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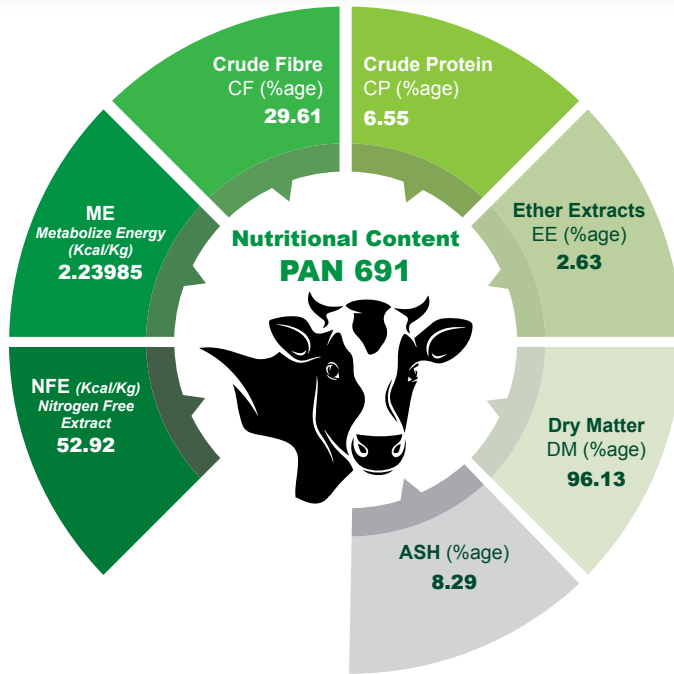


Lisa Tiang'a: For The
Love of Agriculture

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HARVEST

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PAN 691

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Stop Rural-Urban Migration

Migration from rural areas is a fact all over the world, in every country and continent. There are often global similarities between the factors driving a rural person to migrate to an urban area. In many cases, it is a lack of opportunity in their home region – whether that be in terms of employment, lifestyle, or connectivity to the wider world. So this means that we must work more and more together to build new responses and solutions to new situations and challenges.



The lack of decent employment opportunities seems to be at the core of the decision to migrate. Most migrants – and they are overwhelmingly young, aged between 15 and 35 - move to places where they expect to find better jobs. Therefore migration is clearly a response to the gap in incomes between regions. And youth moving out of rural areas threatens the capacity of the agri-food sector to sustain the rural economy. We all agree that the linkages between migration, food insecurity and rural development are often complex.

Agriculture is more and more being acknowledged as playing a key role in dealing with root causes of migration. Building policy and investment structures to bolster food security and enhance rural development must be at the heart.

Our agricultural policies should continue to be coherent with development initiatives. Greater synergy and a more integrated policy approach is required to achieve better results on food security and nutrition, climate action, protection of natural resources, biodiversity, the dissemination of nanotech to all farmers and rules-based fair trade.

Masila Kanyingi
Editor.

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Herbicide Resistance:



The reliance on herbicides became prominent and now, as they begin to fail, controlling weed burdens is again a focus for modern producers in order to remain profitable.

Must be Addressed Seriously

Weeds, the non-desired species, have been recognised for hundreds of years as a major factor in hindering yields of field-based crops. They are notoriously competitive for nutrients, water, light and space and create an undesirable canopy for modern day food production. They're well-recognised for their ability to shed seed at a prolific rate. They also have no value from a nutritional or medicinal point of view.

Over the past century many different control techniques have been used with varying success. Most recently, chemical herbicides have become the dominant control method for mainstream agriculture (estimated 96 % of global agriculture). The reliance on herbicides became prominent and now, as they begin to fail, controlling weed burdens is again a focus for modern producers in order to remain profitable. Organic systems offer much insight into cultural techniques but some would question its sustainability.

High Costs

As an agricultural business, there is need to be aware of all the cost elements to warrant success. Certainly, over the last number of years one of the silently increasing costs has been weed control. Weeds have become a heavy burden on all businesses, absorbing large quantities of cash and hampering yields. It seems almost impossible to pick up an agricultural tabloid anywhere in the world and not find a headline title that mentions the negative impact.

Brome grass, Rye grass and Setaria are of course our version of cancer in agriculture. Over several years, farmers have seen expenditure on dealing with weeds, increase tremendously 680% whilst overall control has evaporated gradually until a point where it's almost impossible, even with the ideal environment, to maintain a stalemate position with the burden.

Along with social pressure and chemical resistance it leaves an unattractive proposition for anyone wishing to produce food in today's markets.

It is, as many growers will say, that simply throwing more money at a failing picture is completely unsustainable and therefore something must give. The typical practice of spraying an area in its entirety resulting in a significant level of spending on herbicides needs to change. Only the location of a weed should dictate the location of spray application.

Need to Re-invent the wheel.

New technologies, both commercially and environmentally, are viable. Each could often be complementary to another with a high level of precision being required. However, more developments are essential to achieve 'market readiness'. It is encouraging when there is enough incentive from both commercial and government organisations to sponsor this technologies.

There is an obvious level of investment in certain locations but it isn't always driven by the need to become more 'sensitive' with herbicide applications.





wheat or barley will be naturally controlled. The spores are starved to death.

Farmers, are best with their business knowledge, open-eyed and also holistic approach to every aspect weed control especially Integrated Weed Management (IWM) or Integrated Crop Management (ICM).

Integrated Crop Management

Integrated Crop Management is a practice whereby different crops are planted in different seasons on the same piece of land. The aim is to enhance sustainable production and increase yield potential, compared to monocultural practices. Crop rotation systems should be planned to suit the farm and its business and to grow healthy, vigorous crops offering economically viable yields and good-quality grains.

These systems should also reduce herbicide pressure. Since specific weeds are associated with specific crops, rotation with an alternative crop reduces the potential build-up (which often happens in monoculture) over time.

The choice of rotation and its sequence depends on the nature of the soil, crop characteristics and climate; together they determine the type of crops that may be cultivated. Herbicides are determined by the crop, e.g. herbicides which are used in maize farming cannot be used in barley and wheat. Canola as a break crop, the herbicides used can easily finish the weeds remnants for wheat or barley.

In Mau Narok, rye grass resistance to herbicides is well pronounced. Farmers are being advised to plant Canola. Herbicides used in Canola farming will control rye grass totally and safely. This is because in Canola you can use specific MOA which cannot be used in wheat or barley farming.

The herbicides will control the weed resistant biotype, deplete the seed bank of that specific biotype and maintain soil nutrients by giving it a break. The soil borne diseases affecting

When you re-introduce the crop after 2-3 seasons, the soils are clean with less weed seeds if any remaining, less threat to soil borne diseases, re-invented nutrition hence better harvest.

Integrated Weed Management

Deep Ploughing: Seeds banks are close to the soil service around 2 inches. Deep ploughing will bury the seeds deep into the soil. This will make it difficult for the weed to germinate as the initial food reserve is not enough to make it push into the service for it to start photosynthesis and grow. Additionally, because of less oxygen underneath, the seeds die. This system will also bring the nutrients down on top of the soil and closer to the root system. Excessively intense cultivation and inadequate soil management can lead to depletion and damage soil structure. Same way it can control or support weeds.



Spray Program:

The new age farmer understands the importance of a spray program. While doing the spray program, a farmer must understand WRAC very well. The farmer must ensure that he alternates chemicals with different modes of action and of different groups and classes. The farmer must also use herbicides according to label specifications (No lower or higher rates). Spray timing must also be correct for optimum results (Not when weeds are too big and hard to kill).

Fallow: It is also advisable to leave the land for some time. This also starves the weeds. However, for many farmers, this may not be possible as they lease the land and also need money from the crop.

Specific Weed Management: When the concept of site specific weed management was discussed, there was initially a lot of opposition to the idea, with questions around the accuracy and ability to recognise weeds. Unlike a disease or a nutritional requirement, which commonly may be specific to each square meter of a field, a weed burden can be acknowledged on a spot-by-spot basis where it is present.

Discussing with the farmers, it was an open secret that the operator, no matter how skilled, wouldn't be able to hit the small, spatially spread out targets at the traditional forward speeds required when using a conventional sprayer. Control of weeds on an individual basis requires individual nozzle control by

computer with the necessary processing speed to make hitting the target with 100% accuracy realistic.

Inter-row management: This means, of course a complete change in direction for the industry and significant change in the mind-set of the grower as much as anything. Imagination throws up some unusual ideas, some of them very questionable but it leads to the avenue of inter-row management; with no understanding of the age-old technique. Not new to the industry, but still commonplace globally, mechanical techniques offer an alternative in lesser economically developed places and where chemical alternatives aren't always readily available.

Global Positioning System: Over the last years there have been some great technical advances with the introduction of the Global Positioning System being one of the most important. What is always mentioned at any 'blue sky' discussion is the use of robotics and the inevitable part that they must play in the future of agriculture. Again, even with less experience of robotics farmers must equally be excited to see what they have to offer the industry going forward with the possibility of 'third generation' technology removing the requirements for herbicides altogether. Today, there is little alternative to the applications of chemicals along with the vicious circle of renewing high cost machinery. There's a gap for new, smaller innovators to disrupt this along with a willingness from the industry to drive them to the market.

Conclusion

The future of weeding technology has yet to develop beyond our current understanding.

Historic change from intensive manual weed management to the standard chemical format has helped shape and more importantly fed the world over the last 50 years. Today we are on the cusp of a new revolutionary curve that will hopefully deliver a better future for weed management and one with which in general society is more comfortable. Social requirements are undoubtedly changing fast and the industry needs to catch up if not get ahead of the game.

The technology promises results, but the overall direction of the technology may yet be set by the willingness or desperation for change from the farmers themselves. As weed resistance develops the investment required from the farmer to control weeds will rise. A reoccurring driver for the non-chemical innovation companies has been the banning of the mainstream chemicals alongside the social frenzy around the health questions of such products. It may become apparent that the uptake of the technology is too slow and expensive for the companies leading the way. Therefore, it could be argued that they might recognise their reliance on the banning of such products to make their systems economically feasible. This is not a negative comment but simply a reality. While pesticides are the most available cost-effective method for weed control the chemicals industry will stay the dominant force.

From the grower's point of view, there is a danger that we will be manipulated into a direction and future that will continue to evolve faster than we can afford. Robotics may not offer a cheaper alternative but will undoubtedly solve some of the issues associated with herbicide resistance and will help control the yield sapping weed burden. Chemicals will continue to dominate in the short term but with a greater assistance from non-chemical alternatives. Simple options such as hoeing may be the first point of call whilst further research continues to find a more effective alternative, but I believe that alternative weed management be the next progressive.

OCP KENYA

Continues With Their Quest For Sustainable Agriculture During A Farmers' Field Day In Meru County

OCP Kenya in partnership with Muuga FM hosted an elaborate and educative field day for farmers on 21st September 2019. Farmers from different parts of the county flocked into the event to gain knowledge on the right agricultural practices and products from OCP in preparation for the planting season.

Development Partner for Farmers

Time and again OCP Kenya has participated in different projects across the country aimed at equipping the farmers with knowledge, linking them with resources, provision of technical services to ensure that smallholder farmers increase their production to realize sustainable livelihood from their investment. The Meru event was one among the many events where OCP has gone an extra mile to help small holder farmer to practice farming in the right way, using the right methods and with the right products. Through their mobile soil testing dubbed as “school lab”, OCP Kenya provides soil testing services to farmers across the country free of charge. Giving them technical advice on crop production, fertilizer use and other good agricultural practices.

