However, the initial investment period requires obligation and determination.

**Improving financial access for the youthful agricultural entrepreneurs**

Accessing sufficient finance to get agricultural production to take off can be a challenge for most of the youth in Kenya due to the lack of guarantee and financial illiteracy. When the banks and corporates in Kenya mean to support the youth in agriculture, then the financial products should be aligned towards benefitting the youth.

**Linking youthful agricultural entrepreneurs to market**

Reliable market access is critical towards the success of any agri-enterprise. Most

factors contributing to market failures could emerge from under developed infrastructure, to poor information on market prices and less exposure. International markets may require exports in large volumes and at certain quality standards that the youth may not be able to meet. The youth in Kenya need better market access to unlock the potential of new agricultural ventures. Education and training, diversity of agri-enterprises, access to price and market information, while practicing sustainable agriculture will enable the youth to have access markets for the products.

**Supporting youthful agricultural entrepreneurs to benefit from agriculture**

The government of Kenya must practically

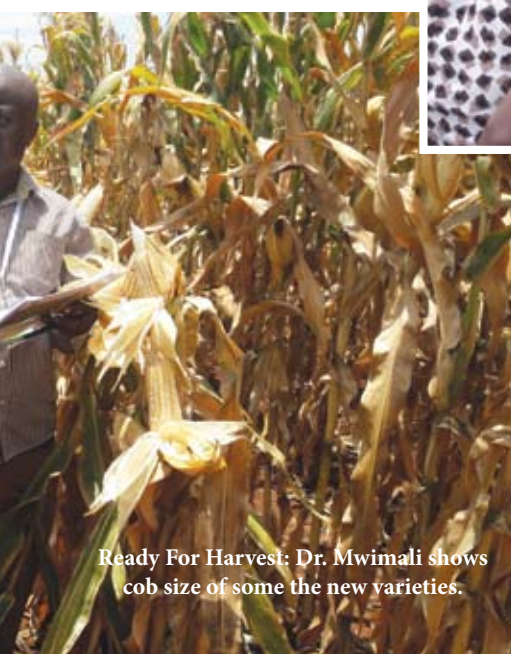
agricultural entrepreneurs to access finance.

Investments that will make agriculture must be attractive to the youth may include the following proposed ag-technologies that in the long run may be useful namely; precision agriculture, robotic farms swarms, closed crop ecosystems, synthetic biology, and vertical farms. It may take a little longer to realize this concepts of new farming in Kenya, but it is a viable venture that is worth trying.

The youth not only need finances, but also improved application of technologies, innovations, management and practices that are compliance to their needs. These



**Dr Mwimali discussing new technologies, innovations, management and practices.**



**Ready For Harvest: Dr. Mwimali shows cob size of some the new varieties.**

and seriously involve youth in agriculture. The youth must be at the fulcrum of the countries' plans to implement the national and counties' agricultural policies. The need to show political support by tailoring agriculture budgets and national budgets so as to create an enabling environment for youths to contribute to diverse food production and consumption. The involvement of the public-private partnerships (PPPs) can be a significant step towards the enabling of the youthful

may include improved seeds, machinery, technology, knowledge and training.

The support of the government of Kenya and the private sector, new opportunities will emerge for the youth who will make a contribution towards food security to the increasing population.

Let us charm Kenya's youthful agricultural entrepreneurs to agriculture by making it sexy!

# The Gender Quest: Empower women in Agriculture, Eradicate Hunger!



Gender issues in agriculture including access to and control over resources continues to be the underlining factor widening the gap in production

The word gender describes a social construct that ascribes roles, rules (norms), responsibilities, opportunities, power, behaviour and what the society considers appropriate for men and women. Though fluid and context-specific, the construction of gender underlines the reason for the persistence of gender inequality experienced differently by men and women. Gender construction is as old as the human race, and so is gender inequality. We are all influenced by gender.

Gender norms seem to influence what is appropriate to do in our society. As a result of gender, girls and women often have lower social status, less access to resources that should naturally be given without applying the gender spectrum. These issues are at the core of the contemporary gender system, which systematically empowers one against the other, consequently producing a bidirectional relationship between gender inequality and development outcomes.

While more women farmers in Africa continue to engage in farming, look for and adopt high yielding nutritious and climate-resilient crop varieties, they face an array of constraints making full involvement in and contribution to agriculture difficult. One of such is the lack or poor involvement of women farmers in technology development and transfer processes.

