THE ENVIRONMENTAL AND BIOSYSTEMS Engineer

2nd Edition

June, 2021

Food Security

A magazine of Environmental and Biosystems Engineering Students Association (EBESA) OF UNIVERSITY OF NAIROBI

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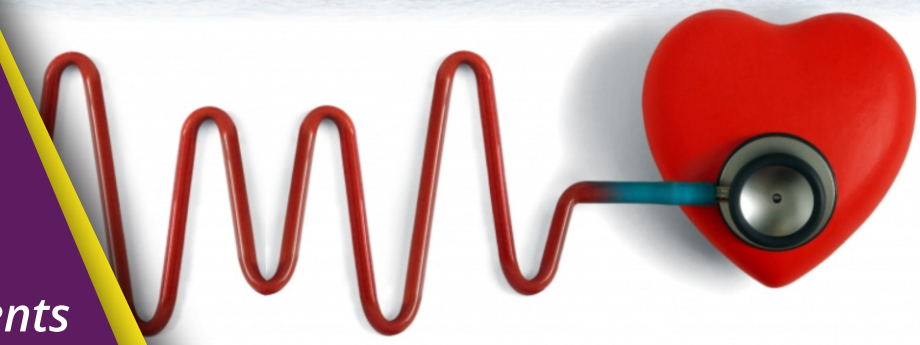

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"why go elsewhere?"

CONTENT

...THOSE THAT WON THIS BATTLE, PROSPERED BEYOND OUR WILDEST DREAMS.THOSE THAT DID NOT WIN, WITHERED INTO OBSCURITY...

EDITORS NOTE

Food. The most basic of necessities and more often than we might want admit, the scarcest. Food insecurity is a scourge.

Human civilizations of the past stood in the ring against this monstrous foe. Those that won this battle, prospered beyond our wildest dreams. Those that did not win, withered into obscurity.

The ancient Egyptians and Mesopotamians overcame the challenge of food security. Mesopotamians wrote the book on surface water distribution systems whereas the Egyptians properly utilized flood irrigation techniques.

These and many other innovations saved their communities. The spirit of innovation is what this magazine celebrates and nurtures.

From the deconstruction of systemic problems in the food sector to the analysis of the impacts of food on our health, here, one will find a vast assortment of insightful and educational articles written in an attempt to foster the spirit of innovation, witnessed in civilizations past.

I would like to thank the team of dedicated individuals that helped edit, design and produce this magazine. It is through your labors-of-love that it has come to fruition.

My gratitude goes out to the administration of the department of Environmental and Biosystems Engineering, that has have encouraged and supported us throughout the process of making this publication.

Finally, recognize that 'tis for you, dear reader, that much effort has been devoted in this endeavor, but not in vain.

Read and internalize the information and lessons herein. Only then, will we be able to effect change in our society. We shall not fade into obscurity.
'We shall not go softly into that good night.'

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A 3rd year Biosystems Engineering student whose interest is easily piqued by environmental issues. As a student engineer, he holds the belief that ruthless focus always translates to results. A leader in his own right.

NIXON

A finalist best described as woke. A quick interaction with her will tell you she highly esteems courage. Believes fear is a waste of creative energy and that most of our generation's problems can be solved by us changing our minds.

BEATRICE

Take a wacky sense of humor add consistent integrity, mix in some confidence and warm it up with a contagious smile, you get this finalist. He believes in humanitarian solutions to societal problems and works toward such ambitious goals. A student engineer leading from the front.

ALPHONSE

A steadfast, meticulous and diligent person, Joshua dedicates himself fully to whatever he decides to do. The personification of reliability, one is certain that every project he adopts will be completed in spectacular fashion. Furthermore, as one of great vision, Joshua inspires those around him to spare no effort in working for a better tomorrow.

JOSHUA

ENG. PROF.AYUB. N. GITAU
Dean school of Engineering

MESSAGE FROM THE DEAN

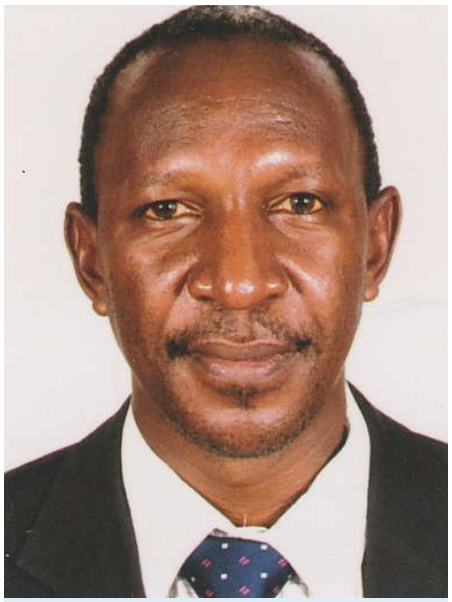
As the field of science, engineering and technology are constantly evolving faster than ever.

Our engineering curriculum is therefore designed to help students advance their knowledge in design and innovation in topics of your choice. Such innovation are what help solve the technical problems in our society in hope of achieving the Sustainability In Food Security .

The university in turn provides students with cutting edge lab facilities for experimentation and world class lecturers for consultation in various research areas.

The department of environmental and Biosystems engineering is a top notch department that produces competent graduates highly employable in various sectors both private and public in all the 5 thematic areas offered by the department that is ;Irrigation,Water Resources and Environmental Engineering, Mechanization ,Power and Machinery Engineering, Processing , Structure and Environmental control.

This Magazine is just but a portal way to what Biosystems and Environmental engineering is,do enjoy .



ENG. DR. D . O. MBUGE
Chairman Department of Environmental and Biosystems Engineering

MESSAGE FROM THE CHAIRMAN

Ideally, the issues of food security is a matter that is approachable in various avenues, the application of science in a creative, yet innovative fashion is key , it requires contribution from all stakeholders.
Intergeneration of irrigation techniques and food storage technologies will bring a synergy in this efforts.
As a Country and Continent, this challenges of food security, industrial development and environmental protection will be solved by dynamic engineering design thinking with a more“Environmental and Biosystems “ Catharsis.
The department is catalytic factor in provision and Inspiration of the academic tools for the sustainable solutions for challenges such as climate change , shrinking biodiversity, increase in Urban and rural waste which require feasible and environmentally and socially acceptable measures.
The second edition of the Biosystems and Environmental Engineering students Magazine is a clear indicator that a breed of open minded and self driven engineers are at bay . The future is brighter .

UNIVERSITY OF NAIROBI
DEPARTMENT OF ENVIRONMENTAL AND BIOSYSTEMS ENGINEERING

Mission
To be a centre of excellence in undergraduate and postgraduate education and training in Biosystems Engineering Vision: To contribute to the attainment of Millennium Development Goals and Vision 2030 through teaching, research, consultancy and outreach in Environmental and Biosystems

Engineering Core Values:
- Innovativeness and creativity in the Engineering profession.
- Collaboration, networking and partnership for scientific and technological change.
- Relevance, effectiveness, performance, efficiency, impact and sustainability of Engineering practice.

BSc. Programme
- Basic sciences (Physics, Chem, Maths, IT, Eng. Graphics)
- Engineering sciences (Thermodynamics, Material science, Mechanics of Machines)
- Majors in any of the five thematic areas

Innovations
- Ecological sanitation
- Drip irrigation kit
- Digital mapping of rainwater harvesting
- Sisal Decorticator
- Groundnut Sheller
- E-learning course materials
- Constructed Wetlands

Research Activities
The department has had an active research programme in the areas of:
- Soil and Water Engineering
- Water Resources Engineering
- Agricultural Process /Food Engineering
- Granular mechanics
- Land Husbandry and Landscape Engineering
- Soil Tillage and Fertility Management
- Occupational Health and Safety
- Agricultural /Aquatic Machinery
- Concrete and Fibre Reinforced Concrete
- Timber and, Animal Housing
- Environmental Control and Simulation
- Rural Power, Transport and Access
- Produce Drying
- Water Systems Engineering
- Egg Incubation
- GIS and GPS Mapping
- Waste water management
- Environmental Impact Assessment and Environmental Audit

Industrial Attachments to:
- ICRAF
- Mabati Rolling Mills
- Davis and Shirtliff
- Unga
- Bidco
- Unilever
- Bamburi Cement
- Agrochemicals and Food Company
- Sugar and tea Companies
- Mastermind
- World Vision
- CMC among others.

International Linkages and Collaborations:
- University of Siegen – Germany
- EurA Innovation GmbH
- Department of Agri-Food Science and Technology - University Of Bologna
- Food and soft laboratory, ETH Zurich, Department of health science SWTZERLAND
- Biofuel Africa
- World Agro forestry Centre

Career opportunities:
- Government Institutions
- Parastatals
- Private
- International
- Academic Institutions

Academic Programme
Five thematic areas:
- Environmental Engineering
- Irrigation and Water resources Engineering
- Power and Machinery Engineering
- Process and Food Engineering
- Structures Engineering

Extra curricular activities Student Clubs
- Engineering Students Association (ESA)
- Environmental and Biosystems Engineering Students Association (EBESA) Professional Clubs
- Kenya Society of Environmental, Biological and Agricultural Engineers (KeSEBAE)
- Institution of Engineers of Kenya
- Engineers Board of Kenya (EBK)

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Let's Talk Food

Interview with Eng. Lawrence Kuria

Engineer Lawrence Kuria is a Head of Department of the Department of Water Supply and Sanitation Engineering at Norken International Limited.

What is food security?

Food security is the ability of each individual in a country to access sufficient food in sufficient variety at any time they wish.

Population numbers: 47 million

If one was to give every Kenyan a modest breakfast and one allocated sh. 20, it would cost close to Ksh. 0.94 billion. If were to then allocate an extra billion for lunch and another for dinner for a period of a 100 days, the total cost would come to Ksh. 564 billion. In a year we would need Ksh. 2.058 trillion, if the government were to feed every man, woman and child.

This is 76% of our national budget. This simple fact puts into perspective the fact that we truly have limited resources when it comes to food security.

If we were to include the distribution of food in sufficient volume and variety, it is astonishingly evident, the role that Kenyans play in feeding themselves. In truth, there is very little that the government actually does to feed you as an individual. If one were to plead," serikali inijalie hali", one would be perceived as irresponsible. Does our constitution not mandate that the government should bear this

responsibility of ensuring every person has food that is enough to eat and wholesome to one's health?

Thus, we see the fundamental problems of the definition of food security. It makes very many assumptions. It assumes that the food has been grown, but who produces the food and where it is produced are not defined.

As far as food security is concerned, our country is in a dire situation, not regarding the recommendations of the United Nations' Committee on World Food Security.