Farmers came in large numbers and brought their soil samples for testing. The company ensured that all were tested. All farmers were assured of getting their results timely to ensure the information gained from the process gets integrated into their planting plans.





Farmers shown NPSB Fertilizers by an OCP Agronomist

(Left Up) Karimi Thurairia discussing with a farmer during Meru training Forum .

(Left Down) OCP Kenya, Country Manager, Mr. Okumu with Meru County CEC Agriculture joined farmers for the training



Farmers also got educated on different types of fertilizers including the right usage and all their questions were answered in real-time. The company majorly educated them on their NPSB fertilizer, which is a major brand among their products and has in the past delivered incredible results for different farmers across the country.

Why is NPSB Fertilizer Important Today?

NPSB Fertilizer is relevant for farmers who have been experiencing reduced yields even with use of other fertilizers. This is because there has been noted decline in soil sulphur and other micronutrients including Boron. Sulphur is an essential micronutrient which is key for protein and chlorophyll synthesis, energy storage and nitrogen fixation. Boron supports the formation and strengthening of plant cell walls, grain setting, inflorescence and grain filling. The fertilizer is suitable for crops such as; maize, wheat, Sorghum, barley, soya beans and vegetables.

OCP has a holistic approach of supporting sustainable agriculture through farmers' training, provision of technical advice, soil testing and education on different types of fertilizers and their usage cementing their promise and commitment to develop, nurture and support smallholder farmers to increase production. This commitment will go a long way in enhancing not only productivity but transforming farmers in Meru County and neighbouring counties to embrace climate-smart agricultural practices and contributing to the government's agenda of food security and nutrition.

As a farmer, to achieve maximum yields and growth you require a partner who is ready to work with you right from soil testing, tillage, fertilizer and other inputs procurement to your eventual harvesting. OCP Kenya is one such partner and their dedication and zeal to attend to your needs is unquestionable and unparalleled.

Corteva Agriscience: Transforming farmers into Smart Businessmen

Farmers experienced Corteva integrated solutions at farm level.



Ms Doris Kinyua explains Farmers SureStart to Farmers.

Capacity building of farmers through training on choice of the right maize seed variety and the right crop protection product is one of the ways to improve agricultural productivity. This was said by the Uasin Gishu CEC Agriculture Mr. Samuel Yego during a farmer exchange program session organised by Corteva Agriscience.

Mr. Yego added that low agricultural productivity was due to limited adoption of new agricultural innovations/Technologies. "I encourage you farmers to adopt the new technologies like genetics, weed and pest management solutions offered by Corteva Agriscience specifically for the control of weeds and Fall Army Worm in maize", he added.

The event held at Komool farm in Eldoret drew farmers across the maize growing regions of Uasin Gishu, Trans Nzoia and Narok Counties. Farmers were not only verbally trained but also heard from first-hand experience of a farmer who had used Corteva integrated maize solutions.

"To see is to believe, this is the reason the event is held in a farm. The farmers can see and experience first-hand results of what we are discussing. In a five star hotel we will only lecture the advantages of Corteva products with no tangible evidence", said Doris Kinyua, Business Development Manager-ESCA, Corteva Agriscience.

Ms Kinyua said Corteva was offering a full maize production package and a great opportunity to bring farmers together to

see and experience, and also hear from other farmers who have benefited from the package and solutions. The solutions included quality Pannar/Pioneer seed varieties, new innovations in weeds and fall army worm management solutions.

During the training, farmers were taken through a demo plot for a Corteva Pannar/Pioneer maize variety that Surestart was sprayed for weed management and Radiant for FAW management. Mr. George Kili, the owner of the farm explained to the visiting farmers the importance of using the Corteva Integrated Solutions. He said the company has advanced innovations in maize farming and their solutions have shown high level of efficacy as well the agronomy support given by their team added value. "Their immense dedication to the growth and expansion of the



agricultural industry has led to them partnering with farmers like us and their internal expertise and competency gives them a leg up in the partnership to deliver maize farming to new heights”, he said

Speaking during the training, Mr. Humprey Kiruaye, Country Leader Corteva Agriscience, Kenya took the farmers through the Corteva Brand and did a formal introduction of Corteva brand to the group stating both seeds and crop protection portfolio. “Farmers must know that, not every variety is good for their geographical zone. The four important factors to consider when selecting a variety are; hybrid maturity, inherent genetic resistance yield robbing (disease, pests), agronomic stability (Stress & drought tolerance) and proven yield potential (Tonnage)”, said Mr. Kiruaye. Adding, “better yields start from selection of quality maize seed variety and planting them using the given procedures and using crop protection well to protect the yield potential of the variety. Corteva has a holistic approach which encompasses; planting, weeding, and control of pests”.

Mr. Kiruaye asked farmers to feel free and share any addition information they needed to ensure they succeeded in feeding the nation. He also assured them that there were more seed varieties and crop protection products in pipeline.

SureStart: Give maize a strong start Before planting season, it’s the opportunity to reflect and make plans for the upcoming season. Since every farmer, field and season is different, agronomists are challenged to develop customized weed control programs to fit customers’ unique needs. Corteva Agriscience is challenging farmers to attack weeds early and often.

It is important to have the strongest start possible by layering residual herbicides to control tough weeds. To achieve full yield potential of a maize crop, the crop needs 60days weed free field .Uncontrolled weeds steal crucial nutrients, sun and water from young maize plants and ultimately, rob yield. Some of the fiercest weed competition have long germination periods and spread to more fields each year.

SureStart® 509 SE fits your spray program well. It has a wide window of application giving the farmer a chance to do a pre-emergent or early post -emergent spray of the product as one go and gives you 8-12 weeks residuality.

It is designed to fit the way farmers grow maize, so they can spend less time worrying about unwanted, yield-robbing weeds. It offers dependability and application flexibility to deal with the unexpected.

SureStart® 509 SE herbicide is proven to give maize a strong start as the first pass to control a broad spectrum weeds like broadleaves, grasses and sedges. SureStart® can be applied preplant giving farmers the flexibility to overcome unexpected weather delays and cover more ground. With three nonglyphosate and nonatrazine modes of action, SureStart® provides residual control of more than 60 difficult-to-control broadleaf weeds and grasses.

Radiant: Fast Knockdown of FAW in Maize Radiant 120 SC is an innovative chemistry for fast knockdown and broad-spectrum control of damaging insects including Fall Army Worm (FAW). Radiant has a unique mode of action with a fast-acting with excellent knockdown. It is effective at low use rates and has short three-day pre harvest interval. The valuable



rotation partner with other chemistries has a minimal impact on beneficial insects and predatory mites.

Conclusion

At the end of the training, the farmers who were drawn from large scale farms asked for further trainings, including more advanced lessons and hands-on demonstrations or visits to model farms. Corteva staff, specifically, said that they were committed to promoting agriculture in the country. The training was also attended by Wilson Seroney, TSR, Corteva and Francis Ndung’u of Corteva among others.

In order to optimize maize production opportunities farmers require a partner like Corteva Agriscience; the company which already has foot print in maize as well as with advanced innovations on maize farming.

University of Eldoret

Annual Agribusiness Trade Fair Held on 12th -14th September 2019



University of Eldoret is no doubt rich in agricultural courses going by the contents embedded in its curriculum. It's investment in agricultural trainings, technological advancement and the increased efforts to inculcate precision farming has seen the institution elevate farming to higher heights through an holistic approach; in order to realize value from the venture.

This is evident from their commitment to host the trade fair annually and bring industry experts, suppliers, researchers, policy makers, financial institutions, government stakeholders and farmers under one platform to share knowledge and emerging developments in agriculture.

This year's trade fair theme "enhancing food security through technology and trade in agriculture for national growth" came at the right time and also in compliment with the national big four agenda where food security is of key priority. The trade fair came at a time when farmers felt ravaging effects of climate change which delayed farming activities in the North Rift this year. Most of the farmers were quick to narrate how they incurred double cost in their farming activities due to prolonged drought which forced them to replant due to uneven germination of their crops. For this, farmers flocked in large numbers to learn emerging techniques and technologies they should employ to combat the dangers of climate change and enable them to practice sustainable agriculture.

The trade fair was officially opened by Governor Wycliffe Oparanya the chairperson of council of Governors. He reiterated the need for Government to finance more research activities on matters climate change and best farming practices in order to bolster the achievement of food security within the country.

The vice Chancellor University Eldoret prof Teresa pointed out the need for more investment on farmers' trainings and more especially on technological use; this is to boost yields and make agriculture more

sustainable. The show highlighted cutting-edge technologies and farming practices of the current times. These advancements ranged from farm inputs and education on the same, grain handling and processing, farm machinery, education on financial knowledge, livestock exhibition and dairy equipment, animal auction and sales and demonstration plots. In a nutshell the show encompassed everything farmers needed to learn about amid the changing trends in climate change and the need for farmers to transition to climate smart agriculture to tackle this menace holistically.

Value addition efforts in milk processing, honey, mushroom, potatoes and bananas which were showcased by the University of Eldoret, Nandi , Kericho and Elgeyo Marakwet counties gave farmers a different perspective on different ways to generate more value from their produce.

Value addition has to be a game-changer for farmers due to the brokers who have polluted every market for farmers, because of this; farmers sell their produce at a lower price which makes their efforts less rewarding and unsustainable.

Demo Plots

This was the climax of the show and where the real action took place. Different companies had their demo plots well organized with most of the plots having capsicum, cucumber,

tomatoes, vegetables, wheat and maize. Each and every crop showcased here was planted based on the recommended guidelines from the exhibiting company. Farmers had a lot to learn, ask questions and of course take notes to replicate the same in their farms for maximum yield.

Climate change, technological advancements and continuous research in matters agriculture, clearly indicates that farmers' thirst for information should scale up if they want to continuously realize value from their farming ventures. A show like the University of Eldoret trade fair provides a platform for farmers to learn and replicate cutting-edge farming practices to their farmers. Sustainability is abroad topic and as such farmers should learn ways on how to make their ventures more profitable and sustainable without compromising environmental health.

The show lived up to its theme based on the number of technologies showcased during the show and ways on how to practice value addition to institute trade in agriculture for more value and returns. Speaking to different farmers; *Cereals Magazine* established that farmers are ready to learn and adopt new farming practices. There is need to deliver more resourceful information to farmers in order to scale up production and contribute towards a food secure nation.



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Climate Smart Agriculture: Way to go

The Government of Kenya is fully aware that the progress being made towards food security, poverty reduction and sustainable development is at risk due to adverse impacts of climate change.

Historical records show that Kenya has experienced rising temperatures over the last 50 years coupled with intense and extreme climate and weather events like droughts and floods.



Slopy Land: This can be easily eroded.

In response to this the Kenyan Government through the Ministry of Agriculture, Livestock and Fisheries launched the Kenyan Climate Smart Agriculture Framework (KCSAF) 2018-2027 to mitigate the risks of climate change through realization of climate resilient and low carbon growth sustainable agriculture which will ensure food security and contribute to national development goals in line to vision 2030.

The Framework is supposed to explore climate smart practices relating to sustainable intensification of crop, agroforestry, livestock and fisheries production; adaptation and mitigation practices in livestock production systems; efficient management of agricultural commodity value chains; opportunities to leverage climate finance for CSA; knowledge sharing and effective learning; strengthening key institutions and systems for CSA initiatives; and mainstreaming CSA elements into national policies and development planning process.

