CEREALS

The leading journal for field crops

January - March 2024

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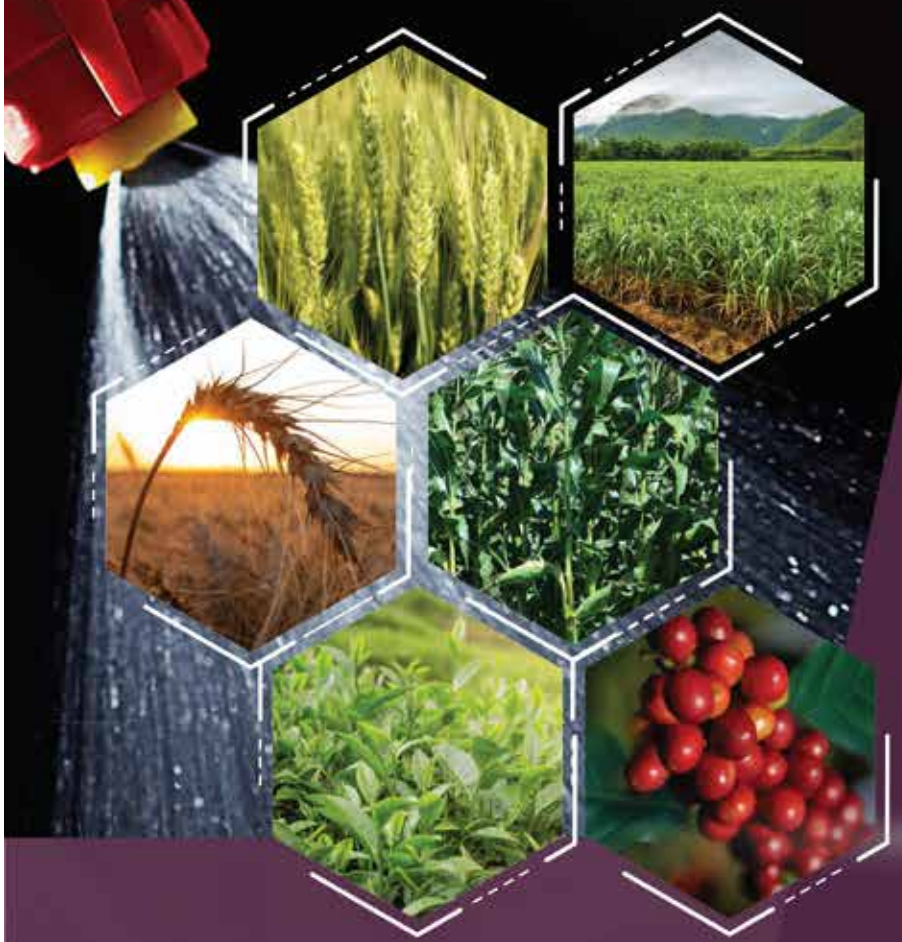

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Unearthing the Forgotten Crop

One of sorghum's most significant advantages is its remarkable drought resistance. As climate change continues to pose challenges to agriculture in Kenya, the drought-tolerant nature of sorghum becomes increasingly valuable. It is a crop that can serve as a buffer against unpredictable weather patterns, offering a reliable source of sustenance even in the face of extended dry spells.

Cereals

January - March 2024

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New Year wishes

Be careful what you wish for in the New Year when it comes to volatility, trade and supply/demand. The New Year is here and, in the spirit of a fresh start, I offer the following wishes for 2024.

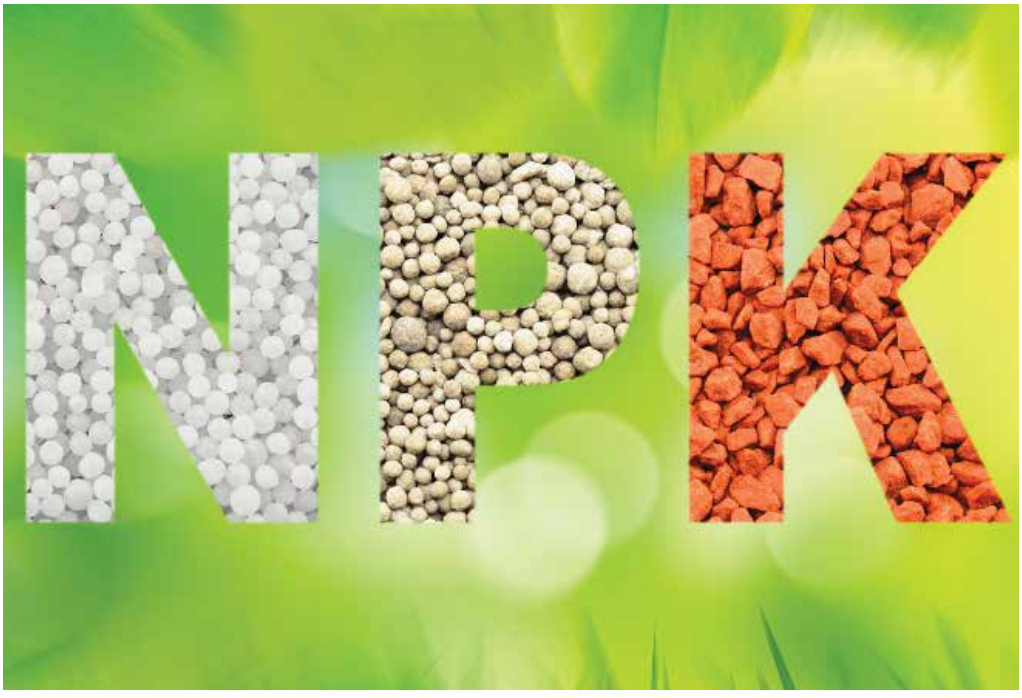
The return of volatility: Is low volatility in commodity prices a lump of coal in my stocking, or an unappreciated gift? I finally make a decision - low volatility is a lump of coal. Volatility and opportunity are opposite sides of the same coin. High volatility leads to greater opportunities, and we need more and better pricing opportunities in 2024. But even as I state my case for greater volatility, a voice in my head is whispering "be careful what you wish for, it might just come true."

Common sense wins in the trade wars: Let me state my opinion clearly: trade is good. And I am not just talking about cereal products – I consider the exchange of all goods and services to be a plus for all parties concerned. For the moment, let's narrow the focus to products important to the good readers of Cereals Magazine.

A crop problem: Cereals are into a fourth consecutive year of supply outrunning demand. Demand is good, but not good enough to overcome record or near-record crops from major cereal growing regions. If the wish is for higher prices, somewhere in this world, We need a crop problem to upset the balance of supply and demand, and that voice in my head is again whispering, "Be careful what you wish for."

Masila Kanyingi
Editor

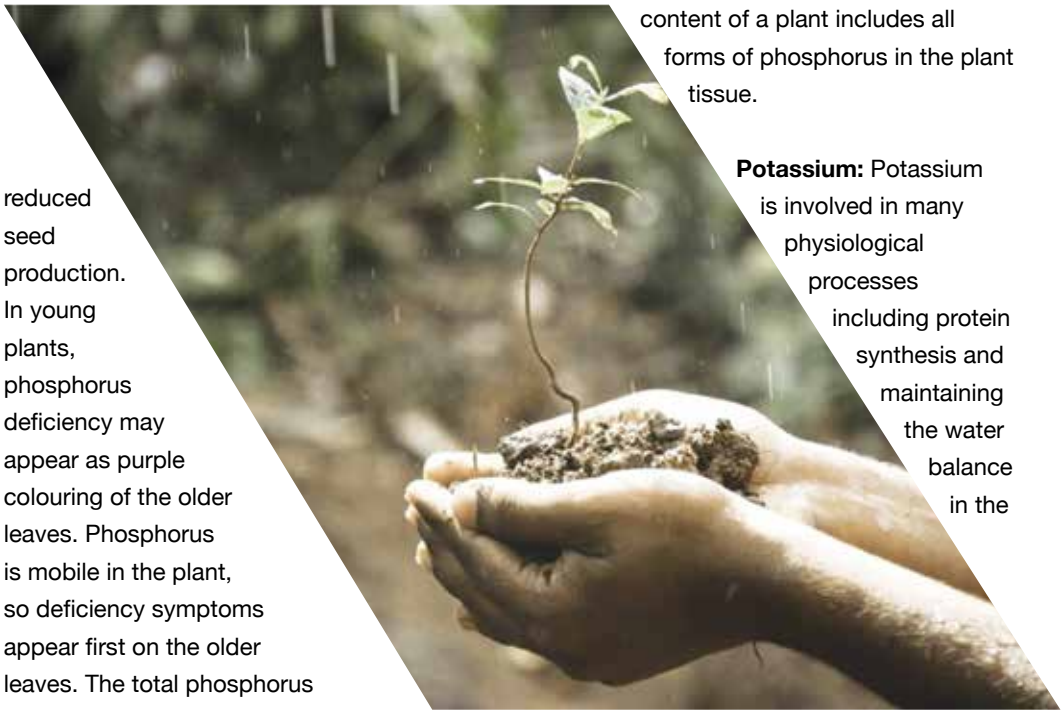
Understanding Your Plant Analysis Report



Total Nitrogen: Nitrogen is a critical part of proteins in the plant. It is also an important part of chlorophyll and plays a key role in photosynthesis. Nitrogen deficient plants usually have a pale green or yellow colour. In grasses, the yellowing usually starts at the leaf tip and goes down the middle of the leaf. Because nitrogen is mobile in the plant, the older leaves will show the symptoms first.

The total N content of a plant includes all forms of nitrogen in the plant tissue. The total N content represents the nitrogen status of a crop up to that point in the growing season, but does not predict the nitrogen status of the crop in the future.

Phosphorus: Phosphorus is important for root growth, seed production and crop maturity along with many other functions. Symptoms of plants deficient in phosphorus include stunted growth, delayed maturity and reduced seed production. In young plants, phosphorus deficiency may appear as purple colouring of the older leaves. Phosphorus is mobile in the plant, so deficiency symptoms appear first on the older leaves. The total phosphorus content of a plant includes all forms of phosphorus in the plant tissue.



Potassium: Potassium is involved in many physiological processes including protein synthesis and maintaining the water balance in the

plant. Potassium deficiency symptoms include reduced growth and yellowing or burning of the leaf edges. Other symptoms include reduced straw or stalk strength, reduced disease resistance and reduced winter hardiness of perennial crops. Since potassium is mobile in the plant, the symptoms appear on the older leaves first. Sandy soils are more likely to be deficient in potassium.

Sulphur: Sulfur is a component of plant proteins. Symptoms of sulfur deficiency can look similar to a mild nitrogen deficiency. The only difference is a sulfur deficiency appears sooner on the newer growth because sulfur is not very mobile in the plant. Sulfur deficiencies are more common on sandy soils with low organic matter. In high rainfall years, sulfur deficiencies can occur on most soil types due to leaching of sulfur. Sulfur deficiency is more common in crops such as canola and alfalfa due to higher sulfur requirements.

Calcium: Calcium is an important part of cell walls. When a soil is limed to an acceptable pH (6.0), calcium is usually adequate. Agricultural lime is composed of calcium and magnesium carbonates (CaCO3 & MgCO3). The Ag lime applied has enough calcium supplied by the calcium carbonate (CaCO3) for good plant growth. Areas where calcium deficiencies may occur are sandy irrigated soils with a low soil pH (<6.0). Symptoms of calcium deficiency include black scorched leaf tips and die-back of growing points because calcium is not mobile in the plant. Boron can cause the same symptoms, but calcium deficiency does not promote lateral shoot development like boron deficiency does.

Magnesium: Magnesium is a key component of chlorophyll and is essential for photosynthesis. Magnesium deficiencies are rare in the Midwest. When a soil is limed to be acceptable pH (>6.0) magnesium is usually adequate. Agricultural lime is composed of calcium and magnesium carbonates (CaCO3 & MgCO3). When magnesium deficiencies occur, they are usually associated with irrigated sandy soils with a low soil pH (<6.0). Symptoms of magnesium deficiency include mottling of older leaves which proceeds to the younger leaves. The interveinal chlorosis starts in the middle of the leaf, with the margins becoming chlorotic last. In some crops the chlorotic areas of the leaf die and the leaf margins become scorched.

Sodium: High levels of sodium are toxic to plant growth. Healthy plant tissue generally contains very little sodium. Symptoms of sodium toxicity include severe stunting and stand loss. A high level of sodium in plant tissue is caused by excessive sodium levels in the soil and is normally linked to high sodium water.

Zinc: Zinc is essential in the production of many plant enzymes. It is also important in balancing hormone levels in the plant. Zinc is moderately mobile in the plant. In some plants the interveinal mottling appears first on the older leaves and in others it appears on the new leaves first. The interveinal chlorosis may be the same as iron and manganese except that zinc deficient plants usually develop exceptionally small leaves. Zinc deficiencies are common on sandy low organic matter soils. Crops which are sensitive to zinc include edible beans, maize and potatoes.