> Upon examination of our education system, any agricultural work is regarded as manual work and all manual work is poorly regarded.

President Uhuru's Big Four agenda rightly recognized the importance of food and nutrition to the society. This was progress in the right direction. However, if one analyzes the distribution of funds keeping in mind the simple statistics mentioned above, it becomes apparent how critical our situation really is.

As an engineer, a biosystems engineer, the parts of this equation that you can influence are primarily in food production. Food production precedes food availability. Food, like any other organic material, requires water for growth.

Unfortunately, in Kenya 97% of agriculture is classified as rainfed agriculture. The proportion of agriculture employing any type of technology is 1%. At the same time, the food produced by rainfed agriculture only accounts for 10% of our food requirements. Our investments in improved technologies are clearly insufficient.

There is need for a renewed approach if our need for accessible and sufficient food is to be met.
Regional organizations put in place to tackle societal issues such as IGAD, AU and EAC, regard issues of food and food security as peripheral. They seem to have a strong preference for pushing trade and security, all of which are important.

So, even if food is available in the areas of the country / continent that can support the growth of the food, making it available to all is another challenge. In the event of a famine, food often has to be imported. Bringing in this food such that it arrives to those in need in a timely manner is a huddle to be overcome. Assuming this huddle is overcome, ensuring this food in nutritionally wholesome is another huddle. The final and perhaps, most difficult huddle to overcome, is that of cost.

A different way of thinking is required. One has to be brought up to think, 'Food'. Upon examination of our education system, any agricultural work is regarded as manual work and all manual work is poorly regarded. Even some of the corporal punishments issued in school, were to engage in agricultural activities. How then, can one cultivate any kind of expertise in such a poorly regarded yet extremely vital sector?
It is therefore easy to see that the solution to food security in our country, has to begin from very far. This also applies in the solving of other problems that plague our society such as corruption and the instilling of values of personal responsibility among members of the society.

The issue of food security is beyond our government, our policies, our systems, our attitudes: It is truly beyond us all as individuals.

Where then do we start?
A systemic change in the policies and the attitudes we bear towards food and food production is required. The agricultural sector's policies are highly demotivating to the farmer. The agricultural sector lacks sufficient renumeration to motivate more food production. In a comparison with our fellow neighbor Uganda, both milk and maize are cheaper in Uganda. Even fuel is cheaper in Uganda and yet all their fuel passes through Kenya. Similar to our policies on fuel, it is our policies that are inflating the costs of our agricultural inputs, raising the cost of our food. The law is very clear and quite patriotic, but when it comes to the implementation of these laws, agricultural inputs like fertilizer are treated just like any other motor vehicle spare part. Surely, the two are not equivalent. The person choosing to invest in agriculture cannot be treated the same as any other businessman. No offense to businessmen. Production of food should be made into a viable enterprise.
In the medium term, investments to projects that can raise our capacity from 10% of our food requirements to 50% or above should be made. In the long term, we need to put in place policies that will conserve the most vital resource in agriculture; water. Protection of our soils from erosion and maintain our environment is key. We need to implement policies to manage the impact of climate change on us.
Marshal the experts and put politics where it belongs. We have the capacity to change this country if we but focus on a common vision, a common goal and work together. #EmPowerTheFarmer

BUY FOOD INSECURITY GET OTHER PROBLEMS FREE

-Winny Dorothy Adongo

Food security is the state of having access to adequate amount of food at all times to meet dietary needs. According to WHO, food security is achieved when all people, at all times have physical and economic access to adequate, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. It's not characterized merely by the availability of food but affordability in adequate quantities and containing essential nutrients.

A research by the Government of Kenya in 2009, outlined the criteria of classifying communities as food-insecure. These include nutrition, availability of food and food stability and accessibility.

Nutrition is the study of nutrients in food and how the body uses them and their relationship between diet, health and diseases. Malnutrition accelerates child mortality rates. Malnutrition is prevalent in areas where poverty and drought is high.

The availability of food in appropriate quality and sufficient quantity is essential in communities. The food sources can be domestic production or importation. Food unavailability can be caused by natural disasters such as pest-infestations, floods and drought, wars and epidemics that constrict food supply. This causes inflation of food prices. Consequently, increase in mortality rate, especially in children due to starvation and diseases caused by low body immunity. If our communities are going to survive and thrive then availability of food should be taken more seriously.

IN KENYA **1.82** MILLION KIDS ARE SUFFERING FROM CHRONIC MALNUTRITION...

Food stability and accessibility is where a household, individual or population have access to food at all times irrespective of economic and climatic crisis. Kenya has tried to attain self-sufficiency in production of foods such as maize, wheat, rice, beans, milk and meat. In the 1970s maize production was in surplus but of late Kenya has been importing maize, an indication that the stability is dwindling. Unfortunately, attaining self-sufficiency does not automatically imply that household food security is achieved. Exorbitant prices of food caused by factors such as high fuel prices, poor infrastructure among others cause a lot of households not to attain food accessibility.

It has been noted that food insecurity as a problem morphs into other issues in our communities. Poverty is one of this issue.

In 2016, it was reported that 35.5% of Kenya's population is living on less than $1.90 per day alias, poverty line, which is basically a third of the population. Poverty and food security are intricately interlinked. Without an income or resources to grow food people's health deteriorates and so does their productivity.

Undernutrition is another intertwined issue. It's basically not eating enough food containing substances necessary for strong immunity. In Kenya 1.82 million kids are suffering from chronic malnutrition and it is known to cause half the death of the kids under 5 years. It also creates diminishing brain and physical development and reduced productivity.

Kenya has made progress in reducing stunting and underweight in children, as well as encouraging breastfeeding but poverty and drought are still a hampering factor in our country.

Productivity of this country hinges on the attainment of food security. The government must involve all the stakeholders to come up with long lasting solutions to this leach that's sucking our community dry. Some of the solutions can involve; Reduction food waste, Investing in infrastructure, Improvement of trade policies, Promotion of diversification and Working toward defeating climate change.

Winny Dorothy Adongo is a student at Multimedia Univerisity of Kenya. winniedorothy5453@gmail.com

FOOD FOR THOUGHT

- Agnes Jagongo

There's one phrase that most people like me grew up with. "Don't waste food because someone out there is starving." True?

Agriculture is the backbone of our economy yet there are so many issues around it.We can say *Points Ni zile zile*. History students know what I mean. So, I assume that some of the food waste reasons would include; - lack of infrastructure (poor roads for instance), poor storage facilities and use of old tillage and storage methods.

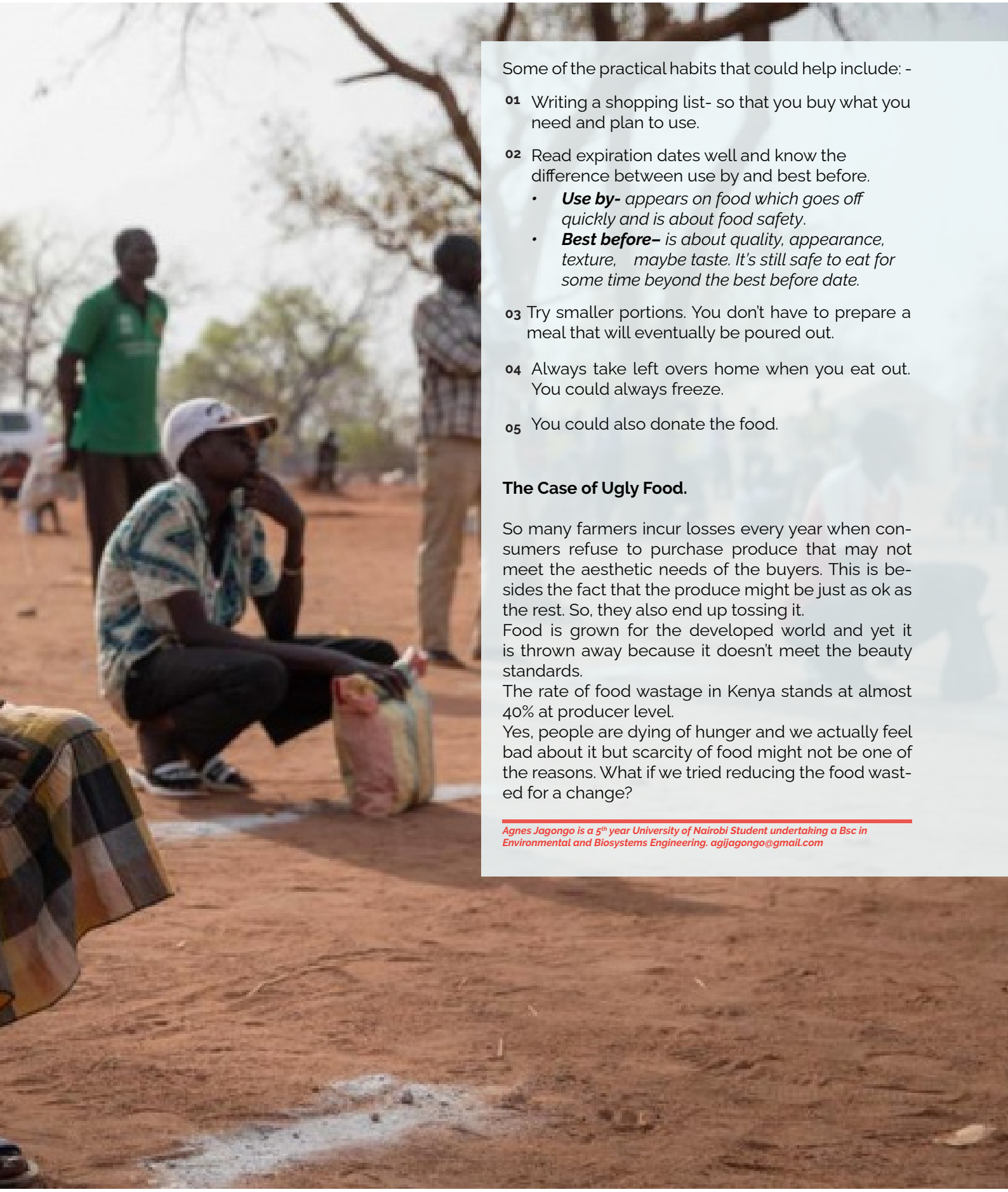
Did you know?

Food wastage contributes to Global warming. Rotting food in landfill sites lets off a very strong harmful gas called methane, a gas more dangerous than carbon monoxide. Hence in essence food waste harms the environment leading to climate change.

