

CEREALS

JULY - SEPTEMBER 2018

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Editorial

Innovation and Its Enemies.



There is no need to re-invent the wheel when some great work has been done. Therefore allow me to share a piece from the late Callestous Juma (God rest his Soul).

The rise of artificial intelligence has rekindled a long-standing debate on the impact of technology on employment. This is just one of many areas where exponential advances in technology signal both hope and fear, leading to public controversy. Many debates over new technologies are framed in the context of risks to moral values, human health, and environmental safety. But behind these legitimate concerns often lie deeper, but unacknowledged, socioeconomic considerations. Technological tensions are often heightened by perceptions that the benefits of new technologies will accrue only to small sections of society while the risks will be more widely distributed. Similarly, innovations that threaten to alter cultural identities tend to generate intense social concern. As such, societies that exhibit great economic and political inequities are likely to experience heightened technological controversies.

Drawing from nearly 600 years of technology history, Innovation and Its Enemies identifies the tension between the need for innovation and the pressure to maintain continuity, social order, and stability as one of today's biggest policy challenges.

GMOs are here to stay, the quicker we accept them, the better.

Masila Kanyingi

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Clodigan 240 EC: Puts Grass to Rest Gives Wheat the Best

It was pomp and dance as cereal growers in Nairage Enkare, Narok County welcomed the entry of a first class grass herbicide in their spray programs. The entry came with an almost audio recorded oratory of Robert Wachira, Country Head, Adama East Africa not previously heard in the area.

In a more theatrical way, Mr. Wachira said, "In today's growing environment- with constantly shifting social, economical, environmental and market priorities, every grower would vote for a product which ensures high yield, cost benefit per Ha is achieved, minimal environmental impact, crop tolerance and High Compatibility. In addition it should lead to more vigorous, healthier and higher yielding crops".

Clodigan is an innovative systemic post-emergence wheat herbicide for the control of annual grasses like love grass (*setaria* spp), wild finger (*Eleusine* spp), wild oat (*Avena* spp), wild love grass (*Eragrostis* spp) & rye grass (*Lolium* spp). This was said by Mr. Robert Wachira while addressing farmers during the one day seminar. Mr. Wachira told farmers that Clodigan 240EC is readily absorbed through the leaf surface and stems, translocated to meristems and inhibits ACC enzymes which are essential for lipids synthesis. The product has minimal Root uptake and degrades rapidly in soil so there is no effective residual weed control.

Delivering an exceptional level of protection against love grass (*setaria* spp), wild finger (*Eleusine* spp), wild oat (*Avena* spp), wild love grass (*Eragrostis* spp) & rye grass (*Lolium*

spp), and unmatched use flexibility with a wide application window, Clodigan is a great choice as the foundation of your herbicide program.

Robert Wachira, Adama E.A regional Manager says "it's highly evident that Narok farmers are facing extreme challenges in managing tough weeds like love grass (*setaria* spp), wild finger (*Eleusine* spp), wild oat (*Avena* spp), wild love grass (*Eragrostis* spp) & rye grass (*Lolium* spp) with existing options. With Clodigan superior level of control, and unmatched application flexibility, the Adama-Amiran team are very excited about the role Clodigan can play to enable farmers to restore effective, efficient and sustainable weed control programs."

Application of Clodigan 240EC must be post emergence to wheat and grass weeds. Application timing is 3 – 6 weeks after

sowing when the wheat has reached the 3 - 4 leaf stage at 0.5 litres a hectare. Clodigan 240EC can also be tank mixed with other broadleafed herbicides like Badge. Optimal activity of Clodigan 240 EC is achieved when applied during weather conditions that are favourable to active weed growth (warm & Humid).

Mr. Wachira concluded by re-echoing the commitment of Adama to consistently bring sustainable and affordable crop protection products to Narok and Kenyan farmers at large.

To sum up the discussion, Mr. Wachira said Clodigan offers:

High yield

Effective and precise grass weed control

Cost benefit per Ha is achieved

Activity on target grass at low rate (1Litre sprays 5 acres)

Minimal environmental impact

No effective residue

Crop tolerance

Good crop tolerance when applied between the leaf stage and stem elongation

High Compatibility

Tank-mixable with many broadleaf herbicides

Remarks

The Sub-County agricultural officer Mr. Kariuki, said the Seminar could not have come at a more opportune moment than this for the region. Growers yearn to obtain quality products that can be integrated in





Part of the farmers who attended the training

their programs; to meet the ever stringent market requirements on safety and environment protection, amongst others. He commended Adama and Amiran Kenya for working hard on this area to provide growers with successful and efficient products.

In his speech, Mr. Ayub Kimani, Amiran Kenya Area Agronomist took growers through the Amiran Kenya portfolio. He said that Amiran Kenya Ltd was keeping abreast of market demand, whilst maintaining the highest standards of operation demanded by the international European standards. "We keep a hawk's eye on our products as guided by the stringent international standards and all the products lined up for you have been able to pass them," he said. Clodigan entry into the area offers growers additional choice of herbicides.

In his remarks final remarks, Mr. Wachira said, "Today marks an important milestone in our history and commitment to growers. We will strive to bring you benefits not just

products. We will not sell products we will provide solutions to enhance productivity per unit area. We will not bring you just new products; we will package technologies to meet the ever changing dynamics of crop protection".

Most of those interviewed by this bi-monthly magazine represented a cross-section of people from all sub-sectors of the agriculture business and they believed Clodigan would be of major commercial advantage to them. "I have used the product before and for sure it is

good," said Mr. Kamau a wheat farmer. Similar sentiments were expressed by Ms. Zipporah Wanjiru another farmer, described it as cost effective.

Addressing the growers, Mr. Mr. Ayub Kimani said, "Our desire is to use our technical capacity and capabilities to introduce quality products like Clodigan. We will also endeavour to offer you professional and ethical advisory services in crop protection. It is our high expectation that we will live to your expectations as world class chemical company".

Humble Correction on Farmers Kit

This come to correct a statement made on the last edition of the Cereal Magazine (issue of April- June 2018 page 45) that stated that Green Arava invented the Farmers Kit.

We would want to clarify that the Farmers Kit (actual name Amiran Farmers Kit) is an Amiran product invented by Agro- Input Supplier – Amiran Kenya.

The product is invented for small and medium scale farmers offering a complete package that includes: Greenhouse, Chemicals, Fertilizers, Seeds, Protective Gear and irrigation kit.



Our Knowledge, Your Success.

Regardless of scientific consensus and countless studies endorsing the safety of GM crops, What else do you need.

What Will it Take to Trust Scientists on GMOs?

Africa continues to lag behind in adoption of biotech crops. In 2016, only two of the 26 countries that planted biotech crops were from the region. Yet, the continent stands to benefit immensely from application of modern biotechnology in agriculture. Reluctance to adopt the technology is partly attributed to safety concerns, heightened by strong activism propagated from the west, by countries that don't face the same challenges that we do. An example is of Kenya, where, agricultural researchers have raised concern over government failure to provide enabling environment to facilitate adoption of new improved crop varieties.

The researchers have said that more efforts is needed to enable Kenya Agricultural Livestock and Research Organization (KALRO), Kenya Plant Health Inspectorate Service (KEPHIS) and other regulatory institutions to avail improved crop varieties to small scale farmers, including biotech GM maize, and GM cotton. Consequently, Kenya's current Deputy President, H.E William Ruto was spot on, in his 2010 COP-MOP 5 address, when he challenged "those with the luxury to choose whether to have red meat, white meat or whatever other colour meat not to stand in the way of those who are simply asking to have a meal"

The researchers in Kenya Agricultural Livestock and Research Organization (KALRO) have been conducting GM maize research since 2004 in confined field trials in Kiboko, Makueni County in the KALRO farm. The demonstration illustrate that use of GM maize can make a contribution to the many options that the farmers can chose from in cushioning themselves against the current challenges of drought, pests like the recent fall army worm and diseases .

Recently, a team of scientists published a meta-analysis on impacts of genetically modified (GM) maize on the environment, agriculture and toxicity. The data generated over 20 years concluded that genetic engineering increased maize yields by 10% on average, and reduced conventional mycotoxins in maize. This multiple data analysis provides very reliable evidence that GM maize can tackle a serious problem that has afflicted the continent for a long time – aflatoxin! Less amounts of natural mycotoxins reported to be both poisonous and carcinogenic to living organisms (humans and livestock) were observed in GM maize compared to their conventional counterparts. The study, like many before it, endorse the safety of GMOs. In 2016, the US National Academy of Science published a report on GMOs which reinforced the scientific consensus that there is no substantial evidence that GM crops are less safe than non-GM crops. The question that lingers on my mind is this: how many studies will it take for our leaders to trust scientists?

Regardless of scientific consensus and countless studies endorsing the safety of GM crops, there is widespread public perception that they are not safe. Worse





Time to Trust Our Scientists



still, some African governments have even hampered their production, only to allow imports of food and feed resulting from or containing GM products! This only benefits farmers from adopting countries and indirectly affects research progress, further delaying access to improved seeds. This is a worrying trend in a continent viewed as the final frontier for agricultural transformation to bring back the massive unemployed youth into smart farming.

It is disheartening when those entrusted with the responsibility of making key decisions about this continent's food and nutrition security, continue to let half-truths impede them from taking decisive action. They shy away from making evidence-based decisions and developing facilitative policies that can enable this

viable technology to blossom! Two decades after the technology has proved itself both in terms of safety and delivery of socio-economic benefits, some of our leaders continue to hide behind precautionary measures and demand for "never-ending research."

There is evidence too that the more the stacks (GM crops containing more than one trait of interest), the better, with over 25% yield increment. In the same vein, no significant impacts have been observed on non-target organisms and other beneficial organisms including bees, ladybirds, beetles, lacewings and spiders. In previous data analyses, it has been documented that adoption of GMOs reduces the use chemical pesticides by about 37% compared to their conventional

counterparts. Why then would our leaders want to come in the way of people enjoying such benefits, long after safety concerns have been put to bed?

African leaders need to care about this study and others that have endorsed safety of GMOs in the past and let credible scientific evidence guide them in decision making. In Africa, we have many collaborative initiatives on GM crops under various projects for example; Water Efficient Maize for Africa (WEMA), GM cassava and banana, Africa Biofortified Sorghum, Bt cotton, and others that continue to face regulatory bottlenecks leading to serious opportunity costs on farmers and their families. What is the scientist supposed to do beyond providing evidence that the technology works?

A Date With Lizano Limited: Passion Beats “Gender And Age Stereotyping”

“Skills are cheap passion is priceless” said Shamira of Lizano Limited; a powerful agro inputs supplier company. My first encounter with her was at Eldoret Agri-Expo which was held at Eldoret polytechnic; what got my attention was the way she attended to each and every customer at their stand; whether a customer was only consulting about the product or purchasing, they were all accorded the same special treatment. Given the constraints of time at the show I had to book an appointment with her to learn more about the kind of zeal and passion she exhibited at the show as far as agriculture was concerned.

“We are investors in agriculture from this we culminated our passion out of enormous experiences in the farm” said Shamira. Interviewing both Shamira and Catherine who are the founders of Lizano limited unleashed a lot of resourceful and inspiring details on their triggers to actively participate in the sector. Being investors, they understood the niche and what the farmer really required. With this knowledge in mind they defied all the odds by investing in a field which for a while now, has been perceived and believed to be a male’s venture and especially agricultural moguls who are of older age ranging from 40 years moving forward.

What makes Lizano exceptional from other suppliers in the country is that; they offer more than just selling products, they understand what they do and they do know it is their obligation to educate the farmer, to institute linkages with them and see to it that farmers achieve desirable results from their investments. With their passion, charming personalities and hospitality farmers feel obliged to express their needs: with this freedom comes confidence and trust for the product and those selling it. “We strive to make good returns in our ventures, but it is not always about the money” said Catherine. I was really inspired by those humble utterances from Catherine; we are in an era where entrepreneurs have made money their first priority without paying attention to quality, market factors and customer hiccups hence exploiting the farmers in return. At Lizano; networking, farmers’ training and quality assurance are their priorities. When this sequence is followed to the latter, farmers will willingly to spend every penny provided they are assured of value.

Well, with only seven months in the market; Lizano keeps on growing, building networks and transforming farming. Lizano

limited is a rising giant in agro input supplies. With shops now in Nairobi and Eldoret. Farmers are keen on supporting and trading with those passionate on what they do. They keep on improving agriculture and touching lives one farmer at a time. The energy, passion, commitment and honesty are what any investor, company and farmers would bet their money on. Check them out



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GMO Maize

KALRO has done a lot of work in sensitizing farmers, politicians and other stakeholders on the importance of GMO products in Kenya through testing Bt maize in confined field trials (CFTs) in Kiboko and Kitale. Bt maize materials in the CFTs have proven to be resistant to insects and drought as compared to the other conventional materials.

What is GMO Maize

Maize whose genetic material has been altered by means of genetic engineering in order to favour the expression of agriculturally-desirable traits including resistance to pests, herbicides and drought tolerance.