Iron: Iron is a component of many enzymes in the plant and is essential for photosynthesis. Iron deficiency starts with interveinal chlorosis of the newer leaves and in severe cases all leaves show symptoms. Soybeans are susceptible to iron chlorosis with some varieties being more sensitive than others. Iron deficiencies are common

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on soils that have high pH (>7.5), or high soluble salts and high carbonate content (>1.0%). Plant analysis can sometime give very high iron readings (contamination) as a result of the dust that normally occurs on plant tissue contains enough iron to contaminate plant samples. Visual symptoms are used to confirm iron deficiency

Manganese: Manganese is essential for many reactions in the plant and is essential for chloroplast production. Manganese deficiency symptoms include interveinal chlorosis on the newer leaves. These symptoms are difficult to distinguish from symptoms of iron deficiency.

Copper: Copper is essential in forming enzymes involved in photosynthesis. In wheat, copper deficiency symptoms include a twisting or whitening of the leaf tip. In later stages of growth, a browning of the upper stem and head may occur. Copper deficiencies are common on peat soils (>15% organic matter). Mineral soils which are course textured and low in organic matter (<3.0%) may also have copper deficiencies. A history of manure application increases the chance of copper deficiency. Crops most sensitive to copper deficiency include spring wheat, barley and winter wheat.

Boron: Boron is important in cell division and is essential for the production of amino acids. Boron deficiency symptoms include browning or blackening of new leaf tips and die-back of growing points similar to calcium deficiency. Growth of lateral shoots can occur on boron deficient plants. Soils likely to be boron deficient are sandy and low in organic matter (<3.0%). Crops most sensitive to boron deficiency include alfalfa and clover.

C**hloride:** Chloride is involved in balancing ion charges within the plant, regulating turgor pressure and reducing susceptibility to some diseases. Chloride is also involved in photosynthesis. A minor chloride deficiency will show few if any symptoms. When chloride deficiency becomes severe, small necrotic areas will appear on the upper leaves of crops such as wheat. Crops most sensitive to chloride include spring wheat, barley and winter wheat.

Aluminium: High levels of aluminium are toxic to plant growth. Plants which experience aluminium toxicity will have limited root growth reducing uptake of phosphorus and several other nutrients. Applying lime to bring soil pH to 6.0 or higher will eliminate aluminium toxicity. Aluminium is only tested by special request on plant tissue.

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Fallarmy worm

NOTE

- Scouting is paramount for early detection of the caterpillars
- Spray at the right place
- Apply insecticides early or late in the day when the caterpillars are inactive
- Apply Belt at the rate of 10mls in 20 litres of water

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HERE'S HOW TO MAXIMIZE YOUR CROP YIELDS IN 2024

The planting season is one of the most expensive times for farmers in the cropping calendar. Farmers must dig deeper into their pockets for seeds and fertilizer. All this with the escalating cost of farm inputs, notwithstanding.

Data from wheat farmers confirms an average wheat production rate of fifteen 90kg bags an acre. There is however potential for farmers to produce over 27 bags from just an acre of wheat. These statistics do not only apply to wheat but to other cereal, horticulture and even industrial crops as well.

Any wise farmer knows that the only way to survive these hard times is by embracing technology, innovation and efficiency. Loosely translated as, getting more out of your piece of land than is invested in terms of profits.

Here are a few tips that you as a farmer can apply to get more yields from your land.

1. Test your soil before buying fertilizer

Buying fertilizer without testing your soil is like self medicating without a proper diagnosis. It is always important to check the nutrients your soil is lacking first before getting a specific fertilizer. Experts advise that you test samples of your soil every year or whenever you notice unexplained changes in the quality of your crop. Your soil test results will reveal which important nutrients are missing in your soil and help you pick out the fertilizer you need. Various fertilizer companies now offer fertilizer blends that are specifically suited to address the nutritional deficit in your soil.

2. Plant Early, Plant Effectively

Picking the most appropriate time to plant is often the most important part of planting. The best strategy is to plant as soon as your soil is ready for planting. An important point to note is that sometimes the rains come early, and it is always good to be caught on the prepared side of things. Planting early can result in increased yields by taking advantage of unexpectedly early favorable soil conditions and earlier than expected downpours.

Alternating crops can help fix soil nutritional deficiencies that result in higher yields.

3. Rotate your crops

When you are planting season after season, it is crucial to understand how planting the same crops back to back can affect your overall yield. Planting maize consecutively for years on the same piece of land for example has been proven to be less effective for optimal yields. This means that planting maize repeatedly for years should only be considered when sure that your soil conditions are good enough. If you don't have access to either, you may need to consider planting alternative crops in alternating years — such as soybeans and canola that help re-condition the soil. Planting alternative crops such as soybeans helps to diversify the demands on your soil. Alternating crops can help fix soil nutritional deficiencies that result in higher yields.

4. Good Seed is everything

Gone are the days when farmers would set aside some of the seed they harvested for the next season. Research institutions like KALRO are always coming up with better yielding, disease and pest resistant seed varieties. A visit to a research institution near you guarantees access to so much information that will help you yield higher this season. Using hybrid seeds that are matched with your soil and climatic conditions will also boost your yields.

5. Consider Seed Dressing

Seed dressing refers to products applied on seeds before planting to protect them from pests and disease. Seed dressing also helps in in root formation and improving plant growth since it supports the uptake of nutrients from the soil. Natural seed dressing treatments have been reported to increase crop yields for farmers.

6. Chisel instead of disc ploughing

Though the disc plough has been around for decades, experts have warned of its negative effects on the environment. Disc ploughing is more likely to compact your soil and when it does, rain water is not able to infiltrate through the soil structure. A heavy downpour for example ends up as runoff water that erodes the soil. Further, continued disc ploughing results in a hard pan underneath the top soil. The use of a chisel plough helps to break any existing hard pan and its narrow double ended chisels help to break and aerate the soil. This not only makes nutrient absorption by plants easier but also helps to maintain the soil in its most natural layering.

7. Deposit your crop residue back to the soil after every harvest

Research shows that depositing organic matter such as your crop remains after harvesting stimulates the growth of soil organisms. This helps to make more nutrients available to your soil and eventually your crop.

Organic matter has also been directly and positively linked to soil fertility and increased productivity. This is because your plant residue also contains nutrients, including nitrogen, phosphorus, potassium and Sulphur needed by the plants. These residues also improve several soil properties such as water infiltration, storage and particle aggregation.

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SEEDS | PACKAGING | FERTILIZER | AGRO CHEMICALS | IRRIGATION | ANIMAL HEALTH

DEMYSTIFYING
AGRICULTURE INSURANCE

Climate change is currently one of the biggest risks that farmers in Africa face. Inconsistent weather in recent years has resulted to a decrease in agriculture production, an increase in poverty levels and a threat to food security. Agricultural risks not only affect farmers, the effects spill over to the entire agribusiness value chain. Previously, the President of Kenya had declared the drought in Kenya a national disaster with a call for international support. The drought starts in periods when rains fail and temperatures are unusually high. Risk mitigation strategies such as climate smart agriculture and agriculture insurance are some of the main ways through which farmers can address these risks.

Agriculture Insurance

Agriculture insurance is the protection which farmers buy from insurance companies for their crops and livestock. Farmers pay some amount of money (premium) to insurance companies to compensate them when they incur losses. The sum insured is agreed at the inception of the contract and may be based on production costs, or on the expected crop revenue. Farmers can also insure against risks such as drought, hail, frost damage, fire and lightning, and pests & diseases for livestock.

The following products are currently available in the Kenyan market from insurance companies and agriculture insurance providers.

INSURABLE RISKS

- Drought
- Hail
- Frost Damage
- Flooding of the crop field
- Fire and Lightning
- Windstorm
- Uncontrollable pests and diseases for livestock

Types of Insurance Products

Name	Description
Weather Index Insurance (WII) * An Index is a formula that correlates as accurately as possible the cropping season experiences for each crop phase and is used to calculate losses suffered. Factors used to develop an index include – crop type, region specification and historical data e.g. weather, yield, and risk occurrence.	This type of crop insurance monitors rainfall amount using weathers stations or satellites in a defined location thereby determining if there is crop failure due to lack of adequate or excess rainfall during the cropping season.
Multi-Peril Crop Insurance (MPCI)	Provides insurance against all perils that affect production unless specific perils have been explicitly excluded in the contract of insurance. Risks covered include uncontrollable pests and diseases, flooding, windstorm, frost, hailstorm, fire etc.
Area Yield Index Cover (AYI)	This cover protects farmers against yield shortfall modelled using data collected over a defined area. It covers against a wide range of risks such as uncontrollable pests and diseases, flooding, windstorm, frost, hailstorm, etc. that can cause significant yield deviation from a long term average of an area.
Hybrid Cover	This is a combination of the Weather Index Insurance (WII) and the traditional Multi-Peril Crop Insurance (MPCI). The benefit of combining the two products is that it enables farmers to take advantage of the relative strengths of each. The WII component provides a more objective way of assessing the impact of excess rainfall and drought on the crop and allows for the crop to be under an insurance cover from planting. The MPCI component allows other risks beyond weather to be covered (e.g. pests, diseases, floods, frost, hail damage, wind damage, etc.)
Indemnity Based Livestock Insurance	The traditional indemnity insurance is a contractual agreement in which one party guarantees compensation for actual or potential losses or damages sustained by another. In this case, compensation is paid by the insurance company should the animal die under the covered risks.
Index Based Livestock Insurance (IBLI)	This product that is designed to protect against prolonged forage scarcity. IBLI triggers payment to pastoralists to help maintain their livestock in the face of severe forage scarcity. IBLI is insurance for drought only. It is a contractual agreement to pay policy holders proportional to the severe forage scarcity experienced as a result drought. The availability of pasture is tracked from vegetation imagery by satellite. IBLI does not give insurance coverage for livestock asset lose due to other causes like predation, disease, raids etc.

> Agriculture insurance is the protection which farmers buy from insurance companies for their crops and livestock

Benefits of Agriculture Insurance

Agriculture insurance provides gives a farmer peace of mind in that if anything happens to their investment, they are sure of compensation from the insurance company. Insurance also allows farmers to de-risk their investment and purchase improved seeds and inputs which produce higher yields, leading to improved livelihoods. With insurance, farmers are able to access credit and repay their loans even if crop failure happens.

Agricultural risk management ultimately is a combination of technical and financial tools. Farmers can use several tools, whenever they are available, to deal with these multiple sources of agricultural risk. For instance, by choosing not to select a particular crop or crops which they consider of high risk for the area in which their farms are located. They may seek to lessen the risk through, for example, planting crops only in very favourable conditions or by investing in irrigation tools. Lastly, they may transfer all or part of the risks to a third party through an insurance contract as described in this article.

Septoria Leaf And Glume Blotch As a Threat to Wheat Production in Kenya

Introduction

Wheat is the second most important cereal grain in Kenya after maize. Wheat farming in Kenya is largely done for commercial purposes on a large-scale. Wheat production faces a range of challenges; unreliable rainfall, Insect pests, weeds and diseases.

Septoria tritici Blotch (STB); one of the major economically important fungal diseases in wheat poses a serious and persistent challenge to wheat grown globally. This threat has triggered an intensive research effort to evaluate current disease control practices and to look for novel control strategies. Septoria leaf and glume blotch attacks the leaves and heads of wheat.

Symptoms of Septoria Tritici Blotch (STB)

Brown necrotic lesions with black specks (bearing spores) on the leaves (Figure 1) and heads (Figure 2). Severe infection of leaf blotch or glume blotch may result in light shrivelled kernels.

Fig.1: Septoria on wheat leaves

Fig.2: Septoria on wheat head

Septoria tritici shows many characteristics typical of fungal plant pathogens it has for example, a mixed reproductive system and can generate large populations of spores.

Environmental factors and their impact on the importance of Septoria tritici as a wheat pathogen

The factors that alter the chance of an STB epidemic are quite well understood. Septoria tritici requires a moist leaf surface for successful infection and is spread through-out the crop canopy via rain splash, the frequency of either very wet days (>10mm rainfall) or consecutive wet days (three days with at least 1mm rain) during the early growth of the wheat crop has been found to be of major importance in predicting outbreaks. Similarly, the frequency of weather fluctuations is important, with temperatures below -2^{0}C in the early stages of growth reducing the risk of STB.

Control

- Plant disease free seed.
- Crop rotation with crops like canola and beans.
- Foliar fungicides can also prevent infection if applied early.

Indeed, the timing of fungicide application is somewhat problematic, as it is difficult to match it confidently with disease progression. Fungicides sprayed at disease onset are effective for approximately seven of the 14–28 day latent period. Thus, whilst the leaves remain asymptomatic and the farmer considers that disease has been eradicated, it is possible that in fact the fungus proliferates. Best practice therefore requires that fungicide be sprayed early, before disease appears, to protect developing stem leaves, and again at ear emergence, to protect the flag and upper leaves.