30 – 40% of food produced in this country never get eaten which is a mind-boggling amount.
Between leaving the farm and reaching our plates, food goes through a number of stages making up what we may call, a food chain. Unfortunately, food is wasted across the whole chain and that's not all, when we waste food, we are also wasting all the resources that went into its production like land, water, effort and energy.

What of food security?

Increasing food availability has always been the main solution to achieve a food secure future but reducing food loss and food waste can also alleviate poverty while reducing pressure on the climate and water supply. If food waste were a country it would be the third largest of carbon emissions behind the US and China.
The reality is that we can't point a finger at a particular people or specific organizations and say, "stop this". Instead let each man, woman and child take up the responsibility of curbing food waste.



Some of the practical habits that could help include: -

01 Writing a shopping list- so that you buy what you need and plan to use.

02 Read expiration dates well and know the difference between use by and best before.
- ***Use by-*** *appears on food which goes off quickly and is about food safety.*
- ***Best before–*** *is about quality, appearance, texture, maybe taste. It's still safe to eat for some time beyond the best before date.*

03 Try smaller portions. You don't have to prepare a meal that will eventually be poured out.

04 Always take left overs home when you eat out. You could always freeze.

05 You could also donate the food.

The Case of Ugly Food.

So many farmers incur losses every year when consumers refuse to purchase produce that may not meet the aesthetic needs of the buyers. This is besides the fact that the produce might be just as ok as the rest. So, they also end up tossing it.
Food is grown for the developed world and yet it is thrown away because it doesn't meet the beauty standards.
The rate of food wastage in Kenya stands at almost 40% at producer level.
Yes, people are dying of hunger and we actually feel bad about it but scarcity of food might not be one of the reasons. What if we tried reducing the food wasted for a change?

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OUT OF A TOTAL UNDER-5 POPULATION OF 7 MILLION, 1.82 MILLION CHILDREN (26%) ARE SUFFERING FROM CHRONIC MALNUTRITION

FIRST FOOD

- Collins Mlamba

There are many things that bring people together and food is one of them. Likewise, food could also easily feature in the list of things that divide people. It does not come as a surprise that food is one of the basic needs, outweighing even those things we have come to cherish more like wealth and fame. A hungry man is an angry man and food is one of the surest paths to every human heart.

Food security, according to the United Nations' Committee on World Food Security, is defined as the means that all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life.

The issues around food in Kenya go over and beyond just food security. The agricultural sector is not only the driver of Kenya's economy but also the means of livelihood for the majority of Kenyan people (Key sectors, n.d.).

From 2013-2017, the agriculture sector contributed on average 21.9% of gross domestic product (GDP), with at least 56% of the total labor force employed in agriculture in 2017, and accounted for up to 65% of merchandise exports in 2017 (Kenya Economic Update: Transforming Agricultural Productivity to Achieve Food Security for All, 2019).
Kenya can sufficiently produce enough food to feed all its people and still have enough to store or sell, yet one still hears of people facing starvation. In one part of the country there is more than enough food while in another part there are only empty plates, if there are plates at all. In Kenya, food is not so much a problem of availability as it one of access. A broken connection between the farm and market, coupled with an overwhelming number of middle men as well as poor infrastructure only serves to deepen the food security 'problem'.

Fluctuation of prices in the market is not just a stand-alone problem. There are a million and one factors that result in such unpredicted changes in food prices. From exploitation by middle men, to poor infrastructure, to high production and storage costs, to adverse weather conditions, to unreliable policies and organizations: fluctuation in prices only seems like the most likely outcome.
The levels of poverty experienced by a sizeable population of Kenyans only serves to worsen the situation. A third of Kenyans are living below the poverty line (that is 15.9 million out of 44.2 million Kenyans) and more than half (53%) of the population (23.4 million) are multi-dimensionally poor ("Sad Reality of 23.4 Million Kenyans Living below Poverty Line," 2020).

It is saddening and heartbreaking when one of the basic needs for every human being becomes elusive to very many people, and seemingly not very many people care. For instance out of a total under-5 population of 7 million, 1.82 million children (26%) are suffering from chronic malnutrition (stunting or low height-for-age) (Kenya National Bureau of Statistics (KNBS) et al. 2015).

The farmer should be empowered in production as well as in access to markets and financial aid. There are numerous advancements in agricultural technology as well as in food processing.

A careful, strategic and timely implementation of this will help lift the country out of food insecurity. A reliable connection between the farms and markets will be instrumental in ensuring increased access to healthy food by every Kenyan. The set-up of more value addition units for the foods produced will not only reduce the amount spent on processed food imports but will increase living standards, provide employment as well as increase the value of exports.

The access and availability of food is not a greater need than is the quality of the food. Policies that ensure safety and hygiene standards in the production, processing, storage and transportation of food at all levels is key also in matters food security. The policies should not just be restrictive but they should also be enabling as well as inclusive.

A lot of food goes to waste while a lot more people go days without food. Food security should be the greatest of all agendas in this country because a people that are well fed are a happy people and a happy nation.

Collins Mlamba is a the author of this article. You can contact him at mlambacollins@gmail.com

FACT

A study conducted recently has demonstrated that hydroelectric dams emit a billion tonnes of greenhouse gases a year. This represents 1.3% of total annual anthropogenic (human-caused) global emissions. Methane is produced at the bottom of the reservoirs, where oxygen is low and bacteria decompose organic material, like trees and grasses, which is already present or carried by watercourse. Part of the methane becomes CO2; the rest is carried to the surface as bubbles.

WASTE FOOD, POLLUTE THE ENVIRONMENT

- Brenda Donna Onyango

Now, most of the times when we talk about food we just look into how important it is to the human body and forget the food loss and food waste. Food loss is the food lost in the earlier stages of production such as harvest. Food waste is the disposal of food items despite being fit for consumption. Food waste is a very important aspect of climate change. It is rarely mentioned compared to its counter-parts such as carbon emission from fossil fuels.

According to FAO, a third of the global food production is wasted annually meaning it is disposed to the environment. This percentage is just set to grow with the world's population, projected by FAO to grow from the current 7.6 billion to 9.8 billion by 2050.

Whenever food is wasted, the resources used to produce the food are also wasted such as the irrigation water, land for planting, fuel used for transport and labor.
Food waste has been proven to cause environmental pollution in the following ways:

a) Air pollution.

Food waste dumped in landfills break down and emit greenhouse gases such as carbon dioxide and methane which is about 25 times more potent than carbon dioxide. Greenhouse gas emissions from food waste have increased more than 300% over the past 50 years. This makes it easy to predict that with the population growth and the current waste trends, there will be an exponential increase of GHG emissions in the coming years.
According to FAO, the carbon footprint of food waste is 3.3 billion tonnes of carbon dioxide per year. This doesn't just contribute to climate change but also cause diseases to the people living around the area. Thus, most people prefer to stay far away from the landfills which brings the next point.

b) Land pollution.

Not only does the landfills take up a lot of land that would otherwise be used for other purposes but the stench from the landfills chase away people which leads to waste of good land. The soils in the areas are also polluted and thus no agricultural activities are viable. This causes major degradation of land.

c) Water pollution.

The waste thrown in the landfills pollute the underground and surface water since the chemicals produced after breakdown are leached as well as washed away. This ends up polluting water used domestically and ultimately leads to diseases.
So, how can we reduce food wastage? It all starts by involving all stakeholders inclusive of consumers, producers, the food industry and policy makers.

The producers can do the following to ensure no food losses and wastes.

01 Harvesting at optimal time.

02 Investing in better storage technology and composting unavoidable organic waste.

The Food Industry can contribute in the following ways:

01 Donating unsellable but edible food.

02 Allowing the consumers to customize the food they buy.

Consumers can help by:

01 Buying just enough amount food.

02 Store food properly; make use of freezers and refrigerators.

03 Heeding to expiration dates.

Policy makers can:

01 Set binding food wastage reduction policies.

02 Fund and create an awareness campaign to reduce food wastage.

On a lighter note, did you know that avocado has the most percentage of most minerals needed in the body?If you want to add them to your body all at once, just have an avocado.

Brenda Donna Onyango is a 5th year University of Nairobi Student undertaking a Bsc in Environmental and Biosystems Engineering. brenderdonna@gmail.com

THE PROBLEM OF OUR EXISTENCE

- Yvonne Kwamboka

Food security can be said to be a state in which all people have access to adequate food to lead healthy and active lives. To ensure that people have regular access to food, they need a good source of income. Food insecurity is a global issue and a public health concern. The causes of food insecurity in Kenya include but are not limited to: poor agricultural practices, high input prices, climate change (drought, floods), decline in world food stock, uneven food distribution, lack of access to markets by small holder farmers, under-investment in rural infrastructure, poverty, political instability and poor housing. We live in a world of finite resources. An increasing population applying ever-increasing pressure on these resources further exacerbates the problem of our existence.

This is the problem faced by all organism that have ever or could ever exist anywhere ever. We as humans have only just recently come together to try and solve this problem but we also hinder and slow any progress made.

We, however, do not share a common existence. I can only speak for myself. You can only decide for yourself. We must each make the decision to take us this responsibility as individuals first and as a society later. Let us thus investigate this problem further.

The economy is in a state of constant flux where ever changing-prices of food shoot up, especially during dry season, increasing the mortality rate. Vulnerable people, particularly young children, lactating and pregnant mothers, the elderly and the sick- HIV/AIDs patients, cancer patients etc., are severely more affected by these unjust circumstances.

Currently over 10 million Kenyans suffer chronic food insecurity and poor nutrition and four million people require emergency food assistance.

Hunger results reduced productivity at the work place and in school thus decreasing the overall capability of citizens. Consequently, the mental health of the citizens also suffers. The nation is left at a substantial loss.

World Food Program works with 'Feed the Children' to serve regular meals to children in 170 schools throughout Kenya in hopes to mitigate the crisis. Action against Hunger (2015-2017) has strengthened its approach to address health problems in Kenya by implementing programs in nutrition and food security. USAID's Office of Food for Peace (FFP) supports WFP to pro-

vide relief among Kenyan population through the US in-kind food aid or cash transfers.
Kenyans in this food insecurity crisis depend of food aid from foreign countries, which is initiated by the government and for how long? The economy of Kenya affects this food crisis. There is high dependence on agricultural imports thus fluctuations in the global market. Poor allocation of funds to such projects to alleviate hunger only keeps the beast at bay. Increasing national debt doesn't help us either as the funds owed to the debtors and the funds used to feed the citizens are all sourced from the citizen as taxes.