The following partners have spearheaded this campaign to ensure Kenyan transform its farmers to adopt climate smart agricultural practices in order to realize food security and sustainability; FAO, NEPAD, UNDP, DFID, CLIMATE CHANGE Agriculture and Food Security and COMESA. Climate smart campaign kickstarted in 2017 and though we still have a long way to go as a far achieving sustainable agriculture; the government is on the right track in training farmers on the best farming practices in a climate changing planet.

Food security will be realized with a paradigm shift of farmers to

modern agricultural practices. This shift will enhance maximum production in spite of climate change and the dangers of drought. The achievement of this milestone will result in maximum yields which ascertain food security and sustainability. There is need for more investment in the climate smart agriculture campaigns across the country if the government is fully committed to their food security agenda.

What is Climate Smart Agriculture?

Climate Smart Agriculture (CSA) is an approach that aids in guiding actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA helps to develop agricultural strategies to secure sustainable food security under climate change. It provides means for stakeholders from local to national and international levels to identify strategies suitable to their local conditions. CSA forms an important part of FAO's strategic objectives which is in line with FAO's vision for sustainable food and agriculture and it also supports FAO's goal to make agriculture, livestock and forestry more productive and sustainable.

Climate Smart Agriculture aims to tackle three major objectives;

- To sustainably increase agricultural productivity and incomes
- Adapting and building resilience to climate change
- To reduce/remove greenhouse gas emissions

These three objectives are geared towards realization of sustainable



agriculture across the agricultural value chain.

Sustainable Agriculture

How do we tell when our agricultural practices are sustainable? There are three components which are of great significance to sustainable agriculture; environmental health, economic profitability, and social and economic equity. Sustainable agriculture occurs when a society can meet its food and textile needs in the present without compromising the ability of the future generations to meet their own needs. Sustainability in agriculture contributes immensely towards climate smart agriculture as it ensures an increase in production and incomes, adaption to climate change and protection of environmental health.

To achieve sustainable agriculture, farmers may use different practices to promote soil health, minimize water use and lower pollution levels in the farms. Consumers and retailers in the sustainability chain can look for value-based foods that are grown using climate smart agriculture framework and also promotes farmworkers wellbeing.

The integration of climate smart agriculture in your farming processes will definitely generate some sustainability out of it. If your farming ventures are not profitable, if the quality of your life as a farmer is not improving and those of your family members and the society at large then you as a farmer has a lot to do in order to make your investment sustainable. The changing climate means that we ought to embrace innovations and transform our farms to adopt modern practices to maximise yields and enhance food security.

Climate Smart Agriculture; the Kenyan Way

According to the Kenya's national development blue print, the Kenya Vision 2030, Kenya envisions being a middle-income country with citizens enjoying high quality of life and a sustained annual economic growth rate of at least 10% by year 2030. The agriculture sector is one of the key sectors to contribute to the projected annual national economic growth.

The Government of Kenya is fully aware that the progress being made towards food security, poverty reduction and sustainable development is at risk due to adverse impacts of climate change. Historical records show that Kenya has experienced rising temperatures over the last 50 years coupled with intense and extreme climate and weather events like droughts and floods. Future climatic predictions for Kenya indicate possible temperature increase of 1°C by 2020 and 2.3°C by 2050.

These changes unless effectively mitigated, will likely result to erosion of the productive assets and the weakening of coping strategies and resilience of rain-fed farming systems, especially in the arid and semi-arid lands. This will lead to more climate related vulnerabilities thereby predisposing farming communities to food insecurity and more poverty.



For The Love of Agriculture: Lisa Tiang'a

Our hybrid maize varieties have something to offer farmers in all regions and cropping environments across Kenya.



Lisa Tiang'a is more than just the Seed Category Lead, Africa and Middle East, Corteva Agriscience. She's empowering farmers in the region to be the most powerful people of tomorrow, one lesson at a time.

Lisa Tiang'a is the marketer you always wished you'd had. You know the type – bright, breezy and approachable. She also knows stuff, lots of interesting and quirky stuff, which she draws on randomly to emphasise a point. The Seed Category Lead, Corteva AgroSciences has been the Seed Category Lead, AME for the last one year.

The decade and half before, she has been a corporate marketing professional in the FMCG, oil and healthcare subsectors. Before joining Corteva Agriscience, the University of Nairobi MBA holder had ironed her agricultural skills and gained the relevant experience at Monsanto. This is the time she realised she had the passion of working with farmers to ensure food security in Africa and Middle East. From then, she has used her advanced marketing skills to develop and grow the seed business in Corteva AgriScience. Lisa spoke to *Cereals Magazine*.



Lisa Tiang' shares a cake with colleagues

Briefly describe your role as the Seed Category Lead, Africa and Middle East

By combining conventional and new seed and trait technologies, Corteva Agriscience™ is delivering more ways to meet the needs of a growing population. It is my duty to develop and support growth of the seed business in the region and ensure the company achieves its mission in Africa and Middle East.

Briefly describe your products and services to the farmer

As demand for food increases, so does the need for seed technology. The world's leading developer and supplier of advanced plant genetics, providing high-quality seeds to farmers is currently offering two brands in Kenya. The Pioneer brand has a high yielding hybrid maize portfolio and Pannar not only offers the best maize varieties but also a range of multi crops.

The two brands boast of white and

yellow maize varieties for both human consumption and silage.

Our varieties are developed and tested in local conditions to ensure they represent superior products to what is currently available. Our hybrid maize varieties have something to offer farmers in all regions and cropping environments across Kenya. As with all our products, there's always a Corteva Agriscience representative in your local area to help you choose the right hybrid maize seeds and provide on-farm backup and technical support — we're committed to providing helpful management advice and support to assist local farmers in making optimum profit from our products.

Beyond product we also offer farmer support services such as yield insurance that we are currently extending to farmers in certain parts of the country this year.

“

We are the leading one stop shop for Seed and Crop protection solutions for the farmer. We also pride on years of expertise from our commercial, regulatory, research functions and all our supporting functions which are focused on enriching our farmers and consumers lives while doing it safely.

How do you adjust working cross-culturally, and how has it influenced the way you lead?

My position requires I traverse and work across Africa and Middle East. The region has different people, cultures, food, religion, economy, climate etc. Having lived in UAE, a multicultural country, this is not a major problem. But let me say that cultural fluency in leadership is critical for building trust, and is a competency that has offered repeatedly better performance. Building long term cross cultural relationships leads to increased creativity and out-of-the box thinking. It is an essential ingredient for driving productivity and innovation while also staving off the kind of uniformity that can lead to “groupthink” (which can limit a company's ability to reach a global customer base).

Like any other leadership competency, cultural fluency is a muscle that can be strengthened, but not built overnight. I have learnt that, to win the hearts and minds of staff in a multicultural setting, the secret is to stay humble, remain curious about learning diverse perspectives, and be willing to adapt my communication approach. Only then will I tap into the power cultural differences and bring success to Corteva Agriscience.

How has Corteva evolved since you joined?

After two years in the making, I witnessed the merger between global companies Dow AgroSciences, DuPont Crop Protection and

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Pioneer Hi-Bred complete, on Monday 3 June at 9.30am, when the New York Stock Exchange bell rang and Corteva Agriscience officially became a publicly listed company. This led to the formation of a company that is squarely focused on agriculture and the needs of our customers. Am eagerly looking forward to the journey ahead.

In reference to the merger, briefly describe its advantage to the farmer

We are the leading one stop shop for Seed and Crop protection solutions for the farmer. We also pride on years of expertise from our commercial, regulatory, research functions and all our supporting functions which are focused on enriching our farmers and consumers lives while doing it safely. This makes the new company quite distinct from other players and different from our legacy businesses.

What are some of your goals/vision for the company?

My vision is to see Africa feeding the world in future not only because of its land mass but its increased use of new innovations and rich soil. I purpose to enrich lives of the AME farmer by ensuring we provide the right products and imparting the right agricultural knowledge.

What drives you?

Will power, Courage, Persistence, Hard work and thirst for Knowledge. I have always been ready to try out new ideas and live in different places, my motivation is from within and am continuously seeking knowledge to improve myself.

What is your biggest challenge?

Ensuring that the smallholder farmer will access the newest innovation and technology to increase their productivity despite the challenges they face. This is curtailed by lack of purchasing power and

enough information on solutions. Corteva Agriscience is continuously working on the latest technology and providing multi-crop solutions to meet farmer needs. We invest a lot in farmer education.

What is your work ethic and how does it inspire or affect your subordinates?

I focus on results, customer centricity and shared vision. I also accept people with diverse personalities, valuing individuals with their differences

As a woman in leadership, what challenges would you be going through?

With the evolving world, women are still not fully represented globally when it comes to leadership roles in agriculture. My biggest challenge has been juggling family and career with travel requirements of a regional role, there's also opportunity for women to be accepted and respected within this industry but it gets better by the day.

Describe Corteva Agriscience in the next five years

There is some really exciting stuff coming through. On the seed side we have some exciting technology in development which is well suited to meet our farmers needs,

fitting into all the environments in our region and a wider seed portfolio of other crops.

We are also looking to leverage our growing digital platform to see where and how this can help African growers be more productive and profitable.

Your three tips for a successful strategy

Understanding the farmer and his needs, ensuring we have the right product to meet evolving farmer needs and ensuring our people are motivated to perform.

Your final Remarks

There's is a shift taking place in agriculture with changing climate patterns, shifts in consumer food needs and purchase behaviour, trends towards digital farming, increasing demand by farmers for solutions that meet these changing environment and we need to invest in organizations that are adapting to the changing environment, continually innovating and invest in talent that seeks to improve themselves whilst providing sustainable solutions.

Such an organization is Corteva.



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Planter Components
To Check Before

1. Transmission. “This really involves anything that deals with the bearings, chain sprockets, idlers, anything that really helps drive that planter’s transmission to the meter itself. Farmers should focus on this area first to eliminate any future problems. One can use spinner motor that will run the main drive shaft of the planter so you can do this step in the shop without the tractor running.

2. Row unit. Sometimes row units can be bent or twisted by rocky soil or sloping terrain. Make sure your row units are still centred. You can check that quickly in the shop. Just stretch a tape back and make sure everything’s uniform.”

3. Down pressure assembly. With many down pressure setups—manual springs and automatic pneumatic systems—the proper setting is still paramount. You just want to inspect your overall system and make sure that you know nothing’s broke.

4. Parallel arms. Really this is your bolts and bushings,” a technician said advising farmers to make sure they are tight. You can also pull them out and if there’s any wear on the bolt or bushing it’s time to replace those. “That’s a pretty easy one to check in the shop,” she said. “Then just make sure those stay tight. We say to

tighten them now when it’s in the shop and then you get partway through your planting season, maybe you get rained out a day, and then we recommend that you tighten those up again.”

5. Row cleaners. “We really recommend running a floating type of a row cleaner in any tillage system whether you’re in conventional tillage, no-till—it doesn’t matter,” she said. The technician recommends only running no-till coulters in no-till conditions. “So if you’re doing a lot of conventional till and some no-till we’d probably say leave it off,” she explained, “but if you’re running pretty much all no-till then we’d say we could leave the no-till coulters on.”

6. Gauge wheels. She says improperly set gauge wheels are one of the most common problems in the field. Make sure they are set tight enough. “We really want them tight up against the outside of that disc opener,” she explained. “If there’s any space in there, we get soil that comes in there off the surface which is dry soil. Now the wheels turn and [the dry soil] gets inside there and then when it falls back out, and it actually falls out into the seed trench. That means you are basically putting dry soil on top of your seed which can be a real negative in trying to get uniform germination.”