Why shift and plant GMO maize

GMO maize can be used because of the following reasons;

a) Insect Resistance

Bt Maize is modified to include genes borrowed from a soil bacterium called *Bacillus thuringiensis*. The bacterium produces a crystal, Cry, protein that disrupts the gut of insects that ingest it. Bt maize now possesses the insect-killing ability, and shows tolerance to Fall Army Worm. Maize can now be grown where infestation previously destroyed harvests or required large doses of toxic pesticides pumped into the environment, often killing beneficial insects in the process.

b) Disease Resistance

Maize is subject to plant diseases, including fungi and bacteria. While all plants are susceptible to some diseases, some plants can resist diseases that attack others. Another benefit of GMO maize is described in an

International Council for Science, ICSU, report cited by the "Public Library of Science-Biology." Corn bioengineered to carry disease resistance genes from naturally resistant plants contain lower levels of mycotoxins, substances produced by fungi growing on insect-infested, non-GMO corn crops. Mycotoxins are potentially carcinogenic to humans.

c) Herbicide Resistance

Agronomists reporting for AgBioWorld describe glyphosate, brand named Roundup, as an example of a weed-killing pesticide to which GMO maize has been made resistant. Similar GMO maize benefits have been developed for other pesticides.

d) Nutritional quality enhancement

Nutritional quality of food crops can be improved through modern biotechnology. Critical micronutrients (the vitamins and minerals that people need for good health) are enhanced. These micronutrients can be provided to millions of people through the staple foods that they eat every day, foods such as maize, sorghum, sweet potato and wheat. While these staples are often packed full of energy, they usually lack essential

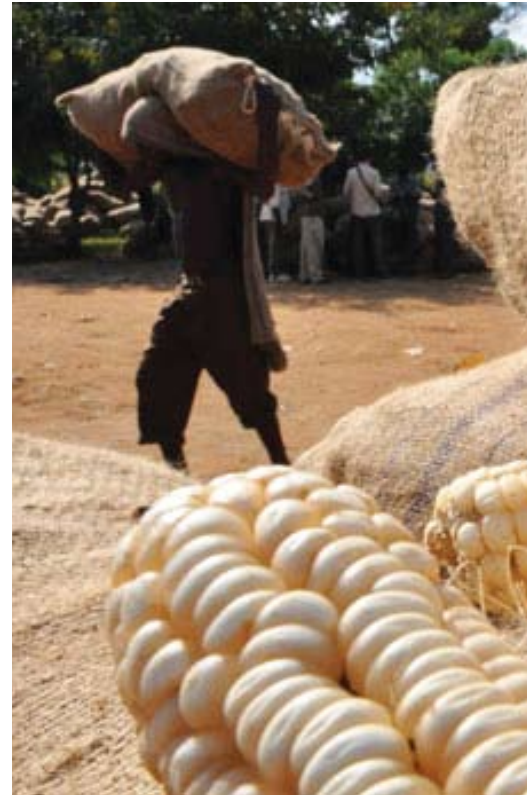
micronutrients such as vitamin A, iron and zinc. When people don't get enough of these micronutrients, they suffer from a hidden hunger. This puts them at increased risk of stunting, anemia, blindness, infectious diseases and even death. Women and children are especially vulnerable.

Its Production compared to current production?

According to the results on drought tolerance and insect pest resistance experiments carried out at the Confined Field Trials in Kiboko and Kitale, GMO maize has a yield advantage compared to non GMO maize. The GMO maize also proved to be resistant to Fall Army Worm.

Why all the hullabaloo from NGOs and other activists

There has been a lot of debate in Parliament. The debates have been due to misunderstanding and lack of proper information on GMO. The conflict of interest from the multinational companies and the fear of change has also majorly contributed to these debates. However, the Government of Kenya through various initiatives including BioAWARE, Biotechnology Sensitization





Harvested Maize



Maize Farm

workshops at county levels, schools' biotechnology sensitization meetings, The Science Centre initiatives with schools, and other publics, Open Forum on Agricultural Biotechnology (OFAB), and other have contributed strongly in informing the public on importance of biotechnology and its applications.

Why is the government unwilling to embrace the technology (Political or Scientific reasons)

Kenya has all the Acts that guide biotechnology applications eg the Biosafety Act of 2009. Kenya too has the Biotechnology policy development of 1986. In addition the country has NBA, KEPHIS, KWS, KIPI, DVS, PCPB, KEBS, and others as competent authorities that will in all ways guide the agribiotechnology applications and deployment. However, it is not known why there is a long delay in the use of crop GMO's? There is a challenge that with a small groups of anti-GM activists who object to the technology on "moral" grounds. They typically claim that GM crops are unsafe - a view flatly rejected by the scientific community over the last two decades

Its market and consumption (effects if any to consumer or environment).

GMO maize seed will be availed to the farmers through local seed companies at prevailing market prices (demand and supply) like any other commercially available improved seeds.

What advice can you give to Kenyans (Farmers and Consumers) on GMO.

The use of Bt maize is not a silver-bullet solution to all our food insecurity challenges, but has potential to contribute towards reduced suffering of the food deficits especially due to maize. By deploying Bt maize products Kenya has the potential of solving food insecurity problems. KALRO has done a lot of work in sensitizing farmers, politicians and other stakeholders on the importance of GMO products in Kenya through testing Bt maize in confined field trials (CFTs) in Kiboko and Kitale. Bt maize materials in the CFTs have proven to be resistant to insects and drought as compared to the other conventional materials.

Any other relevant information on GMO

Kenya has a functional Biosafety Act of 2009 and a further environmental release regulation of 2011 which is the policy basis for GM research. Kenya has all the Acts that guide biotechnology applications eg the Biosafety Act of 2009. Kenya too has the Biotechnology policy development of 1986. In addition the country has NBA, KEPHIS, KWS, KIPI, DVS, PCPB, KEBS, and others as competent authorities that will in all ways guide the agri-biotechnology applications and deployment.

Corruption, **NOT** Drought, Is Worst Enemy to Our Farmers

By Koigi Wa Wamwere

The subsidy the government gave to millers and maize importers to lower the price of unga from Sh140 to Sh90 for a two-kilo packet is not adequate to end the problem of rising food prices.

To begin with, the subsidy should have come with subsidies for other essential commodities such as wheat, cooking fat, bread and milk, as well as rent and school fees.

To be meaningful, food subsidies should go hand-in-hand with price controls, which make sure prices remain low and affordable for all Kenyans, especially those who earn little.

But there are those who argue that price controls are communistic, and should not be allowed in a free market economy. Yet I remember price controls were most effectively enforced by the colonial government that introduced capitalism in this country. Price controls are not incompatible with capitalism with a human face.

The truth is that except for most cruel governments, since the French Queen Marie Antoinette asked why peasants could not eat cake if there was no bread and the subsequent French Revolution, most governments will prefer price controls to anarchy, because without them, the majority that cannot afford food and other essentials will not hesitate to embrace a revolution rather than die of hunger. Given how important food is, how our farmers have not been able to grow enough and how persistent lack of enough food has been for the poor, such a subsidy should be permanent and not something temporarily we use to please voters during an election period.

In addition, food subsidies should also be considered together with farming necessities that make growing more food easier and increase production. That can easily bring down the prices.

There is little doubt that when there is more food, it gets cheaper and when scarce, it becomes more expensive. So to bring down prices of food, its supply must be increased through more efficient agriculture.

As it is now, Kenyans cannot increase food production because farmers cannot afford seeds, fertiliser, herbicides and to pay for professional advice increase their harvest. But on the other side, low food prices also discourage farmers from farming. Yet we know unless prices encourage farmers to grow food, the country will be forced to depend on imports, which will end up being more expensive. Unfortunately, if food imports are too cheap, say because they are subsidised, they risk destroying our agricultural sector, without which we cannot grow enough food or be self-reliant. The other reason why food security will not be easily achieved is because powerful leaders and civil servants take grain from strategic grain reserve and sell it to other countries at a higher price.

Because of food shortage caused by drought and inadequate rainfall, the solution to it relies on the Biblical economics of Joseph, when grains from good harvests are stored and used to feed the nation during the lean years of drought. When leaders of a nation refuse to plan food production, its storage and distribution during the hard times, lack of food is inevitable.

In deed, lack of planning of our economy and agriculture is the biggest hindrance to growth

in this country. Yet we refuse to address it because we are too busy stealing from our economy that we should otherwise have been very busy developing.

Ultimately, the main reason why we have food shortage is corruption, which disposes maize reserve, wheat and other grains, whose purpose is to feed the nation during the hard times. Corruption is infact a greater cause of famine than drought. Notwithstanding that we all know how dangerous corruption is, it continues to envelop all our food related projects.

For instance, in the 70s, Kenya set up Ken-Ren Chemical And Fertiliser Company. Although we continue to pay for it to date, it never produced any fertiliser. This factory did not take off because it was a project meant to enrich those who built it.

Before the fertiliser factory, we had a Guaranteed Minimum Returns project, which encouraged farmers to continue growing food and other crops because, even when there was drought, farmers always got a minimum return that allowed them to always go back to farming. Unfortunately, this fertiliser project was killed by corruption, in instances where briefcase farmers were paid for crops they never grew anywhere.

Right now, there is an irrigation scheme project called Galana Kulaku that is taking billions of shillings without producing maize to its projected estimates.

Unless we eliminate bad leadership and corruption, and restore permanent price controls that will prevent anyone from making billions out of hungry people, Kenyans will never be liberated from food insecurity.

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Magnesium (MgO)	1.0 %
Calcium (CaO)	9.0 %
Calcium (Ca)	9.0 %
Magnesium content	1.0 %
Sulfur content	1.5 %
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CIN	9

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The raw materials used for the production of FERTIPLUS are derived from selected farms that are strictly monitored for hygiene, quality and continuity. The state-of-the-art production process, which takes place in our ultra-modern factory, is continuously checked and monitored. Any germs or weed seeds are killed through a special process of fermentation and drying. The FERTIPLUS produced is overseen by an independent and accredited laboratory. This guarantees the quality of the product!



FERTIPLUS, an unique Product

FERTIPLUS is used by both amateur and professional growers in equal measure. This shows that FERTIPLUS is easy to use and gives good returns for any plants. The right quantities can easily be measured out, making it not only suitable for coarse cultivation methods, such as for potatoes, but also for finer cultivation methods, such as for lettuce, beans, tomatoes, cucumbers and grapes. FERTIPLUS can also be used in glasshouse beds.

Decent yields require high quality fertilization

The depletion of valuable farming and horticultural soils is what is often behind irresponsibly low yields. FERTIPLUS brings about a radical change. This is because FERTIPLUS contains not only the nutrient minerals the plant needs, but also a large quantity of organic matter needed for maintaining the humus level in the soil.

FERTIPLUS is a basic fertilizer which, due to its organic nature, releases nutrients to plants all season round. As the organic matter is largely made up of humic acids, the minerals already present in the soil are released and gradually made available to the plant.

Recommended quantities	Rate per acre
Maize	150-200 kg
Beans	300-500 kg
Rice	125-200 kg
Sukuma Wiki	400-500 kg
Cabbage	400-500 kg
Potato	300-400 kg
Tomato	400-600 kg
Onion	600-800 kg
Peppers	400-500 kg
Watermelon	400-500 kg
Amaranth	150-200 kg
Fodder	125-200 kg
Wheat	150-200 kg
Sunflower	150-200 kg
Flowers	600-800 kg
Sorghum	400-500 kg
Avocado	1 kg/tree
Passion Fruit	0.3 kg/tree
Banana	0.8 kg/plant
Coffee	0.5 kg/tree
Tea	1 kg/bush
Pawpaw	0.8 kg/tree

* Double the quantities for greenhouse cultivation

FERTIPLUS, very user-friendly

The shape of this granulated fertilizer means that FERTIPLUS is easily spread using a fertilizer spreader. It can also be spread using relatively light machines, ensuring that the soil structure is not damaged.

The product can, of course, also be spread using a drill fertilizer, or by hand.

FERTIPLUS can be stored in dry, well-ventilated areas for extended periods.

PICTORIAL : **Fertiplus 4-3-3** LAUNCH



Mr. Hezron Arunga, MD IPS Ltd



Dr. Nicholas Korir, Principal Researcher



Ms. Sigrid Meijer, Program Manager Kenya Market LED Horticulture Program



Mr. Charles Amunga, Head of Agriculture IPS Ltd



KEPHIS Representative



Attendants



THE ULTIMATE SOIL & CROP HEALTH TECHNOLOGY



The Ultimate Soil & Crop Health Technology™

APEX-10™ Puts The
Power of Nature
In Your Hands.