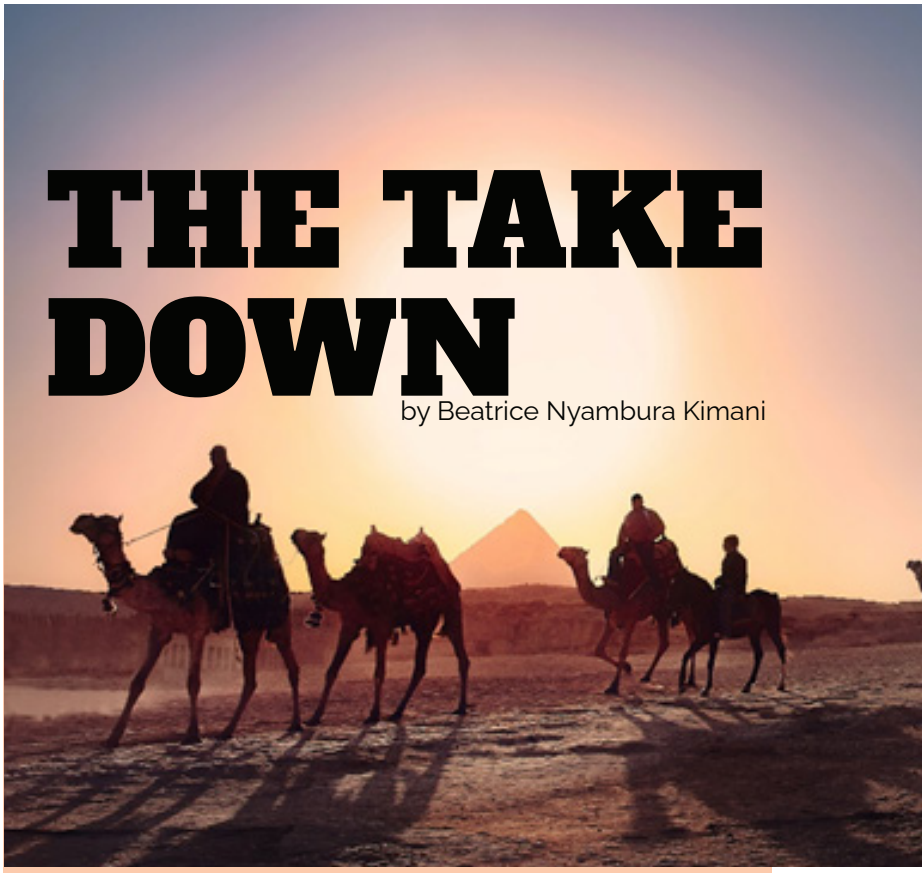
Kenyans face challenges of poor governance from our leaders that lead to debts and lack of sufficient food for the population. Upcoming leaders make promises of dealing with such situations but are nowhere to be seen once the elections are concluded. Greedy politicians squander the governmental-funds for their personal use.

Hunger is in the slums and in the streets where street children scavenge for food. It is in the unstable households in which children have are bereaved of one or both parents or parents. It is in families that lack a stable source of income. Hunger is in the deserted homes, in the arid and semi-arid regions.

The food policy mandated by the government should cater for the needs of all by reducing the prices of food for the average income earners to afford. Money should also be fairly distributed to agricultural practices to improve the quality of food across the country. There should be improvements in infrastructure for farmers to access the markets.

There has been crisis for workers of the factory in Mumias in which the workers have not been paid for over three months. This demoralizes workers. Sufficient pay enables workers to produce food for citizens in plenty. Working together for the benefit of all.
Effort put into solving these problems or at least alleviating their effects would go a long way in improving the state of our lives as Kenyans.

Yvonne Kwamboka Keraka is 3rd year a student at the University of Nairobi inthe school of Pharmacy. You can contact her at yvonnekwambi@gmail.com



THE TAKE DOWN

by Beatrice Nyambura Kimani

EGYPT. What comes to mind? Frankly for me it shouts desert. How is it then that this desert-ridden country not only meets its own food demands but produces surplus for export? Despite the small area of arable land and irregular insufficient water supplies, Egypt's agricultural sector remains one of the most productive in the world. What are they doing right?

The wettest part in Egypt is called Alexandria and it only receives about 200mm precipitation per year while here in Kenya, the arid and very arid areas receive an average rainfall of between 200 and 600mm per year. What are we doing wrong? Is it because Egypt is believed to have begun agriculture way earlier than we did? Agriculture in Egypt contributes to nearly an eighth of the GDP, employs roughly a quarter of the labor force and provides the country, through agricultural exports, a source of funds through foreign exchange.

Could It be said that we are not keen as a nation; large tracts of land left unutilized because we are out there looking for white- and blue-collar jobs. We are considered as a water scarce country because we fail to properly manage our rainwater and lose it to surface runoff. We have constrained mechanization in the country due to uncoordinated research and inadequate information on agricultural mechanization. We could continue on how, as a country we are failing or we could find out what Egypt is doing and incorporate their ideas. Let's find out what Egypt is doing.

Irrigation Systems

To make best use of the waters of the Nile river, the Egyptians developed irrigation systems. Irrigation granted them greater control over their agricultural practices. It was also used to provide drinking water.

The earliest and most famous reference to irrigation in Egyptian archaeology has been found on the mace head of the Scorpion king which has been roughly dated to about 3100BC. The mace head is an ancient depiction that illustrates the pharaoh cutting into a ditch that is part of a grid meant for basin irrigation.

Farming Systems

The civilization of ancient Egypt developed in the arid climate of northern Africa. This region is distinguished by the Arabian and Libyan deserts and the river Nile. The Egyptians took advantage of the natural cyclical flooding pattern of the Nile. The water levels of the river would rise in August and September leaving the floodplain and delta submerged by 1. 5meters of water at the peak of flooding. This is known as inundation, the soil left behind by the flood, called silt, is fertile and promotes crop growth.

Agriculture

The civilization of ancient Egypt was indebted to the Nile River and its dependable seasonal flooding. The river's predictability and the fertile soil allowed the Egyptians to build an empire on the basis of great agricultural wealth. The Egyptians are well known to practice agriculture on a large scale this is due to the development of basin irrigation systems.

Basin Irrigation

Egyptians developed and utilized a form of water management known as basin irrigation. A crisscross network of earthen walls was formed in a field of crops that would be flooded by the river, when the floods came the water would be trapped in the basin formed by the walls. The grid would hold water longer than it would have naturally stayed allowing the earth to become fully saturated for later planting. This practice allowed them to control the rise and fall of the river to best suit their agricultural needs.

Horticulture/Food crops

Orchards and gardens were developed in addition to field planting in the floodplains. These gardens and orchards were generally used to grow vegetables, vines and fruits trees. The Egyptians diets revolves around several staple crops especially cereals and barley. Other staple food grown included beans, lentils, chickpeas, fava beans and root crops (onions, garlic, radish)

Industrial and Fibre crops

Egyptians relied on agriculture for more than just production of food, they were creative in their use of plants using them for medication and part of their religious practices, and in the production of clothing. Herbs perhaps had the most varied purposes they were used in cooking, medicine as cosmetics and in the process of embalming.

On that note, we can clearly see that Egypt defied all odds and eventually came out victorious. It's our belief that if everyone, especially the youth, would have a positive attitude towards agricultural activities then this would help our country tremendously. Our motto should be 'If Egypt the desert country can do it so can we'. This will be the take down of our attitudes towards agriculture.

Beatrice Nyambura Kimani is a 5th year University of Nairobi Student undertaking a Bsc in Environmental and Biosystems Engineering. brandambassador13@gmail.com

FACT

The Sahara Desert at one time was lush grassland and savannah. Overgrazing and/or climate change in 8000 B.C. began to change the area from pastoral land to desert. Now it is the world's largest hot desert at over 9,200,000 square kilometres—roughly the size of the United States. Antarctica is considered the largest desert (of any type) in the world.

PHOTO GALLERY

PHOTOS OF STUDENTS PRESENTING THEIR MECHANICAL DESIGN PROJECTS

PHOTO GALLERY

PHOTOS OF STUDENTS AT THE ANNUAL 5TH YEAR DINNER

An Interview with EVANDER

How did you become "Governor of CAE"?
It was definitely difficult. Partially due to the notion that being from EBE and schooling from Kabete, I would be a "Governor Away from Home". We were however able to dispel those rumors and win eventually. Through careful planning and mobilization, we are able to campaign well even amidst the Corvid-19 pandemic and emerge victorious.

What are the key responsibilities of the "Governor of CAE"?
As the CAE representative, I have many responsibilities. Students' welfare and academic welfare are key. The College of Architecture and Engineering, is home to the crème de la crème of this country. If they are to serve their communities well, the educational foundation they receive must be of the highest standard. This includes both class lectures, industrial exposure as well are corporate exposure. I look for internships for our students as well as industrial and field visits.
Given the current state of the country, we have encountered an unexpected challenge in the facilitation of these services. However, with the country slowly opening up, we look forward to once again providing these services.

One takes up office to bring about change. One cannot bring about change without first identifying it. In the social sphere, what are the flaws you have identified in CAE and which of these have you decided to do something about?
CAE has a weakness in the extent to which students participate in the Universities. CAE students are ever in their books and yet they have some much more to offer. Their talents and ideas are left unstimulated and under-utilized in the 5 years of their study. There is a lack of a platform in which students can showcase their talents.
To this end, I plan to establish the first ever Talent and Innovation Week for CAE. A platform where student's ideas and talents can be showcased, nurtured and appreciated.

How did you get into politics?
I have always aspired to be a great leader. In high school, I held leadership positions. When I joined the University of Nairobi, SONU had been undergoing some changes and UNSA's unveiling was underway. I had a vision of holding the position of CAE representative from the first day. In fact, in first year, my fellow first years and I, formed a team towards this goal but unfortunately our plans were foiled by a provision in the constitution stating that students vying for this seat must not be first or final year students.

'Politics is the engine that enables people to come together and work for a common purpose.' However, people don't make arbitrary decisions. They come together and rally under the leadership of a singular person. Why did people choose to follow you?
I am trustworthy person, a team player and a visionary leader. My integrity is beyond reproach and I am a mindful person conscious of the needs of the people I lead. This is who I am, with or without the office. I have been an active participant in the planning and facilitation of the EBESA activities for years despite not holding any EBESA position.

How would you describe your personality?
I am an extrovert. I am very active and industrious. I love interacting with people in all manner of events and occasions.

What is one last time you would like to say?
My life's purpose Is to motivate those around me to achieve their dreams. My success is seeing people achieving all they can be. That is my happiness.
I believe in integrity, influence and innovation.

I AM A **TRUSTWORTHY** PERSON, A TEAM PLAYER AND A VISIONARY LEADER.