7. Disk openers. Make sure you have right size disk opener for the model of planter you have. “Most manufacturers talk about only a half inch away or in the diameter of those opening disks,” she said. They also need to be set for the right point of contact. She recommends double checking with your dealer or looking in your manual to find out how to set them. “That really varies not only on the brand of the planter but also the model of the planter,” she said.

8. Seed tubes. The technician recommends inspecting seed tubes for wear and damage. Worn seed tubes can cause seeds to go where you don’t want them. “We’re trying to make it so there are no issues,” she said.

9. Guards. Inspect the guards on your seed tubes, she advised. “We replace those a lot because if that gets worn it damages the seed tube,” she adds.

10. Closing wheels. According to her, ensuring closing wheels are working properly is essential. “The key is making sure they’re centred behind the planter,” she said. And she encourages farmers to evaluate all of the many options that are on the market.

Farming for the Future

Optimising soil health for a sustainable future in Kenyan broad acre cropping



Soil health is the linchpin of the entire agricultural sector. As Lloyd Noble once said, “No civilization has outlived the usefulness of its soils. When the soil is destroyed, the nation is gone” (Noble Research Institute, 2017).

By definition, sustainable and successful farming businesses depend upon the health of their soils. For many years, conventional farming practices have been degrading soils, creating issues such as erosion, and negatively affecting crop yields. Full-disturbance tillage of the soil and whole paddocks left bare to fallow, goes against the laws of nature. A recent shift in farming practices towards minimum tillage has seen many benefits – yield increases, reduced erosion, improved cover retention and better water infiltration to name a few. The zero-till revolution has been paving the way for the agricultural industry to further improve management practices, in a push towards biomimicry.

Farming in nature’s image is increasingly important to maintaining soil health in agricultural operations. Bio-diversity and ground cover retention are both

“The total nutrient surplus generated by fertiliser and manure use on managed agricultural land remains high. There is scope for every farm business to be more efficient through reducing waste across the entire production cycle. If they do not, then further restrictions on nutrient use may be imposed from external sources such as government rules or market pressure. There are many available technologies, including precision farming and nutrient recovery systems, to be harnessed to reduce nutrient loss.”

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key elements to obtaining optimal soil health. Multi-species cover cropping is an emerging innovation in soil health management proving to be extremely effective at incorporating both of these elements.

It is important to review the functions of multi-species cover crops as ground cover for weed suppression, erosion prevention, increasing soil organic matter levels, and improving water infiltration and moisture retention. There is also importance to investigate the effects of bio-diversity on soil function, with an analysis of the significant interactions provided, including microbial activity, the bacteria to fungi ratio, the carbon to nitrogen ratio, and carbon and nutrient cycling. Key findings indicate that the species-richness effect on soil health is predominantly related to root biomass production, which stimulates growth and diversity in microbial communities within the soil, balances the bacteria to fungi ratio, and generally creates synergy between all soil elements and processes to promote a healthy soil ecosystem.

The logistics, considerations and financial viability of incorporating multi-species cover crops into broad acre cropping rotations is also assessed. Research shows that despite initial financial deficits being possible in early cover-cropping seasons, the long-term soil health benefits prove to be profitable through increased yields and decreased costs on fertiliser and chemical inputs.

The sustainability of Kenyan broadacre dryland cash cropping operations, and the agricultural industry in general, hinges heavily on a soil health focus. Incorporating multi-species cover crops into cash crop

rotations is the most effective way to improve soil health.

Research has proved that multi-species covers can alleviate several environmental factors affecting soil health by:

- reducing or preventing erosion.
- increasing water infiltration.
- inhibiting weed growth.
- increasing SOM.

Further, emphasises should be made on the importance of bio-diversity within a

cover crop, showing how a species-rich environment creates synergy between all soil components. Bio-diversity encourages:

- effective carbon and nutrient cycling.
- a balance of C:N ratios.
- microbial growth and activity.
- healthy bacteria to fungi ratios.

Though implementing diverse cover-crops can pose initial economic issues, the long-term environmental and economic benefits prove to outweigh the financial deficit associated with the transition phase.



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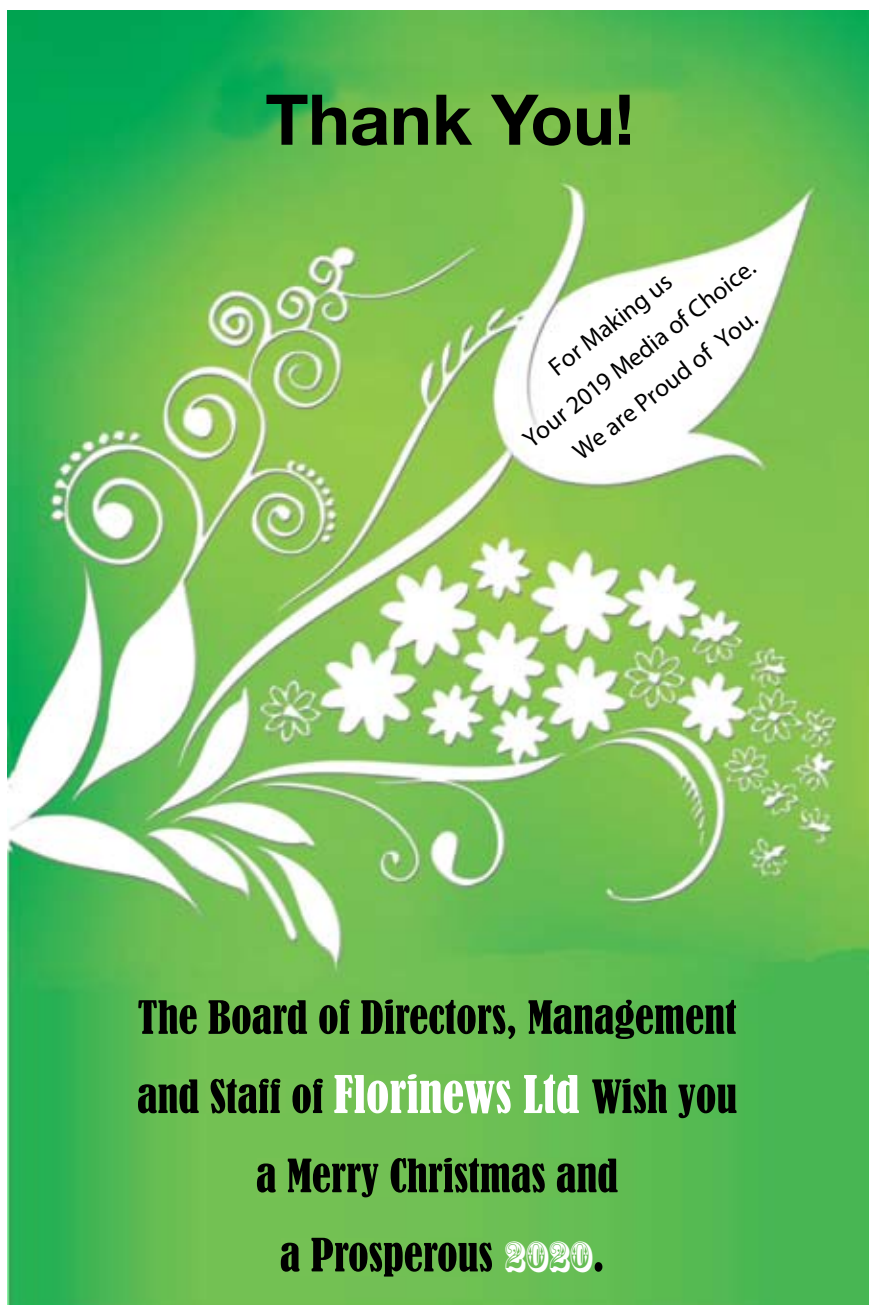
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Through careful management and mix-selection, multi-species cover cropping can certainly be a viable option for Kenyan broadacre farmers seeking to improve soil health.

Recommendations

- Employ zero-till farming practices wherever possible to lessen soil degradation.
- Create a cover crop rotation schedule – based on soil test results and current cash crop rotations. It is imperative to have a plan, goal and strategy in place in order to be effective and efficient in any business venture.
- Implement a business plan for the transition phase – expect that multi-species cover-cropping is a long-term investment, interim alternative income sources may be required to support the associated expenditure.
- Conduct regular soil testing – knowing your soil and monitoring soil changes will ensure that appropriate actions can be taken e.g. which paddocks require attention, what soil health issues are arising, and which plant species are most suited for rectification.
- Research plant varieties suitable for the region – understanding species for both their benefits and their required growing conditions is advisable. Consider contacting a local agronomist if necessary and remember, the more species the better!
- Construct a “seed budget”. Seed will be the primary input cost. Pricing different varieties and options available and adhering to a budget will minimise any negative financial impacts in the initial season.
- Decide which methods will be employed for planting and termination – performing an opportunity cost analysis may assist when considering alternatives.
- Consider value-adding (such as livestock grazing). It is important to closely monitor and control any grazing to ensure the best results from plant growth benefits.
- Encourage neighbours to get involved – a local cooperative initiative could be an option for capital investment of plant and machinery, bulk seed purchases to obtain discounts and disseminating local knowledge, information and findings from trials.
- Consider applying for government grants and subsidies associated with agricultural conservation practices.



Seed Firms Watch Farms For GM Maize Demand

Marketers say commercial interest will be key to determining whether to adopt the genetically modified (GMO) maize seed that is on trial in the country as part of their varieties.

They argue that their key market — the farmers — need to accept it first before they can adopt the technology once the country allows its commercialisation.

“We need to weigh benefits of science against commercial returns. We need to know the cost of production and many other underlying factors,” said George Osure, regional director for Syngenta East Africa.

Seed companies, he said, make profits by selling their commodity in huge markets and that there should be a sizeable number of farmers, not only in Kenya, but also in the entire East African market for them to recoup production costs.

“Our big clients are farmers and they need to understand what this technology is, once they embrace it then we shall have no problems in accepting it,” said Mr. Osure

He said that seed companies may end up adopting the biotech seed only to be rejected by farmers, a move that will lead to heavy losses.

Seed firms want the statistics on production cost per unit, data on its nutritional value after milling to be made available, saying this move will guide not only the farmers but also the consumers to make decision.

“We have to look at GMOs from the entire value chain. Consumers need to know its nutritional value after milling and they would also want to know its taste and appearance,” said Mr Osure.

Once the ban on GMO is lifted, seed firms will be allowed access the technology.

The Kenya Agriculture Livestock and Research Organisation said the seed will be royalty free, meaning that seed companies will not have to pay a shilling to access the technology.



Seed firms want the statistics on production cost per unit, data on its nutritional value after milling to be made available. This move will guide not only the farmers but also the consumers to make decision.



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Plant

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Grow

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Harvest

Harvest crop at half milk line stage or at 35% dry matter level. Chop length must be less than 1 (one) inch with broken corn grains.



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than 21,000 full time staff members.

OCP AFRICA

In 2016 OCP Group created a new subsidiary dubbed 'OCP AFRICA' which is responsible in spearheading the development of the group on the African fertilizer market through a network of several subsidiaries across Africa. Their commitment is to contribute to the sustainable development of agriculture through provision of fertilizer solutions customized for local conditions and crop needs.

Currently, OCP Africa has a presence in Nigeria, Rwanda, Ethiopia, Senegal, Burkina Faso, Ghana, Cameroon, Benin, Cote d'Ivoire, Zambia, and Tanzania.