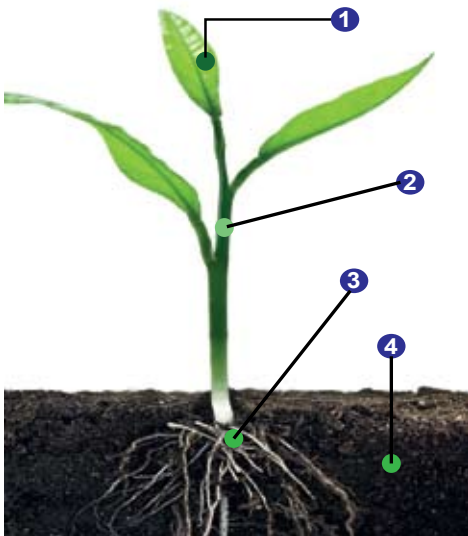
Nature's Wonder® APEX-10™ is backed by university & field studies to successfully:

1. ENHANCE FERTILIZER & WATER EFFICIENCY

By increasing crop chlorophyll levels and accelerating crop metabolic performance

The Bottom Line:

- Increased Fertilizer Efficiency + Less Water = Cost Savings
- Less inputs are better for the environment



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2. INCREASE CROP TURDIGITY

Increases the crop's ability to move water more efficiently

The Bottom Line:

- Better Drought Tolerance
- Less Syringing Due to Hot spots
- Crop Remains Upright

3. DRAMATICALLY REDUCES POTENTIAL OF ROOTS LOSS UNDER STRESSFUL CONDITIONS

Increases root mass, root density, and root strength

The Bottom Line:

- Maintain crop performance and root strength even during heat and traffic

4. ENHANCE SOIL NUTRIENT RETENTION & MAKE NUTRIENTS MORE AVAILABLE TO THE CROP

Enhances growth of native microbial population and it's activity

The Bottom Line:

- Solubilize nutrients that are tied up in the soil reducing inputs

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Nature's Wonder APEX-10™ is proudly backed by a risk-free evolution guarantee. If you're unhappy for any reason, you'll get a full refund. Please see our Evaluation Guarantee Certificate for complete details.

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OUR STORY



» Overview:

Revolutionary products created through extraordinary vision. Learn where it all started.

» Mission & Values:

Read about our company's identity "From the Earth... For the Earth™" and the mission and values behind it all.

» Leadership:

A letter from the CEO. Learn how and why we are committed to making quality products and contributing to greener world.

APEX-10™ BUILDS
HEALTHIER,
STRONGER
CROPS
... Naturally.



PRODUCTS



» Overview:

Learn all about Nature's Wonder APEX-10™: The Ultimate Soil & Crop Health Technology.

» A Unique Formulation:

Scroll through slides that outline why APEX-10™ is a unique formulation.

» APEX-10™ Technology:

Scroll through slides that outline the major benefits of the product and how it positively effects each part of the crop.

» How to Apply:

Shown here is the application process and how to easily mix, apply and integrate APEX-10™.

» How to Buy:

Learn how to partner with us to increase world food production in a sustainable way and improve food security with APEX-10™ for the global market.

RESEARCH



» Research:

We firmly believe in proof of concept through University studies and real world applications to clearly demonstrate the positive impacts Nature's Wonder APEX-10™ offers users. Here you can read summaries of those studies.

RESOURCES



Recommended Literature:

Here you will find a whole list of helpful marketing material in which you can click and download for your own use.

» FAQs:

We have compiled some of the most frequently asked questions that we have received around the country. Review them in this section. If you have any other questions that you do not see here, there is an e-mail address listed where you can contact us.

APEX-10™

Visit our official
International Partnership Services Limited
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and get all the answers you need!

What makes Nature's Wonder® APEX-10™ different from any product on the market?

- APEX-10™ is a powerful bio-stimulant and soil amendment in one. This is a one-of-a-kind peat extract made from 10,000 year old active and complex naturally occurring materials.
- A patented extraction process is used to recover all of the natural substances in their most beneficial form. The result is a formula with greater power than simply the sum of it's parts. APEX-10™ is available as a liquid formulation.

ACTIVE INGREDIENTS:

- Peat Humic Substance 12%
- Humic Acid 9%
- Other Substances 3%

DIRECTIONS OF USE: *Invert and shake well before use.*

- Short Term crops (Less than 75 days), Dress seeds with 5 ml per kg of seed; Drench 2L per acre just before planting; dip seedling just before transplanting in a mixture of 30 ml ApeX-10™ and 10 L of water; foliar apply 0.5-1 L per acre from emergence at an interval of 14 days to reproductive stage at a mixing rate of 50 ml per 20 L of water.
- Long Term Crops (More than 75 days), Dress seeds with 5 ml per 100 g of seed; Drench 2L per acre just before planting; dip seedling just before transplanting in a mixture of 30 ml ApeX-10™ and 10 L of water; foliar apply 0.8-1 L per acre from emergence at an interval of 14 days to reproductive stage at a mixing rate of 50 ml per 20 L of water.
- Nursery: Dress seeds with 5 ml per kg of seed, Foliar apply on emerging seedlings with ApeX-10™ mixed at a rate of 50 ml per 20 Litres of water. Repeat at an interval of 14 days.

Why use ApeX-10™ as a Bio-stimulant

- » Enhances fertilizer efficiency by over 66% through improved soil nutrient retention and making nutrients more available to plants.
- » Increases chlorophyll index thus improving photosynthesis.
- » Increases water efficiency by 30% through osmotic adjustment and water-stress tolerance.
- » Enhances hormonal activities in plants i.e. cytokinins, auxins and abscisic acid thus improved growth.
- » Increases seedling vigor and establishment.
- » Enhances seed germination by promoting gibberellic acid functioning.

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FERTIPLUS is a granular organic fertilizer. It's the sustainable solution to increase your yield.



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Greedy Traders, Rich Farmers Fight for Control of **NCPB** Billions

Money is sweet. Money obtained corruptly seems even sweeter. But it is not. Like wearing a stolen jacket, one keeps looking over the shoulder fearing that the owner might spot it and embarrass him, but keeps hoping it won't happen.

Wealth obtained through corruption is stolen property. And like all stolen property, culpability falls on both the thief and the beneficiaries. Ever heard of a crime called handling stolen property? That is what children, spouses, relatives and friends of corrupt individuals are guilty of whenever they drive cars, sleep in houses and even eat food bought with money stolen from the public through corrupt means.

So the next time you sell that towel at Sh100,000, remember that you are making your child, wife, husband and mother an accomplice of theft. And soon, you are going to get caught. And all your beneficiaries will be exposed for who they are - beneficiaries of the proceeds of crime!

You see, that whole system of corruption is about to fall apart. The house of cards is about to start crumbling, and the hidden cogs will be exposed.

Another mega has been exposed - the National Cereals and Produce Board (NCPB) has been used to pilfer billions in public funds to private pockets again. I have a feeling that more scandalous enterprises will be brought to light soon and their architects exposed.

The unmasking of multi-billion shilling corruption scandals is not new. We have seen and heard so many. What is new in the latest trend is that the exposure of executives seems to be orchestrated by the Executive.

By the time the media highlighted the robbery at NCPB, the board's chief executive and a few managers had already been pushed out of office, indicating that unlike in the past, the media are catching up with what the Executive is doing and not the other way round.

The Scam

The conspiracy of silence that bound greedy brokers, connected large-scale farmers and corrupt officials at the NCPB has been unmasked.

Background

It all started last year, or in late 2016, when the skies refused to open. A crippling drought that depressed harvests for the better part of 2017 saw the Government throw open the country's borders, allowing for duty-free entry of white, non-GMO maize from as far as Mexico, South Africa and Uganda.

According to official figures, between April and December 2017- the period when the maize subsidy programme was implemented - some 15 million bags of maize valued at Sh39.6 billion was imported taking up all the space in the 39 NCPB depots around the country. The uptick was unprecedented.

Although most of the imported maize was absorbed by millers, a good chunk of it remained in the Government stores. Experts have questioned the validity of these figures as given by KNBS but signs of a maize glut were unmistakable.

As soon as the subsidy programme came to an end, it was the turn of local farmers to take their produce to the Government stores. Spurred on by an irresistible offer of Sh3,200 per bag from the Government large-scale farmers loaded their produce onto trucks, others hired more lorries and went round mopping up much of the harvests from their poor neighbors who had no muscle to reach the nearest NCPB depot.

Meanwhile, a few opportunistic brokers, not registered with NCPB, hastily crossed the Kenya-Uganda border to Western Uganda where they snapped up any grain of maize they could lay their hands on.

Most of the depots, already filled with maize from Mexico and South Africa, were fast running out of space. But the queues outside of the 39 depots around the country were getting longer and longer. NCPB panicked. They needed to create more space if they were to avert any fall-out.

NCPB enticed millers with a price of Sh2,300 per 90-kilogram. Unfortunately, the scheme floundered. Millers were not interested. They already had more than enough stock of imported maize in their stores.

Kenya Farmers Association Director Kipkorir Menjo, says that a cornered NCPB is only going after “well-off” Kenyan traders who have perfected the art of doing business. “The real cartels,” says Menjo, “imported maize last year between October and December, 2017 from Mexico.”

Players in this sector are also not buying into the narrative that it is the maize from Uganda that is distorting the market. Traders have been getting maize from Uganda. It is not so significant to distort the market.



“The rot at the National Cereals and Produce Board has been laid bare, exposing how well connected cartels are minting billions at the expense of the Kenyan farmer.”

Timothy Njagi, a research fellow at Tegemeo Institute, an agricultural policy think-tank affiliated to Egerton University, feels that the current NCPB structure “creates a huge incentive for corruption.”

Dr Njagi explains that because the Government is always giving a price that is higher than the market price, it creates a situation where everyone wants to cash-in, including those who are not farmers.

He does not understand why the Government has not been keen on changing this structure. “Why doesn’t the Government, for example, want to buy directly from farmers?” he wonders. “There is no political goodwill to try and change the current structure,” says Njagi, noting that the subsidy programme has failed to live up to expectations.

Dr Njagi says it creates the notion that the Government is about to mop up every maize from the market. Some farmers believed the Government was supposed to pay them about Sh3,600 for a bag of maize.

The current system, says Dr Njagi, creates a culture of dependence. For example, last year, even when the rains had started, most farmers delayed planting as they waited for cheap fertiliser from Government. “The Government has to choose whether to subsidise from the production side or market side,” he said. “Or they can subsidise consumers, which is easier to implement,” said Njagi.

RICE

Increased production of rice will ensure food security and save much-needed foreign exchange. Local rice production, processing, and marketing will improve the livelihoods of rural and urban populations by creating employment, opportunities for private investment, and income for small-scale farmers.

With a population of 40 million, an annual population growth rate of 2.7% and recent rainfall deficits threatening its food security, Kenya needs to engage in crop diversification at the national level, with a focus on targeting production of staples such as rice in suitable agro-ecological systems. Such enhanced production could play a key role in ensuring that food production gaps are sealed and improving overall national food security.

Rice consumption in Kenya is increasing at a rate of 12% annually, as compared with 4% for wheat and 1% for maize. The annual consumption stands at about 300,000t against a production of 80,000t. Despite the increased consumption, there has been little growth in rice production despite the huge potential that exists in the country.

The Ministry of Agriculture developed a comprehensive National Rice Development Strategy for the period 2008-2018, with the aim of doubling current production. The Rice Promotion Unit, in collaboration with the Japan International Cooperation Agency (JICA), conducted a questionnaire survey in the Mwea Irrigation Scheme, Kirinyaga District, to determine whether this target was achievable by identifying some key challenges that must be solved to meet the goal. Inefficient water management methods and water-rationing programs, crop damage caused by *Quelea quelea* and weaver birds, and expensive inputs were identified as key



bottlenecks. Almost all production activities are done manually, resulting in health hazards and higher costs of production. The rice seed industry is informal, often with poor quality seeds that result in poor crop establishment and yield.

Lack of a structured market and access to milling facilities has resulted to very low farm-gate prices. These challenges will affect all the other irrigation schemes currently in operation, as well as new ones. Producers of rain-fed rice will share some of these same challenges. Collaborative initiatives by all the stakeholders involved in every stage of the rice value chain must be emphasized. With accelerated support from local and international development partners such as JICA, rice production in Kenya could be doubled before 2018.

Conclusion

To double production of rice in Kenya by 2018, the Rice Promotion Unit (RIPU) under the Ministry of Agriculture, in collaboration with all rice stakeholders, must come up with strategic interventions that will address the challenges affecting the Mwea Irrigation Scheme and apply the same strategic interventions to existing rice irrigation schemes, as well as to new production areas.

According to the survey results, the country has enormous opportunities in regard to enhanced rice production. With improved water resource utilization, as well as innovative management technologies, an additional 800,000 ha could be irrigated and about 400,000ha could be used for rice production. This compares with about 20,000ha currently being used for irrigated rice production. In addition, another 1.0 million ha could be used for rain-fed rice production, as compared with the current 5000 ha. It is important,

however to improve the utilization of the existing potential for rain-fed rice production through the development of NERICA varieties that are adaptable to the country's ecological zones.

Locally produced rice is of high quality compared with imported rice and is preferred by consumers. Officials from Mwea Rice Farmer's Cooperative Society reported that there have been incidences of fraudulent repackaging of poor quality, cheap imported rice; this presents unfair competition to locally produced rice.

They therefore recommended that the Kenya's Bureau of Standards (KEBS), being the national body mandated to oversee standardization, should enforce compliance of standards for imported and local rice.