Thank you 'CAE'sians' for this opportunity. I will do my best to achieve what I promised. To my department, Biosystems, I want to put you on the map. Thank you.

I would like to thank my team, without whom none of this would have been possible.
Special Thanks goes out to:
Sheryl Cherono – 4th Year Civil Engineering

Millenials vs Agriculture

- Joshua Mwamu

IF WE ARE TO GET APPROPRIATE SOLUTIONS TO THE FOOD INSECURITY ISSUE THEN WE CANNOT AFFORD NOT TO INVOLVE MILLENNIALS.

Described as a generation that is taking too long to grow up are the millennials, my generation. Millennials are different from the previous generations on a grand scale. The essence of 'popular' is rapidly changing.

On top of the list of 'things becoming unpopular' is baggy jeans and agriculture. It seems like practicing agriculture among the millennials is viewed as an awful activity. Why would one want to commit social suicide by declaring that a love for agriculture brews in them? It's as if the society is a boxing ring; on the blue corner are the millennials and the red corner Agriculture.

Food Security is among one of the agendas of the vision 2030, a towering reflection of the determination of the human spirit. According to the publication, 'THE STATE OF THE WORLD series of the Food and Agriculture Organization of the United Nations' of 2019 the number of people who suffer from hunger has slowly increased. As a result, more than 820 million people in the world were still hungry in 2018, underscoring the immense challenge of achieving the Zero Hunger target by 2030. We need solutions to food insecurity and as the population increases, we need them fast.

They say the future of a nation is in its young populace. Millennials are the only faction of the populace that are not actively involved in the conversation of food security and our country Kenya is not spared. This perhaps is partly the fault of the older generation for not giving us a seat in the table.

If we are to get appropriate solutions to the food insecurity issue then we cannot afford not to involve millennials. Millennials versus Agriculture is a war that gains traction because of the perception of agriculture. Agriculture is perceived as disconnected from technology which is at the core of being a millennial. But this can be altered by digitalizing farming for instance projects like smart farming.

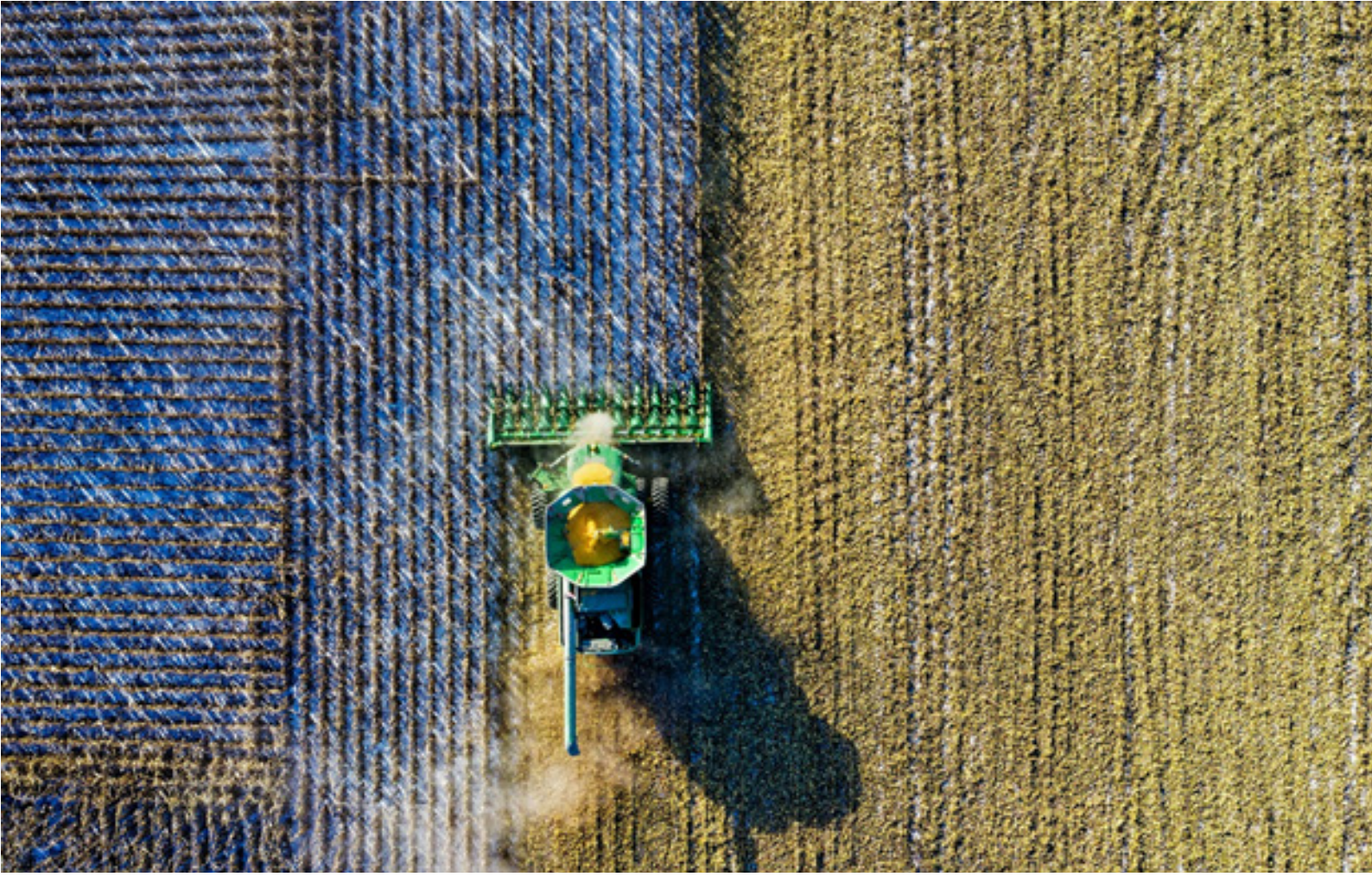
Farming in the 19th century cannot be compared to the 21st century due to the needs and resources having changed. As our numbers, there's need to increase farming lands in the country. This is the reason why many irrigation schemes are coming up. Irrigation allows farming on lands that would otherwise not have supported faming. Millennials too can get involved in this. Just recently the 8 Billion project, Galana Kulalu, was declared a failure by the Israeli ambassador, Noah Gal Gendler. This project, funded by the Israeli government, was to develop a 10,000-acre model farm in the one million-acre irrigation scheme for crop production in Kilifi and Tana River counties. A failure in the government's part. It's about time change came from the youth in that, millennials can explore ways to come up with private companies that oversees projects in the agricultural sector such as irrigation. Long gone is the time for pointing fingers and blaming the government.

Millennials in Kenya need to venture into irrigation, or even better smart irrigation. We as millennials need to have a system whereby we form partnerships, seek for funding and establish farms with local-based agendas to produce food for this country. This could be part-time or full time initiatives but in the baseline, aimed at producing affordable, sustainable, safe food for our country. The war for the millennial shouldn't be against agriculture but food insecurity.

Why should every millennial be alarmed about our world? Because all over the world, the notification sound for 'food low' is being heard. Why should every millennial in Africa be worried about our continent? Because, hunger is on the rise in almost all African sub regions, making Africa the region with the highest prevalence of undernourishment, at almost 20 percent.

Why should every millennial in Kenya be worried? Because we are not doing any better. Let's not pick a fight with agriculture but with this thing that's taking away our fellows in parts of the country; food insecurity.

Joshua Mwamu is a 5th year University of Nairobi Student undertaking a Bsc in Environmental and Biosystems Engineering. jmwamu.jm@gmail.com



RESEARCH:
THE SILVER BULLET

- *Mulinge Grace Mumbua*

The issue of food security has become a large concern over the years in Kenya. Food Security is defined as the state of having reliable access to a sufficient quantity of nutritious food. Kenya has the largest, most diversified economy in East Africa with agriculture being its backbone. More than 75 percent of Kenyans make part of their living in agriculture, and the sector accounts for more than a fourth of the Gross Domestic Product (GDP).

However, agricultural productivity has stagnated in recent years despite continuous population growth. Moreover, only about 20 percent of Kenyan land is
suitable for farming, and in these areas maximum yields have not been achieved, leaving considerable untapped potential for productivity .

Food insecurity persists due to various factors. Most farmers don't have access to basic agricultural inputs or updated technology and they lack adequate financial and extension services. Recurrent crises such as drought in arid and semi-arid areas have exacerbated the vulnerability of basic livelihoods.

This has posed critical challenges to food security. Over two million Kenyans receive food aid annually. USAID is focused on increasing agricultural productivity and incomes for smallholder farmers by increasing access to credit for farmers and agribusinesses; and building more resilient communities that can move out of humanitarian assistance and into development .

Climate change is a major contributing factor to food insecurity. Inconsistent rainfall due to the change has led to diminishing yields making food supply in Kenya a challenge. Kenya is a victim due to the lack of funds and tools for research in combating climate change. Paradoxically, many farmers are not even aware of the growing concern of climate change in the world.

This therefore leads to low production as many subsistence farmers continue using traditional methods of seasonal agriculture despite the climate having changed. Climate change also causes increased floods and drought leading to a decline in food production both in large scale

and small scale. To mitigate the issue, the country is required to put more effort in research on climate change. Being a signatory and member of the Paris agreement on climate change as well as other Climate and environmental agreements is not enough. Domestication of the regulations and full implementation will provide wind to the sails of food security.

Aside from climate change the environment also plays a role. Over the years, ecosystems and biological diversities have gradually changed. Animals and plants are increasingly becoming extinct leading to food shortage humans and animals struggle to survive in such times. There's minimal research done on balance of ecosystems thus the agricultural sector is left in the dark on the effects this has on food production. Equipping the sector with this knowledge is another effort to provide wind to the sails of food security.

Another factor is not embracing of new technology to curb food insecurity such as the use of GMOs (Genetically Modified Organisms). Viable solutions such as GMOs foods have faced major hurdles in their path. Most Kenyans fear that these forms of crops are unnatural and harmful for consumption. Others believe that it's nothing but a ploy by developed countries to 'extinct' developing ones. Although, there's no conclusive information about GMOs safety, the products undergo strong regulations for import and export .

To enable better use of GMOs, extensive research is required as well as effective public sensitization. It is however noted that the government is very keen on public safety and research institutes on Agriculture continue to work towards better use of GMOs. Cross breeding and grafting have been seen over the years as a way of increasing agricultural production.

A growing concern is the lack of focus in other agricultural sectors such as Aquaculture (rearing of fish) or Apiculture (bee Keeping) and Livestock keeping. Many farmers rely heavily on cash crop production hence little or no concern is given to research and production of food crops.