However, if lesions begin to show on the leaves, STB has taken hold and fungicide application will be of limited utility. Few curative fungicides chemistries that prevent pathogen colonization of host tissues are available.

R&D companies create chemistry for a sustainable future. Their scientists consistently work to come up with innovative branded crop protection solutions that enable our wheat farmers to manage various insect pests, diseases and weeds. This eventually aid in ensuring that they derive benefits from farming. Their premium fungicides have been successfully used by wheat farmers in Kenya and East Africa at large to manage fungal diseases in wheat. Their effects on the crop have consistently guaranteed them improved yields.

Wheat farmers can count on partnering with them to ensure that their farming venture is assured and their improved yields guaranteed. They are also committed in ensuring that farmers and our environmental safety is taken care of by offering safe and cost-effective crop solutions.

Modernizing Grain Storage with Technology: A Post-Harvest Perspective

Grain storage has been a fundamental aspect of agriculture for millennia, dating back to the early days of human civilization when people realized the importance of preserving surplus crops for lean times. Over the centuries, the methods and technologies used for grain storage have evolved significantly, with the primary goal being to reduce losses due to pests, spoilage, and environmental factors. In recent years, the advent of advanced technology has ushered in a new era in grain storage, enabling farmers to modernize their post-harvest practices and enhance food security.

The Need for Modernization

Grain is a staple food source for billions of people around the world, and efficient grain storage is essential for food security. Traditionally, grain storage has been fraught with challenges, including losses due to pests, fungi, and moisture. These losses not only reduce the quantity of available food but also compromise its quality. Additionally, poor storage practices can lead to post-harvest losses, contributing to food scarcity and economic losses for farmers. The world's population continues to grow, and with it, the demand for grains. To meet this demand, we must optimize every stage of grain production and distribution, starting with post-harvest storage. Modernizing grain storage is not just about improving the bottom line for farmers; it is about ensuring that we can feed a growing global population while minimizing waste.

Smart Silos and Bins

One of the most significant technological advancements in grain storage is the development of smart silos and bins. These storage units are equipped with sensors and monitoring systems that provide real-time data on temperature, humidity, and grain moisture content. This data is crucial for preventing spoilage and infestations, as it allows farmers to take proactive measures.

For example, if the temperature in a grain silo rises above a certain threshold, it may indicate the presence of fungi or insects. With smart technology, farmers can receive immediate alerts and take action to address the issue before it spreads and causes significant damage. This not only reduces losses but also ensures that the stored grain maintains its quality.

Furthermore, smart silos and bins can be connected to central control systems, allowing farmers to remotely monitor and manage multiple storage units. This level of automation and control improves efficiency and reduces the labor required for grain storage management.

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Pest Control through Automation

Pest control has long been a challenge in grain storage. Insects and rodents can quickly infest grain stores, leading to substantial losses. Traditionally, chemical pesticides were used to combat these pests, but concerns about environmental impact and food safety have prompted a shift toward more sustainable and technology-driven solutions.

One such solution is the use of automated pest control systems. These systems employ various technologies, including sensors, cameras, and automated traps, to detect and manage pest infestations. For instance, sensors can monitor temperature and humidity levels, which can indicate the presence of pests. Automated traps can then be deployed to capture or eliminate the pests, all without the need for chemical interventions.

Additionally, some advanced systems use artificial intelligence (AI) algorithms to predict pest outbreaks based on historical data and current environmental conditions. This proactive approach allows farmers to take preventive measures before pests become a significant problem.

Grain Drying Technology

Moisture content is a critical factor in grain storage. Grains with high moisture content are susceptible to mold growth and spoilage, while those with low moisture content may suffer from brittleness and reduced nutritional value. Therefore, maintaining the optimal moisture level is essential.

Modern grain drying technology has made significant strides in achieving precise control over moisture content. High-efficiency grain dryers utilize advanced techniques such as continuous flow drying, temperature control, and airflow management to remove excess moisture from freshly harvested grain. These dryers can be programmed to achieve specific moisture content levels, ensuring that the grain is stored in optimal conditions.

Furthermore, some grain drying systems are equipped with remote monitoring capabilities, allowing farmers to track the drying process and make adjustments as needed. This not only improves the quality of stored grain but also saves energy and reduces operating costs.

Data Analytics for Decision-Making

In addition to monitoring and automation, data analytics is playing a crucial role in modernizing grain storage. By collecting and analyzing data from various sensors and monitoring systems, farmers can make informed decisions about storage conditions, ventilation, and pest control strategies.

Data analytics can help identify trends and patterns that may not be apparent through manual observation alone. For example, by analyzing historical temperature and humidity data, farmers can determine the optimal storage conditions for different types of grains and adjust their practices accordingly.

Furthermore, data-driven insights can contribute to long-term improvements in grain storage. Farmers can use the knowledge gained from data analysis to refine their storage techniques, reduce losses, and increase the overall efficiency of their operations.

Sustainable Practices

Modernization in grain storage is not just about efficiency; it's also about sustainability. Sustainable practices are becoming increasingly important in

agriculture, and technology is playing a significant role in achieving this goal. For example, the use of renewable energy sources to power grain storage facilities is reducing the carbon footprint of the agriculture industry. Solar panels and wind turbines can generate clean energy to run the monitoring systems, ventilation, and drying equipment in grain storage facilities.

Additionally, sustainable packaging materials and practices are gaining traction. Farmers are exploring alternatives to traditional plastic bags and containers, opting for biodegradable and recyclable options that reduce environmental impact.

Challenges and Considerations

While technology has brought about significant improvements in grain storage, it also presents challenges and considerations that must be addressed:

1. Cost: The initial investment in modern grain storage technology can be substantial. Small-scale farmers and those in developing countries may face financial barriers to adopting these innovations.

2. Data Security: The collection and storage of sensitive data, such as temperature and humidity readings, raise concerns about data security and privacy. Robust cybersecurity measures are essential to protect this information.

3. Training: Farmers need training to effectively use and maintain modern grain storage technology. Access to training and support is critical for successful adoption.

4. Infrastructure: In some regions, inadequate infrastructure, such as reliable electricity and internet connectivity, can hinder the implementation of technology-driven solutions.

Conclusively, modernizing grain storage with technology is a vital step toward improving food security, reducing post-harvest losses, and promoting sustainable agriculture. Smart silos and bins, automated pest control, advanced grain drying technology, data analytics, and sustainable practices are transforming the way farmers store and protect their grain harvests.

> Insects and rodents can quickly infest grain stores, leading to substantial losses. Traditionally, chemical pesticides were used to combat these pests, but concerns about environmental impact and food safety have prompted a shift toward more sustainable and technology-driven solutions.

While there are challenges to overcome, the benefits of modernization are clear. By embracing these technological advancements and addressing the associated challenges, we can ensure that our grain storage practices are efficient, sustainable, and capable of meeting the growing global demand for grains. This not only benefits farmers but also contributes to a more secure and resilient food supply chain for all.

Advantages of Minimum Tillage

By Kimuri Mwangi

Conservation Agriculture is described by FAO as a farming system that promotes minimum soil disturbance (no, or minimum tillage), maintenance of a permanent soil cover, and diversification of plant species. It enhances biodiversity and natural biological processes above and below the ground surface, which contribute to increased water and nutrient use efficiency and to improved and sustained crop production.

One principle of conservation agriculture that is being advocated to farmers is minimum tillage. Experts have described it as "where you minimize breaking your land as we've always done usually using the disc plough where every year, we keep on breaking the soil."

"This creates what we call a hardpan below the soil and that reduces the amount of water that can infilter into the soil. So, we advocate for minimum tillage where we only open areas where we want to plant and the advantage of this is that those particular areas that you've opened up are the ones that cause water to get into the soil, deep to the deeper layers," they says. Hardpans in the soil damage the soil structure hence increase soil erosion, reduce water conservation, prevent root penetration, and tend to limit root development of crops to just near the surface hence low crop yields.

The second advantage is that when you practice minimum tillage, you enable the rest of the area that is not cultivated to heal like the way we used to do furrow farming where you leave a place and you move to another area. Since today its hard to practice furrow farming where you have to shift from one

area to another you can only open up areas where you want to place the seed and the fertilizers and the manure and then the rest of the area starts healing over time making your soil to start getting much better. This improves soil health, which helps crops to establish quicker over time. Healed soil has a reduced soil structure damage.

"With the continuous breaking of the soil you are exposing the soil end to the sun and this loses a lot of what we call organic carbon and that is a contributor to climate change. So, by practicing conservation agriculture we are able to conserve as much carbon into the soil and therefore reducing on climate change but also using that carbon as the food for the microbes in the soil," opines the experts. Microbes increase soil fertility by incorporating air, minerals and nitrogenous compounds. They also assist in decomposing organic matter to simpler forms that can easily be absorbed by plants.

This was said during a mechanization exhibition also featuring conservation agriculture where they were showcasing some of the options in the market.

This is a regional initiative by the CGIAR centers where they are looking at diversifying and building resilience of maize cropping systems.

Ukama Ustawi

"So, what we do under *Ukama Ustawi* is to promote and scale sustainable intensification, climate smart agriculture and conservation agriculture technologies so that farmers can adopt this for purposes of making sure that we build resilience to changing climate. We focus on maize because it is one of the major crops in Eastern and Southern Africa, where again this particular crop as much as it is being consumed widely, we also realize that climate change affects significant portion of maize production in the region. So, we need to develop strategies and technologies that enable to build resilience of this particular system," he noted.

The initiative is also looking at mechanization saying it is a key component as it helps to ease operations, bring efficiency in farming and it can also be used to promote conservation agriculture and other sustainable management practices.

Hardpans in the soil damage the soil structure hence increase soil erosion, reduce water conservation, prevent root penetration, and tend to limit root development of crops to just near the surface hence low crop yields.

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Carbon Sequestration in Africa at the Expense of Livelihoods and biodiversity

By Dr Arne Witt, CABI Africa

According to the World Resources Centre, Africa accounts for only 2–3 percent of the world's carbon dioxide emissions from energy and industrial sources. In fact, Africa's per capita emissions of carbon dioxide in the year 2000 were 0.8 metric tons per person, compared with a global figure of 3.9 tons per person.

However, climate change will have a disproportionate impact on the world's poorest countries, most of them in Africa. In order to mitigate against climate change, some donors have developed, and in some cases already initiated, massive 'greening' programs across much of the continent, largely to sequester carbon dioxide produced by the donor countries themselves.

In some cases, these may benefit African nations by improving land productivity and biodiversity conservation. However, in many cases development agencies advocate the planting of exotic species, many of which are known to be invasive, in large monocultures across what many development actors perceive to be unproductive land or wastelands.

Climate change burden

In other words, Africa not only has to carry the burden of the impacts of climate change, to which they have contributed very little, but now also has to make land available in order to mitigate against those impacts by planting invasive alien species, which are known to have significant negative impacts on the natural resource base on which millions of people directly depend.

To further extenuate the point, they now have to carry a double burden in dealing with climate change and invasive alien species. One such plan is to plant cacti, a group of plant species native to the America's, across millions of hectares in Africa, as part of the green wall initiative.

The majority of cactus species (250) have mainly been introduced outside of their natural distribution for ornamental purposes while only 45 have been introduced for food or fodder. Of those species that have been introduced outside of their native range, 57 have escaped cultivation and become

problematic, particularly in arid rangelands, where they impact negatively on biodiversity and livelihoods.

Costly losses

All invasive cactus species form dense impenetrable thickets which reduce rangeland productivity and prevent access to grazing lands and water resources. In Laikipia County, Kenya, two-thirds of respondents estimated that 50-75 percent of valuable grazing land had been invaded by erect prickly pear cactus, which was originally introduced for live fences. In some area's invasions are so bad that pastoralists have abandoned their land and moved elsewhere. In Kenya, the majority of pastoralists recorded negative impacts such as mouth sores, weight loss, general sickness, reduced milk production, blindness or eye injuries, and

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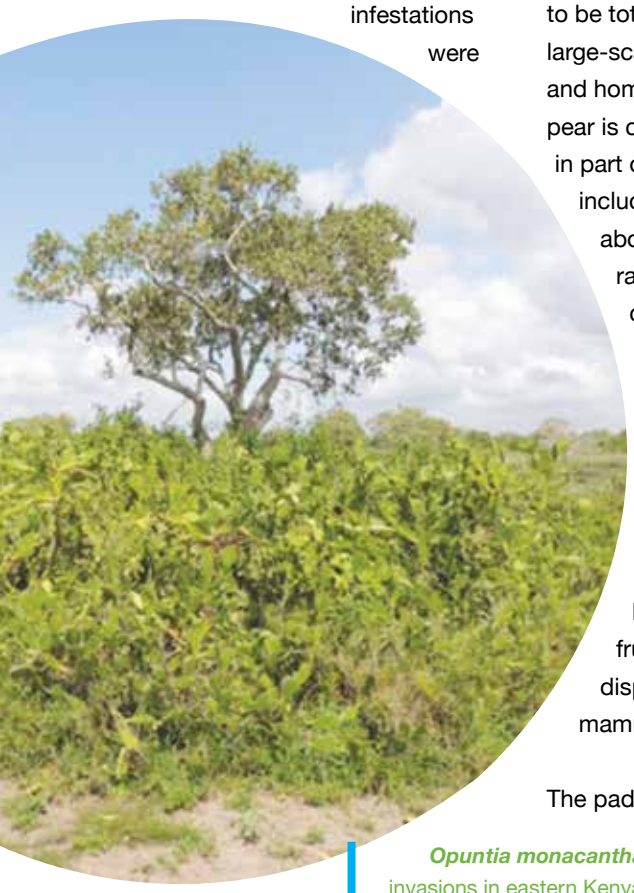
even death of their livestock due to cactus infestations.