Production should begin with market orientation, and everybody along the value chain should have a specific role; the farmer should be involved in all stages along the chain. Capacity-building is necessary so that farmers see farming as a business, and training of agricultural extension staff is essential.

If collaborative initiatives by all stakeholders involved in every stage of the rice value chain are emphasized, and with accelerated support from local and international development partners (e. g., JICA), rice production in Kenya could be doubled. Several technical committees established under RIPU have been created to drive the NRDS, and a number of intervention points have been identified.

Rice research in Kenya was formerly solely under the NIB, but is now also handled by Kenya Agricultural Research Institute (KARI). MIAD, in collaboration with the Japanese Government (JICA), has embarked on research to create technologies that



will boost yields; improve quality, disease resistance, and pest tolerance; and improve highland rice varieties.

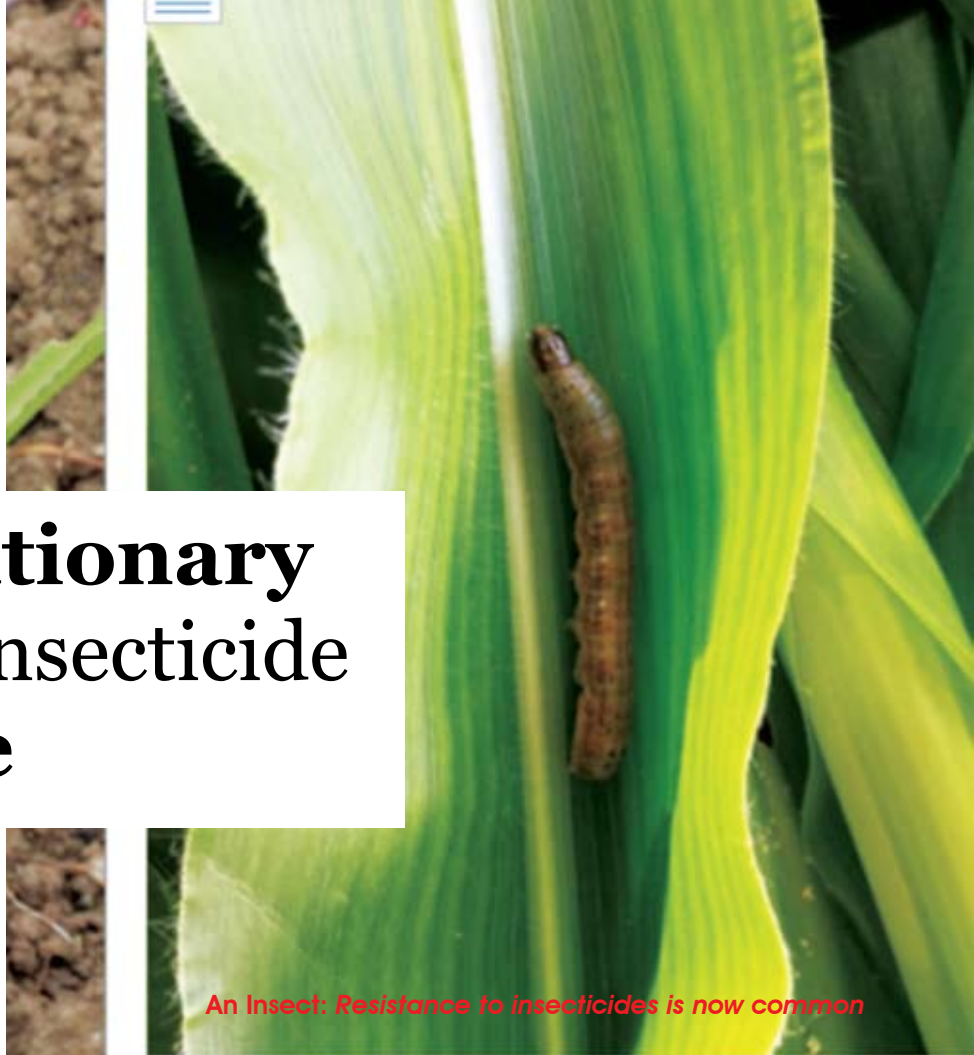
Working with other stakeholders, RIPU has developed a road map to seed certification and multiplication as a key starting point.

To solve the problem of land subdivision, some family members are making agreements on land use that limits subdivision, with one family member doing the farming each season and then sharing the products and proceeds in a rotational manner.

Pesticides continue to be a significant and growing component of modern farming technology. The relative importance of pesticides has increased, despite the availability of alternatives to chemical pest control. To reduce the contamination of water with chemicals, water delivery canals will need to be redesigned to separate unused and used water for treatment and recycling. This will also aid in water-use efficiency and reduced environmental contamination. Designated water treatment and delivery systems for domestic water should be established to supply water to all households.

Increased production of rice will ensure food security and save much-needed foreign exchange. Local rice production, processing, and marketing will improve the livelihoods of rural and urban populations by creating employment, opportunities for private investment, and income for small-scale farmers.

The Evolutionary Context of Insecticide Resistance



An Insect: Resistance to insecticides is now common

From The National Geographic to The Wall Street Journal, popular media are fond of stories on how insects have ruled the Earth from the Dawn of Time, and how their rule will continue well into the distant future. Indeed, insects and their relatives, such as centipedes, springtails, mites, and spiders, were among the first organisms to colonize terrestrial habitats.

Since then, they have successfully survived all the major extinction events and, as a group, prosper in a wide variety of rather diverse environments. Unfortunately, quite commonly such a high adaptability represents a serious problem to humans. Professional entomologist, find it borderline offensive that all-too-many people consider every insect to be a disgusting and vaguely dangerous creature that should be stepped on, smashed with a folded paper or, even worse, sprayed with insecticide from a bright and shiny aerosol can. In fact, most insects are highly beneficial. Without

them, we would not have most fruits and vegetables in our daily diets (if you eat a cucumber, thank a pollinator), drowned in refuse, and could not have received a gift of real silk pajamas. Furthermore, there would be no honey to put in a cup of tea to combat a common cold contracted while volunteering for Read-a-Loud Day at a local children's library.

Having said that, many insect species are indeed pests. Not because they are evil or malicious, but because they happen to utilize the same resources – food, fiber, construction materials, or recreational facilities – as we do. This creates understandable tensions, and we are trying to use our highly evolved human brains to do something about it. Despite the size of our brains, however, we eventually settled on a single most common solution: to produce some poisons and use them to kill the little buggers as quickly as possible. Such an approach comes with

a considerable environmental price tag attached, but it works. Until it doesn't.

Repeated applications of insecticides lead to resistance development in exposed insect populations. It is a typical selection process. With uncountable billions of insects out in the field, a few of them develop random mutations allowing to deal with insecticides in one way or another. Some of the resistant individuals get a capability to digest toxic compounds and break them down into harmless molecules. Others become able to pass poisons through their bodies without having them stuck to any internal tissues. Still others start avoiding exposure to toxic chemicals by changing their behaviors.

Without insecticides in the environment, such mutations usually come at a cost. Resistant mutants often have a shorter lifespan, lower reproductive success, and suffer high mortality. As a result, they are

being outcompeted by their susceptible counterparts, and their numbers remain low. After an insecticide is applied, however, only resistant organisms can survive a toxic onslaught, while their susceptible competitors are removed from the population. Resistant survivors quickly build up in numbers and prosper, often to a great detriment to human well-being. Insecticide resistance is a very serious problem in agriculture. For example, the potato beetle, an important pest of potatoes, tomatoes, and eggplant, has become resistant to at least 56 different chemicals. The diamondback moth, which is a real curse for growers of cabbage, broccoli, and related crops, can withstand a whopping 95 insecticidal compounds. Not every population is resistant to every chemical, but the number of failures still speaks for itself.

As frustrating as it is, insecticide resistance should not be much of a surprise to anyone familiar with the basic concepts of the theory of evolution. This point often escapes common discourse, but toxic environments are not limited to agricultural fields or faculty meetings. Herbivorous insects have been likely exposed to insecticides for about 420 million of years, which predates not just our species, but mammals in general. Back then, those insecticides originated from plants. Not from human-built chemical plants with smokestacks and loading docks like now, but from living, photosynthesizing plants.

Many insect-plant interactions, such as pollination or seed dispersal, are mutually beneficial to the parties involved. However, many insect species eat plants. In response, plants develop defenses against being eaten. Synthesizing toxic chemicals is a very common approach to protection against herbivores. Many insecticidal

compounds produced by plants affect their insect targets in similar ways to insecticidal compounds produced by humans: disrupt cell membranes, inhibit metabolism, suppress nutrient and ion transport, inhibit transduction of nerve impulses, and disrupt hormonal regulation. Some chemical groups of synthetic insecticides are even modeled after natural molecules. For example, pyrethroids are similar in structure to pyrethrum produced by daisies, and neonicotinoids are similar to nicotine produced by tobacco.

Not surprisingly, exposure to plant toxins triggered the evolutionary process described above for synthetic insecticides: only resistant mutants survived and reproduced. Those mutants became capable of devouring previously protected host plants, except for a few mutant plants that produced a different toxin still effective against the mutant population of herbivores. Those mutant plants survived and reproduced, until a new mutation in the insect population rendered their defenses obsolete. And so on, and so forth.

Such a sequence of reciprocal changes is known as co-evolution, and it is likely to be responsible for a large portion of the diversity of life on Earth. It is also no different from the “pesticide treadmill” of insecticide/resistance/new insecticide/new resistance sequence of events that is taking place in agricultural pest management.

Even underlying biochemical mechanisms may have considerable similarities. In particular, a family of enzymes known as P450s is extremely important for detoxifying chemicals of both plant and human origin. Changes in the amount and structure of those enzymes have been shown to be instrumental both for adaptation to new host plants, as well as for resistance to a



Repeated applications of insecticides lead to resistance development in exposed insect populations.

number of synthetic chemicals.

Insecticide resistance should be treated as a specific case of co-evolution, not as some kind of a new phenomenon unique to industrialized pest control. This is not a very comforting thought because pest control practitioners have to combat resistance mechanisms that are well entrenched over hundreds of millions of years of evolution.

However, our ability to continue overcoming pest problems depends on our ability to understand their evolutionary origins. While many plant species successfully adapted to withstand insect herbivory, more than a few went extinct since early Devonian. If we do not want to join the latter, we should be able to reconstruct evolutionary history, learn its lessons, and act accordingly.

Fertiliser Use & How to Spot Fakes

It is that time of the year when farmers have prepared their farms and are ready to plant taking advantage of the rains. Every farmer normally hopes to get the best harvest at the end of the season. However, the successes of the crops depend on proper soil fertility management through the use of the right fertiliser.

Why add fertiliser to the soil?

All the nutrients in our food originally come from the soil. Soils naturally contain many nutrients like nitrogen, phosphorous and potassium. But when the nutrients are missing or are in short supply, plants suffer from deficiency and do not grow well. Once crops are harvested, the natural supply of nutrients in the soil must be re-filled, which is why it is important to add nutrients to the soils through the use of fertilisers. Fertilisers contain nutrients such as nitrogen, phosphorus, and potassium and they are applied to supplement the elements for healthy crops.

How and when to use fertiliser

Genuine fertiliser when applied to your farm will lead to improvement of the soil health, your crops will grow vigorously and you will get the best harvest for higher profits.

After getting the genuine fertiliser, how and when do you apply it?

Before adding fertiliser, you should send a soil sample to a laboratory for baseline testing. By testing soil, farmers know which nutrients are missing and how much to apply to the soil. If too little is added, crops will not produce as much as they should. If too much is added, excess nutrients will run off the fields and pollute streams and groundwater. So, while fertilisers serve an important purpose, farmers must be careful to use the right amount, at the right time. When it comes to applying fertiliser, more does not mean better. Too much fertiliser can damage and maybe even kill your plants. Be sure to check the label for the N-P-K ratio, as you may be able to use a general fertiliser with close to the same nutrient percentages but at a lower price.

Knowing when to fertilise is as important as using the right fertiliser. If you don't apply the fertiliser at a time when the plant can use it, then all the fertiliser will go to waste. For example, the most important time to apply super phosphates (TSP or SSP) or DAP is before planting. This is because phosphorus is critical for seedling root development and early growth. Apply very soon before planting to ensure that fixation does not render the phosphate unusable by the time it is needed by seedlings. Repeat the application of fertiliser as needed to maintain good plant growth. Using smaller amounts of fertiliser at frequent intervals may be



more beneficial than applying at once at a higher rate.

How to spot fake fertiliser

Many farmers have claimed losses due to fake fertilisers sold to them. When you are buying a fertiliser, make sure the contents are listed on the bag with their percentages clearly labelled, for example, N:P:K 23:23:23. Also check the packaging of the production batch number and seal. Also check the purity of the fertiliser you are buying. One way of doing this is to look at the physical and some chemical properties. For example, DAP is hard, granular, brown or black in colour and does not break easily by nails. If some granules of DAP is heated slowly on a plate, it swells.

If it is super phosphate like TSP or SSP and it is hard, brown or black in colour and hard to crack by nails, there is a possibility that the fertiliser has been adulterated with DAP and NP fertilisers. If it is heated, its granules do not swell whereas





acidic or alkaline due to the mineral composition as well as external factors, including plant root exudates, acid rain, mine spoils and decomposition of organic matter in the soil.