The glaring inequality between men and women farmers in the African agricultural sector is alarming evidence that calls for fair, inclusive and sustainable development. Gender productivity gaps vary across and even within countries, but recent studies suggest that gender gaps are in the range of 10% to 30%. Women have far less access than men to input,



financial services, land ownership, training and other means of increasing agricultural production and improving family income, nutrition and health.

Gender gap in agricultural productivity means that crop production is lower than its potential. Closing the gender gap in access to production capitals alone has been estimated to have the potential of lifting 100–150 million people out of hunger, thus resulting in benefits that spread far beyond female farmers.

Gender issues in agriculture including access to and control over resources continues to be the underlining factor widening the gap in production between male and female farmers in Africa. Much of the work women do as household providers and agricultural producers is unpaid, making their contribution essentially invisible. Women and female-headed households are disproportionately affected by economic recession and higher food prices and trade policies.

The crucial question becomes, how do women farmers involve in, equitably benefit from and contribute to agriculture development? We cannot overcome these challenges while age-old, ingrained ideas of gender roles deny women's full participation in decision-making and social and economic development. The stage of intentions, promises and pious hopes should be over; we must now not only act but must all act targeted to challenge and combat gender inequality. Investing in women farmers significantly increases productivity, reduces hunger and nutrition, and improves rural livelihoods for both women and men, and the next generation, partly because women spend their money and their produce differently and save their



income by investing in areas such as health, education, social assistance, and child nutrition.

#### Approaches and actions to reduce gender inequality

- a) Targeting to ensure that nobody is left behind and no need is forgotten or neglected
- b) Reaching the areas of interest and impactful
- c) Customize interventions that equally benefit women actors of the agricultural value chain
- d) These actions require urgent interventions to act now by investing more resources and energy in the empowerment of women farmers to facilitate their access to productive resources and their capacity in agricultural innovations for a fairer, more equitable and more balanced world.

e) Go beyond the production stage to support women in each key segment of the agricultural value chain.

f) Identify entrepreneurial and paid off-farm options for women in each key node of the agricultural value chain.

g) Provide a 'package' of support services such as credit, business development training, and transportation services for women farmers.

h) Facilitate reducing women's drudgery and access to inputs, equipment and skills to help them take advantage of innovations, market, and development outcomes.

**Authors: Jummai O. Yila, Scientist – Gender Research**  
**Almamy Sylla, Scientific Officer, ICRISAT, WCA Bamako**

# Digitization equipment set to accelerate Kenya's breeding programs

New equipment will speed up and enhance the accuracy of national breeding processes including seed preparation, data collection and inventory management.



**CGIAR EIB NARS Coordinator Biswanath Das share remarks at the digitization handover event in Nairobi, Kenya (Photo: Joshua Masinde /CIMMYT)**

The CGIAR Excellence in Breeding (EiB) platform handed over digitization equipment to the Kenya Agricultural and Livestock Research Organization (KALRO) as part of ongoing efforts to modernize the public agency's crop breeding programs. The handover of the equipment, valued at roughly \$85,000, took place at KALRO headquarters in Nairobi, with representatives from the International Maize and Wheat

Improvement Center (CIMMYT), EiB and KALRO in attendance.

KALRO received 23 units of equipment including seed counters, label printers, handheld data collectors, tablets and package printers. These will help the organization speed up and enhance the accuracy of various breeding processes, including seed preparation, data collection and data analysis. They will also support inventory management within KALRO's maize, wheat, rice, sorghum, bean, soybean and potato breeding programs at six of its research centres in Kenya.

## **Dispensing with laborious systems**

A lack of digitization equipment hampers the research efforts of many national agricultural research systems (NARS) across Africa. This adverse situation is compounded by unreliable institutional memory, which constrains NARS efforts to breed an assortment of crop varieties efficiently.

"Currently, KALRO uses very laborious systems including manual layouts and collection, followed by manual data entry into computers. This old age process is prone to data entry errors and delays in analysis, publication and reporting," says KALRO Director General Eliud Kireger.

"With the equipment we are receiving, information and data can be recalled by a click of a button. The equipment will also significantly reduce research costs related to labour, thus freeing our scientists to focus on core research activities."



The equipment will also support KALRO's ongoing efforts to digitize its historical data, especially for the maize and wheat programs using the Breeding Management System (BMS). So far, 20 years of maize historical data has been uploaded onto the BMS platform for ease of access.