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African Fertilizer Complex in Jorf Lorf, Morocco



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KENYA

OCP Kenya was established in 2016 as a subsidiary of the group with the aim of contributing to the development of agriculture in Kenya through;

- Provision of suitable and affordable fertilizers to farmers
- Soil testing and development of fertilizers customized to crop and soils to increase yields
- Training farmers on good agricultural practices to improve yields
- Developing farmers from subsistence to commercial farming
- Focusing on development of smallholder farmers



Joyous women after OCP Farmer Training Forum in Meru

OCP Kenya imports and sells different types of fertilizers from Morocco, where the group has vast experience (100 years), in the development and manufacture of wide portfolio of highest quality fertilizers to international standards.

OCP Kenya has since 2016 trained farmers on good agricultural practices and soil testing in the following counties: Nyeri, Embu, Meru, Nakuru, Uasin Gishu, Nandi, Kirinyaga, Narok, Machakos, Muranga, Kiambu and Laikipia. To date the number of farmers who have benefited from the program directly is more than 85,000.



Karimi Thurairira of OCP training Farmers during a Forum in Meru

To add value to farmers, OCP Kenya has invested in mobile trucks fully equipped with laboratories for soil testing services for suitability mapping (to match crop requirements to soil nutrients) and qualified agronomists and field staff to offer solutions to farmers, in order to effectively contribute to improving the yields and productivity.



SchoolLab Trucks



Group Photo of farmers who attended OCP Farmer Training Forum in Meru

OCP has developed and commercialized a very successful fertilizer formula – NPSB that is suitable for maize, wheat, barley, sorghum with increased yields of more than 20% and sold at affordable prices country-wide.

Water Quality Challenge in Agriculture



Sprinkler Irrigation System.: One of the ways water gets to the farm

Loss of nutrients to waters from agriculture is a significant pressure on water quality in Kenya. Excessive nutrient losses, primarily nitrogen and phosphorus, to waters can lead to accelerated growth of algae and plants, significant ecological impacts and eutrophication in rivers, lakes and marine waters and is the most significant pollution issue for surface waters in Kenya.

While agriculture is not the only pressure on the water environment and farmers in Kenya have made a considerable commitment to environmental measures, it is clear that supplementary action by the agriculture sector at a local and regional level will be required to further improve water quality.

The main water quality challenges as they relate to agriculture are:

- Nitrogen leaching leading to eutrophication and drinking water quality issues

- Excess phosphorus leading to eutrophication of waterways
 - Excess sediment leading to local deoxygenation and resulting in the degradation of important habitat
 - Pesticide in particular found in drinking water sources
 - Microbial contamination of drinking water, such as cryptosporidium
- An intensive assessment process conducted has shown that agriculture is a significant pressure in approximately 60% of impacted rivers and lakes.

Global Water Quality Challenge

In terms of global agriculture, water quality is becoming increasingly important. For centuries, many waterways were seen as a means of disposing of our waste which was eventually washed out to sea. With an ever increasing world population demanding a higher standard of living meaning intensified food production, water quality globally is

coming under unprecedented challenges.

While urban centres and industry are making efforts to address the challenges through new technological fixes, global mitigation in agriculture cannot be addressed through one-off technological fixes. Rather, mitigation will require the sustained application of processes or management practices by individual farmer.

Water quality represents a challenge to which all sectors of society must respond and the Kenyan farming sector is no exception. There is need to assess the challenge posed to the farming sector, looking at key competitors globally to determine what lessons can be learned, investigating where the sector is in addressing water quality and establishing what practical actions could be taken.

Feeding and nourishing a world population that is expected to increase by more than 2 billion by 2050, while recognising and balancing the environmental limits of the planet, is the most significant challenge facing global agriculture. While the overall

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outlook for the sector is positive with a growing and more affluent global population ensuring greater demand for agricultural products, our ability to grow the industry will be defined by our custodianship of the environment.

The government sets out a plan for further growth in the sector, recognising at all times, the importance of the industry committing to processes that are sustainable – economically, socially and environmentally.

Increasing farm output while meeting Nitrates and water quality targets poses a substantial challenge for Kenyan farmers but also presents a fantastic opportunity. The challenge is to demonstrate that intensive food farming is compatible with meeting the required water quality. The opportunity lies in the potential to capitalise on sustainable farming credentials.

The Opportunity

Retailers and food manufacturers are increasingly looking to the supply chain, including the primary producer, to provide details of the sustainability impact associated with their products. Those that can proactively establish strong credentials are well placed to secure long-term business relationships with leading retailers and food manufacturers.

Embracing sustainability has the potential to deliver a point of differentiation in what remains an extremely competitive global marketplace. The environment is a central pillar of sustainability with water quality a key component.

Over the last two decades, many farmers have incorporated practices which have led to efficiency gains such as improvements in cereal farming and crop protection methods. Now, farmers need to embrace and have a better understanding of best



Drip Irrigation System.: One of the ways water gets to the farm

practices for nutrient management to demonstrate true commitment, rather than simply being compliant, to achieving superior water quality.

There needs to be better recognition of the positive correlation that exists between efficiency, profitability and sustainable farming. The cereal sector can do more to convince a wider cohort of farmers that environmental friendly farming is in fact profitable, efficient farming.

Increasing profitability is a key goal of every farmer. While silage is the cheapest feed farmers can produce for their livestock, the majority are not getting the most from the farm because of poor soil fertility. If this fertility level were increased, significantly greater farm income could be achieved.

Soil fertility needs a focused approach where nutrients are applied in a targeted way rather than as done traditionally. In this way, farmers can significantly improve crop growth and consequently improve farm income. There is an added bonus that if nutrients are applied where they are most needed on the farm, they are more readily absorbed by the plant and do not end up in streams, rivers and lakes. Likewise, better farmyard management to prevent nutrient leakage and discharge will also protect clean water sources.

The core message is a simple one – better nutrient management will improve soil performance, farm profitability, protect local water sources and improve environmental performance. More farmers need to apply the approaches and recommendations in relation to soil fertility improvement and better farmyard management.

*Elgon Kenya appointed Corteva maize seed distributor in Kenya
Brings PANNAR maize variety to more farmer's in Kenya*



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Climate resilience with smart inputs and precision agriculture

By Monica Njoroge and Moses Kimani

Unpredictable weather is the new normal. Increased drought, flooding and off-season rains are now common-place and part and parcel of today's agriculture. Whereas previously, planting dates and seasons were clearly defined, farmers now have to contend with erratic weather patterns.

Is it possible to survive, let alone thrive in this new order?

There is no silver bullet to climate change adaptation for farmers, but there are a series of measures that farmers can take to adapt to the effects of weather patterns safeguard their business that include climate smart practices, climate smart inputs and precision agriculture.

We focus on the latter two:

Climate smart inputs

Most input providers now claim to provide climate smart products, but are they really climate smart? Climate smart inputs support plants to tolerate effects of drought stress, pest and disease stress without negatively affecting the environment. Organic planting fertilizers are a great alternative to conventional synthetic fertilizers. Understand your soil profile first before using these products to make sure you match nutrient requirements with what the products offer.

The biggest advantage of organic planting fertilizers is that most provide organic carbon which greatly increases the soil's ability to retain water. For a farm in drought, the carbon left in the soil can be as low as 0.5-1% which means that one hectare of soil can only retain about a quarter of a swimming pool worth of water when it rains (average swimming pool holds 280k liters). When soil carbon is at 5%, a hectare of soil can retain up to one and a half

swimming pools of water. When soil carbon is at 8%, a hectare of soil can retain up to three swimming pools of water (carbon8.raise.com).

Other climate smart fertilizers include organic acids such as silicic acid, humic acid, flavic acid that increase drought tolerance as well as resistance to pests and diseases. Bio-fertilizers that use beneficial microbes have also shown a great effect in increasing plant vigor during periods of climate stress. Ask your inputs provider for these alternatives. Incorporating these inputs to your crop nutrition regime does have a positive return on investment. As with most products, performance depends on your soil/crop mix. A bit of trial and error will reveal the products that work well on your farm and inputs providers are often willing to share trial samples for your farm.

Precision agriculture

Emerging technology is an enabler for climate smart agriculture. Precision agriculture is the use of technology and data to enable next generation farming.

Satellites and drones provide aerial view of farms. Equipped with infrared cameras, one can spot signs of crop stress that are not visible to the naked eye. They also allow for variable rates of application of inputs saving you on fertilizer and pesticide/fungicide costs. Hyper localized weather services that give you highly accurate weather predictions for your farm are now possible thanks to computational advances. It is now possible to get advice on when to plant, when to irrigate, and when to scout for pests and diseases. Drones can also be used for crop protection and to scare birds that can ravage cereals before harvest.

Precision agriculture is often thought to be a preserve of large commercial farms. Technology has made it possible for smallholder and medium scale farms to benefit from these services as well. Through our precision agriculture services, farmers receive SMS alerts when certain conditions such as drought stress, occur in their area. Farmers can receive a report of how their crop is progressing on a weekly basis. Penetration of smart phones has also made it possible for farmers to use applications to keep farm records, keep track of pests and diseases and to monitor farm performance over time.

Artificial intelligence has exciting applications such as making it possible to predict pests and disease outbreaks before they occur allowing farmers to take remedial action before the outbreak.

Automation is the next level of precision agriculture where a farmer can control irrigation lines, monitor farm operations using a smart phone. Applications such as robots that harvest fruits raise concerns about labour replacement but are a long way from being introduced in Kenya, or are they?

The next generation of farmers will not only rely on crop science to adapt to the effects of climate change but also rely on technology and data to ensure they are growing crops sustainably and profitably.

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LENTERA PRECISION AGRICULTURE

Technology enabling farmer success



SATELLITE IMAGING



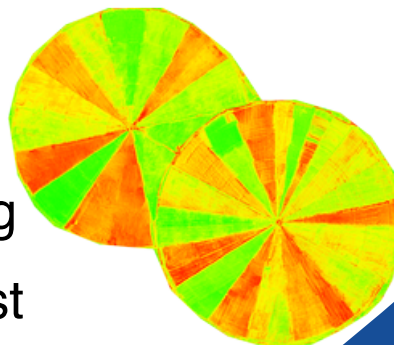
DRONE IMAGING



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Land Use and Development Farming viability in a changing landscape

The world faces a resource management challenge which will require a renewed approach to communication, flexibility and understanding in planning and farm diversification, in order for farmers to remain financially viable and feed our growing global population.

Agribusiness has a public relations issue which should be taken seriously by the industry as a whole. A discerning population is looking for choice, with a nostalgic image of farming which can no longer feed them, based on technological advances they do not understand or trust.

An anti-agribusiness movement has arisen which feeds consumers misleading information, and there is a mainstream media that celebrates shortcomings and hardships rather than achievements and successes. Confidence and trust in agribusiness is needed and this can only be achieved through improved communication.

For farmers, a fair financial return on

investment in a volatile market environment can be an issue, with many seeking expansion and scale to ensure viability. Technology is available to improve the utilisation of resources. However, these are poorly understood by a non-farming population, including planners, who often believe that scale and intensification is unnatural and leads to poor environmental, quality of life and animal welfare outcomes.

Investment researching the outcomes of technologies to support agribusinesses need for expansion and technology adoption through industry, research and government collaboration would be a step in establishing confidence in change. Management of land in terms of policy and legislation should address the question “can the tide of urban populations be stopped, diverted or taught to live in harmony with their rural cousins?” Incentivising the use of land for agricultural purposes through taxation, securing land through trusts and specific planning designations plus policy and legislative objectives which focus on key areas of

agricultural development should be encouraged.

Any recommendations should centre on improving the outcomes of agribusiness expansion and intensification through more effective engagement with the media and the general public.