Acidic soils are common in areas with abundant rainfall. In the soils, nutrients dissolve slowly or not at all. Critical plant nutrition is locked up in insoluble mineral compounds hence plants cannot utilise them. Fertiliser is of little use in acidic soils because nutrients cannot be absorbed. Most field crops including beans, sugarcane, barley and vegetables like cabbage, asparagus, broccoli, melons and spinach will grow best if pH is close to neutral (pH 6 to 7.5). A few crops will tolerate relatively acidic soils (pH 5 to 6) such as oats, corn, tobacco, wheat, carrot, cucumber and potato. In acid soils, calcium and magnesium, nitrogen, phosphorus and boron are deficient, whereas aluminium and manganese are abundant. In alkaline conditions, phosphorus, iron, copper, zinc and boron may be deficient

Diseases Will Thrive

Some diseases will thrive when the soil is either alkaline or acidic. For example, the fungus *Gaeumannomyces graminis* is favoured by alkaline pH and infects wheat, barley, rye and several grasses. Plants grown in acid soils can experience a variety of problems, including aluminium, hydrogen and manganese toxicity as well as nutrient deficiencies of calcium and magnesium.

Nitrification and nitrogen fixation are also inhibited by low pH. Additionally, mobility and breakdown of herbicides and insecticides in the soil are affected by soil pH. Also, the solubility of heavy metals is increased in solutions of low pH. Failure of degradation of these compounds can lead to environmental pollution when they eventually find their way to water ecosystem. Other processes that depend on soil pH include organic matter mineralisation, which is conversion of organic matter into utilisable nutrients. To manage acidic soils, farmers need to add limestone or gypsum to increase soil pH. In addition, crop rotation especially by replacement of leguminous crops with non-legumes can help interrupt the acidifying effect of leguminous crops.

Application of basic fertiliser such as NPK instead of DAP help curb acidic soils. In areas with alkaline soils, application of ammonium fertiliser, urea and ferrous sulphate can decrease the soil pH. Farmers should always consider taking soil samples for testing at least every growing season.

John Nganga and Prof Lenah Nakhone, Crop Horticulture and Soils Department, Egerton University
The writer is based at Crops, Horticulture and Soils Department, Egerton University.

granules of DAP and other complexes swell. Urea is white, shining and has consistent particle size and is round in shape. It is completely soluble in water and one feels cold when the solution is touched. It also melts when kept on a hot plate. If the particle surface colour is too dark or reflective, then it was mixed with impurities.

Hey, don't apply fertiliser before you test that soil

Not many farmers consider taking their soil for testing before venturing into farming. Usually, there is a general perception that soil contains everything the crop needs with probably the exception of few major nutrients that can be obtained from fertiliser. The conditions that contribute to soil health include; the right proportion of nutrients and organic matter; adequate amounts of soil air and soil water and most importantly soil pH.

Soil pH generally refers to the degree of soil acidity or alkalinity. Chemically, pH is the concentration of hydrogen ions in the soil. Soil pH is measured in a scale of 0 to 14. If pH values are greater than seven, a solution is said to be basic or alkaline, while if the pH is seven, the solution is acidic. Soil pH affects its physical, chemical and biological properties and processes as well as plant growth. The nutrition, growth, and yields of most crops decrease when pH is low and increase as pH rises to an optimum level. Indiscriminate use of nitrogenous fertiliser, especially DAP (Diammonium Phosphate) and CAN (Calcium Ammonium Nitrate) is a major contributing factor to elevated pH in most soils.

In addition, many nutrient deficiencies, decline of microbial activity and crop yield and deterioration of environmental conditions are due to poor soil pH levels. Soils can also be

WEMA Achieves

Major Milestone in African Agriculture

The WEMA project has developed conventional drought-resistant maize hybrids, which are sold under the brand name DroughtTEGO, as well as genetically modified (GM) varieties

By Winnie Nanteza

The Water Efficient Maize for Africa (WEMA) project has concluded its first decade of research, achieving significant advances that are benefitting small-holder maize farmers in sub-Saharan nations.

Some 300 million Africans depend on maize as their main food source, but the crop is frequently destroyed by drought and insect pests, leading to hunger, poverty and human suffering. Hybrids developed under the WEMA project can help farmers better respond to droughts, and the associated loss in productivity, caused by climate change.

“It’s been a thrilling journey and a lot has been accomplished,” said Lawrence Kent of the Bill & Melinda Gates Foundation, which was joined by USAID and the Howard G. Buffett Foundation in funding WEMA. The

public-private partnership is led by the nonprofit African Agricultural Technology Foundation (AATF). Other partners are the International Maize and Wheat Improvement Center (CIMMYT), Monsanto and the National Agricultural Research Systems (NARS) from the participating nations: Kenya, Uganda, Tanzania, South Africa, Ethiopia and Mozambique.

The WEMA project has developed conventional drought-resistant maize hybrids, which are sold under the brand name DroughtTEGO, as well as genetically modified (GM) varieties — to be marketed under the brand name TELA — that offer both drought tolerance and insect resistance.

“When the project started 10 years ago, it was rather unclear how it would go,” said Mark Edge, director of WEMA partnerships



“

The WEMA project has developed conventional drought-resistant maize hybrids, which are sold under the brand name DroughtTEGO, as well as genetically modified (GM) varieties — to be marketed under the brand name TELA — that offer both drought tolerance and insect resistance.



Research Field for new seeds

at Monsanto, which offered to share its drought-tolerant and insect-resistant traits royalty-free for humanitarian purposes. “But together, we are making progress.”

The various stakeholders met recently in Nairobi, Kenya, to discuss the achievements to date and plan for the next phase: deregulating and deploying the drought-tolerant and insect-resistant TELA maize hybrids for smallholder farmers in sub-Saharan Africa.

Tracy Powell, the USAID representative at the meeting, emphasized that WEMA has demonstrated the power and functioning of public-private partnerships.

Sylvester Oikeh, WEMA global project coordinator, said the next phase will focus on ensuring that Kenya, Uganda, Tanzania, Ethiopia and Mozambique initiate commercialization of the improved

GM maize by 2023. South Africa commercialized insect-resistant (Bt) TELA maize and its farmers are currently growing the royalty-free seeds. The other countries are held back by the lack of legislation or policies to authorize the adoption of biotechnology.

Still, they have been moving forward with the field trials that are required for commercialization. In late 2017, Ugandan researchers reported promising results from its last set of confined field trials, conducted on WEMA maize with the two traits. However, Uganda must pass a biosafety bill before the seeds can be sold to farmers.

Mozambique harvested its first trial of the drought-tolerant, insect-resistant maize earlier this year. Researchers in both Mozambique and Uganda found that TELA maize, which was developed to deter

attacks by the corn-borer pests, appeared to also successfully resist infestations by the destructive fall armyworm.

Fall armyworm — first detected in West Africa in 2016 — has spread across the continent, devastating the maize fields that provide both food and income for smallholder farmers.

WEMA products also showed strong protection against maize lethal necrosis (MLN), according to Dr. Godfrey Asea, the project coordinator for Uganda. Meanwhile, Tanzania is conducting its second set of confined field trials on the drought-tolerant and insect-resistant variety, and Ethiopia planted its first GM TELA test crop this month.

Though Uganda has not yet approved the TELA maize, it has released about 10 conventionally-bred DroughtTEGO hybrids. This maize has the potential to give farmers an average yield of three tons per hectare in moderate drought conditions, and eight tons in well-watered conditions with good crop management, according to the AATF. WEMA is developing TELA hybrids that are also resistant to several foliar diseases, such as maize lethal necrosis, turicum leaf blight and gray leaf spot, which can cause significant economic losses.

Though the WEMA project initially was projected to commercialize only 25 conventional hybrids, “up to 106 varieties have been released across the participating countries,” according Dr. Ambrose Agona, chairman of WEMA’s executive advisory board and director general of Uganda’s National Agricultural Research Organization. USAID’s Powell noted that these achievements with conventional maize are worth celebrating. “We have actually helped smallholder farmers improve their livelihoods,” she said. “We hope that the next phase of the project can make the necessary contribution to deliver even more compelling products to the farmers.”

How Fall Armyworm Can be Beaten in Africa

B.M. Prasanna, Director of the Global Maize Program at the International Maize and Wheat Improvement Center (CIMMYT), believes that the fall armyworm on the move in sub-Saharan Africa can be beaten. In this guest blog for Farming First, he outlines the actions that must be urgently taken to protect African harvests from the plight of this pest.

Fall armyworm is one of the most destructive insect pests worldwide, and it is on the move. In 2015, this pest migrated for the first time to Nigeria. As of today, its devastation has been reported in 30 countries in Africa.

Estimates in September 2017 showed that just in six African countries, the pest has devastated almost 1.5 million hectares of maize crops. Without proper management, over the next one to two years, fall armyworm is expected to cause up to six billion dollars worth of damage across affected maize growing regions in sub-Saharan Africa.

Why is it such a majorly concerning pest? The first, most important reason is that fall armyworm is very highly poliphagus – which means the pest can attack not just one or two crops, but as many as 80 different plant species. Second, it can migrate very fast. Each moth population can travel up to 1,500 km.

In case of America, where fall armyworm has been present but under control, it usually migrates to warmer weather in the winter. But in Africa, the weather conditions are quite conducive for the pest to remain in certain countries for a long time. This means fall armyworm is here to stay in sub-Saharan Africa. So we need to know how to adopt from various practices that have been followed elsewhere, tailor them to African agro-ecologies and sustainably manage the pest.

Raising farmer awareness on effective pesticide use and cultural control

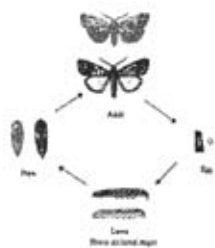
The first, most important action that must be taken, is to raise awareness among farming communities on how to make wise decisions on application

of pesticides. It is critical to apply the right kind of pesticide, at the right stage. This is when the larvae is within the first three of its six stages of development – in the final three stages larvae have become very big, and can protect themselves from coming into contact with the pesticide.

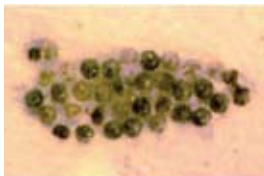
We must also create awareness amongst extension agents and the farming communities on what exactly this pest is, how not to panic, how to recognize the early stages during the early crop growth, and apply the right types of pesticides.

“ We need to take advantage of digital tools or applications for the farmers to actively send messages about the pest in different parts of the countries or provinces, and how best to communicate with them about control measures ”.





There are also certain cultural control efforts which need to be validated and quickly disseminated. For example – each larva lays as many as 1000 to 1500 eggs each month, and these are laid in batches of around 200-300 eggs. These could be very easily recognized even with the naked eye on the leaves. If a farmer is trained to understand how to recognize those egg masses, then destroying them means you are destroying 300 potential larvae. So understanding what these egg masses look like, and quickly collecting and destroying them will be key.



Stepping up research on control measures and host plant resistance

The second most important aspect is to urgently carry out strategic research on control measures, such as biological control options. For example, there are many pesticides derived from naturally occurring bacteria and viruses that could be helpful, such as *Bacillus thuringiensis* pesticides, Neem based bio pesticides, as well as egg and larva paracetoids that are known to be very effective against fall armyworm outside Africa. So

the capacity to quickly validate these options, to scale them up and release them is an extremely important action.

In a more long-term approach, institutions like CIMMYT are also intensively working on host plant resistance. Making use of historic research, we are now extensively testing maize and wheat varieties against the fall armyworm populations in Africa and we have got some very promising sources of resistance which we will be validating very soon.

But this will not be immediately available, the seeds for resistant varieties need to be identified, validated, and then systematically seed needs to be scaled up and deployed. But we must remember, this pest is unfortunately here to stay for

decades. So we are running a marathon here, not a 100 meter sprint. We must conserve our energy to ensure we reach the finish line, employing both short and long-term solutions.

A manual for action

CIMMYT, in partnership with USAID and a number of research and development partners, national and international partners is working to produce a comprehensive manual on fall armyworm pest management in Africa. It will focus on six topics: how to apply integrated pest management to fall armyworm management; fall armyworm monitoring and surveillance; cultural control and sustainable agro-ecological approaches for fall armyworm management; biological control options; host plant resistance and sustainable pesticide use. The manual will be available in January.

There is a tremendous coordination effort at the local, regional and continental level that is required in the years to come in order to make these things happen.

This pest is not to be treated as some localized problem, because of its rapidly migrating capacity. So monitoring and surveillance methods across the continent need to be intensified, we need to take advantage of digital tools or applications for the farmers to actively send messages about the pest in different parts of the countries or provinces, and how best to communicate with them about control measures. We must also urgently plug research gaps that examine the efficacy of certain interventions, and also ensure the best pesticides are registered and available for use across all countries.

All these things mean there has to be a very strong investment in research and development and in active outreach program and coordinated networking. I estimate that it could cost in the next four to five years no less than 200-300 million dollars per year.