**Prepared for emerging challenges**

The CGIAR EiB platform was established in 2017 to help modernize public breeding programs in the CGIAR and NARS to increase their rates of genetic gain. In recent years, there has been an upsurge in challenges including climate change, population growth, rapid urbanization, changing dietary inclinations, transboundary movement of pests and diseases. These have exerted an enormous strain on food production systems and elicited the urgency to prioritize the adoption of new plant breeding techniques and technologies to address current and emerging threats. This calls for a holistic approach to tackle the issues including better agronomy and policy, according to EiB NARS Coordinator Biswanath Das.

“Modernizing our plant breeding programs to develop new, climate smart, market driven varieties will be at the heart of the solution,” says Das. “We must ensure that public plant breeding programs are not left behind because for many crops in Africa, there is limited private sector interest. Public breeding programs must shoulder the responsibility for ensuring the development and adoption of the next generation of crop varieties.”



**L-R CIMMYT Regional Representative for Africa and Kenya Country Representative Moses Siambi CGIAR EiB NARS Coordinator Biswanath Das KARLO Director General Eliud Kireger and KARLO Deputy Director General for crops Felister Makini at the digitization equipment handover event in Nairobi, Kenya (Photo: Joshua Masinde/CIMMYT)**

Already, KALRO breeding programs, in collaboration with international CGIAR centres, have played a leading role in supporting farmers in sub-Saharan Africa to address many emerging plant threats such as wheat rust (UG99), maize lethal necrosis (MLN) and fall armyworm.

As part of its commitment to supporting NARS partners, EiB provided over 10 million Kenyan shillings (\$92,000) worth of material and in-kind support to various KALRO breeding operations in 2020. This included genotyping support for maize and wheat, support to adopt the BMS digital data management system, technical support and training of KALRO breeders. Much of the digitization work is driven by EiB's Operations and Phenotyping module, led by Gustavo Teixeira. “We'll continue to consider a whole range of devices and solutions,” says Teixeira. “It's a part of our culture of continuous improvement, so breeding programs can focus on what really adds value to their clients.”

EiB will continue to support NARS across Africa and beyond to digitize their operations, and is working with partners to secure more equipment, training and resources. With this digitization project, EiB has targeted 24 breeding programs in 14 African countries. These include programs run by AfricaRice, CIMMYT, the International Institute of Tropical Agriculture (IITA) and the International Rice Research Institute (IRRI).

“We want to do more to support centers to improve their operations so they can achieve the most effective and cost efficient phenotypic processes — agronomic practices, seed processing and other areas,” explains Teixeira. “We aim to expand to more programs and partners.” EiB and partners are supported by CGIAR Trust Fund Contributors and the Crops to End Hunger initiative, via the Bill and Melinda Gates Foundation, GIZ, BMZ, USAID, UK Aid, ACIAR and other partners.



# Examining the Farming Crisis in Kenya

Being an agricultural country from the beginning, Kenya ranks among the top countries in farming outputs. With agriculture employing more than 70% of Kenya's workforce, it's also the largest source of livelihood in Kenya with more than 90% of its rural households depending primarily on farming. Despite the incredible importance of farmers to the Kenyan economy and way of life, farmers in Kenya have a history of debts, extreme poverty and low quality of life. In addition to these existing problems, the global pandemic has greatly intensified the pressure on farmers and has made it considerably more difficult for many to sustain themselves, resulting in a farming crisis in Kenya. According to our sources, most people in the farming sector in Kenya are losing hope.

### Farmer Debts and Loans

According to our investigations, the average Kenyan farmer earns about Kshs. 100,000 annually. As reported earlier, only about 50% or less of the household income of a farming family comes from farming, while the rest comes from other sources. To supplement for low income, many farmers take up more than one job, sometimes working as a bus driver or security guard for example. With the pandemic and nationwide lockdown, many farmers lost their second source of income, further aggravating their already strained financial situation.

The rising costs of farming and the low pay for farm produce have pushed many farmers into a cycle of vicious debts. We interviewed Mr. Kioko Mutua from Makueni County. Mr. Kioko attempted to secure a loan of a few thousand shillings, due to fears that his farm would be seized.

Unable to sustain himself and his attempt to secure a loan failing, he ran from the village in June 2020. Benedict Kioko, his 24-year-old son, had to stop his schooling in order to save money on tuition fees so that he could help his family. Gerald Musyoka described the pandemic and the enormous stress that his family must endure when he said: "We are now having to beg for money from someone or the other."