Bee keeping and fish farming provides both food and income to communities living in lands not arable. It is also noted that many communities are shifting back to traditional sources of food such as wild fruits, vegetables and insects. This will help combat the issue of food shortage as it diversifies food in the granary. However, research on the safety and consumption of such foods should be considered since some sources may be unsafe. Communities that hunt should be regulated to prevent extinction of animals.

Pastoralism is a major food source for nomadic communities. Regulations and more government involvement will help in bettering the lives of many pastoral communities. This has been noted in cross breeding research to ensure rearing of high yielding, drought resistant breeds and government participation in livestock auctioning.

Research is the only way to ensure the issue of food shortage is combated. Research in GMOs, climate-smart agriculture, alternative food sources and appropriate technology should be at the fore. Lack of adequate financial assistance and equipment should be addressed in the various research institutions.

PASTORALISM IS A MAJOR FOOD SOURCE FOR NOMADIC COMMUNITIES.

[1] *Kenya_Agriculture_and_Food_Security_Feb_2020.pdf (usaid.gov)*
[2] *Kenya_Agriculture_and_Food_Security_Feb_2020.pdf (usaid.gov)*
[3] *The Kyoto Protocol and The United nations Framework convention on climate change.*
[4] *The Biosafety Act*

Grace Mulinge is a fourth-year law student at the JKUAT, currently serving as the Deputy President of the International Law Commission under the Kenya Model United Nations National Secretariat

THE FUTURE IS AGROBOTICS

-By Nixon Khaemba

The future is a beam in the horizon an enigma that we hope but not certain of what it might hold.
In the world of science and engineering time is just but a tool of the continuum of innovation.
Going into the first quarter of thecentury a lot has been advanced and the rate at which innovation grows is outstanding.
The use of IoT and drones is increasing at a fast rate and the world is moving towards the synchronization of machines and man.
Watching cinematic works from Holywood we sometimes get an envisioning of how the world is taken over by robots. The future of agriculture and life as we know it is going the direction of robotics and Artificial intelligence.

Currently these two elements are majorly used in plants and industries in:

01 Automated harvesting systems.
02 Robots for weed control.
03 Robots with autonomous systems for navigation in the fields.
04 Robots mowing, pruning, seeding, spraying and thinning.
05 Robots in nurseries.
06 Robots for sorting and packing.
07 Agricultural robot platforms.

Let's level up! Make this a tad fun. think of agrobots (Robocop's sister), bringing down all the pests in your farm. imagine having a farm that is alive but not only alive but capable or self-sustenance and the self- maintenance. Heck looks so far-fetched, so out of reach, but wake up and smell the roses!
Let's break down to the dynamics and make this bots limbo.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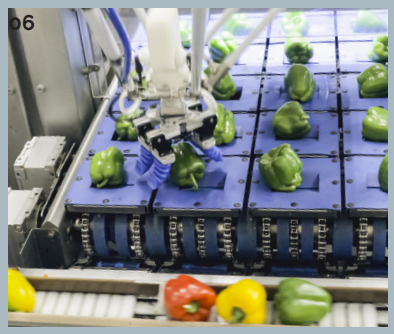
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The use of IoT and drones is increasing at a fast rate and the world is moving towards the synchronization of machines and man.

What do agrobots mean in terms of food production?

Food production is a labour and often capital-intensive initiative. What if you never have to spend a shilling more than you have to. Agrobots bring precision and efficiency.

What does this mean for the Biosystems engineer?

We as Biosystems engineers will need to acquire skills in the world of AI and robotics if we are to survive. We are the agent who will bring the world to the Agrobotics revolution.
So, what does this speak to the current Biosystems student. you need to do more research on the world of robotics. to make a better world,
being proficient in machine language and mechanics of robotics is a basic requirement.
We as biosystems engineers, can not only bring our specialized knowledge for the development of these technologies but also for their environmental sustainability.
This also means that an Environmental and Biosystems engineer's mandate also advances as being a champion in the field of revolutionary agriculture. This thus leads to more involvement in the cycle of food production.

What's our role as Biosystems engineers in smart farm development?

The future envisioned, basically Biosystems engineers having a better understanding on water engineering and programming can facilitate a more complex interaction between farms and the Agrobots.

This in turn will increase the use of low cost IoT and analytics in the food production phase down to the harvest and the manufacturing phase
(according to UK-RAS NETWORK).

A farm that has a nerve centre and requires minimal input from the farm will require a Biosystems engineer. The road towards increased food production is ambitious but achievable.
If embraced it may prove to game changer in the agricultural sector in Kenya and the world.

Nixon Khaemba is a 3rd year student at JKUAT undertaking a Bsc in Environmental and Biosystems Engineering

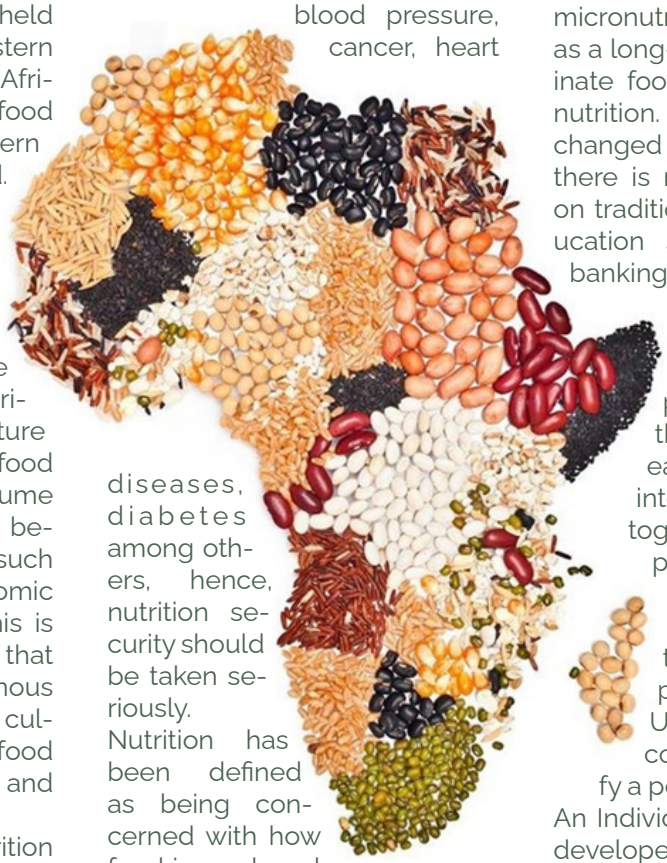
Ancient Mesopotamians allowed for equal rights of both men and women. Women could enter into contracts, make business deals, buy and own properties, and even legally divorce theiar husbands on the grounds of infidelity.

FACT

Traditional Food for healthy life.

Africa as a continent is viewed as desperate, her people suffer from litanies of social, economic, political, and environmental problems. The plights are held together by attitude of western imperialism lifestyle. While Africa faces a lot of problems, food insecurity is a major concern that needs to be addressed. There are mechanisms and strategies that have been developed to solve food security and nutrition problems. For instance, Kenya has developed the Food and Nutrition Security Policy (FNSP) that capture several areas in improving food security. The strategies assume that food crises emerge because of negative shocks such as drought, floods, economic downturns and conflict. This is true but it is also important that Kenyans attitude, indigenous knowledge and positive cultural practices pertaining food and nutrition be embraced and strengthened.

The fight for food and nutrition is not a new phenomenon, the fact that it is also featured on the Sustainable Development Goals (SDGs) i.e. SDG2 (Zero Hunger), SDG1 (Zero Hunger), SDG5 (Gender Equality), SDG8 (decent work and Economic growth) and SDG12 (Responsible Consumption and Production), makes it a crucial and urgent need for the world. However, unhealthy modern lifestyle and negative attitude like a web held people into unhealthy eating habits that solidifies vicious circle of desperation. Unhealthy eating lifestyle has contributed to several diseases among the people of Kenya. For example, high blood pressure, cancer, heart diseases, diabetes among others, hence, nutrition security should be taken seriously.



Nutrition has been defined as being concerned with how food is produced, processed, handled, sold, prepared, shared, and eaten and what happens to food in the body - how it is digested, absorbed, and used. The Kenyan community has traditional ways of maintaining their diet. Traditional vegetables are advocated for by many health nutritionists; African Kale, spider plant, black night shade, pumpkin leaves, slender leaves, jute mallow, cowpeas. Other varieties that farmers grow include climbing vine and ngwalo.

Communities in Kenya have access to the traditional vegetable and crops that are rich in micronutrients. This can serve as a long-term strategy to eliminate food insecurity and malnutrition. Modernization has changed people's attitude and there is need for re-education on traditional foods. The re-education should not take the banking approach. Instead, it should adopt a transformative approach that changes people's perception and invoke them to adopt healthy eating habits. Complex interrelated factors work together to influence a person's dietary and lifestyle choices. Such factors include attitudes, beliefs and their personal environment. Understanding these concepts helps to modify a person's dietary choices. An Individual's dietary choice is developed over a long period of time and eventually become automatic.

Motivation to change is mainly intrinsic which aids in self-regulation. A model developed by Rothschild shows an interaction between motivation, opportunity and ability which intertwine in the changing of a complex habit. Motivation is the drive that enables a person to pursue a goal and being intrinsic, provides for a better outcome. Self-efficacy which is a person's belief in their ability to accomplish a goal, is

important to show their ability to change to a new behaviour. Opportunities are the external factors that provide the mechanisms to make a new behaviour possible to achieve. The three provide the basic elements in adoption of a new habit.

To get people adopt traditional foods that are healthy there must be constant exposure to them. For instance, an educational system that triggers psychological reflection is proposed by Paulo Freire. This should show the reality of effects of unhealthy foods, reinforcing healthy eating habits which do not have immediate rewards but require external rewards to enable motivation of the behaviour. It is therefore important to find a motivating reward to apply to adoption of Traditional food. Through the process of learning and repetition, the new habit can be formed as automatic and unconscious.

In light of this information, it is important to understand how people can change from unhealthy eating habits to healthy ones. Currently individuals are unable to practice healthy eating habits as they have been socialized into eating a lot of processed junk food which pose a big threat to their health. The eating habit in Kenya is a product of a social order set by external factors. i.e western influence. Eating junk food is popularized by the media as having a satisfactory effect. This motivates one to purchase the products regularly which can lead to devastating effects in the long run such as harmful levels of cholesterol and obesity. To change this habit loop one needs to understand the consequences and have a desire to achieve healthy eating habits.