CIMMYT is ready to stand with others; IITA, ICIPE, CABI, national programs, and the private sector, to beat this pest – with a unified and systematic approach, it can be done.





By Bitange Ndemo

During last year's Jamhuri Day speech, President Uhuru Kenyatta revealed his legacy agenda under the banner the "Big Four".

The agenda focuses on food security, affordable housing, manufacturing and affordable healthcare as key pillars anchoring his development policies during his second and final term in office.

Let us critically analyse each of the pillars and make suggestions on how best we can achieve these goals starting with the first pillar -- food security. Food security is a vital cog in the economic growth of any country. The Food and Agriculture Organization (FAO) defines food security as a state "when all people have physical, social and economic access to sufficient, safe, and nutritious food that meets dietary needs and food preference for an active and healthy life at all times."

Population and Land

Without such in any country, there will be social and economic instability.

There are several variables that impact food security. Key among them is population and land resources. In 2018, Kenya's population is expected to hit 51 million, more than 13 million new lives since the last census of 2009, when the country had 36.8 million people.

If you carefully scrutinise the population density and the climate maps below, you can see that they mirror each other. In other words, the density of the population is higher in the most arable land inhabited by largely peasant farmers who own small pieces of land.

How to Grow More Food For a Growing Population

Food security is a vital cog in the economic growth of any country. The Food and Agriculture Organization (FAO) defines food security as a state "when all people have physical, social and economic access to sufficient, safe, and nutritious food that meets dietary needs and food preference for an active and healthy life at all times."

Yet, according to FAO, smallholder farmers contribute more than 80 percent of food supply in Africa, as well as in Kenya. The nexus between population, land size and productivity was the subject of a 1997-2010 study by Milu Muyanga and T.S. Jayne in their paper Effects of Population Density on Smallholder Agricultural Production and Commercialization in Rural Kenya, through a grant from the Bill and Melinda Gates Foundation to Michigan State University's Department of Agricultural, Food, and Resource Economics.

“Traditional methods of farming can no longer support the growing population”.

The study established that "farm productivity and incomes tend to rise with population density up to 600-650 persons per km²; beyond this threshold, rising population density is associated with sharp declines in farm productivity."

Minimum Land Size

At the time, "14% of Kenya's rural population was residing in areas exceeding this population density." Although no new study has been undertaken, the additional 13 million people must have pushed the percentage of Kenyans living in areas that they will experience drastic productivity decline.

The study concluded that Kenya needed to explore the nature of institutional and policy reforms needed to address these development

problems. Indeed at the time, the then Lands minister Amos Kimunya came up with a policy on minimum land size but political pundits destroyed it before the public debated it.

As a result, there isn't much arable land in Kenya where farm mechanisation can help improve productivity. In my view, for Kenya to be food secure, it is necessary to discourage further land subdivision and possibly start land consolidation to enable large-scale mechanised commercial production to meet the needs of the growing population.

Danger of Relying on Peasant Farmers
The danger of the continuing reliance on peasant farming is that a few Lords of Poverty have mastered ways of manipulating small-scale farmers and carting away huge sums of money. Every year, we are told that farmers will get fertilizer but no one has ever questioned why yields are declining if the farmers are using fertilizer.

The truth is that more than 70 percent of fertilizer in the country is counterfeit. Even government officials cannot explain how or who imports such fertilizer.

In the past few years farmers have lost their entire crop as a result of maize lethal necrosis, a seed-borne disease that may have entered the country due to regulatory failure. The



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liberalised seed market must be subjected to a strict regulatory environment if we want to realise food security.

Other factors that impact food security include the high percentage of food that goes to waste due to poor storage and non-scientific methods of food preparation; cultural practices that undermine the health of the people; farming methods; consumption patterns; and poor logistics in moving food from areas of surplus to deficient regions.

Food Storage Options

Between harvest and the dining table, more than 50 percent of food goes to waste. Much of this can be eliminated. The Ministry of Agriculture has been talking about hermetic storage bags (used for food preservation to reduce post-harvest losses) but the fear persists of unscrupulous businessmen flooding the market with counterfeits.

There are also galvanized small grain storage bins that can provide secure storage for medium enterprises. Essentially, the technologies to eliminate as much as 30 percent of waste exist. Other types of food waste results from failure to align food preparation and consumption. Tons of unwanted food ends up in waste dumps while millions of people go hungry.

Many people cook more food than they consume due to cultural beliefs that if every bit of food is consumed you must be selfish. This causes even the poor to waste large quantities of food even when hunger looms. Before the 1950s, land use in Africa was communal. As independence approached, many African countries adopted new land-use methods of individual ownership.

Taxes On Unused Land

Today, it is not uncommon to find large,



unused tracts of arable land owned by a single individual. This anomaly must be corrected through land-use policy interventions like paying taxes for not-utilisation of land. At the same time, a lot of land lies idle and unused in places like Nakuru, Uasin Gishu, Laikipia and Trans Nzoia because people who hold titles to it cannot access it for purposes of farming owing to hostilities from communities claiming it as their ancestral land, grazing lands or forest lands.

This poses a serious threat to food security. Counties where this is happening and the national government should perhaps be made to pay annual rent at market rates to the titleholders for failing to facilitate the use of the land. This process should start with a census of such inaccessible land. Traditional methods of farming can no longer support the growing population. Adoption of new methods is imperative and for this to work, the mind-set on large-scale production must become part of the farmer's DNA.

Commodity Exchanges

This cannot happen without sustained training programmes through incubation and financial support to undertake initial projects

in productive areas as well as an intensified programme to use irrigation methods to expand farming into arid and semi-arid lands.

Other programmes like dairy and beef production are essential especially in areas with a high incidence of children with stunted growth.

Perhaps the weakest link in our food security is the distribution from low to high-surplus areas. Through incentives, the government must encourage the private sector to develop commodities exchanges to help with the logistics of food to reach those who need it throughout the country.

Already there are start-ups building supply chain networks but they may need policy support to distribute food to sparsely populated areas that may not be attractive to invest in. Lastly, there is a need to encourage people through education to diversify their foods. In most cases when people say there is hunger, they mean there isn't enough maize.

Other Food Options

Yet, at the same time, there are potatoes, rice and other foods that are not culturally considered as "food". Making Kenya food-secure does not need to be a complicated affair with billions of resources being deployed. We simply need prudent policy changes, political will and tax incentives to stimulate the agricultural sector. Parliament should by now be crafting new legislation, especially on land use, stiffer penalties for those manipulating the sector for their own benefit.

With proper policy measures, strict standards, assisting farmers to reduce post-harvest losses, irrigation (arid and semi-arid lands), adjusting cultural practices, improving farming methods, we can attain food security.

The writer is an associate professor at the University of Nairobi's School of Business.



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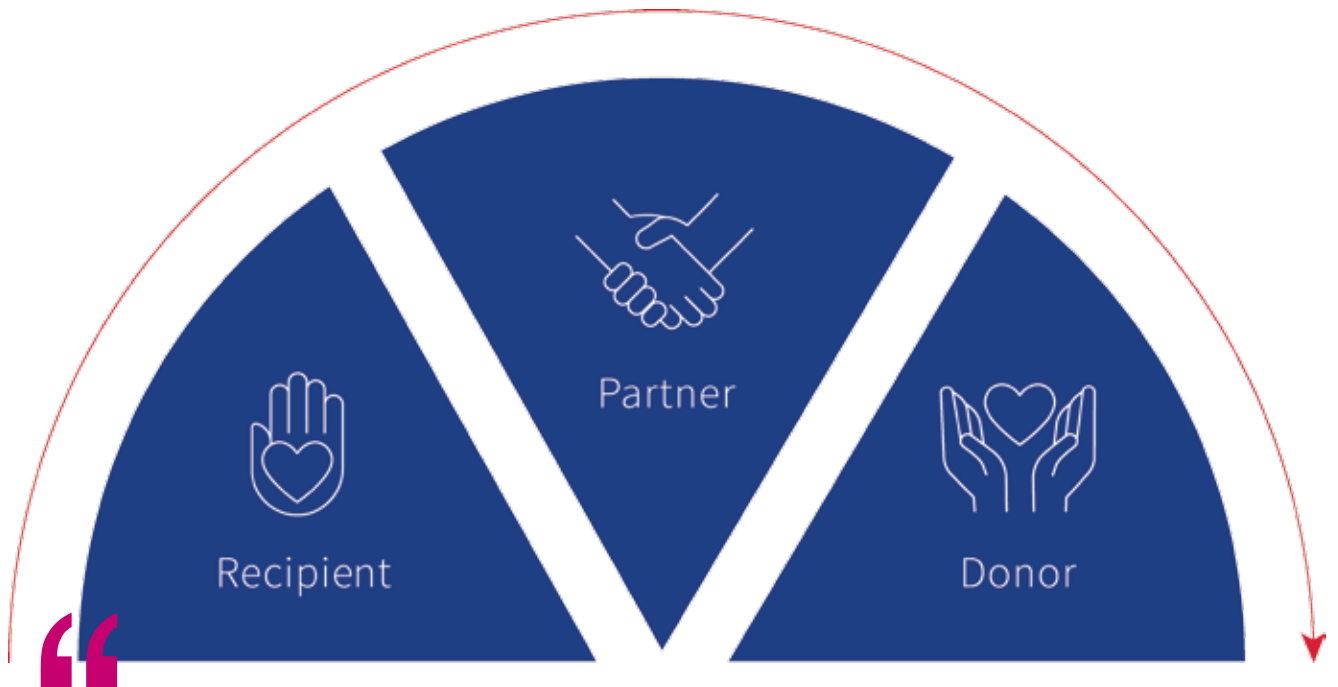
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How Collaboration Can Help Grow and Transform Agriculture in Africa



“We don't only work directly with farmers. It's important to develop skills and capacity in crop and soil management, market development, resource conservation, gender issues and project management and evaluation.”

It's been a while since African leaders met in Equatorial Guinea to commit themselves to boosting agricultural growth across the continent. This is an important way to create real change in Africa. During the gathering, all the African Union's heads of state signed the Malabo Declaration. It offered a blueprint for Africa's agricultural sectors, to be achieved by 2025.

For example, the declaration called for at least 10% of any nation's public expenditure to be allocated to agriculture and rural development. It also set out plans for increasing countries' food security by intensifying agriculture in a way that didn't destroy the environment.

There has been some progress in attaining these goals, as a recent status report conducted by the African Union Commission shows. But there's still a great deal of work to be done.

The report shows that in 2015 and 2016 only ten of the 47 signatory states reached or exceeded the target of 10% investment in public expenditure in agriculture and rural development. These are Malawi, Ethiopia, Angola, Egypt, Sudan, Mauritania, Mali, Senegal, Burkina Faso and Equatorial Guinea. Some other countries had invested as little as 0.6% of public expenditure in these crucial sectors. Only 20 of the 47 signatories are on track to meet the declaration's goals by 2025.

There's no doubt that investment in agriculture can empower economic transformation in the region. But money alone can't solve Africa's agricultural problems. International collaboration is key. And it can yield real results, as a project we're involved in has proved.

The project has relied on multidisciplinary

teams of both local and international researchers from the International Maize and Wheat Improvement Centre, The University of Queensland and the Association for Strengthening Agricultural Research in East and Central Africa. Ethiopia, Kenya, Malawi, Mozambique and Tanzania's departments of agriculture are also involved.

The collaborative effort has meant that it's been possible to address multiple constraints. These include low crop productivity, poor market access, environmental degradation, and social inequalities. The project had a strong value chain focus. This involves linking – among others – farmers, agribusinesses, traders and policy makers. The result has been improved productivity. We've also seen reduced climate risks and improved soil fertility and soil conservation among highly vulnerable smallholder farmers in five East and Southern African countries.

Initiatives like these can help translate the Malabo Declaration from mere document to reality.

Great gains

The Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa Programme is led by the International Maize and Wheat Improvement Centre. It is funded by the Australian government. Researchers from Australia and the participating African countries have worked together with researchers from the centre.

The project was set up in 2010 in response to major concerns about food security across the eastern and southern Africa regions. So far, 258,393 smallholder farmers in Ethiopia, Kenya, Malawi, Mozambique and Tanzania have benefited from our activities. We expect this number to increase to 600,000 by 2020.

To date, up to 91% of the targeted farmers have adopted at least one of sustainable intensification practices the project promotes. These practices include using drought tolerant maize non-GMO varieties; the rotation of maize and legumes; and intercropping, where a



Scientists and farmers Collaborate

legume is sown into a standing maize crop. Yields have increased between 30% and 60% across the five countries because these practices and associated technologies were adopted.

We don't only work directly with farmers. It's important to develop skills and capacity in crop and soil management, market development, resource conservation, gender issues and project management and evaluation.

One key resource here has been the Australia Awards Scholarships. These give people from developing countries the chance to undertake undergraduate or postgraduate studies at Australian institutions. So far this award has supported 65 Master's and doctoral candidates.

Once they return to their countries, these graduates can contribute to solving the complex problems of achieving food security and eliminating poverty. They apply modern research tools, inform policy, train others and even provide leadership in their original institutions.