In one study, 48% of Kenyan pastoralists interviewed reported losses of US $500-1,000 per household per year due to the negative impacts of invasive alien prickly-pear cactus, and all the pastoralists who were interviewed said human well-being would be improved if the cactus infestations were remove. Even in South Africa invasions of sweet prickly pear in the late 1800s, were so severe that half the affected farming population in the Cape Province was facing extreme poverty.



Opuntia monacantha invasions in eastern Kenya Credit:CABI

Not limited to Africa

The problems associated with cactus invasions have not been limited to Africa. In Australia for example, the Australian pest pear, which was first introduced to pastoral areas in the 1840s, covered over 4 million hectares in Queensland and New South Wales by the early 1900s, and by 1925 had invaded over 24 million hectares resulting in the abandonment of large tracts of agricultural land.

In fact, 12 million hectares was so badly invaded that it was considered to be totally 'useless,' leading to the large-scale abandonment of farms and homesteads. Even today cactus pear is considered to be problematic in part of its native range in the USA, including Texas, where it occupies about 10.3 million hectares of rangeland reducing livestock carrying capacities.

The reality is that the spread of these and other invasive plant species cannot be contained. In other words, they do not stay where they have been planted. This is largely due to the fact that the fruits are eaten, and the seeds dispersed by birds, bats and mammals.

The pads or stem sections of the cactus will also root if they are broken off the main plant, so reproduction from dislodged stem fragments is another form of reproduction that results in the development of dense and impenetrable stands.

This means that even if only a few thousand hectares of cactus are planted, they are likely to escape cultivation and invade millions of additional hectares in Africa, impacting on poor communities who are already struggling to survive.

Impact of invasive alien plant species Africa is already awash with many invasive alien plant species, many of which were largely introduced by development agencies to improve livelihoods, but now occupy millions of hectares of productive land where they are impacting on water resources, crop and pasture production, human and animal health, and biodiversity.

While a few species of cactus have some beneficial attributes, such as their capacity to sequester carbon, as well as their use as a fodder crop and the production of edible fruit, these benefits must be weighed up against their potential negative impacts when they invade productive landscapes.

In our experience the costs of invasive species always outweigh the potential benefits. Interventions to mitigate against the impacts of climate change should not be at the cost of poor communities in Africa.

In fact, the only real beneficiaries of such interventions will be those countries that have contributed the most to carbon emissions. Why should Africa carry the double burden of having to deal with a catastrophe to which they have contributed little, and then also carry the cost of carbon sequestration by making its land available to the planting of vast monocultures of invasive species?

Additional information
Main image: Opuntia engelmannii invasions in a conservancy in Laikipia, Kenya (Credit: CABI).SOURCE: https://blog.cabi.org/

Unearthing the Forgotten Crop: Sorghum's Decline in Kenya and Its Revival Prospects

The Historical Significance of Sorghum in Kenya

Sorghum, a hardy and versatile cereal crop, has deep roots in the agricultural history of Kenya. For generations, it served as a dietary staple and an integral component of the nation's farming landscape. Before the onset of modern agriculture and the widespread cultivation of alternative crops, sorghum held a revered position.

Communities across Kenya relied on sorghum as a source of sustenance. Its impressive adaptability to the varying ecological zones within the country made it an invaluable crop for farmers. Whether it was the arid landscapes of Turkana or the more temperate regions around Mount Kenya, sorghum's resilience and ability to thrive in diverse conditions made it a dependable food source.

Sorghum was integral not only to subsistence but also to cultural identity. Across the numerous ethnic groups in Kenya, the crop found a place in traditional ceremonies, family gatherings, and daily meals. The process of harvesting, threshing, and grinding sorghum into flour was not just a culinary practice; it was a communal experience that strengthened the social fabric. Ugali, the popular Kenyan dish made from sorghum flour, became a symbol of togetherness and a manifestation of the people's agricultural heritage.

The Decline of Sorghum in Kenya

The Rise of Maize: The first turning point in the decline of sorghum was the introduction of maize, primarily by colonial authorities. Maize quickly captured the imagination of both farmers and consumers. With its shorter growing period, relatively higher yields, and versatility in various culinary applications, maize emerged as an appealing alternative. In time, maize outshone sorghum, becoming the preferred choice for many.

The shift towards maize had profound implications. Sorghum, once a dietary cornerstone, faced an encroaching rival that was reshaping the country's food landscape. The rise of maize marked the beginning of a transformation in the agricultural traditions and culinary preferences of Kenyan households.

Changing Diets and Urbanization: As Kenya underwent rapid population growth and urbanization, dietary habits experienced a significant shift. The allure of processed and westernized foods, including wheat-based products and rice, began to overshadow traditional dietary choices. Urban consumers, influenced by globalization and marketing, favored the convenience and perceived modernity of these new food items. Sorghum, which was often considered rural and old-fashioned, faded from the urban diet.

This transition was not merely gastronomic; it was also a reflection of changing lifestyles and

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aspirations. Sorghum, often associated with rural living and traditional values, lost its luster in the eyes of a generation more inclined toward urban existence and the accompanying dietary trends.

Lack of Research and Development: The decline of sorghum's prominence can also be attributed to a lack of concerted research and development efforts. In contrast to crops like maize, which benefited from extensive research, breeding programs, and technological advancements, sorghum was relatively overlooked.

The consequence was clear: limited access to improved sorghum varieties, reduced productivity, and heightened vulnerability to pests and diseases. While some regions in Kenya have benefited from agricultural research and extension services, the focus remained largely skewed toward maize and cash crops, neglecting the potential of sorghum to improve food security and livelihoods, particularly in arid areas.

Low Profit Margins: Kenya's agricultural landscape underwent further transformation as farmers pursued crops with the promise of higher profits. Maize, and later, cash crops like cashew nuts, emerged as lucrative alternatives. The commercialization of these crops attracted more farmers due to the perceived financial benefits.

Sorghum, on the other hand, faced challenges in terms of commercialization. Limited market demand and price competitiveness discouraged farmers from allocating their resources to its cultivation. As a result, the crop's presence in the fields dwindled.

Climate Change: In Kenya, climatic patterns have been increasingly erratic, with droughts occurring more frequently, particularly in arid and semi-arid regions. While sorghum has been celebrated for its drought resistance, it is not immune to the amplified impact of climate change. The unpredictability of weather patterns and the intensification of droughts added another layer of vulnerability to

sorghum production, further contributing to its decline.

The Revival Prospects for Sorghum in Kenya

Drought Resistance: One of sorghum's most significant advantages is its remarkable drought resistance. As climate change continues to pose challenges to agriculture in Kenya, the drought-tolerant nature of sorghum becomes increasingly valuable. It is a crop that can serve as a buffer against unpredictable weather patterns, offering a reliable source of sustenance even in the face of extended dry spells.

Nutritional Benefits: Sorghum is a highly nutritious grain, boasting a wealth of dietary advantages. Rich in fiber, antioxidants, and essential minerals, it has the potential to contribute to improved food security and better nutrition for Kenyan communities. Moreover, the dietary fiber in sorghum can help combat non-communicable diseases such as obesity and diabetes, which are on the rise in the country.

Cultural Significance: Sorghum holds deep cultural roots in many Kenyan communities. The revival of sorghum offers an opportunity to preserve cultural heritage and traditions. Reintroducing sorghum into everyday life fosters a sense of identity and pride among Kenyan people, allowing them to connect with their heritage in a meaningful way.

Market Diversification: Sorghum's revival is not limited to traditional uses. It opens the door to market diversification and provides an alternative income source for farmers. The versatility of sorghum enables the creation of various products, such as flour, beer, and snacks, which align with the growing demand for healthier, locally-sourced foods in Kenya.

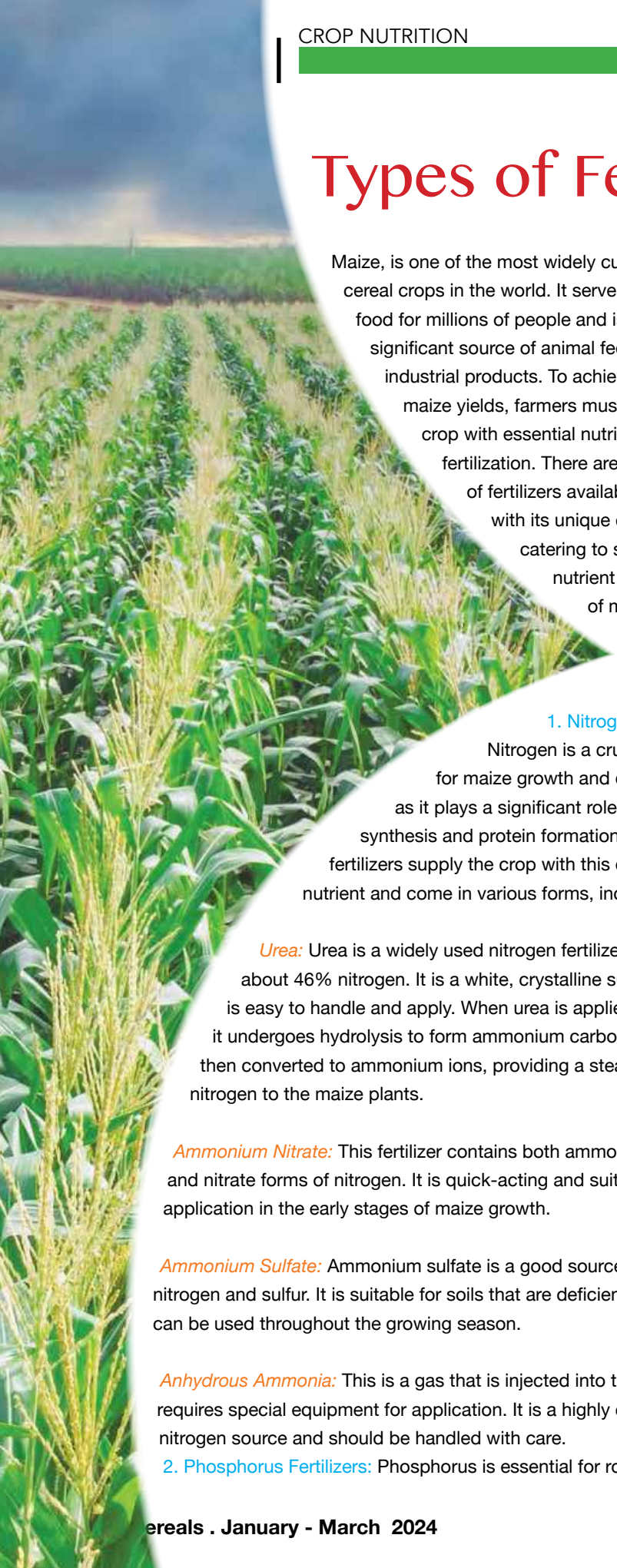
Research and Development: Increased investment in research and development for sorghum holds the promise of enhanced productivity and greater resistance to pests and diseases. Breeding programs can create improved varieties that not only yield more but also maintain the crop's resilience in the face of climate change.

Government Support: Government policies and incentives play a pivotal role in promoting sorghum cultivation. Subsidies, agricultural extension services, and value chain development can encourage farmers to adopt or reintroduce sorghum into their cropping systems. The government's commitment to supporting sorghum can significantly influence the revival of this crop.

Consumer Awareness: Creating awareness about the nutritional benefits of sorghum and promoting it as a healthy and sustainable alternative to other grains can stimulate consumer demand. Public education campaigns can help consumers make informed dietary choices, thereby bolstering the market for sorghum-based products.

