

Open Forum on Agricultural Biotechnology in Africa (OFAB)

Kenya Chapter 2016 Report (Vol X)

*Experiences in sharing knowledge and
information on agricultural biotechnology*



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Open Forum on Agricultural Biotechnology in Africa (OFAB) Kenya Chapter 2016 Report (Vol X)

Experiences in sharing knowledge and information on agricultural biotechnology

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Contents

Acronyms	2
Executive Summary	3
OFAB 82 – June 3, 2016	5
OFAB 83 – November 17, 2016	12
OFAB County Events	18
Study tour to KALRO Kitale	19
Exhibition at 3rd National Devolution Conference in Meru	22
Exhibitions at Kagio and Kutus Townships in Kirinyaga County	23
Special OFAB Activities	25
Conclusion	29
OFAB Kenya Programming Committee Members	30

Acronyms

AATF	African Agricultural Technology Foundation
ABCIC	African Biodiversity Conservation and Innovations Centre
Bt	<i>Bacillus thuringiensis</i>
CECs	County Executive Committee Member
CFT	Confined Field Trial
CIMMYT	International Maize and Wheat Improvement Center
DT	Drought Tolerance
EIA	Environmental Impact Assessment
GM	Genetic Modification/ Genetically Modified
HT	Herbicide Tolerance
ICOSEED	Integrated Community Organization for Sustainable Empowerment and Education for Development
IITA	International Institute of Tropical Agriculture
IPM	Integrated Pest Management
ISAAA	International Service for the Acquisition of Agri-biotech Applications
KALRO	Kenya Agricultural and Livestock Organization
KBC	Kenya Broadcasting Corporation
NACOSTI	National Commission for Science, Technology and Innovation
NBA	National Biosafety Authority
NMG	Nation Media Group
NPTs	National Performance Trials
PBS	Program for Biosafety Systems
RMS	Royal Media Services
SG	Standard Group
WEMA	Water Efficient Maize for Africa

Executive Summary

OFAB-Kenya being the pioneer of the OFAB Chapters: Uganda, Nigeria, Ghana, Ethiopia and Burkina Faso marked 10 years of outreach on agricultural biotechnology in 2016. These have been years of remarkable success in awareness creation and more importantly, a period of tremendous learning. In 2006, the African Agricultural Technology Foundation (AATF) sought to establish a platform that would facilitate flow of information from the scientific community to policy makers and the general public. Through the years, stakeholders have shown interest in the forum by their consistent and growing participation. The forum's recognition by decision makers as a platform worthy of partnering with in discussing matters of national significance such as agricultural biotechnology is indeed something to be proud of.

The journey has had numerous successes, from the passing of the Biosafety Act, 2009, the formation of National Biosafety Authority, successful conduct of various CFTs to the approval of environmental release of the Bt cotton and WEMA-Bt maize. It is gratifying to note that through its awareness creation activities, the Chapter initiated dialogue on GMOs that was hitherto inexistent or marred with inaccuracies, deceptions and non-facts. While not everything has been achieved, quite remarkable strides have been made.

Progress in agricultural biotechnology in Kenya has however not been without hurdles. In 2012, the government imposed a ban on GMO food importation, following a publication by a French scientist of a journal paper that linked consumption of GMO maize to development of tumours in laboratory rats. That paper was later withdrawn from publication after it was established that it was based on flawed scientific data. That notwithstanding, the Government of Kenya has not lifted the

ban, 5 years later, despite promises by key government officials including the Deputy President William Ruto. The ban has continued to be the greatest impediment to delivery of biotech crops to farmers. For instance, it has been reported that the Cabinet Secretary for Health, Dr. Cleophas Mailu advised NEMA not to issue an EIA certificate for NPTs of WEMA-Bt maize to commence, based on the ban. In 2015, civil society groups went to court to challenge the Deputy President's promise of lifting the ban.

The challenges enumerated earlier, coupled with gross misinformation among the public by well-funded anti-GM groups continues to derail progress with adoption of the technology in the country. However, through continuous awareness creation activities, people at the grassroots, especially young farmers are beginning to discern untruths, myths and misconceptions in their beliefs about GMO crops. The farmers realized that they have long been denied a chance to make a choice to grow biotech crops due to non-factual information resulting into fear. It is against this backdrop that OFAB-Kenya has been conducting awareness creation activities through exhibitions, topical discussions and study visits. The events have enabled a change in perception about GMO crops among a variety of stakeholders. Additionally, Kenya is faced with recurrent droughts, new disease and pests that will require to be addressed with the best of the existing technologies together with modern biotechnology.

OFAB Kenya would like to appreciate the valuable and consistent inputs from members of the Chapter's Programming Committee. The secretariat is grateful for the invaluable support from partners: the African Agricultural Technology Foundation (AATF), the Program for Biosafety Systems (PBS), the National Commission for Science, Technology and Innovation (NACOSTI), among others.



Quarterly OFAB Events



1

OFAB 82 – June 3, 2016

**Launch of Global Status Report on Commercialization
of Biotech/GM Crops: 2015 by Dr. Faith Nguthi**



Dr. Faith Nguthi

Presenter's Profile

Dr. Faith Nguthi is a Senior Program Officer at ISAAA AfriCenter. She holds a PhD in Social Science from Wageningen University in the Netherlands and an MSc in Horticulture from the University of Nairobi. Prior to joining ISAAA, she worked as a Senior Research Scientist with KARLO, from 1987-2008.

Introduction

The world population is projected to reach 9.7 billion by 2050. This will require the agricultural sector to double food production despite the decrease in world's vital resources such as water; as well as the shrinking arable land. In addition, the continent has numerous food production related challenges, ranging from aging farmers, little use of technology in agriculture and depleted soils.