Harnessing potential

The Malabo Declaration is a useful document

against which to measure progress. It offers countries clear targets. It sets metrics against which they can monitor their success. This will help countries to achieve many of the UN's Sustainable Development Goals by 2030 – including those related to agriculture and food security.

The work of the Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa Programme offers an insight into how these goals can be met.

Countries must develop a better understanding of constraints and opportunities so they can massively scale out more productive, efficient and sustainable farm practices. They also need to develop markets, value chains and supporting policies and institutions. And crucially, continued collaborations will be necessary to increase the continent's capacity in science, extension, policy, institutions, governance and leadership. These must be priorities to harness Africa's agricultural potential and spur economic growth.



Rice Husks to be Used in the Manufacturing of Ceiling Boards

For many years, Mwea Irrigation Scheme farmers have grappled

with disposing of rice stalks and husks, which take a long time to decompose. For more than 60 years, since the formation of the Mwea Irrigation Board, farmers have had to burn the stalks and husks, which presents another challenge – producing too much ash.

This will no longer be the case after it emerged that the two by-products will soon start earning farmers extra cash. Rice stalks will now be used to make hay, thanks to a partnership the county government has announced it is pursuing with a private firm. On the other hand, Deputy Governor Peter Ndambiri said, the husks will be used to make block boards and ceiling boards, among other products. Production of hay, in particular, is set to be a multi-million-shilling business given the shortage of pasture due to prolonged drought that has hit many parts of the country.

Farmers say the demand for rice stems is already high due to the drought, even though their nutritional value is low. “We have been forced to take the husks away from the mills to avoid heaping them because they don’t rot. The miller has to ensure that the husks are taken far away before they are burnt, which means additional costs,” said Morris Mutugi, a local farmer. “We are happy with the recent announcement by the county government that there are plans to enter into a partnership with a private company that will see the tonnes of husks used to make various products.” Speaking over the weekend, Mr Ndambiri said the

county government was concerned that rice husks were burnt. “We

have consulted with experts who have assured us that husks from rice can be used to make block boards and ceiling boards, among other products. We are pursuing the matter as this will mean extra cash for farmers,” he said.

Crop scientist John Kimani said rice husks could also be used to produce high energy charcoal briquettes, which are environment friendly. “I think our farmers have been sitting on a gold mine. Rice husks have many uses, including cement manufacturing. I think the county government is moving in the right direction by helping farmers add value to the byproducts of rice,” he said. Dr Kimani, who is also the Kenya Agricultural and Livestock Research Organisation (KALRO) Mwea Centre director, said the husks could also be used in tree nurseries. “The husks provide a loose texture ideal for root development in a nursery before a farmer transplants the seedlings,” he said.

Charles Njiru, who runs a milling factory, said adding value to the husks would also save millers a lot in costs. He said he even began making charcoal but abandoned the venture due to high costs. “The charcoal was of good quality but very few people could afford it. That is why I abandoned the venture,” said Mr Njiru.

Bran, which is used as animal feed, is another by-product of rice.

CGA Empowering Farmers in Climate Smart Agriculture

By Christopher Mutisya

With Kenya being a food deficit country importing up to 20% of its annual cereal requirements, the improvement of cereal and pulse production remains constrained by climate change effects arising from poor adoption of improved seed varieties, inefficient water and soil management, inefficient fertilizer use, lack of conservation agriculture practices, inadequate crop diversification coupled with poor access to agromet information.

According to the Stockholm Environment Institute (2009), if climate change in Kenya is not addressed effectively, economic costs of its impacts are estimated to be 3% of GDP per year by 2030 and possibly 5% by 2050. The agricultural sector which contributes to over 25% of the country's annual GDP is particularly affected by changing climatic conditions. Nearly 98% of crop production is rain-fed. Thus the increased incidence of droughts and unreliable rainfall patterns are expected to affect the sector significantly.

In light of this, Cereal Growers Association (CGA) with support from the Australian High Commission through the Direct Aid Program has embarked on creating awareness and building the adaptive capacity of smallholder farmers in Kitui, Machakos, Kakamega and Bungoma Counties on climate change adaptation and mitigation. This training is focused on introducing Climate smart Agriculture (CSA) as an approach to farming, whereby existing agricultural systems are adapted to be more sustainable, more productive and more responsive to local environmental conditions (land, weather and climate).

The main objective of this training is to build the capacity of farmers in the region, more so the vulnerable yet viable smallholder farmers to sustain themselves and to prosper in the face of a changing climate and harsh weather

conditions. In order to reach out to smallholder farmers, several methodologies are being utilized. These include the mobilization of agricultural stakeholders in the four counties around climate smart agriculture actions, capacity building of county extension officers, training of lead (progressive) farmers who will serve as CSA champions beyond the training, and capacity building of smallholder farmers on the awareness and adoption of CSA practices for improved food security and increased household incomes. In addition, the establishment of crop demonstration plots coupled with farmer field days will be carried out to enhance CSA technology transfer among smallholder farmers.

To date, CSA stakeholders in the counties have been mapped out and commitments relating to various partnerships agreed upon. These stakeholders include experts in conservation agriculture (Participatory Approaches for Integrated Development), suppliers of drought tolerant crop varieties (Dryland Seed Company and Kenya Agriculture Livestock & Research Organization), service providers of soil and water management technologies (Crop Nutrition Services), experts in integrated pest management (Food & Agriculture Organization) and proponents of agroforestry (Kenya Forestry Research Institute and Agroforestry). Other CSA practices to be promoted include mulching, cover crops, crop rotation and small-scale irrigation.

In addition, CGA field officers in collaboration with the respective county extension officers have established eight crop demonstration plots in the four counties. In Lower Eastern Counties (Kitui and Machakos), the demo plots will promote the adoption of drought tolerant crops such as sorghum, green grams and cow peas as opposed to maize whose production has been on the decline due to frequent rain failures in the region. In Western Kenya (Bungoma and Kakamega), the crop demo

plots will focus on maize and beans varieties that are suitable for these counties.

At the same time, CGA engaged a climate smart agriculture expert from the Climate Unit in the State Department of Crop Development (Ministry of Agriculture & Irrigation) to train all CGA field agronomists and county extension officers through training of trainers' mode on the CSA approach and its application in the field. The trainees will then train lead (progress) farmers at the county level who will then be the CSA champions going forward. The next phase of activities will involve direct awareness creation and training of smallholder farmers on the CSA methodologies in the above paragraphs. This will be carried out by CGA field agronomists, county extension officers with follow-ups made by lead farmers (CSA champions). Once the crop demo plots are ready, a farmer field day will be held in each of the four counties. In addition, two farmer exchange visits will be carried out to promote farmer learning on soil and water management as well as conservation agriculture practices.

Ultimately, it is expected that the initiative will build climate change resilience among 2,000 smallholder farmers in Kenya arising from the adoption of CSA technologies in the four counties. While the initial farmer outreach can be considered a drop in the ocean, CGA is actively seeking strategic partnerships with local and international organizations in order to scale up CSA interventions to a larger population of farmers. More important, scaling up CSA interventions through the Direct Aid Program (Australian High Commission) will be critical in enhancing CSA ability to expand to more counties. In the final analysis, the ability of smallholder farmers to adapt to climate change is key to achieving Sustainable Development Goals especially SDG 1 – Ending Poverty and SDG 2- Zero Hunger. Without food security, income security will remain a pipe dream and poverty a cruel reality.



Good Data Management Key in Fight Against Food Insecurity

Over the next 50 years, the world's population is set to be more than 9 billion. To feed this amount of people food production will need to more than double. Doing this will require us to grow food faster than ever before, a global task which will be even more challenging if we don't first improve the way we collect and share information, according to Carolina Rivera, a wheat physiologist at the International Maize and Wheat Improvement Center (CIMMYT) and data coordinator with the International Wheat Yield Partnership (IWYP).

Demand for wheat by 2050 is predicted to increase by 70 percent from today's levels due to population growth and dietary changes, but the challenges to wheat production are stark and growing. The crop is at risk from new and more aggressive pests and diseases, diminishing water resources, limited available land and unstable weather conditions related to climate change.

"The data tells us that we won't meet future demand unless we're able to significantly increase genetic gains," says Rivera. Current annual genetic yield gains of cereals range from 0.5 to 1 percent, meaning that genetic improvements made to crops by scientists are at best resulting in 1 percent higher yields than the previous year, notwithstanding the possibility of improvements due to crop management which are known to be

much harder for resource-poor farmers to implement.

Since Rivera started as an IWYP data coordinator, she's helped release a new instance of the public database called "Germinate," which hosts phenotypic, genotypic and other data on wheat collected by CIMMYT staff, IWYP project members, and partners around the world. She seeks to deploy new technologies to capture data and develop better systems to standardize, collect, compile and curate field data gathered by members of her CIMMYT research team and their partners.

"Three years ago, around 80 percent of CIMMYT's wheat physiology field data in Mexico were collected manually," said Rivera. "But now, the use of tablets for data collection, improved protocols for data processing, among other tools allow us to have real-time quality control. By standardizing our results and facilitating data curation and analysis, we help scientists make faster, more informed decisions."

Rivera has a unique perspective in crop data management because she applies her on-the-ground knowledge of wheat research to adopt and adapt new technologies and systems that meet the needs of scientists. As a wheat physiologist, she has identified new traits associated with the optimization of plant

morphology aiming to boost grain number and yield. "Data management can seem like an afterthought to the research, but having more controlled and optimized workflows will become crucial for breeding programs as data volumes increase," says Rivera. "Achieving high-quality data management is a challenge – like with any change in technology, it requires a huge shift in the way people do their job and tools they use."

Despite this, more than 2 billion genotypic data from CIMMYT have been made available in the Germinate and Dataverse platforms, and Rivera believes that data sharing will eventually become part and parcel to the work wheat researchers conduct. Before starting her current position at CIMMYT, Rivera received her doctorate in crop science from the University of Nottingham. Ultimately, she believes that the adoption of better data management practices across research institutions will soon become a cornerstone in the ability to create "ideal" wheat plants that produce more grains, feeding more people.

The International Wheat Yield Partnership (IWYP) is a long-term global collaboration with funding from public and private research organizations that seeks to increase the genetic yield potential of wheat by 50 percent in 20 years. Find a full list of funders here.

A Description of Excellent Customer Service

By Amanda C. Kooser

Customer service sets great businesses apart from the rest. Customers are the reason that businesses exist. Keeping those customers happy means being responsive to their needs and wants. A good customer service experience can turn a one-time customer into a lifelong repeat customer. People like to share their good experiences. Excellent customer service can turn into positive word of mouth.

Proactive Customer Service

Customer service should come into play long before any problems or issues arise. Anticipate service issues that may occur. For example, you can offer manuals for products that you sell, include troubleshooting tips on your website, offer a FAQ section and make sure that customer service contacts are prominently available for online and real world customers. Make yourself or your employees available to answer questions and help lead customers to the products or services that best fit their needs. Keep prices reasonable so that customers feel they are getting a good value.

Employees

Excellent customer service starts with the business owner, but involves all of the employees in an organization. Conduct special training sessions dedicated to

customer service so that your employees know how to handle themselves, keep a cool head, answer common questions and know who to refer more complex issues to. Empower employees to provide strong customer service by giving them the skills to work well with customers.

Overcoming Obstacles

No matter how great your customer service is, at some point you will have to deal with an unsatisfied customer. The way you handle the situation tells a lot about your

business. Always react calmly and offer to work through the problem. Find out the root of the issue. You may need to give a refund, rework a project or offer store credit. A defective product may be the result of a manufacturing issue outside of your control, but if the issue is something that you can improve within your business, then take the criticism to heart and work to make the matter better. Let the customer know what steps you are taking to remedy the situation.

Personal Touch

Approach your customers on a personal level. This may start with a smile when they walk in the door and end with a “Thank you

for your business.” when they leave. Taking an interest in your clients’ lives outside of the walls of your business shows that you care about them as customers and as people. This sort of interaction fosters a sense of loyalty and can help you better understand what motivates your customers. Even if you primarily deal with customers electronically, you can still take the time to get to know them better as you work with them over email and the phone. Send a coupon for a birthday or check in with a client about how his vacation went.

“ Make yourself or your employees available to answer questions and help lead customers to the products or services that best fit their needs”.

Reliability

Customer service is an ongoing proposition that should radiate from the owner on down to each employee. Offering excellent customer support includes showing that your business is reliable and consistent over time. Explore new methods of connecting with customers. Conduct regular training sessions with employees and formally recognize workers who have done a particularly good job dealing with customers. Conduct surveys and speak with customers on an informal basis about what you can do to improve service or go the extra mile.

Mr. Timothy Munywoki

A multi-skilled Agronomist



Who is Timothy Munywoki?

Am a multi-skilled agronomist with vast knowledge in general crop husbandry with a key focus on crop pests, disease diagnosis, product development, strategy management, marketing and Product development.

Why did you choose to be an agronomist?

I come from dry area and when I was a young boy I used to have a small kitchen garden which I had like 10 stems of kales. I used to apply farmyard manure and I would use like 5 litres per day to irrigate. To my surprise, at times the whole family would rely on my kitchen garden for food. From there I developed strong interest towards farming...