Government and agribusiness cooperation is needed to compile data on existing developments and create a database of approved technologies. The aim being to give planners added confidence in approving intensive farming developments, when such developments compete with the needs of urban expansion. Efforts to retain agricultural land in production through taxation and marketing intensive urban living as a desirable and environmentally friendly option, would ease the pressure on land release and reverse sensitivity by maintaining critical mass of both agribusiness and housing.

Innovative solutions for production with fewer resources

Moving forward, the challenge is one of acceptance to the inevitability of change and deciding how those changes will be managed. Increasing global population's need for food will see an increased pressure on natural resources including water, land, people and climate.

Agriculture has historically done well in developing new innovations. As the population has become urbanised, technology has taken the place of people and animals.

Many innovative methods are being employed by farmers in order to adapt to changes in growing conditions which ensure viability for these farmers, despite the prioritisation of other needs ahead of agriculture. For example, drip irrigation technology from Netafim allows targeted use of water, enabling areas that are extremely arid and hot to produce food. Environmentally controlled systems utilise technology to create environments within areas that would otherwise not support many particular types of production.

Agribusiness is well placed in its ability to deal with land and climate change. This can

be counter-productive for prioritising current agricultural land, as it can re-assure decision-makers that food security can be maintained with less land, hindering efforts to preserve quality land close to cities.

What can farmers learn or adopt?

A study into the global challenges and potential solutions for the intensification and development of agribusiness is broad and varied. The topic is, in itself, complicated as it relies heavily on managing people's fears and uncertainties; the feeling of confidence in a situation needs to be established for development to occur.

The understanding gained may send a farmer onto a different path to diversification based on their specific licence, for example, niche products like ice-creams or agri-tourism. The understanding gained may allow for farmers to build licence through the engagement of local "thought leaders". Thought leaders are respected members of the community, who are able to influence the greater community. By engaging these types of people, the desires or fears of potential complainants can be mitigated or built into the development plan.

It is true however that a farmer may have the rights under planning law, engage with stakeholders, explore diversification and still not gain a licence. There are times where the only solution is to ensure that the development proposal is still viable with the added cost of defending the proposal. The defence of the proposal can easily equal or exceed the original development documentation cost.

A variety of different legislation, policy and

schemes need to be investigated to discover ways in which agribusiness could remain viable in a changing landscape. In analysing these there are a range of goals against which they are measured. There is need to summarise the desired outcomes in terms of retaining agricultural land in production and limiting changes to the rural demographic. Kenya is in a position to learn from international legislative experience in determining and establishing its own.

Some key areas guide and focus farmers looking to intensify, expand or develop their land. Having situational awareness of licencing and managing the fear response to change cannot be underestimated. Time and money can be saved by engaging with community stakeholders early. In doing so, Farmers have an opportunity to allow for potential objectors fears and desires to be factored into development proposals, before investment in the proposal documentation is made.

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Fostering Political Will to Drive Agricultural Transformation

Those who wish to increase political will for agricultural transformation can pursue several avenues. Most important is strengthening farmer organizations.

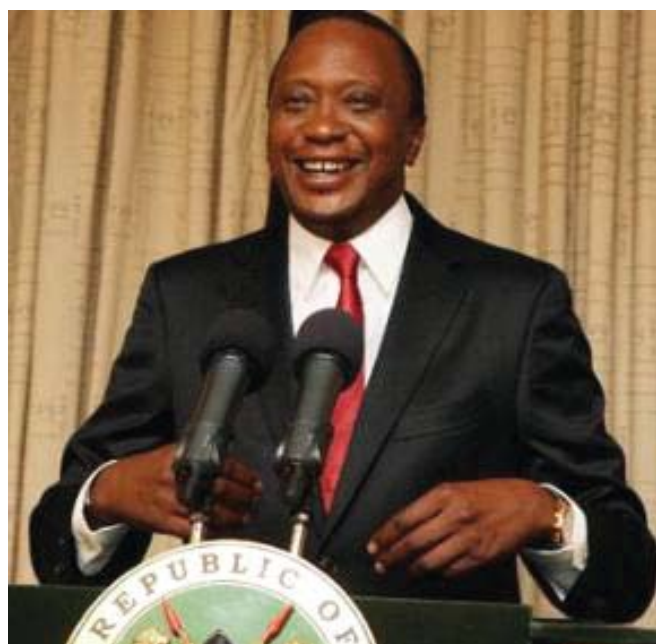
Political will describes the commitment of major political figures in support of government actions to accelerate agricultural transformation and growth. Without that commitment the agricultural transformation will not occur. Political will is especially important for agricultural transformation because of the predominant role of public sector investment, institutions, and policy in that sector. Agricultural growth depends on large and decisive government actions and hence requires political will.

Lack of political will for making the various requirements of achieving agricultural growth central to their approach to governance is endemic in African countries. It is the underlying cause of poor progress in agricultural growth and hence of poverty reduction.

Prime examples of lack of political will for agricultural transformation are the urban bias documented by Lipton (1989), the heavy taxation of agriculture documented in many publications, particularly including those of the World Bank, and widespread failure to meet the CAADP calls for 10% of government budget to agriculture, or the 1% of agricultural gross domestic product (GDP) to be spent on agricultural research. A sign of change is the now widespread abandonment of the deleterious taxation policies—mainly under the pressure of measurement and documentation of the harmful effects in World Bank and other publications.

There are nine aspects of political will namely:

- (1) Government initiative (not largely non-government sources)
- (2) Development and implementation of a national plan (which has the backing of the Head of State)
- (3) Choice of policies and programs (based on economically sound criteria)
- (4) Mobilization of stakeholder support of policies (efforts to mobilize support)
- (5) Public commitment and allocation of resources (formal statement of policies and commitment of resources)
- (6) Investments and reforms to strengthen implementation capacity (e.g., in the area of procurement and human resource management)



- (7) Application of credible sanctions (to ensure difficult to achieve programs are implemented)
- (8) Continuity of effort (recognition of need for long-term efforts)
- (9) learning and adaptation (demonstration of ability to adapt to changing circumstances).

In practice, measurement of political will has concentrated on the easily derived CAADP stated 10% of government budget to agriculture. By that measure, none of the regions of Africa met the target and, on average, were less than half. Although the measure seems reasonable, it is notable that Ethiopia, a major success story in agricultural growth rate, also fell short of meeting that target.

Because of the importance of public sector research an alternative measure of political will is the extent to which the CAADP target is reached of 1% of agricultural GDP spent on research. Only 6 of 36 African countries surveyed met that goal. On average, the percent allocation has declined since 2014, suggesting decline in political will. To summarize, political will towards agricultural transformation has improved very little in Africa over the past few decades and remains far less favourable than in Asia. There are hints that the situation is beginning to turn.

What should be done about this?

Obviously, when the Head of State shows an interest in moving

towards transforming agriculture donors should respond vigorously. This should include increasing support for the key government institutions in agricultural transformation—research/extension and planning.

Without that move by the Head of State, donors need to search out the ever-present national proponents of government orientation towards agriculture and support them with the burgeoning literature on the broad impact of accelerating agricultural growth. Universities will always have scholars interested in agriculture and they need to be supported, with conferences, travel grants, and direct research support. Foreign researchers should also be supported as they ally with national researchers. Support for rural infrastructure is always helpful. All this prepares the way for eventual change towards a positive approach to agriculture at which point donors can weigh in directly.

These must seem weak recommendations, given the central requirement of political will if the agricultural transformation is to be pursued. However, that is simply recognition that political will must come from within the national elites. It cannot be imposed from outside.

Securing a Strong Country Vision, Strategy, and Prioritized Plans and Flagships

Implementation begins with a vision, leading to strategy and hence a basis for a plan and setting priorities consistent with the limited resources. While the vision tends to be maintained over time, the strategy and priorities that follow from the vision are adaptable and ever-changing with conditions including those that follow implementation.

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“Agricultural transformation is only possible if the elite of a country and the Head of State genuinely view it as central to their political agenda. A country’s elite needs to see it as central to their broader development view; providing that broader view is an important entry point for implementing change.”



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Agricultural transformation is not a product solely of the ministry of agriculture. It is shaped and implemented through several ministries and many non-governmental institutions. That requires a vision, strategy, and implementation measures that are economy wide. This, in turn, requires that the Head of State be the source of the vision and strategy and provide the required national leadership. Agricultural transformation is an economy-wide effort with large-scale economy-wide benefits. If seen as solely an effort of a ministry of agriculture, it fails.

Vision comes from the mindset of elites.

Elites are not just in government. Elites come from across the society: government, the legislature, business leaders, nongovernmental public sector leaders, and farmers. It is their mindset—in other words the way they think and the way they choose to act—within the context that they live in day-to-day that determines vision. Of course, the vision must be popularized if it is to be implemented. Strategy is the path followed for implementation of the vision. That path must be consistent with the realities of the institutional structures, capabilities and development context.

Agricultural transformation is only possible if the elite of a country and the Head of State genuinely view it as central to their political agenda. A country's elite needs to see it as central to their broader development view; providing that broader view is an important entry point for implementing change.

The elite may well have a vision constrained by limited knowledge of the full ramifications of accelerated agricultural growth. This weakens their ability to obtain a broad following for their vision. The broad range of academic studies is important in bringing to the elite a full understanding of the immense impact of an agricultural transformation. It is much more than feeding people.

Unfortunately, much of the foreign aid community is also deficient in this knowledge with consequently impaired impact. They often see agriculture as simply meeting the need for food for a growing population. That simple need can be met by imports, but the full range of effects of an agricultural transformation cannot be met in this way.

Ethiopia's and Morocco's leadership provided a vision and strategy for broad-based agricultural transformation.

When the implementation structure and institutions are weak, as is the norm in African countries, special efforts are needed to mobilize foreign aid, foreign institutions, and national support to strengthen those institutions and manage in the face of weakness.

As implementation proceeds, the focus must shift from simply meeting numerical targets such as 10% of government expenditure on agriculture to attention to the quality of that expenditure. Meeting the 10% target with low quality effort is not likely to succeed in meeting the objectives.

In summary, developing effective links between policy and budgeting is necessary.

More important is to harness political capital to reforming public budget architecture in favor of rural and agrarian transformation.

Lack of democratization looms large when it comes to explaining (and hence diagnosing implementation needs) lack of political will to pursue agricultural transformation.

Political competition increases the attention to agricultural growth and hence to the extent of discrimination against agriculture on such items as taxation. Although increasing, democratization change has still been too small to allow much impact on the overall level of support for agriculture. However, there does appear to be change in favour of more democratization, hence political competition

and hence more favourable policies towards agriculture. Farmers comprise a major share of households in low and even in middle income countries, leading to more emphasis on agriculture when votes matter.

Those who wish to increase political will for agricultural transformation can pursue several avenues. Most important is strengthening farmer organizations.

While organizations of large-scale farmers are common, strong and influential, organizations of small-scale commercial farmers are virtually non-existent and their lack reduces the potential importance of the large population of such. Other approaches such as promoting policy-based research are less direct and less likely to succeed on their own but play an important role when other forces are brought into play. Conditioning foreign aid on increased national resources to agriculture is a substantial alternative, although foreign aid agencies seem rarely to do so.

In conclusion, democratization in the natural course of events shifts political will towards agricultural transformation. African countries seem to be moving slowly in that direction.

In this context, foreign aid could condition aid to reinforce that tendency. It is notable that foreign aid to Asian countries resulted in substantial development of critical public institutions for accelerated agricultural growth, ready for when the context changed.