In conclusion, the decline of sorghum in Kenya is a multifaceted issue with historical, cultural, and economic dimensions. However, the prospects for its revival are both promising and necessary. Sorghum's inherent qualities, such as drought resistance, nutritional benefits, and cultural significance, make it a valuable addition to Kenya's agricultural landscape. With the right support and investment in research, sorghum can reestablish its role as a crucial crop in ensuring food security, supporting local livelihoods, and preserving cultural heritage.

Types of Fertilizers and their D



Maize, is one of the most widely cultivated cereal crops in the world. It serves as a staple food for millions of people and is also a significant source of animal feed and industrial products. To achieve optimum maize yields, farmers must provide the crop with essential nutrients through fertilization. There are various types of fertilizers available, each with its unique composition, catering to specific nutrient requirements of maize.

Types of Fertilizers

1. Nitrogen Fertilizers: Nitrogen is a crucial element for maize growth and development, as it plays a significant role in chlorophyll synthesis and protein formation. Nitrogen fertilizers supply the crop with this essential nutrient and come in various forms, including:

Urea: Urea is a widely used nitrogen fertilizer that contains about 46% nitrogen. It is a white, crystalline substance that is easy to handle and apply. When urea is applied to the soil, it undergoes hydrolysis to form ammonium carbonate, which is then converted to ammonium ions, providing a steady source of nitrogen to the maize plants.

Ammonium Nitrate: This fertilizer contains both ammonium and nitrate forms of nitrogen. It is quick-acting and suitable for application in the early stages of maize growth.

Ammonium Sulfate: Ammonium sulfate is a good source of both nitrogen and sulfur. It is suitable for soils that are deficient in sulfur and can be used throughout the growing season.

Anhydrous Ammonia: This is a gas that is injected into the soil, and it requires special equipment for application. It is a highly concentrated nitrogen source and should be handled with care.

2. Phosphorus Fertilizers: Phosphorus is essential for root development, energy transfer, and overall plant growth. It is particularly critical during the early stages of maize development. Common phosphorus fertilizers include:

Diammonium Phosphate (DAP): DAP is a widely used phosphorus fertilizer. It contains both ammonium and phosphate, making it a good source of nitrogen and phosphorus.

Monoammonium Phosphate (MAP): Similar to DAP, MAP is also a source of both ammonium and phosphate. It is quickly absorbed by maize roots and is suitable for early-season application.

3. Potassium Fertilizers: Potassium is vital for maize plants, as it influences water uptake, enzyme activation, and carbohydrate movement. Common potassium fertilizers include:

Muriate of Potash (MOP): MOP is a common source of potassium. It contains chloride, which can be harmful to certain crops in excessive amounts but is generally well-tolerated by maize.

Potassium Nitrate: This fertilizer supplies both potassium and nitrogen to maize plants, making it a suitable option for crops requiring both nutrients.

4. Secondary Nutrient Fertilizers: Apart from nitrogen, phosphorus, and potassium, maize also requires secondary nutrients like sulfur, calcium, and magnesium, although

eficiency Symptoms in Maize

in smaller quantities. Some fertilizers provide these secondary nutrients:

Calcium Ammonium Nitrate (CAN): CAN is a nitrogen fertilizer that also contains calcium. It is suitable for soils deficient in both nitrogen and calcium.

Magnesium Sulfate: This fertilizer supplies magnesium and sulfur to maize plants, addressing deficiencies of these secondary nutrients.

Deficiency Symptoms in Maize

Nitrogen Deficiency: When maize plants lack nitrogen, they exhibit slow growth, reduced plant height, and pale green or yellowish leaves. Older leaves may show interveinal chlorosis, starting from the tips and progressing toward the base. Stunted plants with fewer tillers and smaller cobs are common symptoms.

Phosphorus Deficiency: Maize plants deficient in phosphorus have stunted growth and develop a purplish coloration on the leaves and stems. The leaves may also become narrow and erect, exhibiting delayed maturity. Root development is poor, resulting in reduced water and nutrient uptake.

Potassium Deficiency: In maize, potassium deficiency leads to weak stalks and lodging, making plants susceptible to wind damage. The leaves show chlorosis and develop yellow or brown necrotic spots. The lower leaves may exhibit firing, where the tips and edges turn brown and dry.

Sulfur Deficiency: Sulfur-deficient maize plants display overall yellowing of young leaves, along with interveinal chlorosis. The leaves may become brittle and develop a reddish-purple pigmentation.

Calcium and Magnesium Deficiency: Calcium deficiency in maize can lead to tip dieback, stunted roots, and irregular cob development. Magnesium deficiency manifests as interveinal chlorosis, starting from the tips and progressing toward the base of the leaves. It is important to note that these deficiency symptoms may vary depending on the severity and stage of the deficiency. Soil testing and plant tissue analysis can help identify specific nutrient deficiencies, enabling targeted fertilizer applications.

Maize showing signs of potassium deficiency

In conclusion, the selection and application of appropriate fertilizers are crucial for maintaining optimal maize growth and yields. Understanding the types of fertilizers available and their associated deficiency symptoms in maize is essential for effective nutrient management. By addressing nutrient deficiencies promptly, farmers can ensure healthy maize plants, maximize productivity, and contribute to food security.

A sample rotavator also commonly known as a bed former.

TECHNOLOGY IN FARMING:

HOW FARMERS CAN USE TECHNOLOGY TO BE MORE EFFICIENT AND COST EFFECTIVE

Agriculture is among the main pillars of our economy; it contributes to Gross Domestic products and export earnings.

The increasing human population has resulted in a decrease in the land to cultivate; this has led to scarcity especially due to real estate's development. This, therefore, demands for an increase in production per unit area at the lowest cost possible. This will help to ensure constant food supply and zero hunger in our nation. The use of technology plays a significant role in increasing efficiency and boosting agricultural productivity and resilience while ensuring sustainability.

FARMING AS A BUSINESS

Farming is just like any other business, and hence farmers need to have a business plan for their farms, this involves having an investment plan and crop budget.

This serves as an indicator of all the activities and total cost of production that the farmer is likely to incur during the entire production and the expected yields.

The incorporation of technology in Agriculture has led to the development of farm management software aids in facilitating automation of all farm activities such as; record keeping, data storage, monitoring and analyzing. This kind of technology has made it easy for the farmers to identify if they are making profit/ losses and it's being adopted at a faster growth rate.

The execution of the business plan starts from the land preparation. The nature of the soil determines the kind of implements to be used to obtain the required soil tilth.

TECHNOLOGY IN FARMING

In areas prone to flooding and poor drainage especially in black cotton soils, beds are prepared using a rotavator commonly referred to as a bed former. This prevents the formation of hardpans as one leaves 30cm from one bed to the other which serves as a path and a working area. Use of the bed former saves times and raising the beds ensures easy management of crops.

During planting, farmers can employ mechanization for example using the planting machines. Planting machines encourages precision planting and saves time and cost of labor. At the same time, a farmer can also easily apply fertilizer and manure during planting with the help of a planting machine.

SOCIAL MEDIA AND MOBILE APPS

There are s mobile apps that farmers can use to diagnose crop diseases and enhance their crop quality. One such app is Plantix which enables farmers to diagnose plant diseases through their mobile phone. This reduces post-harvest losses through provisions of timely and accurate information directly to the farmer's phone. The use of drones is also an effective method in the control of pest and diseases. The drones are mounted with a near –infrared or remote sensor that is capable of detecting pests and diseases. This is a crop health monitoring based on Normalize Differences Vegetation Index (NDVI). This gives an early warning to the farmer on the pest infestation, and its precision is more accurate compared to the human eyes since they have high-resolution images. This helps to minimize the use of chemicals to control pests and diseases.

The use of social media such as WhatsApp groups, Facebook, and Instagram among others is also becoming very widespread.

Farmers can very easily use the platforms to interact with other farmers from all over the world to exchange ideas, challenges and possible solutions which helps them to improve on their productivity. Marketing of farm produce has also been made easier by farmers using such platforms to access markets thus minimizing the role of middlemen and brokers who exploit them. For example, through online shopping consumers are now able to order the products they require, and they are delivered to them directly.

BOOM SPRAYERS

The use of manual knapsacks is swiftly being replaced by the boom sprayer made up of two wheels and a tank where water and chemicals are put. The boom sprayer has a mortar that sucks the pesticides from the tanks and flows through the pipes. It's easier to spray, less cumbersome and can be used in large scale farming, unlike the manual knapsack. However motorized knapsack has also be invented which has made work easier since one does not require to keep on pressuring it up.

GPS AND SATELLITE WEATHER MONITORING TECHNIQUES

The increase in global warming has resulted in climatic changes resulting in high-temperature fluctuations and irregular rainfall patterns. However, the use of GPS and satellite technology is helping to forecast the weather conditions and give farmers a heads up on the necessary action. Farmers that are registered to the platform access timely weather and plant health updates that guide their farm activities.

PRECISION IRRIGATION

In dry areas boreholes are helping to provide irrigation water. To minimize the cost of pumping water, the installation of solar pan-els and windmills that are both environmen-tally friendly and pocket-friendly compared to the use of electricity. This technology is on the rise since it ensures the production of food in dry seasons.

Precision irrigation systems provide water at the root zone hence little water wastage. Fertigation involves the application of fertilizer and water at the same time is a technique that is readily achievable with precision irrigation. Also, precision irrigation prevents leaves diseases especially the fungal that is quickly spread by water.

The use of soil moisture sensors to determine the soil moisture can also play a significant role in helping farmers pick out the best watering regime.

INORGANIC MULCHING

The use of inorganic mulch materials such a plastic covering of about 300 microns colored black on the lower side and white on the upper side smoothers the growth of weeds while conserving soil moisture. This is because it deprives the weeds light thus affecting their growth. The white reflects light for crops above enhancing the process photosynthesis.

SOIL TESTING

To develop efficient fertilizer programs for specific crop farmers have taken the initiative of conducting the soil analysis. Simple soil kit gadgets such as the agrocares soil testing kit are used to test the soil and gives the farmers recommendations on soil improvement on the spot. This is handheld gadgets and mobile linked to Bluetooth application makes it easier for the extension officers to understand the soil and advise the farmers accordingly on the type of fertilizer to use on their soil. This helps to improve the yields and reduces wastage since the farmers provide the right inputs at the right stage and amount to the crop. Farmers have been working together with numerous soil testing companies in Kenya to offer soil testing services.

PLANT BREEDING

Plant breeding has made possible the production of seeds that are resistant to disease and pests. These hybrid breeds of seeds are more productive thus increasing the output per unit area. For example, Plant breeding has made it possible to increase the production of Irish potatoes through certified seeds that use the rooting apical cuttings technology. Plant breeding has led to the introduction of new crop varieties with reduced growth period, high yielding and with prolonged shelf life attracting more consumers.

While raising seedlings the use of substrate such as cocopeat, vermiculite, and peat moss help to raise seedling that is free of pest and diseases giving the plants a good start, the seedlings trays are filled with this media, and the seeds sowed precisely in each cell. It's easy to carry out the management practices, and the germination percentage is quickly determined to enable the farmer to plan effectively.

A sample boom sprayer that both small- and large-scale farmers can use.

A picture sample of a precision irrigation system.

Inorganic mulching materials.

Maize Farming

Topography of the Land and Its Impact On Maize Crops

The topography, or physical features of the land, encompasses its contours, slopes, and overall structure. Maize crops, sensitive to their environment, respond dynamically to these features. Understanding the lay of the land is crucial to the planting and growth of maize.

Crucial aspects of topography in maize crops

Water Drainage Dynamics: One of the paramount considerations in topography is its influence on water drainage. The slope of the land dictates how water moves across the field. For maize ensuring proper drainage is essential. Waterlogged conditions can compromise root health and overall plant vigour. Through contouring and strategic planning, farmers can mitigate drainage challenges.

Erosion Control Measures: Sloping terrains, if not managed effectively, can be susceptible to soil erosion. Erosion poses a dual threat to maize crops – loss of fertile topsoil and potential damage to young plants. Implementing erosion control measures, such as terracing, cover crops or contour ploughing, becomes pivotal. These practices safeguard the integrity of the soil, ensuring it remains a nurturing bed for maize seeds.

Sunlight Exposure: Beyond water dynamics, topography influences sunlight exposure. The orientation and slope of the land determine how sunlight interacts with the maize canopy. Ensuring uniform sunlight exposure across the field promotes even growth and development. This consideration becomes particularly crucial during critical stages like flowering and grain filling.

Precision Agriculture and Topography: Advancements in precision agriculture leverage topographical variability data for targeted decision-making. By integrating technology and topography, farmers can optimize planting patterns and irrigation strategies. Precision agriculture brings a nuanced understanding of the land, allowing for a customized approach to maize cultivation that adapts to the unique features of each field.

To summarize our discussion, it's clear the topography of the land emerges as a silent yet influential partner. By embracing the variability of the terrain, farmers empower themselves to navigate challenges and harness the advantages that topography offers.