What would you point out as your strongest attribute that has made you succeed?

Am persistent, aggressive and hardworking. All this combined has contributed to my success.

In your experience, discuss some of the challenges cereal growers are facing?

There are several challenges that cereal farmers face. However, the major ones are climate change. Last year many farmers encountered losses due to insufficient rains. Rains patterns have changed although we anticipate this year to be a good year. Maize farmers are having challenges to control Fall Army Worms because the FAW products are above board in terms of costs. Controlling brome grass in cereal farms has since remained a challenge.

What do you think is the role of the agrochemical sector to the development of the Cereal Sector?

Agrochemical sector is a back bone in Cereal sector. In modern times, crops are being threatened by pests. Farmers cannot produce quality and good yields if they don't use chemicals. Again chemicals like Herbicides make it possible for the farmers to save the costs of weeds control which would have been a big challenge for farmers with big junks of land.

What are some of the things Amiran has contributed to the Cereal sector?

Amiran is a regional leader in not only selling inputs for farmers but also offering solutions to farmers. We have partnered with farmers to offer them extra services like



agronomic support and trainings to equip them with knowledge hence our motto Our Knowledge Your Success.

Growing up, who was your inspiration/idol?

Martin Luther King Junior

As one of the major influencers in Kenya's cereal sector, how are you unique from the others?

Our approach is different. We position ourselves as solution providers. We are actively involved in Research to make sure we raise above threats that affect Cereal industry.

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

My day starts at 4:30 am. I work out for 30 minutes...Take shower, breakfast and hit the road by 6 a.m to visit clients. My day ends by 5:30 p.m

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

I would like to leave behind a happy farmer. A farmer who will have access to quality products which are affordable. A cereal farmer whose market for cereals is not threatened by illegal importation.

Give your final comments

We need to bring all the stake holders onboard to see how cereal farmers can be assisted through either subsidy of inputs and securing markets for their produce. The governments need to regulate importation of cereals so as a local farmer can benefit from the farming venture.



**Senior Monsanto Staff,
Tony Gathungu and Jimmy Kiberu.**

Monsanto Fund and Africare

To Address Acute Hunger, Malnutrition in Northern Kenya

Monsanto Fund, in partnership with Africare, has pledged \$5 million over a five-year period to improve nutrition and access to healthy food for women and young children in Turkana County, Kenya.

Africare, based in Washington, D.C., works in partnership with African people to build sustainable, healthy and productive communities. With support from the Monsanto Fund, the new Improved Approach to Community-based Nutrition in Turkana (IMPACT) Project, will provide increased access and availability of diverse and nutrient-rich food to pregnant women, new mothers, infants and young children. The initiative, which is aligned with the Kenyan government's Big 4 Agenda to address food insecurity, will also improve access to quality health services while sharing information about the prevention and treatment of malnutrition.

"We are grateful for the support of the Monsanto Fund in providing us the resources to help the people of Turkana County lead healthier lives," said Robert L. Mallett, President of Africare. "We believe that everyone needs to be at the table – local non-governmental organizations (NGO's) and the private sector – to drive real and sustainable relief for the people of Turkana County."

Turkana County is located more than 450 miles north of Nairobi, Kenya. According to a report released last month by the Kenya National Bureau of Statistics Office, Turkana County is the poorest among the nation's 47 counties; 88 percent live below the poverty level compared to 45 percent nationally. Most of the county's villages do not have electricity or running water.

Record malnutrition rates, erratic climate and a disruption of traditional food sources have led the World Health Organization to designate Turkana County as an Acute Food and Livelihood Crisis area. The IMPACT project is expected to reach 27,000 children who reside within the county's 7,800 households.

"Every family should have access to a balanced meal. However, such access becomes difficult when there is limited availability to healthy and nutritious food options," said Al Mitchell, Monsanto Fund President. "The Monsanto Fund is committed to globally fighting malnutrition. Our partnership with Africare provides an opportunity for both organizations to collaborate and develop effective and direct solutions for those who reside in the region."

The IMPACT Project's approach will include a program to increase the capacity of health facilities to screen and treat children

diagnosed with acute malnutrition, educate key community leaders and mothers on the role of nutrition in long-term behavioral change, establish household and communal gardens and ensure access to quality water through the restoration and construction of various water sources.

In 2016 the Monsanto Fund introduced a new strategic platform aimed at partnering with specific organizations to address global malnutrition and food insecurity. The first investments were for programs launched in St. Louis, Mo., and in Petrolina, Brazil. The IMPACT program in Turkana County, Kenya, is the third site, with the primary goal of improving access to food and encouraging healthy eating behaviors, with a focus on the needs of women and children.

"The IMPACT Project is the latest nutritional commitment of the Monsanto Fund in Africa," added Mitchell. "Last week, we launched the Monsanto Fund Latia Resource Centre Poultry Project in Kajado, Kenya which will train more than 2,500 women to become poultry farmers, allowing them to earn an income and provide food for their families. Also in 2016, we continued our long-standing investment in the Buhle Farmers Academy in South Africa to provide rural farmers access to technical, production and business support services to improve their farming methods."

An Emerging Alternate of DAP

By Moses Kimani

Phosphorus is required by all plants but is limited in soil and organic matter. In many areas phosphorus must be added to soil for the extensive plant growth that is desired for crop production. Phosphate Rich Organic Manure (PROM) - is an emerging class of phosphatic planting fertilizers. PROM technology was first developed in India as a response to soils that were losing their productivity despite extensive application of conventional fertilizer. PROM is produced by co-composting high-grade rock phosphate in a very fine size with organic manure. Research indicates that this may be a more efficient way of adding phosphorus to soil than applying chemical fertilizers.

Phosphorus dissolution in the soil is most favorable at a pH between 5.5 and 7. Ions of aluminum, iron, and manganese prevent phosphorus dissolution by keeping local pH below 5.5, and magnesium and calcium ions prevent the pH from dropping below 7, preventing the release of phosphorus from its stable molecule. With a carbon to nitrogen ratio less than 20:1, PROM allows for beneficial microorganisms to flourish in



Mr. Rajender, Punjab, India Revived His Rice Farm Using PROM

the soil. Microorganisms produce organic acids, which cause the slow dissolution of phosphorus from rock phosphate dust added to the soil, allowing more phosphorus uptake by the plant roots over a longer time.

With available phosphorous (P₂O₅) at 10.4%, one might wonder how you can expect to get the same or better yield applying PROM at the same rate as conventional planting fertilizers. Field evidence suggests the same. Mr. Kharan Singh, a wheat farmer from Abohar, Punjab

State, India, did a side by side comparison of PROM at 125kg per acre and DAP at 125kg per acre. Despite the PROM plot showing a paler shade of green in the leaves compared to DAP within a few weeks of planting, his yield was 6.451 tons per hectare in the PROM plot as compared to 4.795 tons per hectare in the DAP plot.

PROM is a granulated fertilizer that is easily applied manually or mechanically

and has several Benefits:

- It acts as basic nutritional food for soil at the time of planting
- Improves the soil structure and does not acidify your soil
- Phosphorus, Nitrogen & Organic Carbon helps to keep the luster/moisture of soil
- Keeps the fertility of the land alive over a longer time and does not leach like conventional fertilizers
- Movable organic carbon helps to improve the efficiency of crop growth
- Prevents land from being acidic & toxic
- Improves the water holding capacity of soil

By Moses Kimani

Sources: Narmada Biochem Limited, and https://en.wikipedia.org/wiki/Phosphate_rich_organic_manure



“Healthy Soil Makes A Farmer Wealthy”

Phosphate Rich Organic Manure

PROM

Phosphorus : 10.4% (Min.), Nitrogen : 1% (Min.)

Organic Carbon : 7.9% (Min.), CN Ratio : < 20:1

Organic Matter : 50% (Min.), Moisture : 15 to 25% (Max.)



PROCESSES OF INFLUENCE

PROM

- ▶ Organic Carbon injected with contained C:N Ratio, less than 20:1, enhances microbial counts - induces bio chemical reaction - producing organic acids (humic and fulvic) - That **biochemically dissolves** Phosphorus - slow and sustained release to plant.
- ▶ Induces the default uptake of other plant nutrient present in the soil - application area.
- ▶ Water insoluble phosphorus does not leach/fix into the ground water.
- ▶ **pH-balancing** : Organic matter prevents ions of other elements from locking phosphorus into insoluble form. Aluminium, Iron and Manganese ions keeps pH below 5.5. Calcium and Magnesium ion prevents pH from dropping below 7.

DAP

- ▶ Only the P ions near the plant makes plant roots to exude organic acids (malic and oxalic) for dissolution and uptake of **Water Soluble** Phosphorus - immediate release to plant.
- ▶ Limiting Nutrient Use Efficiency, NUE, Phosphorus (20%) and Nitrogen (30-35%).
- ▶ Remaining 80% of Water Soluble phosphorus becomes prone to fixation and leaching into ground water, damaging the soil Environment.
- ▶ Limited efficacy of nutrients applied through DAP at the cost of soil degradation makes a farmer believe that only incremental doses of chemical Fertilizer is the solution next.

PROM - An Emerging Alternate of DAP



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: CONTACT FOR KENYA SALES :

LENTERA LIMITED

Opp. 5 Star Meadows, Off. Kiambu Road,
P.O.Box 61840-00200, NAIROBI (KENYA)

Tel : 0743162357

E-mail : info@lenterafrica.com

CEREAL FARMERS IN KENYA

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

CEREAL FARMERS IN KENYA

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

European Studies

Disprove Seralini's GMO Maize Tumor Claims

Three European studies have disproved Gilles-Éric Seralini's widely circulated claims that genetically modified maize (corn) induces tumors in rats.

Seralini, a professor at the University of Caen, published his sensational claims in *Food and Chemical Toxicology* in September 2012, and used them to call for long-term GMO feeding studies. Though the publication later retracted his study, anti-GMO groups have continued to circulate Seralini's conclusions in a bid to stoke fears about the safety of GM foods.

Now three studies — GRACE and G-TwYST, funded by the European Union, and GMO90+ in France — have refuted Seralini's main conclusions about the toxicity of herbicide-tolerant (Roundup Ready) maize. The research — conducted to address concerns raised by the Seralini study and provide the EU with guidance on the need for long-term studies — identified no potential risk from the product.

“European consumers must be informed of the results of these studies, [which] should reassure them on the quality for their health of genetically modified plants authorized for commercialization and on the European evaluation procedure, already the most rigorous in the world,” the French Association of Plant Biotechnology (AFBV) stated. “In addition, these new studies contradict Seralini's proposal on the need to carry out long-term studies.”

The EU requires applicants to conduct a 90-day feeding assessment study on whole GMO food/feed before it can be placed on the market. The original assessment

conducted for herbicide-tolerant maize identified no potential risk to humans. “The G-TwYST (GM Plant Two Year Safety Testing) data from 90-day and long-term rodent feeding studies did not identify potential risks as well, and therefore support the results from the initial analyses,” according to the study's conclusions and recommendation's document, which was presented at an April 29, 2018 conference in Bratislava, Slovakia. “It was concluded that there were no adverse effects related to the administration of the GM maize NK603 cultivated with or without Roundup,” the report stated.

The research included a combined chronic toxicity and carcinogenicity study, and “no toxicologically relevant effects related to the GM maize NK603 or the GM maize NK603 treated with Roundup were observed,” the report stated.

The GRACE (GMO Risk Assessment and Communication of Evidence) study conducted two 90-day feeding trials on rats using two different varieties of maize genetically modified to resist insect pests and tolerate glyphosate. “The results showed that the two GM maize varieties tested did not trigger any negative effects in the trial animals,” according to a report on the findings.

Additionally, data showed the GM maize did not affect the immune functions tested in both of the 90-day studies.

The GRACE study was published in Archives of Toxicology.

The GMO90+ study also assessed the Bt maize, using a 180-day feeding trial, and found no negative effects on the rodents.

In addition to addressing concerns raised by the Seralini study, the research was intended to provide the EU with guidance whether it's necessary to conduct a two-year carcinogenicity feeding trial on rats with whole food/feed. “The necessity to perform a feeding trial with whole food/feed should be carefully evaluated given the high number of animals needed,” the G-TwYST report concluded.

Due to the controversial nature of the research, “substantial efforts were made to ensure stakeholder engagement, transparency and data accessibility,” the G-TwYST report stated. “These included stakeholder engagement in both project plans and results; making available draft research plans and preliminary research results (all data produced) for stakeholder scrutiny; a procedure for discussing, systematically considering and responding to all stakeholder comments as well as tracking how the comments were considered in the project; detailed documentation and transparency of all steps; open access publications, and an open access repository for raw data to be available following academic publication of the results. The approach received high praising from the majority of stakeholder participants.”

The report further noted: “These challenges and the considerable resources and efforts needed do not suggest this approach to be used on a routine basis. Yet, in case of highly contested scientific-technical issues and polarized views, the approach remains an interesting option to improve the quality and social robustness of research.” The results from the experiments are now published on envision.com.



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