Indigenous foods have been grown and consumed locally for long and have always provided sufficient nutrients. For instance, vegetables such as terere, managu, sagaa, mrenda and kunde are not strange to Kenyans. These can be full substitutes to introduce healthy eating habits. The change is dependent on individual choices. It is not impossible for Kenyans to condition their brains to consuming indigenous foods. People can also take up a practice of farming, growing their own crops can motivate them to consume them. They will then find a way to reward themselves by finding a personal motivating reward to apply to this new healthy habit of eating indigenous foods.

Edwine Jeremiah Otieno and Juma Njeri Georgina are students at Tangaza University College

MOTIVATION TO CHANGE IS MAINLY INTRINSIC WHICH AIDS IN SELF REGULATION.

OH, FECUND LAND

- Alphonse Mbogo

Fecund - productive and/or profitable.

Picture this, a land fertile and rich in every resource, streams of water inebriating the earth and the warm radiant glow of the sun peering through trees. A seed newly germinated breaks through the tender earth and spreads its leaflets as if to bask in the sun. The latent potential hidden behind the green leaves takes action as photosynthesis is carried out for the first time. Much toil and suffering has been borne for the sake of this moment. It is a glorious one indeed!
Here in Kenya, thousands of farmers place all their hopes on the fruits of the phenomenon described. How often does the beautiful fruits of labour spoil and rot in the farms? Is there no person that can partake of these fruits and vegetables? Are there not thousands of families sleeping hungry in one part of the country while in another, food lies in heaps as waste? If the supply is sufficient and the demand is as well, how can we ensure that food gets to where it's needed as fast and efficient as possible?

Several solutions exist to combat this problem, key among them being; food production mechanisms such as irrigation, preservation techniques such as drying and storage infrastructure such as silos. A pragmatic step that would support each of the above strategies is probability and prediction.
Probability and prediction.

As far as I know, there is no system that can accurately predict the volume and variety of food that will be produced in the country in the coming months. Models may exist but pale in comparison to the data a farmer on the ground may be able to provide. It thus would be logical to acquire this data from the farmer directly as often as possible.
Farmer Direct is the culmination of these ideas.

It would be a system designed to collect data and predict the expected quantity of produce. The user interface would be a mobile application. Farmers would use this application to indicate what has been planted, in what quantity and the expected harvest. It would also allow the farmers to express challenges they are experiencing and be linked to extension services or assistance. This service would be offered free of charge to farmers all

over the country. Since the approximate harvest quantity and timeline would be known, the produce would be allocated a certain expectation coefficient that would then determine the price. This coefficient would be a variable dependent on factors such as demand, supply, variety, transportation cost among others. This system would not only assist farmers get remuneration for their produce and ensure a good harvest but would further incentivize them to diversify in their crop production.
In conclusion, the future of Kenya's food can be one that's rich in both quantity and variety. For this to be achieved, we must learn how to manage our resources and to respect the personnel that form the linchpin of our economy. The Farmer Direct system is far from perfect, but it's a step in the right direction. No perfect solution exists for the problems we face. On the other hand, we cannot roll over and concede defeat. We must continue to innovate and improve ourselves and our country, for that is our solemn duty as engineers. Our duty as Kenyans.

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Historians credit the invention of the wheel to the Mesopotamians. Other pioneering works of Mesopotamia include: sails and sailboats, irrigation, wine, time demarcation (seconds, minutes and hours), beer among others. Particularly interesting was their obsession with the number sixty. They considered it a sacred number of the gods. This explains why they went for a sixty-second minute and a sixty-minute hour- a concept that we still use.

FACT

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The Problem of Food Storage in Kenya

Policy making and implementation would actually be a simpler exercise if the welfare of humanity in all their equality was prioritized. Controversial, right? Or too far-fetched I suppose? Well how about this? The only reason global pollution and world hunger are still a problem to date is because it's not financially profitable prevent such scourges.

In the wake of the aflatoxin poisoning menace we have seen in our nation one can't help but think of two things; One, that the government doesn't have as many professionals in the sector of food storage and processing. Two, that the government doesn't have appropriate machinery for quality control and standards.

To say any of the above is true is, in fact, to be in denial. With all the graduates coming out of universities with degrees in Agriculture and Food Production, Kenya is more than spoilt for choice. Knowledge that Aflatoxin is the secondary metabolite produced by specific strains of Aspergillus that is produced by fungi that grow on grains that are not dried or stored in proper conditions is basic in the food production field. That therefore eliminates the fact that there isn't enough knowledge and knowledgeable personnel on the subject. As for quality assurance machinery, we have an entire bureau specifically for quality assessment and standards checking; KEBS (Kenya Bureau of Standards).

In such a government as our own, where there are endless talks of cartels with interests in making profits of such events as spoilt maize, it would seem more profitable for them to let the grains grown by local farmers go bad in order to create an artificial shortage so that in the event of importation of maize they can then make their profits. Politics is nothing more than a trade of interests, unfortunately, it seems to be in no one's interest to promote local farmers and provide safe food to the nation. It's like playing Russian Roulette with the health and lives of the populace.

Objectively speaking, the government has to stop playing politics with the lives of the people. Kenyan's health can't be juggled alongside minting money. A strong and healthy workforce must be the priority of any leader. This doesn't get any more complicated than increasing the nation's capacity to handle grain and to prioritize maize grown by our farmers. No farmer must have their grain rotting in the field whilst the government purchases maize from Mexico or wherever else.
It also goes without saying that the place of the Biosystems Engineer—an expert in Food Processing, (with grain handling being a major part of it)—is increasingly becoming paramount as the link between agricultural understanding of grain characteristics and the engineering aspects of designing machinery for handling the grains in such a manner as to keep them from going bad and poisonous is what will be key in appropriate policy making.

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Health is wealth

If agriculture contributes about 27% of GDP , employs more than 40% of the total population and more than 70% of Kenya's rural population, physical and economic access to sufficient, safe and nutritious food that meets dietary needs for healthy and active life at all times should be nigh at hand. Melancholily, over 1.8 million people in rural and Arid and Semi-arid lands (ASAL) face high level acute food insecurity in 2020.

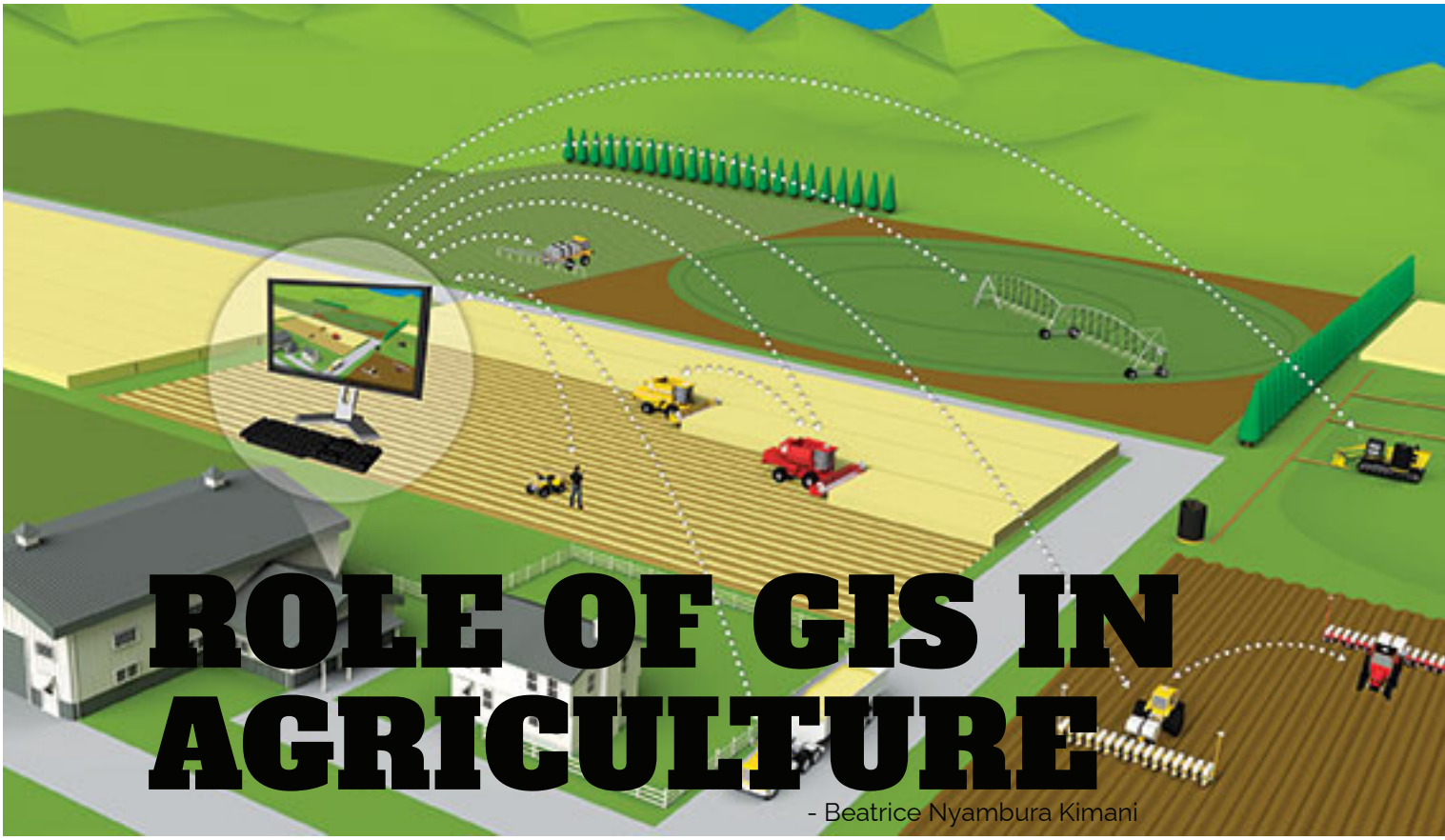
Nearly 1.1 million people in Kenya's urban counties, Nairobi, Mombasa and Kisumu face high level of food insecurity with Mukuru and Dandora suffering extreme levels of this phenomenon. Over 530, 000 children under the age of five and approximately 97,300 lactating women were acutely malnourished. Measures and restrictions to control COVID-19 led to losses of jobs, high food prices, lowered market operations and limited access to market. This has caused an unprecedented challenge in upholding food security at the household level. Desert locust infestation affected about 1,000,000 hectares of cropland leading to adverse food insecurity in in Turkana, Marsabit, Samburu and Tana River counties.