The Stages Involved In Maize Land Preparation

Embarking on the journey of maize cultivation requires a strategic approach, with proper land preparation standing as the compass guiding farmers to success.

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Understanding the land topography, and aligning with climatic conditions allow farmers to work with nature. Soil testing, informed fertilizer decisions, and soil cultivation practices are important considerations for farmers, and each decision contributes to the prosperous cultivation of the maize crop

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Consider Topography: Examining topography becomes a crucial stage, guiding farmers to identify potential hurdles such as water drainage issues or areas prone to erosion. By understanding the landscape, farmers can implement effective contouring and drainage strategies, setting the stage for a resilient maize crop.

Factor in Climatic Conditions: Acknowledging the impact of temperature, rainfall, and sunlight on maize growth is paramount. This maize land preparation stage involves aligning land preparation schedules with the local climate, ensuring that the soil is optimally primed for planting when the conditions are most favourable. It's a dance with nature, choreographed for success.

Evaluate Water Availability: Assessing the water resources on the land, be it natural sources or irrigation options, is a pivotal stage. Adequate water availability, especially during critical growth stages, safeguards the maize crop from drought stress, contributing to higher yields and robust plant health.

Soil Testing and Analysis: As the planting season draws near, soil testing takes centre stage. This stage involves obtaining crucial information about soil pH and nutrient concentrations. This knowledge empowers farmers to make informed fertilizer purchase decisions, avoiding unnecessary expenses by applying the correct type and amount of fertilizers required for their specific soil conditions.

Fertilizer Decisions and Soil Amendments: Armed with soil analysis results and recommendations, farmers navigate the maize land preparation stage of fertilizer decisions. This involves choosing the right type and amount of fertilizers, considering factors like cost, availability, and nutrient content. The emphasis is on efficient nutrient management, ensuring that the maize crop receives the essential elements for robust growth.

Cultivating the Land: The stage of cultivating the land involves decisions on tillage practices. Disc ploughing and chisel ploughing vie for

attention, each with its advantages. No-till farming emerges as another viable option, gaining popularity for its soil structure benefits. Farmers carefully weigh these tillage options, recognizing that the health of the soil directly influences maize productivity.

Timing of Land Preparation: Early preparation allows for addressing soil issues, adjusting pH levels with any recommended lime treatments, and enriching the soil with organic matter as guided by soil analysis recommendations. Early timing allows the pre-planting soil amendments to work on the soil, laying the groundwork for a successful maize harvest.

To summarize our post, the maize land preparation stages above play a vital role in shaping the success of the crop. Understanding the land topography, and aligning with climatic conditions allow farmers to work with nature. Soil testing, informed fertilizer decisions, and soil cultivation practices are important considerations for farmers, and each decision contributes to the prosperous cultivation of the maize crop.

Significance of Proper Land Preparation for Maize Cultivation

Proper land preparation for maize is more than a preparatory step; it forms the very foundation of a successful maize crop. The condition of the soil directly influences maize growth, impacting both quality and yield.

Enhanced Soil Structure: Land preparation contributes significantly to improved soil structure. Well-structured soil enhances root development, allowing maize plants to access nutrients efficiently and ensuring optimal water retention, fostering a conducive environment for growth.

Optimal Soil Fertility: Optimizing soil fertility is a key objective of land

preparation for maize. Through soil testing and analysis, farmers can tailor their preparation process to ensure the soil contains the right balance of nutrients crucial for maize growth.

Effective Water Management: Effective water management begins with land preparation. Practices such as contouring and proper drainage reduce the risk of waterlogging or drought stress, ensuring that maize crops receive the right amount of moisture at critical growth stages.

Weed and Pest Control: Land preparation plays a pivotal role in weed control. A well-prepared field minimizes the competition for resources and reduces the risk of pest infestations. This sets the stage for effective pest management strategies.

Climate Resilience: Adapting land preparation for maize to specific climatic conditions enhances the resilience of maize cultivation. Cover cropping, minimum or no-till techniques, and permanent residue cover can conserve soil moisture and fortify crops against environmental stressors.

Economic Impact: The economic impact of proper land preparation is profound. Increased yields and improved crop quality directly contribute to the financial success of farmers. Investing time and effort in land preparation becomes a wise economic strategy.

The significance of proper land preparation for maize cultivation cannot be overstated. It is a holistic practice that influences soil structure, fertility, water management, climate resilience, and economic outcomes. By adhering to these principles, farmers lay the groundwork for a maize crop that thrives, ensuring a bountiful harvest and the sustainable prosperity of agricultural communities.

Battle Ryegrass On All Fronts

By David Jones

Ryegrass remains one of the foremost difficult weeds to control in areas such as the Mau and is increasing through the Rift Valley and other highland areas such as Molo and Timau.

More suited to cooler temperatures than Brome, Ryegrass is not only a prolific seed producer so multiplies very rapidly, but also tends to have a much longer germination period than other grass weeds. In other words, waiting for a flush of weeds to spray off before planting rarely solves the problem as the weed continually germinates over several months.

Ryegrass also has a history of developing resistance to herbicides – not only herbicides in cereals but many of the 'fops and dims' or Group A herbicides in broadleaved crops (familiar trade names are Agil, Fusilade, Pantera etc).

So what can you do? The first thing is to put aside herbicides for a moment. Consider these a nice to have that will make life easier, but which cannot be relied upon forever. Think instead about farming practices, or cultural controls such as:

Changing the season – you can delay sowing but Ryegrass germinates over months rather than weeks. If you traditionally plant in April but have a field with terrible Ryegrass pressure, you have little downside from planting in August or September to erode some of the seed bank in the soil.

Crop competition – barley is more vigorous than wheat, and stiff varieties such as Planet or Cocktail allow the seed rate to be increased with less risk of lodging. In the past specific varieties have been bred to be planted at very high seed rates without increased screenings or bushel weight.

Varied cropping – a fast crop such as peas allows the Ryegrass to be cut before the seed is viable, dense canola will drastically reduce seed return and beans allow the use of an inter-row mechanical weeder.

Moisture seeking – if you can plant deep, into moisture and establish the crop before the rain arrives, this can be very successful.

Once you have implemented some of the above measures, it is then time to look at using chemistry to help:

Pendimethalin – various products available. Provides more control of Ryegrass than you think, typically 50-70%. Remember that you need a fine, level seedbed for best results with any residual herbicide.

Flufenacet – usually more of a mixing partner to pendimethalin but can be used as a standalone product.

Resistance in Ryegrass has increased gradually in most countries over the years but is still effective. Quite a short half-life in the soil; don't expect more than 3-4 weeks of activity.

Post-emergence of the crop *Atlantis* gives around 50% control of most Ryegrass populations at best and is of course in wheat only. Not barley. Be aware that Atlantis products in other countries contain much higher amounts of mesosulfuron as they are targeted at winter crops where crop safety is less of an issue. Needs a suitable adjuvant to be added too.

Axial occasionally gives 30% control, but target site resistance usually develops rapidly. I generally find that it is largely ineffective once a field has received three or four applications. Fenoxaprop and clodinafop will not control Ryegrass; do not be persuaded by anybody who tells you otherwise.

Pyroxsulam used to give reliable control but is rarely more than 25% effective in the field.

Ultimately *clethodim* is by far the most effective in-crop herbicide for controlling Ryegrass. It is available in many products and depending on the label, can be used in a range of broadleaved crops from canola, peas, beans, sunflowers, and linseed. Exercise extreme caution, however; clethodim is only marginally safe on certain crops, so consult an agronomist. And NEVER ever tank mix clethodim with anything else.

David Jones is an independent agronomist in Kenya.

Managing Herbicide Resistance

Herbicides have played a pivotal role in modern agriculture, providing effective weed control in cereal crops, such as wheat, rice, corn, and barley. However, over the years, the widespread and often indiscriminate use of herbicides has led to the emergence of herbicide-resistant weeds, posing significant challenges to cereal production systems worldwide.

Cereal crops are essential staples for human and livestock consumption, providing a significant portion of global caloric intake and dietary needs. To maximize cereal yields and minimize weed competition, herbicides have become an integral component of modern agricultural practices. However, repeated and exclusive use of herbicides has exerted selective pressure on weed populations, leading to the evolution of herbicide-resistant weeds that can survive and reproduce even in the presence of the applied herbicides.

Causes and Mechanisms of Herbicide Resistance in Cereal crops

Herbicide resistance in cereal crops is primarily a consequence of natural selection. When herbicides are applied to control weeds, a few individual plants in the weed population may possess genetic mutations or traits that allow them to survive the herbicide treatment. These resistant individuals then reproduce, passing on the resistance genes to their progeny, and the resistant population grows over time. The three major mechanisms of herbicide resistance in cereal crops are:

Target Site Mutation: In this mechanism, the resistant weed species undergoes a genetic change in the target site of the herbicide's mode of action. As a result, the herbicide can no longer bind effectively to the target site, rendering it ineffective in killing the weed.

Enhanced Detoxification: Herbicide-resistant weeds may develop enhanced mechanisms to detoxify or metabolize the herbicide before it can cause any damage. These mechanisms often involve the overexpression of certain enzymes that break down the herbicide into harmless compounds.

Reduced Herbicide Absorption or Translocation

Resistant weeds may develop barriers that limit the entry or movement of the herbicide within the plant, reducing its efficacy.

Consequences of Herbicide Resistance

The emergence of herbicide-resistant weeds has significant consequences for cereal production systems and agricultural sustainability:

Yield Losses: Herbicide-resistant weeds can significantly reduce cereal yields, leading to economic losses for farmers and food scarcity for consumers.

Increased Herbicide Use and Costs: Farmers often respond to herbicide

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resistance by increasing herbicide application rates or adopting multiple herbicides, leading to increased costs and environmental concerns.

Environmental Impacts: The excessive use of herbicides to manage resistant weeds can lead to environmental pollution, harming non-target species and disrupting ecosystems.

Loss of Herbicide Effectiveness: Continuous reliance on herbicides can lead to a decline in their efficacy, making weed control more challenging even for non-resistant weed species.

Strategies for Managing Herbicide Resistance

To address herbicide resistance in cereal crops, integrated weed management (IWM) practices should be adopted. These strategies combine various management tools and approaches to minimize the reliance on herbicides and delay the onset of resistance:

Rotation of Herbicides: Using different herbicides with different modes of action in successive seasons can reduce selection pressure for resistant weed populations and slow down resistance development.

Crop Rotation: Alternating cereal crops with non-cereal crops disrupts weed cycles, reduces the buildup of resistant weed populations, and provides opportunities for non-chemical weed control methods.

Cultural Practices: Implementing cultural practices such as crop density manipulation, planting date adjustments, and crop competition enhancement can help suppress weed growth and minimize herbicide use.

Mechanical and Physical Weed Control Utilizing mechanical weed control methods, such as tillage, hand-weeding, and mulching, in combination with herbicides can provide effective weed management while reducing herbicide reliance.

Biological Control: Harnessing natural enemies of weeds, such as insects, pathogens, and competing plant species, can help control weed populations and reduce the need for herbicides.

Future Prospects: To ensure the long-term sustainability of cereal farming and effectively manage herbicide resistance, ongoing research efforts should focus on the following areas:

Development of New Herbicides: Investing in the discovery and development of new herbicides with novel modes of action can provide alternative options for weed control and overcome existing resistance mechanisms.

Molecular Approaches: Advancements in molecular biology and genetic engineering can facilitate the identification of resistance genes in weeds, allowing the development of diagnostic tools and tailored management strategies.

Precision Agriculture Technologies: Integrating precision agriculture technologies, such as remote sensing, GPS, and machine learning, can enable site-specific herbicide applications and optimize weed control efforts.

Adoption of Weed-Competitive Cereal Varieties: Breeding and selecting cereal varieties with enhanced competitive traits against weeds can help suppress weed growth and reduce herbicide dependence.

Managing herbicide resistance in cereal crops requires a comprehensive and proactive approach that integrates multiple strategies. By adopting integrated weed management practices, promoting sustainable agricultural practices, and investing in research and innovation, we can minimize the development and spread of herbicide resistance, preserve the efficacy of herbicides, and ensure the long-term viability of cereal farming systems.

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Magical Canola

The striking colourful flowers resembling a rolled out yellow carpet create a rare spectacle on a farm. This exotic plant which can grow up to four feet with a maturity period of between 75 and 90 days can easily be mistaken for an overgrown kale plant. Though not relatively new in Kenya, canola crop is fast gaining popularity among farmers, both large and small scale. Majority of those who have embraced the crop are doing so for purposes of selling the seeds for production of cooking oil. The by-product is a much sought commodity by dairy farmers. What remains after the oil has been extracted from the canola seeds is fodder rich in proteins. Its scarcity in the country has seen dairy farmers import the product from Tanzania to supplement the protein diet for their cows.