### The Reason Farmers are in Debt

According to an earlier publication, 85% of Kenya's farmers operate on less than five acres of land. With 82% of farmers being small and marginal and contributing 51% of agricultural input, small farmers are the backbone of the agricultural industry. Despite this, farming remains an unstable and difficult profession. In order for many small farmers to escape the clutches of poverty, they must find additional sources of income.

Risks in production further aggravate the low quality of life for small farmers. The increased cost of cultivation, inadequate irrigation, drought, flood and crop failure all contribute to the lack of viability in the farming profession and debt of farmers. Additionally, difficulty in selling within the market can make or break the income of a farmer. Agricultural costs and unstable incomes have caused many farmers to take on even more debt. Furthermore, money-lending due to necessity and often the inability to pay back loans, have pushed farmers further into poverty and debt. The nationwide lockdown only exacerbated these existing problems, which resulted in difficulty in taking produce to the markets and selling it.

### Solutions to the Farming Crisis in Kenya

Despite the potential for productivity in the agricultural sector, low productivity in agriculture contributes to the difficulty and poverty among farmers in Kenya. Unutilized scientific knowledge and the mechanization of small farms are major solutions to the issue of low productivity. According to the World Bank, a key solution for increasing agricultural productivity and



improving the incomes of farmers is the adoption of innovative technologies and practices by farmers. These actions will facilitate farmers in improving their yields, managing inputs more efficiently, having a better quality of products, adapting to climate issues and conserving resources.

The Open Knowledge Repository states that efforts to improve agricultural productivity include the gradual reforms in the agricultural sector that have spurred innovation and changes in the food sector due to private investment. These efforts have been successful and continue to succeed in light of the ongoing policy and investment imperatives. Due to these efforts, agricultural growth has improved in recent years, but with a long-term rate of 3% improvement, agricultural improvement has been meagre in comparison to its potential.

#### Organizations that are making a Difference

International lending institutions offer major support to the agriculture and rural development of Kenya. Focusing on agriculture, resources, irrigation and rural livelihood development, their programs in Kenya have committed billions in net commitments. This money is going towards new technology, innovation systems, farmer livelihood support and poverty reduction efforts.

Many NGOs have emerged in recent years in order to improve the livelihood of farmers and to make farming a viable profession. Some organizations work on projects that target water harvesting and management, crop optimizations, afforestation and the conservation of resources. Additionally, they focus on improving child education, promoting women's empowerment, reducing illiteracy, responding to a lack of health care and assisting farmers struggling with extreme poverty. They provide farmers with



seeds samplings, pesticides and other supplies in order to alleviate the financial strain of farmers and ensure that they are able to support their families. They have constructed water harvesting structures, built trenches around hills to treat non-arable areas and improved and diversified agriculture in order to create additional employment in the farm sectors. To support those in poverty, it has aided in the formation and strengthening of village water supply and sanitation.

The farming crisis in Kenya has resulted in challenges for many families in the country. However, the efforts of such organizations should reduce some of the challenges farmers in Kenya are facing.



# My Day with the Village Supreme Court

**E**arly Saturday, PMQ 700 AM was ready to snake through the deep forest. “This death trap will boil before doing 100kms, why can’t you call for a cab? Why are you so mean? You have been given the last chance to appear in the commission of inquiry, yet you are risking. You are even taking mileage to launch for a claim. God forbid, you gave me a sting for a husband?”, Eve’s descendant complained. I did not answer any of the questions for I knew every answer will lead to another question.

Thank God PMQ was on a rhino charge mood, he roared like a four by four by far. In no time, it had hit 100kms per hour. Eve’s descendant sat quietly looking at the dailies which she had bought to keep her busy in case we stalled. In less than 2 hours we had done 180Kms with only five to go. Suddenly PMQ started coughing, then croaked, jerked and suddenly stalled. “I knew it, I knew it”, Eve’s descendant laughed. “The problem with you is you cannot listen”, she complained as she stood a Kimbo by the road side.

Some passersby helped me push it to the edge of the road. “*Mzee tupange*”, their spokesman said. “Yes”, a colleague added, “*Hii Kazi tumefanya si bure, harakisha tunachelewa na case*”. I gave them a two hundred shillings note and they left. I had two important phone calls to make, so I reached for my phone. I was shocked to find my sophisticated gadget had no network. Two old passersby asked what had happened and I explained to them. “Let me help you my son, this phones you keep on pushing up using a finger do not work well in the village. The network around is only fo *Mulika Mwizi*, so use my phone”, said one of them.