Budget allocation in Agriculture unlike 2019/2020 budget, Kenya should increase the allocation by 6% from 52 billion in 2020/2021 budget. Taxes in agricultural sector should be reduced so as to make it easy to access agricultural inputs hence alleviating food insecurity. Smallholders ASAL farmers and agro-pastrolists have potential to grow cereals like maize, sorghum and millet for subsistence if National Cereal and Produce Board (NCPB) provides the grains. Agriculture Finance Corporation issuing agricultural development funds to the farmers would help boost food security.

In recent years, the application of technology in the agricultural sector has increased. This has meant the increased use of machineries, green houses and currently National Biosafety Authority (NBA) is gearing up for the introduction of gene edited crops into the agricultural system.

This is expected to bolster the quantity and quality of available food. According to International Monetary Fund (IMF), the economy is likely to rise to 6.1% and one of the key drivers of this is expected to be strong performance in agricultural sector. Climate, inadequate policy implementation and constant under-estimation of this sector remain our challenge to the achievement of food security.

Bernard Murimi is the author of this article,you can contact him at benarmrimi@gmail.com



ROLE OF GIS IN AGRICULTURE

- Beatrice Nyambura Kimani

GIS – Geographic Information System. It is a framework for gathering, managing, and analyzing data. In simpler terms, it is a system that allows a person to collect, store and analyze data on places, events and people.

GIS IN AN AGRONOMIC VIEW

Agriculture is the practice of growing crops and rearing of animals and it entails land preparation, land cultivation and planting crops.

THE ROLES INCLUDE:

Precise agriculture

Government authorities or local authorities can use remote sensing data to make important decisions about the policies they will adopt or measures to tackle national issues regarding agriculture. Individual farmers can also receive useful information from remote sensing images, when dealing with their individual crops, about their health status and how to deal with any problems. Precision farming aims to optimize the use of soil properties and external contributions on a site-specific basis.

Soil

To identify the potential land for any particular crop, GIS is the best technique as it brings all the data on a single platform for the analysis. To monitor crop health, its growth and production, various factors come into play such as temperature, irrigation facilities and the most important soil health condition. A soil health card can be used.

Identifying the best irrigation system

Global databases assist in land evaluation, planning, land monitoring, and water productivity monitoring. They assists farmers in reliable and consistent assessment and monitor-

ing of the best irrigation scheme to use.

Marketing product

By use of outreach initiatives in mapping and monitoring of population density, crop areas and yield forecasting; farmers can position their business where there is market for their agriculture product.

Pest control

Remote sensing commonly refers to the use of satellite- or aircraft-based sensor technologies to detect and classify objects on the Earth; on the surface and in the atmosphere and oceans, based on propagated signals such as,electromagnetic radiation.

It can be used to map infestation of pests and diseases and how to treat it.

PROBLEMS FACING GIS IN AGRICULTURE

Cost

GIS equipment is quite costly. A gadget can go up to around KSH 30,000 while the software is very expensive. A few years back only a few companies were able to afford GIS software.

Technological Expertise

Without adequate data, GIS is not very useful. The technology includes; computer hardware, GIS software and training.

Data concerns

GIS techniques rely in data. Basic environmental data such as soil characteristics, type of crop, land uses, topography, rainfall, accurate data on infestation of pests and diseases; and demographic data on the movement of people should be accurate. Difficulty arises in the gathering of this information and the privacy concerns members of the population must have with respect to how their data is handled.

Public Participation

GIS works best when the public is involved. In a case in Nyandarua, the county government demolished houses to allow for a railway to pass. The locals expressed their concerns saying they did not support the building of a railway.

RECOMMENDATIONS

Actively involving the public directly or indirectly: using questionnaires, educate the farmers on the importance of using GIS. Educating them on the benefits and job creations in GIS could further promote the use of GIS technology in the agricultural sector.

The cost of applying GIS to one's project can be decreased with the use of available free open-source GIS software such as QGIS, ERSI ArcGIS and Global Mapper.

An oral interview of Ann Rose was conducted and this article was derived from the interview.
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FACT

Despite seemingly catastrophic incidents such as Chernobyl and Fukushima, that the amount of energy generated by nuclear is so vast that it more than outweighs these incidents over the long-term. The reality is that nuclear energy is much more comparable to renewables like solar or wind, in terms of safety. More importantly, it's on the polar opposite of the spectrum from coal, which manages to kill 4,400 people daily in China alone.

Energy Source	Deaths per 1,000 TWh	% of Global Primary Energy Supply (2015)
Coal	100,000	28.1%
Oil	36,000	31.7%
Natural Gas	4,000	21.6%
Hydro	1,400	2.5%
Solar	440*	<1%
Wind	150	<1%
Nuclear	90	4.9%

WHAT'S YOUR REFLECTOR JACKET?

-By Hillary Indiazi

I have this Uncle of mine, who works in Vihiga County. In my first year of campus he asked for my CV and recommendation from my department. He assured me that he will secure me a job in the County. Soon after I had a long holiday and needed something relevant to keep me busy. Guess who I went to first? You are right! My uncle! I went to him only to get disappointed and ended up doing something else. Today when we meet in family gatherings the greeting usually is, *'ile maneno yako bado nashughulikia usijali. Wewe maliza tu campus.'*

You probably have such an Uncle or you are such an Uncle yourself. One who has your credentials on top of his desk and always gives you hope, the false kind. Perhaps you already received the promise and are working at a company, or like me, still waiting. Let us reason together, shall we? If my Uncle does get me the job wouldn't that be nepotism? What if I ask my classmates to apply for the position too and after the interview I get shortlisted and they don't would that still be nepotism?

There's a fine line between nepotism and deserving the job. Some people believe 'connections' is but a toned-down version of corruption however, what if you are qualified and the 'connection' is just an added advantage?

Suppose you are a girl from a humble background in Baringo who got a chance to study in a university in Nairobi and don't know any professional in your field. Your folks are back in the village and do not have access to the professionals either. Well, you are precisely the reason for this article. Your connected classmates brag about how assured of employment they are and it seems like you have no hope at all. Well, the best news is you can get connections through networking.

You probably are on Instagram and follow models that do make-up tutorials or Seth Gor for his funny videos. However, are you on LinkedIn? If you are, have you ever interacted with other professionals? Also have you ever talked to your lecturer about the jobmarket? About companies relevant to your field? Do you possess any special skills? AutoCAD, programming, people skills are some of the additional skills to set you apart, your reflector jacket.

If your connections cannot come from family, they need to come from your interactions. Networking pegged with a special skill set can take you far.

So, your reflector jacket should always be on. When a company is looking for people to employ, they should spot you through your reflector jacket. Remember your uncle, father or the friend from church can also be your reflector jacket. Start selling yourself as early as today by networking and honing your skills. Don't settle and most of all be hopeful. I hope my two cents worth of advice gets you to places you have never imagined before.

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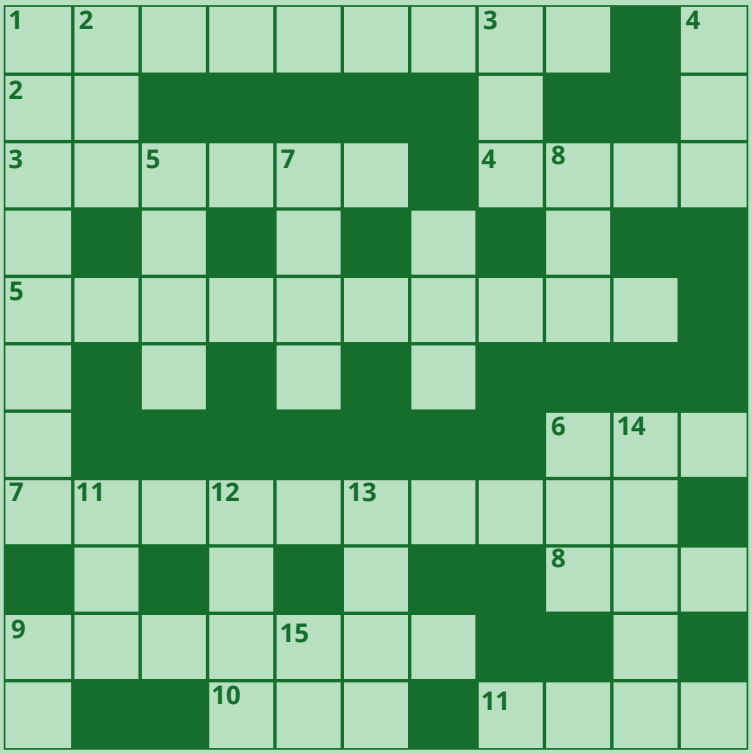
CROSSWORD
for engineers



ACROSS

1.Father of fluid mechanics
2.Machine Intelligence
3.Water unfit for irrigation
4.What the sun and Van Gogh's famous painting have in common.
5.Archimedes' Law
6.Water's solid State
7.Contaminated water
8.Industrialist's association in Kenya
9.Tractor engine's pulling power
10A method of infrared spectroscopy
11.A river training structure

DOWN

1.Not run-off
2.Examination of effects of a project
3.Unit of Mass
4.Streamline rowing device
5.Company providing internet access through balloons
6.Association of Kenyan Engineers
7.Place for industrial training in Kenya
8.Binary
9.Amount of oxygen in water
10.Shaft for transfer of power in a tractor
11..Mixture of gases
12.Urban
13.Action of friction
14.Engine Shaft
15.Two

NGARA MEN'S HOSTEL

We are located along Ngara Road opposite Star House, near Fig Tree Hotel
Other landmarks along Ngara Road include:- Fig Tree Market and Kenya Police Sacco Building

DAILY RATES

Single Room First Category - **1200/=**
Single Room Second Category - **800/=**
Room Shared by 2 First Category - **600/=**
Room Shared by 2 Second Category - **500/=**
Other Categories - **400/=**

RATES:

Our rates include two meals on weekdays and three meals on weekends
All meals are served with the exception of lunch on weekdays

Room	1st Category	2nd Category	3rd Category
Single Room	26,500.00	22,500.00	15,500.00
Room Shared by 2	17,000.00	15,000.00	
Room Shared by 3 or 4	13,000.00		
Room Shared by 5 or 6	11,000.00		

(No extra payments or deposit required)

AMENITIES INCLUDED

- **Free Wifi**
- **DSTV**
- **Hot Shower**
- **Serene Atmosphere**
- **Good quality meals**
- **House Keeping and beddings laundry**

DISCOUNT:

KES. 8,000/= is allowed for 4 Month Semester payments.

RULES & REGULATIONS

- Drugs and Alcohol not allowed
- Hostel facilities restricted to hostel residents only.
- Students should be in the hostel by 10pm unless special arrangements have been made.
- Students should maintain discipline and neatness

CONTACT: GEORGE - 0722 692 813