It is equally notable that foreign aid has not, in recent years, played that role in Africa. When foreign aid was doing so much to assist Asian countries agriculture, it was doing likewise in a few African countries, notably Ethiopia and Nigeria. In these countries, the foreign aid assisted agricultural universities to continue to graduate the agricultural elite and provided the core of national support for the agricultural transformation. By the time other African countries were ready for this influence it had largely receded from foreign aid priorities.

Who will help run the farm?

Creating a pathway to a career on farm for the next generation of farm managers

For many in the agriculture industry around the world, an issue of significant concern is the sourcing of staff with the required skill set to assist in managing the operation of their farm businesses. In an environment of technological advancement, demographic shifts, urban-rural disconnect and increasing size, farm businesses struggle to access an appropriately trained and skilled workforce from which to source labour to fill the increasingly multifaceted roles on farm. In particular, the industry has a 'missing middle', with a dearth of talent to fill middle management roles that assist in both the decision-making process and the implementing of on farm operations.

It is important to investigate existing programs based in industry, education and privately, that assist in a person's development towards a career in farm management. Globally, many programs exist in this field. However, it is important to examine the potential links between these programs and initiatives. By doing so, the objective is to develop a career path that begins at a primary school age and allows individuals to develop an appreciation of agriculture, make a head start in an agricultural career and develop knowledge with an emphasis on tying that knowledge to experience, to ensure the skills and abilities built up have an applied nature and are 'paddock ready'.

Whilst not all may be directly applicable at farm level, it's important to provide a viewpoint that can provide industry with a bigger picture on the pathway required



University of Eldoret; One of the Universities Training Agricultural Students

to bring more people into agriculture. This is through supporting and advocating for curriculum-based programs in the classroom, more children from a broader range of backgrounds can be introduced to agricultural whilst learning their Science, Technology, Engineering and Mathematics (STEM) subjects. It also suggests that by supporting school-based traineeships and apprenticeships, those who are inclined towards agriculture can be given a head start. In turn, by helping to establish and utilise links between vocational and tertiary education institutions, agriculture can further up skill its workforce and importantly keep all participants engaged in further learning.

The resolution of this issue is as multifaceted as the skills requirement of the 'missing middle'. What is important is the

creation of a pathway that engages the next generation of farm managers at a young age and sets them on a trajectory towards a career in agriculture and farm management that will allow them to enjoy professional and personal development, provide the opportunity to build a career in agriculture without necessarily coming from a farming background and to allow the agriculture industry to further build its capacity and not be hamstrung by a lack of human capital.

In a modern day environment of technological advancement, demographic shifts, urban-rural disconnect and increasing size of farm businesses, it is important that the agricultural industry – and more specifically the farming sector – work collaboratively to address the issue

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of the missing middle within the available farm workforce. In order to do so, the development of a career pathway starting from a school age is vital in attracting people to a career in farm management.

In order to attract the next generation to a future in farming, the industry needs to address the disconnect that exists between today's youth and agriculture and that this can be achieved by using agriculture as a vehicle to deliver the curriculum requirements of STEM subjects in schools. Not only will this help to change the image of farming and agriculture in young people, but it has the potential to set the next generation of farm managers on a trajectory to a career in farm management.

Once set on this path those individuals with an inclination to a career in agriculture must be further encouraged and given the opportunity to make a head start down that pathway. Whilst the future may be in thinking jobs, it is important that future managers are able to develop both the increasing levels of digital skills as well as building the traditional skills of a farmer.

Equally as important is that this pathway captures not just those with an academic ability and desire for further education but those with a more vocational method of learning. The development and support of traineeship and apprenticeship programs is integral to bringing through potential





managers
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pathway to
management,
not just a skilled plant
operator or farm hand.

Once established on a pathway to a career in farm management, individuals must be able to continue learning whilst tying new knowledge to experiences gained on farm. Both industry and educational institutions recognise the value of ensuring this in producing a readily employable workforce. Continuing to develop partnerships between industry, educational institutions and farm businesses will help increase the capacity of a workforce with an applied knowledge. It will also allow achievable development opportunities for those already participating in the workforce and access for farm businesses of all sizes to up to date and specialised training for their staff, bringing learning to the farm.

The programs exist to help address the issue of the missing middle. What is required is for those programs to be adapted, supported, implemented and linked together to create a clear pathway for the next generation of farm managers, from school to a rewarding career in farm management.

Conclusions

It is important to advocate for the development and adoption of teaching packages which use agriculture as the vehicle to deliver STEM subjects in schooling systems on a national level. In collaboration with existing programs, develop a national outreach program to allow school age people the opportunity to spend time on farm and gain rural experience

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agriculture a head start on their careers and building necessary skills, creating a more formalised training pathway and instilling importance in further education. In addition, expansion of existing programs linking farm businesses with new entrants and providing a continuation of pathway from trainee to further training is important.

It is important to investigate existing programs based in industry, education and privately, that assist in a person's development towards a career in farm management.

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There is need to support and advocate further partnerships between vocational and tertiary educational institutions allowing further learning to be tied to hands on experience, more readily accessible to more participants and streamlining the advancement of people to farm management positions. This will address the difficulty in recognising agricultural skills by developing more targeted and specialised qualifications by which to measure them by while also bringing more achievable specialist learning to the farm.



Farm Management: Sound Management Gives a Business the Edge



What makes one farmer more successful than another?

This can be debated endlessly, but in the end it all comes down to farm management.

There are many definitions for farm management, but if we combine them, they all come, more or less, down to farm management being “the efficient employment of all resources, human and physical, to achieve the aims of the farming business.”

The human and physical resources, mentioned in the definition, are:

Management – which consists of 4 tasks:

- Planning (what to do, how to do it, and when to do it),
- Organising (who will do what, when will it be done and where will it be done),
- Implementing (physically doing what was planned and organised)
- Controlling (to evaluate what was done and compare it with the original plan and to seek reasons for deviations on which can be improved in future).

Business Goal

A bit theoretical some would say, but let’s analyse the definition, beginning at the aims or objectives of a farming business.

The most important aim would be to make a sustainable profit. Yes, there could be additional objectives such as to improve the standard of your living, to produce a product consumers would prefer, among them.

All additional objectives can only be achieved if a profit is made.

In financial terms, the objective would be a good return on investment.

In its most basic form, profit (P) or loss (L) is determined by Income (I) minus Expenditures (E). (P or $L = I - E$).

To be in a position to make a sustainable profit and achieve all objectives a farming business has to produce a product that meets the needs of customers in terms of quality, quantity, specific time of and/or consistent delivery, place of delivery, and packaging.

Labour – represents all employees.

Land – represents the physical land (soil, vegetation, grazing and water).

Capital – the term used for tangible money and immovable assets such as buildings, fencing, kraals, sheds and so forth and movable assets such as vehicles, implements, tractors, breeding livestock, and production inputs.

While applying management tasks the farmer/manager must be the leader and he must take decisions, communicate internally and externally, delegate work, co-ordinate sections, motivate his people and maintain discipline, both informally and formally.

Taking Responsibility

The term “farm management” could therefore be explained as planning, organising, implementing and controlling employees, land, all immovable and movable assets (including production inputs) by leading, taking decisions, communicating, delegating, co-ordinating, motivating and maintaining discipline to deliver products customers need – and all at a profit.

The questions asked at the start can now be rephrased:

- Do you plan, organise, implement and control to take care of your crop properly?
- Do you plan, organise, implement and control your farming system properly?
- Is the production of a crop properly planned, organised, implemented and controlled, including (for instance) such aspects as soil analysis?

As an example, the 4 management tasks could be seen as the wheels of a vehicle. Each wheel must be inflated correctly if the vehicle is to move forward efficiently. The same applies to a business – should one of the management tasks not be executed properly, your business could still make a profit but sooner or

later it would grind to a halt.

And that is also the challenge for the future – if your management doesn’t improve every year, your business will eventually come to a halt – that is, there is no longer any profit. One cannot simply do things the same way, year after year. One has to improve by increasing income and/or controlling expenditure.

Income can be increased, for instance, by increasing prices, higher production per unit, improved production plans (precision farming), increased productivity, a change or diversification of enterprises.

Costs can be limited by, for instance, bargaining for lower input prices and/or improved production plans, and/or reducing costs (such as reducing staff and/or controlling costs by implementing budgets and/or higher productivity).

Areas of Management

In every farming business, the owner/manager has to manage:

- Production (physical production of products).
- Purchasing (buying production inputs and

assets).

- Marketing (selling products).
- Finances (including taxes, estate planning, risk and uncertainty).
- Administration (office and records).
- Human resources (personnel).
- Public relations (relationships and communication).
- Assets (control, maintenance and selling of assets) and stock management (Control of production inputs).
- General (aspects such as occupational health and safety, fire control, farm safety).

Although the areas are mentioned separately, they are interrelated; so, even though you may be busy managing (planning, organising implementing or controlling) one area, you’ll probably also be managing one or more of the others.

Value of Information

The task cannot be carried out without external and internal information. So as much information as possible needs to be gathered, by reading, listening, observing and recording – if you don’t compare, you cannot manage.

If you don’t know that the calving percentage of your beef herd is only 60%, what are you going to “manage” to improve the calving percentage? So you start recording and then gathering information about what causes the calving percentage to be low and how to improve on the percentage or rectify the possible causes.

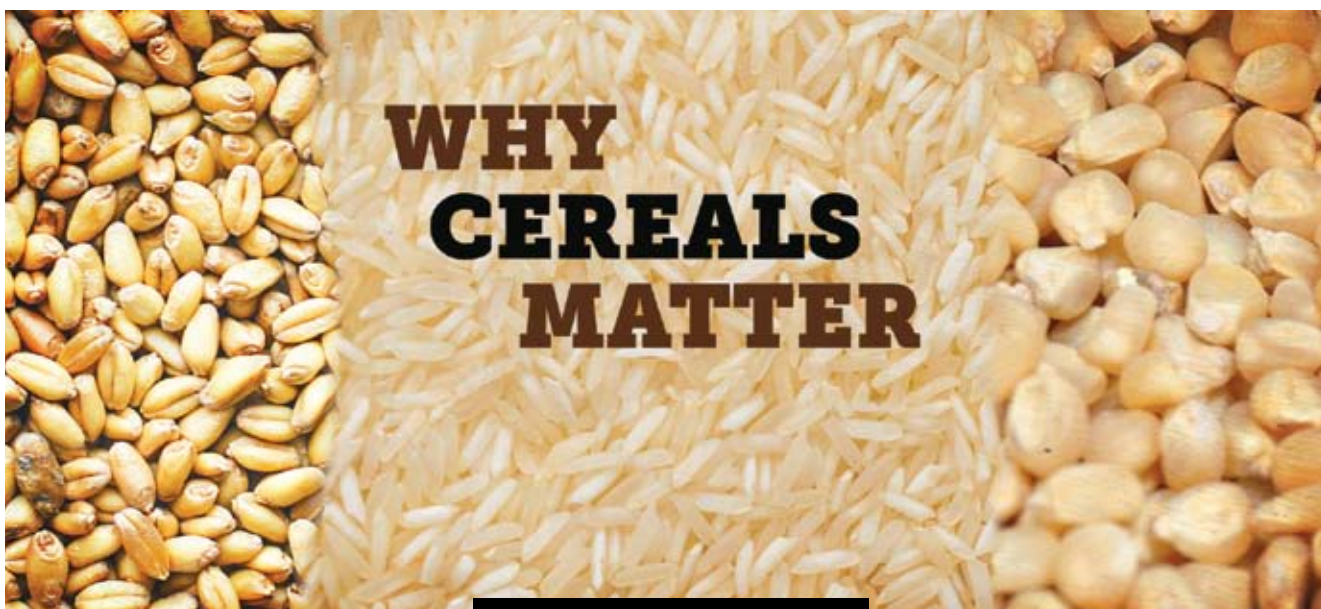
The same principle applies to your crops, milk production, the production of wool or the growth rate of your broiler chickens.