But while many of the growers are aware of the benefits of this crop which traces its origin to Canada, few of the farmers are yet to fully appreciate its weed and disease controlling capability especially on cereal crops. Growing canola as a rotational crop could resort to a farmer saying goodbye to disease such as fusarium and pythium which are known to cause heavy losses in barley and wheat. Experts now say using canola as a rotational crop reduces close to 100 percent of all post-harvest losses associated with cereal crop diseases. They suggest that a lot of the root diseases affecting wheat and barley can easily be avoided especially if farmers moved away from mono-cropping.

As a commercial crop, canola is earning farmers good income as its demand continues to soar across the farming community as well as cooking oil processors. Mr. David Kimondo who is credited with introducing canola farming among Nyeri's smalls scale farmers in 2011 found out

that the demand for canola seeds was high such that farmers are placing orders when the crop is still growing in the fields. About 50 farmers mainly from Kieni sub-county of Nyeri were the early raisers. A kilo of seeds vary from the variety and an acre requires four kilos with an expected harvest of two tones.

While the small scale farmers continue to enjoy huge returns from the investment, they are yet to realize the additional benefit their counterparts in other regions of the country are reaping.

Use of canola crop especially among wheat and barley large scale farmers has shown reduced crop losses during harvest seasons. Farmers who have practiced rotational cropping with canola as well as experts say they have witnessed reduction of wheat and barley diseases. A renowned researcher on canola notes that weed competition from wild oats and rye and use of crop herbicides have significant effect on cereal farmers. There is also a lot of weed competition particularly against grass weeds. "Grass weeds such as such as brome, rye and wild oats are a big disease burden to cereal farmers which has led to high costs of herbicide use. That is why use of canola as a rotational crop among farmers is highly encouraged.

> Growing canola as a rotational crop could resort to a farmer saying goodbye to disease such as fusarium and pythium which are known to cause heavy losses in barley and wheat. Experts now say using canola as a rotational crop reduces close to 100 percent of all post-harvest losses associated with cereal crop diseases.

One of the founder members of Agventure Limited adds: "We have developed a market for canola for many farmers who wish to use it as a rotational crop. Canola use in Kenya is more frequent with medium and large scale farmers. They are the ones who mostly cultivate cereal crops".

Agventure Limited, has already developed a market for canola and is looking for more farmers to come on board. It is already working with a few farmer groups. "We have a factory in Nakuru and we purchase directly from farmers. Canola is a very important crop that is already being encouraged worldwide, that means it cannot be ignored Canola is also one of the most widely used oils worldwide and presently, the market demand is higher than the supply," he says.

A Nairobi based economist says that the high increase in wheat and barley products such as bread can be blamed on losses that farmers face.

"In recent years, heavy losses from cereal farmers has contributed to about 68 percent of the price increases though heavy government taxation on wheat and barley products has also contributed, ",he adds.

Going by government reports using canola as a disease control crop is yet to be appreciated by framers, a factor attributed to little knowledge about the benefits of canola.

However, according to figures from the United Nations Conference on Trade and Development (UNCTAD), there is a growing interest in canola use in Kenya than in neighbouring countries.




"Rooting for a Sustainable Future: The Crucial Role of Tree Planting in Achieving the Sustainable Development Goals"

By Mary Mwende

In the face of unprecedented environmental challenges, the act of planting trees has emerged as a powerful tool for fostering sustainable development. The Sustainable Development Goals (SDGs), established by the United Nations, provide a comprehensive framework for addressing global issues, ranging from poverty and hunger to climate action. Amidst these goals, the role of tree planting stands out as a catalyst for positive change.

In a vibrant display of environmental stewardship and communal commitment, the Ministry of Environment in Kenya recently orchestrated an inspiring event, aptly named 'The Green Day.' This initiative, held with a vision to fortify the nation's green legacy as part of its ambitious plan to plant 15 billion trees by 2032, brought together citizens, government officials, and environmental enthusiasts alike in a collective effort to combat climate change and bolster the ecological balance.

Against the backdrop of Kenya's breathtaking landscapes, the event unfolded as a testament to the power of unity in fostering positive change. As the sun dappled the participants, each armed with a sapling and a sense of purpose, 'The Green Day' became a symbolic step towards a sustainable future, where the roots of responsibility intertwine with the branches of progress. Examining the multifaceted contributions of tree planting to the achievement of the SDGs

SDG 13: Climate Action - Carbon Sequestration and Mitigation:

At the forefront of the environmental benefits, tree planting plays a pivotal role in combating climate change. SDG 13 emphasizes the urgent need for climate action, and trees act as nature's carbon sinks. Through photosynthesis, they absorb carbon dioxide from the atmosphere and store carbon in their biomass. Afforestation and reforestation projects reduce greenhouse gas emissions, mitigate the adverse effects of climate change, and promote climate resilience.

SDG 15: Life on Land - Biodiversity Conservation and Ecosystem Restoration:

Sustainable Development Goal 15 focuses on protecting, restoring, and promoting sustainable use of terrestrial ecosystems. Trees, as fundamental components of ecosystems, provide habitats for diverse plant and animal species. Afforestation efforts aid in restoring degraded lands, fostering biodiversity and preserving the delicate balance of ecosystems. By planting trees, we not only protect existing biodiversity but also create corridors for wildlife, enabling the free movement of species and enhancing overall ecosystem health.

SDG 2: Zero Hunger - Agroforestry and Food Security:

Tree planting intersects with SDG 2, which aims to end hunger, achieve

food security, and promote sustainable agriculture. Agroforestry, the integration of trees into agricultural systems, offers a sustainable solution. Trees provide shade, improve soil fertility, and offer a diverse range of fruits and nuts. The integration of trees into agricultural landscapes enhances crop yields, contributes to food security, and promotes sustainable farming practices.

SDG 4: Quality Education-Environmental Awareness and Education:
SDG 4 emphasizes inclusive and quality education. Tree planting initiatives serve as practical platforms for environmental education. School and community-based tree planting programs not only contribute to achieving environmental sustainability but also instill a sense of responsibility for the environment among students and communities.

SDG 6: Clean Water and Sanitation - Watershed Protection:
Sustainable water management is critical to achieving SDG 6. Trees play a vital role in watershed protection, preventing soil erosion, and maintaining water quality. The roots of trees act as natural filters, preventing sedimentation in water bodies. Afforestation in watershed areas ensures a sustainable supply of clean water, benefiting both ecosystems and communities.

SDG 8: Decent Work and Economic Growth - Forest-Based Livelihoods:
Economic sustainability is a key component of the SDGs. The forestry sector, supported by responsible tree planting and management, contributes to job creation and economic growth (SDG 8). Sustainable forestry practices ensure a balance between economic interests and environmental conservation, providing livelihoods for communities dependent on forest resources.

SDG 11: Sustainable Cities and Communities - Urban Greening:

As the global population gravitates towards urban areas, SDG 11 calls for sustainable and resilient cities. Urban forestry, encompassing tree planting and green infrastructure development, is instrumental in achieving this goal. Trees in urban environments mitigate the urban heat island effect, improve air quality, and provide aesthetic and recreational benefits. Community engagement in urban tree planting initiatives fosters a sense of environmental stewardship among city dwellers.

SDG 12: Responsible Consumption and Production - Sustainable Forestry Practices:
Responsible consumption and production, as outlined in SDG 12, are closely tied to sustainable forestry practices. Tree planting aligns with the promotion of sustainable management of forests, combating deforestation, and ensuring the responsible use of forest resources.

In conclusion, the act of planting trees emerges as a linchpin in the pursuit of sustainable development. Its impact resonates across various SDGs, addressing environmental, social, and economic challenges. As we strive for a sustainable future, recognizing and supporting tree planting initiatives is not merely an option but a necessity. Through a collective commitment to tree planting, we can foster a world where human well-being harmonizes with the health of the planet, advancing the vision encapsulated in the Sustainable Development Goals.

Wheat Harvest Results

By David Jones

David is an independent agronomist in Kenya and a member of the Association of Independent Crop Consultants. David gives independent advice based on scientific trials and experience. Currently works with the Centre of Excellence for Crop Rotation.

The wheat variety trial and 'league table' is without doubt one of the most hotly anticipated pieces of research that we do each season. The objective is to provide information to enable farmers to choose a variety that is suitable for their region, and to provide some knowledge of how to grow them.

For a crop as important as wheat, it is important to get it right! For this reason, we generally try to keep the trial to a maximum of 14 varieties in order to focus on doing a top-quality job, on the varieties that are relevant to farmers.

There will always be new varieties coming along, and by the time they get into the main trial known as 'Stage 3', they have been through at least three seasons of trialling, giving us confidence in their potential.

The rest of the trial is made up of widely grown, reliable, and trusted varieties to provide a comparison against the newer introductions.

This year has actually seen no new introductions, as we have not been convinced by any new varieties that have come through the earlier stages; in other words, the existing varieties are still the top performers.

	Timau	Meru	Nakuru	Moiben	Nyahururu	Five-site mean
Control yield (T/ha)	**3.63**	**11.55**	**8.44**	**3.7**	**3.24**	**6.11**
Hawk	–	107	–	–	–	**107**
Kasuku	105	98	99	122	103	**105**
Impala	107	97	101	122	99	**105**
Robin	96	103	103	100	106	**102**
AGV249	105	93	99	–	96	**98**
Korongo	90	98	99	76	117	**96**
Mwera	99	99	98	78	91	**93**
Jacana	87	93	94	73	103	**90**
Hyrax	92	92	94	78	91	**89**
Brambling	87	91	99	62	89	**86**
Njoro2	90	81	80	68	93	**82**
5% LSD as a % of control	8.8	4.7	9.0	14.5	–	–

****The control is the average yield of Mwera, Robin and Kasuku – three widely grown varieties.***

First up is Hawk, which was only included at one site in Meru where it has on several occasions been the top performer. If the Stem Rust weakness is managed, Hawk is usually one of the top yielders at this site, but it is also the least consistent wheat that I have ever grown. Anywhere!

In second place is Kasuku; this was included at all sites so is really the true top variety. Kasuku had a tough year in 2022 which was unusual, so it is good to see it back at the top. I always emphasize the risk of sprouting in Kasuku; if you often have rain at harvest, it is not the most sensible variety.

It is very encouraging to see Impala, a relatively new introduction, performing very well across all sites. As I have said before, if you are growing a quality white grain wheat Impala is a no-brainer; it has better all-round disease resistance and better standing power than Korongo as well as higher yield.

Robin performed well and is always very consistent; hence why it is still included 14 years after its introduction. We all know about the Stem Rust risk, so only grow this in an area that you can spray within 3 days, and in the main season / Long Rains when disease pressure is usually lower.

At mid-table AGV249 continues to perform well in Timau, but in other areas of the country is less consistent. AGV249 is a very fast-developing, shy-tillering variety; my instinct is that at lower altitudes the variety moves through the growth stages too quickly and with too few heads.

Mwera had a disappointing season for such a widely grown variety, but it still possesses excellent all-round disease resistance and grain quality. Also low down are Jacana and Hyrax; these two tend to perform okay in the Rift Valley, but at higher altitudes are less impressive.

And in the relegation zone is Njoro 2 – a variety that if nothing else is consistently low-yielding! At 20% below Robin, Impala, and Kasuku, on a 4 t/ha crop the difference in yield is worth over 45,000/- per hectare.

Top Wheats For 2024:

1. Narok – Mwera
2. Mau Narok – AGV249, Kasuku
3. North Rift – Kasuku, Impala
4. Southern Rift, Nakuru – Mwera, Hawk, and Jacana
5. Timau – AGV249, Mwera, and Kasuku
6. Laikipia – Mwera and Impala

*AGV249 is still in National Performance Trials and subject to release.

Think Agronomy is brought to you by Cropnuts and the Centre of Excellence for Crop Rotation. We share the same vision for sustainable, dryland farming across Africa, and Think Agronomy is our independent voice to promote profitable, climate-resilient farming through better management of soil health, systems-based agronomy, crop diversification, and farm mechanization.

The world must act to avert a climate-induced food shortage.

Cary Fowler, U.S. special envoy for food security, warns of dire consequences if the international community fails to act to mitigate climate change impacts on agrifood systems. The CIMMYT 2030 Strategy holds the approach to respond and mitigate some of the worst effects of this looming crisis.

By Julian Bañuelos-Uribe

Erratic climate patterns, global and regional conflicts, biodiversity degradation, and insufficient funding for agricultural research pose a serious risk to meeting global food production goals by mid-century, according to Cary Fowler, the U.S. special envoy for food security.

The world must produce 50-60% more food by 2050 to nourish a growing population. Yet global crop yields are projected to drop between 3-12% over the same period. Wheat yields in Africa and South Asia, two regions with the fastest growing and youngest populations, are expected to decline by 15% due to global warming. Food systems have also been disrupted by the Russia-Ukraine conflict and the COVID-19 pandemic, raising food and fertilizer prices, and exacerbating regional instability.