I called Simba my mechanic. The man who calls himself engineer though he never progressed to the classes whose pupils carry packed lunch. He laughed and started issuing instructions, “open the bonnet, Pull the pipe that comes from the fuel tank to the carburettor, sip a mouthful of petrol then vomit it on top of the air cleaner. It will go direct to the carburettor, the car must start”. The first sip went direct into my stomach with some little coming out through my nostrils. This gave me a black out for some few minutes. The

second worked and the car started. Simba requested for his consultation fee.

All this time, the two men were conversing in low tones a few metres from the car and the village pastor was praying in a language I did not understand hitting the car with the bible. He then smeared some liquid on the boot and the bonnet, took a broom and swept in front of the car. He then instructed me not to reverse but engage a forward gear. “*Mimi nimekwambia siku nyingi, panda mbegu na hizi shida zitaisha, sasa panda, kisha ununue hii mafuta niliyopaka gari na hiki kifagio kwa shilingi mia mbili*” he added. After paying, he left and the two elders called me for what they termed “men talk”. “Our son”, the elderly of the two started. “Next time never use this road, your enemies had sent the village witch doctor, he picked some soil from the road last night. Immediately your car stepped on the spot, it stalled. This was to make sure you will not get to the Supreme Court in time. In addition when you get there, do not sit on the chair they will show you, request for another”. As usual, they requested for some airtime and consultation fee which I paid. I joined Eve’s descendant in the car and Slowly we snaked into the village square where the hearings were to be heard in public.

On arrival, I found men in different groupings conversing in low tones. Immediately, the chairman called the meeting to order. However, one of the elders intervened and informed him that elders are never kept idle and therefore I had to pay a bee hive full of bees or Kshs 1000, for them to quench their thirst, I did.

The chairman called the petitioners to state his case. “Our Lords, elders of the village, I stand to represent a group of farmers who had entered this year’s cereal competition. We have noted with a lot of concern that the respondent has been winning the competition for the last four years. Despite changing the Electoral commission, he still wins. This is because he uses witch craft, money, intimidation and all sorts of tricks to rig the competition. Allow me to present exhibit SD 01, these are the seeds he buys for his neighbours which we believe he takes them to a witch doctor before. I also present exhibit SD 02, a photo of him taking tea in the village hotel with one of the

commissioners. Exhibit SD 03 is another photo of him in dark glasses with a cowboy hat pointing to one of the commissioners during the competition day. This was a sign of intimidation”.

The chairman then called me to respond to the allegations. “Our Lordship, village elders I greet you all. It is true, I buy seeds and distribute them to my neighbours whom we compete for the best cereal harvest. However, I do not take them to any witch doctor. As you all know, most cereals are cross pollinated and the only way I can attain the best harvest is by ensuring my neighbours plant quality variety to avoid cross pollination of inferior quality”.

I added, “for a start, I use trichotech and mytech to protect the seedlings from soil fungal pathogens and plant paristic nematodes. To win my battle against broadleaf weeds, I visit Corteva where I buy Ariane EC 450 WG. For nut grass, I pass through Bestfield East Africa Ltd for a dose of Patriot 750 WDG. You cannot get quality produce if you do not take care of your diseases; therefore I constantly give my cereals a royal treatment by visiting BASF for a dose of Rex Duo. This ensures good control of diseases for higher yields”.

Lastly, “I can’t always be there for my crop but ProSaro can, as it delivers unrivalled disease control on *septoria* and other leaf diseases. For the powdery and yellow rust, Shafi 125 SC distributed by Juanco SPS Ltd, ensures am covered through its rapid intake and quick translocation into the plant. After taking care of my diseases, I pass through Syngenta East Africa Ltd and get a dose of Engeo 247 SC, a new insecticide for total control of sucking and chewing insect pests in wheat.

“My Lordships I kindly request my competitors to stop wasting their time in requesting for a disbanding of the Electoral Commission and invest in the above”. With those few allow me to rest my case. The elders requested for time to deliberate and make their decision. All my competitors ran to me and apologised and also requested me to buy some of the products for them. So next time when you meet PMQ 700 AM squeaking, you rest assured am serving my community.



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