Lastly, as farm managers, we have also to remember that it’s part of our responsibility to bear in mind the conservation of the environment by applying sound agricultural practices. Land is one of our most valuable resources; without it, we wouldn’t be able to farm.



The Cereals imperative of future food systems

The world urgently needs a transformation of the global food system, leading to healthier diets for all and a drastic reduction in agriculture's environmental impact. The major cereal grains must play a central role in this new revolution for the benefit of the world's poorest people. By Martin Kropff and Matthew Morell



Pioneering research on our three most important cereal grains — maize, rice, and wheat — has contributed enormously to global food security over the last half century, chiefly by boosting the yields of these crops and by making them more resilient in the face of drought, flood, pests and diseases. But with more than 800 million people still living in chronic hunger and many more suffering from inadequate diets, much remains to be done. The challenges are complicated by climate change, rampant degradation of the ecosystems that sustain food production, rapid population growth and unequal access to resources that are vital for improved livelihoods.

In recent years, a consensus has emerged

“Cereal crops show much potential not only for enhancing human health but that of the environment as well. Compared to other crops, the production of cereals has relatively low environmental impact.”

among agricultural researchers and development experts around the need to transform global food systems, so they can

provide healthy diets while drastically reducing negative environmental impacts. Certainly, this is a central aim of CGIAR — the world's largest global agricultural research network — which views enhanced nutrition and sustainability as essential for achieving the Sustainable Development Goals. CGIAR scientists and their many partners contribute by developing technological and social innovations for the world's key crop production systems, with a sharp focus on reducing hunger and poverty in low- and middle-income countries of Africa, Asia and Latin America.

The importance of transforming food systems is also the message of the influential EAT-Lancet Commission report, launched in early 2019. Based on the views of 37 leading



experts from diverse research disciplines, the report defines specific actions to achieve a “planetary health diet,” which enhances human nutrition and keeps the resource use of food systems within planetary boundaries. While including all food groups — grains, roots and tubers, pulses, vegetables, fruits, tree nuts, meat, fish, and dairy products — this diet reflects important shifts in their consumption. The major cereals, for example, would supply about one-third of the required calories but with increased emphasis on whole grains to curb the negative health effects of cheap and abundant supplies of refined cereals.

This proportion of calories corresponds roughly to the proportion of its funding that CGIAR currently invests in the major cereals. These crops are already vital in diets, cultures, and economies across the developing world, and the way they are produced, processed and consumed must be a central focus of global efforts to transform food systems. There are four main reasons for this imperative.

1. Scale and economic importance

The sheer extent of major cereal production and its enormous value, especially for the poor, account in large part for the critical importance of these crops in global food

systems. According to 2017 figures, maize is grown on 197 million hectares and rice on more than 167 million hectares, mainly in Asia and Africa. Wheat covers 218 million hectares, an area larger than France, Germany, Italy, Spain and the UK combined. The total annual harvest of these crops amounts to about 2.5 billion tons of grain.

Worldwide production had an estimated annual value averaging more than \$500 billion

in 2014-2016. The prices of the major cereals are especially important for poor consumers. In recent years, the rising cost of bread in North Africa and tortillas in Mexico, as well as the rice price crisis in Southeast Asia, imposed great hardship on urban populations in particular, triggering major demonstrations and social unrest. To avoid such troubles by reducing dependence on cereal imports, many

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Cereal Products on Shelves.

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countries in Africa, Asia and Latin America have made staple crop self-sufficiency a central element of national agriculture policy.

2. Critical role in human diets

Cereals have a significant role to play in food system transformation because of their vital importance in human diets. In developing countries, maize, rice, and wheat together provide 48% of the total calories and 42% of the total protein. In every developing region except Latin America, cereals provide people with more protein than meat, fish, milk and

eggs combined, making them an important protein source for over half the world's population.

Yellow maize, a key source of livestock feed, also contributes indirectly to more protein-rich diets, as does animal fodder derived from cereal crop residues. As consumption of meat, fish and dairy products continues to expand in the developing world, demand for cereals for food and feed must rise, increasing the pressure to optimize cereal production.

In addition to supplying starch and protein, the cereals serve as a rich source of dietary

fiber and nutrients. CGIAR research has documented the important contribution of wheat to healthy diets, linking the crop to reduced risk of type 2 diabetes, cardiovascular disease, and colorectal cancer. The nutritional value of brown rice compared to white rice is also well known. Moreover, the recent discovery of certain genetic traits in milled rice has created the opportunity to breed varieties that show a low glycemic index without compromising grain quality.

3. Encouraging progress toward better nutritional quality

The major cereals have undergone further improvement in nutritional quality during recent years through a crop breeding approach called "biofortification," which boosts the content of essential vitamins or micronutrients. Dietary deficiencies of this kind harm children's physical and cognitive development, and leave them more vulnerable to disease. Sometimes called "hidden hunger," this condition is believed to cause about one-third of the 3.1 million annual child deaths attributed to malnutrition. Diverse diets are the preferred remedy, but the world's poorest consumers often cannot afford more nutritious foods. The problem is especially acute for women and adolescent girls, who have unequal access to food, healthcare and resources.

It will take many years of focused effort before diverse diets become a reality in the lives of the people who need them most. Diversified farming systems such as rice-fish rotations that improve nutritional value, livelihoods and resilience are a step in that direction. In the meantime, "biofortified" cereal and other crop varieties developed by CGIAR help address hidden hunger by providing higher levels of zinc, iron and provitamin A carotenoids as well as better protein quality. Farmers in many developing countries are already growing these varieties.

A 2018 study in India found that young children who ate zinc-biofortified wheat in flatbread or porridge became ill less frequently. Other studies have shown that consumption of provitamin A maize improves the body's total

stores of this vitamin as effectively as vitamin supplementation. Biofortified crop varieties are not a substitute for food fortification (adding micronutrients and vitamins during industrial food processing). But these varieties can offer an immediate solution to hidden hunger for the many subsistence farmers and other rural consumers who depend on locally produced foods and lack access to fortified products.

4. Wide scope for more sustainable production

Cereal crops show much potential not only for enhancing human health but that of the environment as well. Compared to other crops, the production of cereals has relatively low environmental impact, as noted in the EAT-Lancet report. Still, it is both necessary and feasible to further enhance the sustainability of cereal cropping systems. Many new practices have a proven ability to conserve water as well as soil and land,

and to use purchased inputs (pesticides and fertilizers) far more efficiently. With innovations already available, the amount of water used in current rice cultivation techniques, for example, can be significantly reduced from its present high level.

Irrigation scheduling, laser land leveling, drip irrigation, conservation tillage, precision nitrogen fertilization, and cereal varieties tolerant to drought, flooding and heat are among the most promising options. In northwest India, scientists recently determined that optimal practices can reduce water use by 40%, while maintaining yields in rice-wheat rotations. There and in many other places, the adoption of new practices to improve cereal production in the wet season not only leads to more efficient resource use but also creates opportunities to diversify crop production in the dry season. Improvements

to increase cereal crop yields also reduces their environmental footprint; using less land, enhancing carbon sequestration and biodiversity and, for rice, reducing methane emissions per kilo of rice produced. Given the enormous extent of cereals cultivation, any improvement in resource use efficiency will have major impact, while also freeing up vast amounts of land for other crops or natural vegetation.

A major challenge now is to improve access



to the knowledge and inputs that will enable millions of farmers to adopt new techniques, making it possible both to diversify production and grow more with less. Another key requirement consists of clear signals from policymakers, especially where land and water are limited, about the priority use of these resources — for example, irrigating low-value cereals to bolster food security versus applying the water to higher value crops and importing staple cereals.

Toward a sustainable dietary revolution

Future-proofing the global food system requires bold steps. Policy and research need to support a double transformation, centered on nutrition and sustainability.

CGIAR works toward nutritional transformation of our food system through numerous global partnerships. We give high priority

to improving cereal crop systems and food products, because of their crucial importance for a growing world population. Recognizing that this alone will not suffice for healthy diets, we also strongly promote greater dietary diversity through our research on various staple crops and production systems and by raising public awareness of more balanced and nutritious diets.

To help achieve a sustainability transformation, CGIAR researchers and partners have developed a wide array of techniques that use resources more efficiently, enhance the resilience of food production in the face of climate change and reduce greenhouse gas emissions, while achieving sustainable increases in crop yields. At the same time, we are generating new evidence on which techniques work best under what conditions to target the implementation of these solutions more

effectively.

The ultimate impact of our work depends crucially on the growing resolve of developing countries to promote better diets and more sustainable food production through strong policies and programs. CGIAR is well prepared to help strengthen these measures through research for development, and we are confident that our work on cereals, with continued donor support, will have high relevance, generating a wealth of innovations that help drive the transformation of global food systems.

Martin Kropff is the Director General of the International Maize and Wheat Improvement Center (CIMMYT).

Matthew Morell is the Director General of the International Rice Research Institute (IRRI).

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	

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	dgitonga@mastermindkenya.com	0722751488	Wheat	
Tumili ltd		David Beak	tumili@wananchi.com	0722823543	Wheat/ Barley	Peas, Canola
Thamba Ngombe		Thamba	thamba@gmail.com	0724927351	Wheat/ Barley	
Mt Kenya saw mill		shah	nainhshah@gmail.com	0722511691	Wheat	
-	NAROK	-	-	-	-	-
Simba Estate		SS. Dhillon	simbaestate@simbaestate.com	0722511460	Wheat	Maize
Farm Africa ltd		Raghu	raghu.penmetasa@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	firtundo@gmail.com	0724333322	Wheat / Barley	
Madrugada		Jonti	jonti@madrugada.co.ke	0722734179	Wheat / Barley	Maize, Peas, Canola, Sunflower
Tony		Hughes	hoozie@swiftkenya.com	0722808058		
Chepkonga		Andrew	andychep@yahoo.com	0710308917	Wheat / Barley	
Siruai		Rose	skvarose@gmail.com	0722865892	Wheat / Barley	Maize
Sasumua Agriculture		Luke	luke@sasumua-agriculture.com	0722779618	Wheat / Barley	Canola, Peas, Sunflower, Maize
Kenana Farm		Oliver	pkenana@africaonline.co.ke	0722725002	Wheat / Barley	Canola, Peas, Sunflower, Maize
Remsons Ltd		Mugambi	remsons.ltd@gmail.com	0722807773	Wheat / Barley	
Molodowns		Chris Foot	ckfoot@gmail.com	0722717130	Wheat / Barley	
Gogar Farm		Simon	md@gogar.co.ke	0722327718	Wheat	Maize
Kinoru Farm		Barlow	barlow@africaonline.co.ke	0725777479	Wheat / Barley	canola, Peas, Sunflower
Comply industries		Sandhu	sckihumba@complyindustries.com	0729870025	Wheat / Barley	



Farmers Keenly Listening as they are taken through



Doris guiding farmers.



Farmers shown the Demo plots of Corteva maize variety



Tete a tete as farmers walk around the farm



Farmers Keenly Listening as Corteva Staff explain their products



Farmers taken through field trials and results.



A group Photo.



Discussion time after a successful Day.

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CONTAINS:

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Flumetsulam 14gm/L

Clopyralid 35 gm/L



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