Fowler cites inadequate government funding for plant breeding programs as a contributor to an ineffective response to introducing improved climate-adaptable staple crops. "With the state of current affairs, we are on our way to failing to feed the world by century's end," said Fowler.

> "With the state of current affairs, we are on our way to failing to feed the world by century's end," said Fowler.

Science and Innovation for a Food and Nutrition Secure World: CIMMYT's 2030 Strategy

Global peace and development efforts will demand a cross-sector and coordinated response. Through its 2030 Strategy, CIMMYT has laid out a robust series of investments in crop systems innovation, partnership, and sustainable development, to advance more resilient food systems. The 2030 Strategy consolidates CIMMYT's target areas through three pillars: Discovery, SystemDev, and Inc. These pillars focus on research and innovation, systems approach, and strong partnerships and advocacy efforts with the private and government sectors to address an emerging food crisis.

Maize vendor at village market in Arsi Negel, Ethiopia. (Photo: Peter Lowe/ CIMMYT)

"Our 2030 Strategy places research, innovation and partnership at the center of facing the challenges of the 21st century to solve tomorrow's

A CIMMYT staff member gives a farmer training session in Boiragee, Bangladesh. (Photo: S. Mojunder Drik/ CIMMYT

problems today—for greater food security and the prosperity of smallholder farmers.

As we implement work plans, CIMMYT is proud of the achievements it has seen through projects in sub-Saharan Africa, our contribution to influential policy reports, and continued praise for our agri-development initiatives in Latin America. All these feats will help us deliver on and expand our efforts to reach our 2030 vision," said Bram Govaerts, CIMMYT director general.

CIMMYT remains prominent in developing sustainable solutions for farmers and policy actors

CIMMYT has achieved important progress in Eastern and Southern Africa. Projects such as the Southern Africa Accelerated Innovation Delivery Initiative (AID-I) Rapid Delivery Hub have brought together regional seed partners, government agencies, and CGIAR Research Centers, to reduce fertilizer prices, boost resilience to drought and pests, and facilitate market access for smallholders.

In the recent SPG Coalition report, CIMMYT featured prominently as a leading organization in climate-smart agriculture, nutrient-use efficiency, and pest and fertilizer management. This report informs researchers, non-governmental organizations and private sector partners in agrifood and climate policy development.

MasAgro, a research-for-development initiative, has received praise by international organizations and governments as an exemplary program for sustainable development in Latin America. Over 500,000 farmers in Mexico have adopted hardy maize or wheat varieties and resource-conserving agricultural practices. To maximize on the experience of MasAgro, CIMMYT has partnered with a CGIAR initiative: AgriLAC Resiliente. This initiative aims to bolster the competitiveness and sustainability of agrifood systems to respond to forced migrations in Central and South America which are worsened by regional food insecurity and conflict.

The world must produce 50-60% more food by 2050 to nourish a growing population. Yet global crop yields are projected to drop between 3-12% over the same period. Wheat yields in Africa and South Asia, two regions with the fastest growing and youngest populations, are expected to decline by 15% due to global warming. Food systems have also been disrupted by the Russia-Ukraine conflict and the COVID-19 pandemic, raising food and fertilizer prices, and exacerbating regional instability.

Science and innovation powered by partnership can deliver a food secure world Climate change undoubtedly threatens global peace and agrifood systems. With over 130 countries depending on food imports, today's hyper-connected world demands collaborative partnership across all sectors to build up shockproof food systems.

Through a grassroots approach to research and innovation, the CIMMYT 2030 Strategy is built upon decades of applied science which has impacted communities around the world, to continue influencing policy, pioneering innovations, and advocating for the development of a food secure future.

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Strategic Interventions by the Private Sector and Research to Achieve 100% Food Security

It is no gainsaying that Kenya needs to critically discuss 'Enablers towards Achieving Food Security' with the objective of discussing strategic policy and technological interventions that enhance agricultural productivity and access to food.

The discussions must be guided by 'Strategic Interventions by the Private Sector and Research to Achieve 100% Food Security'. It is worthy noting, while the achievement of the desired food security level is possible, myriad challenges hinder it. These include: a poorly performing agriculture due to low soil quality, over reliance on rain-fed agriculture, pre-and post-harvest losses and underfunding of the sector; and, market access barriers characterized by poor infrastructure, high cost of doing business and lack of market information and an early warning system.

Other significant challenges he highlighted include: constraints to research such as low investment in agricultural research, weak links between research and farmers, collapsing extension systems, poor enforcement of Intellectual Property Rights (IPRs) and low uptake of research evidence by policy makers in decision making. It should be further noted that the private sector which plays a key role in enhancing food security and access in the nation is also constrained due to high costs of doing business, poor infrastructure, barriers to trade as well as the existing competition with the public sector leading to market distortions.

In line with the Institute's mandate of providing evidence based advice to policy makers to help formulate appropriate policies, it highlighted the following strategies towards achieving 100% food security in the nation. Deliberate investments in the agriculture sector must be made through development of irrigation and sustainable land management; extension of support towards research in new technologies;

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enhancement of the whole value chain productivity; development of effective pre- and post-harvest management strategies; strengthening extension services; establishment of climate smart agriculture programs; promotion of drought tolerant crops as well as diversification of crop enterprises.

In addition, he noted there is need to enhance food access through poverty reduction; increase in trade and market access such as through inter-county and intra-county initiatives; strengthening of producer organizations as well as the role of women and youth participation in socio-economic decision making, that affect household livelihood opportunities; strengthening early warning systems and put in place emergency preparedness and disaster management schemes; rethinking the strategic food reserves (physical vs virtual stocks).

The agriculture sector in the country has been greatly influenced and affected by the changing agricultural policy land-scape especially devolution. Given the importance of the sector in the Kenyan economy and the dynamic nature and complexity of challenges facing the sec-tor, it is also important to invest in an early warning system that will also be strengthened to handle emergency preparedness and disaster management schemes. The strategic food reserves also play a key role in enhancing food security hence their status should be addressed in addition to encouraging Private Public Partnerships by improving business environment, addressing market failures and enhancing good governance.

The annual devolution conference meeting on agriculture also addressed interventions that can be used to transition the nation from production oriented actions to actions that address the total factor productivity. On this, it is notable that an investment in credible evidence and knowledge transfer through the adoption of result-based monitoring and evaluation systems; an emphasis on accountability and an invest in a learning culture will greatly increase the potential in the ag sector as lessons are drawn from the achievements and failures of programs and projects initiated and used for future decision making and implementation.

As a leading Agricultural policy research Institution in Kenya and the African region, Tegemeo Institute has been in the forefront advising farmers, policy makers and other institutions on the way forward.

Leveraging on its rich panel data which dates back to 1997, the Institute provides valuable information covering agricultural production statistics locally and in the region to all the stakeholders. Among the data provided is on cost of production, national and regional production and productivity trends, commodity price trends over time and public expenditures and budgetary allocation to agriculture. This is an invaluable input to the sector and the county governments during this era of knowledge based economy.

Here are Farming Rules

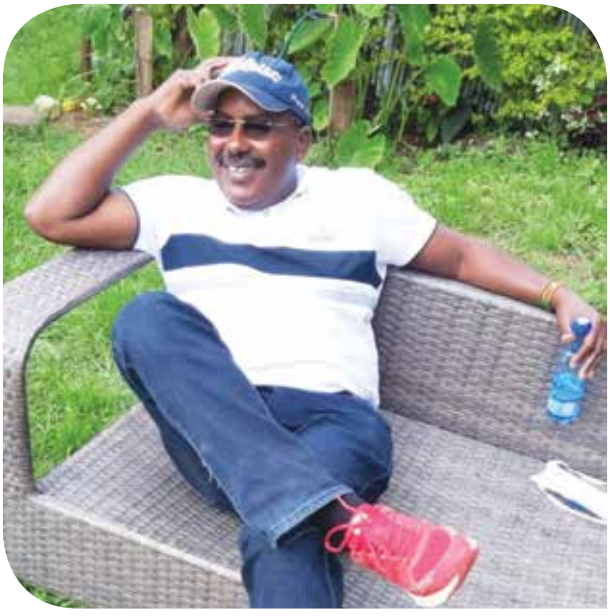
By David Ndegwa

Farming is like a game and to play any game effectively, one must acquaint himself/herself with its rules. A chess player who wins the game usually has the same number of subjects as his opponent but what makes him win is how he moves them. In farming, all farmers use the same tools but the difference comes in how each tool is used. Success or failure in farming, therefore, comes as a result of efficiency on the use of the tools but not on luck or timing.

In farming, there are two major key components that define success or failure.

– Things that a farmer can control
– Things that a farmer can't control.

To succeed, a farmer needs to identify what is under his/her control and take charge of that on a 100% basis. What is in the farmer control?



1. Choice of the growing area. You can't grow crops in an area with poor soil, inadequate water etc and then start complaining about how you are not making money.
2. Type of land preparation
3. Type and quantity of fertiliser to use
4. Spacing and plant population to be adopted.
5. Quality of crop husbandry to be employed
6. Variety and seed quality.
7. Method of irrigation to adopt and how much water to give in each stage
8. Basic questions of where, when, how and what to grow must be answered.

Growing is like driving a car. A car has 5 gears which must be engaged at the right terrain for a smooth drive. You do agree with me that not everyone can drive a car and the disaster is that everyone thinks that he or she can practice successful farming. I would advise everyone who is in farming or has intentions to do farming to define how he or she will farm in 1m² and then prolate this information to the acreage which you want to farm.

The battle in farming is won or lost at the production per unit area/ plant. How much have you planted (plant population) in 1m² or per plant, at what cost and what yields are you getting per plant or per m². If you are a cabbage farmer and you don't know exactly the size of your field, the total number of cabbages in your field, the % grade one and the % grade 2, wewe ni wa bahati nasibu .

If you ask many farmers, they will tell you that they don't make money because of the low prices or because of brokers. My friend, price is just an excuse and the real issue is low production per unit area which increases the cost of production. In order to make a profit in such circumstances, the option is to sell at a higher price which unfortunately is not under a farmer's control.

As I said earlier, there are factors that are not under the farmers control eg:-
1. Weather
2. Seed contamination by unscrupulous traders
3.Price
4.Unusual gluts, etc

In order to succeed in the farming game, farmers must learn the art of farming. *Sio lazima ufanye science, hio achia agronomists .*

One of the major reasons why farmers sometimes don't trust agronomists in the field is because we don't understand that Agriculture is both a Science and an Art and it is the art part of farming that makes money which most of the agronomists are not familiar with as they are more science-oriented.

Gooseberry Crumb Cake

Servings: 6

Ingredients

- 2 cups gooseberries
- 1/4 cup sugar
- 2 teaspoons cornstarch
- 1/2 teaspoon ground ginger
- 1/3 cup dark brown sugar
- 1/3 cup granulated sugar
- 1 teaspoon ground cinnamon
- 1/2 teaspoon ground ginger
- 1/8 teaspoon salt
- 1/2 cup melted butter
- 1 3/4 cups cake flour
- 1/3 cup sour cream
- 1 large egg
- 1 large egg yolk
- 2 teaspoons vanilla extract
- 1 cup cake flour
- 1/2 cup sugar
- 1/2 teaspoon baking soda
- 1/2 teaspoon baking powder
- 1/4 teaspoon salt
- 6 tablespoons softened butter (cut into 8 pieces)

Directions

1. Rinse the gooseberries and toss with the sugar, cornstarch and ginger to coat.
2. Mix the brown sugar, sugar, cinnamon, ginger, salt and butter in a large bowl.
3. Mix in the flour.
4. Mix the sour cream, egg, egg yolk and vanilla in a bowl.
5. Mix the flour, sugar, baking soda, baking powder and salt in a bowl.
6. Add the butter to the flour mixture and mix in the sour cream mixture 1/3 at a time mixing in between.
7. Pour all but 1/2 cup of the batter into a greased 8x8 inch baking dish followed by the gooseberry mixture and the remaining batter.
8. Break the topping into big crumbs with your hands and sprinkle onto the cake.
9. Bake in a preheated 325F/170C oven until a toothpick pushed into the center comes out clean, about 50 minutes.

Farmers Jokes

A young city couple was driving down a country lane on their way to visit some friends one day.

They suddenly came to a muddy patch in the road and their car got bogged down and stuck in the mud.

After a few minutes of trying to get the car out by themselves, they saw a young farmer coming down the lane, driving some oxen in front of him.

The young farmer stopped when he saw the couple in trouble and offered to use the oxen to pull the car out of the mud for $50. The husband accepted and a few minutes later the car was out of the mud.

Afterwards, the young farmer said to the husband, "You know, you're the tenth car I've helped out of the mud today."

The husband looked around at the fields and asked the farmer, "And when do you have time to plough your land, at night?"

The young farmer said, "Oh no, at night is when I put the water in the now muddy patch."

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