One of the approaches to respond to the challenge of increasing food production would be to use modern technologies such as agricultural biotechnology, combined with other tools including plant breeding, conservation tillage, Integrated Pest Management (IPM), sustainable resource management, variety selection, organic farming and indigenous knowledge. It is important to point out that though it has demonstrated substantive benefits for improved crop production, agricultural biotechnology is in itself not a system and does not replace traditional agriculture, but it is a tool to complement the existing ones.

Global Status on Commercialized Biotech/GM Crops in 2015

2015 marked the 20th anniversary of commercialization of biotech/GM crops since 1996. According to James (2016), the 20 years of commercialization of biotech/GM crops were characterized by an unprecedented cumulative 2 billion ha. In 2015, 18 million farmers grew biotech crops, 90% of whom were small resource-poor farmers. In that year, farmers planted biotech/GM crops on 179.7 million hectares, a 100 fold increase from the initial 1.7 million hectares in 1996, making it once more the fastest adopted crop technology in the history of modern agriculture (Figure 1).

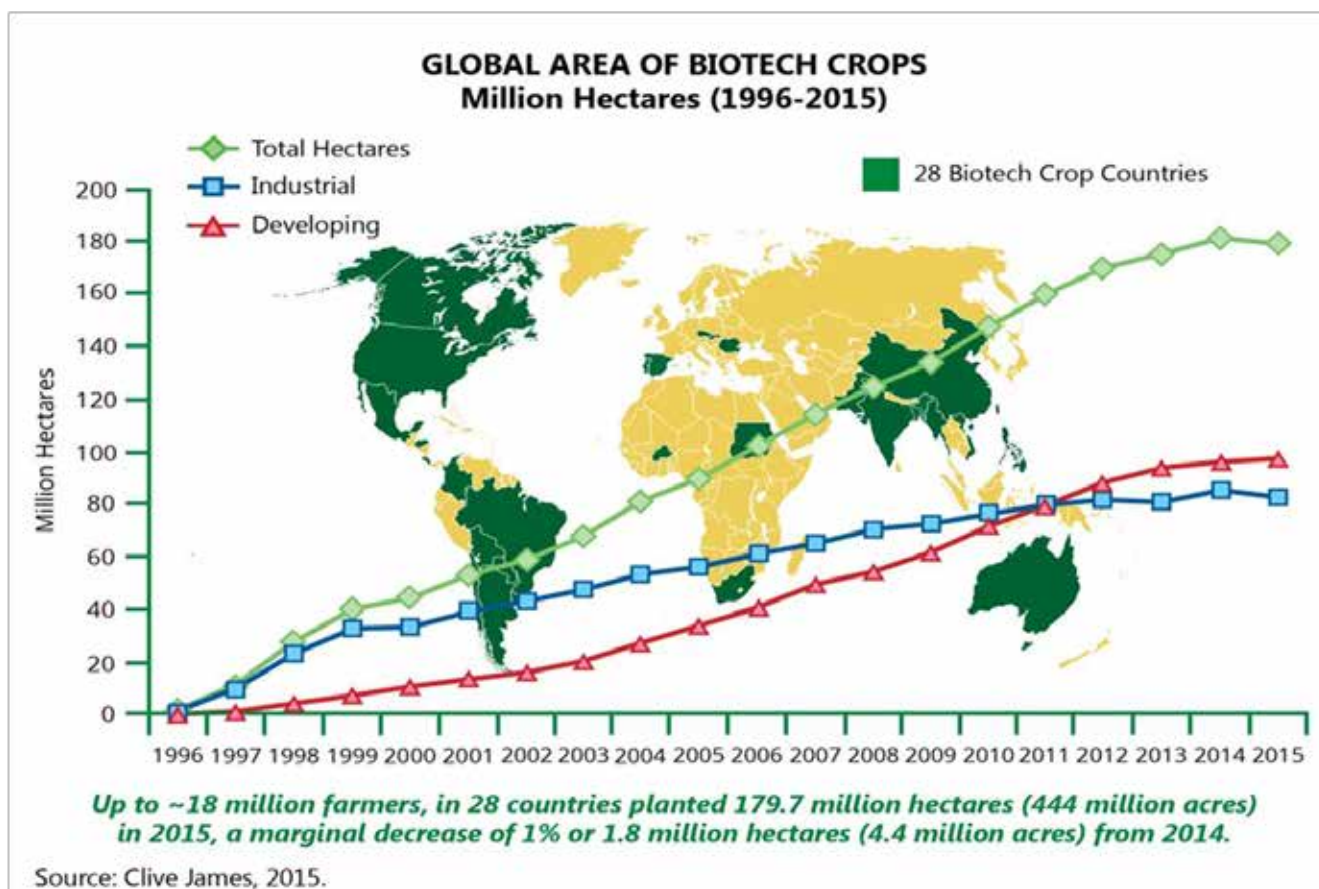


Figure 1: Curve showing adoption of biotech crops from 1996-2015 and a comparison on adoption trends between developed and developing countries

In 2015, genetically modified (GM) cotton, maize and soybeans occupied the largest hectareage, at 68%, 39% and 82% respectively. Genetically modified canola came in the 4th position at 25% of the total hectareage cultivated to the crop, worldwide. Key traits of the biotech crops planted in 2015 were herbicide tolerance, insect resistance and stacked trait (herbicide tolerance and /insect resistance). Other GM crops cultivated worldwide include sugar beet, alfalfa, squash, pawpaw, sweet corn, sugarcane, eggplant (brinjal), potato, eucalyptus and apple.

Out of the 28 countries that grew biotech crops, 20 were developing economies, a marked dominance over the 8 industrialized countries. Compared to 2014, one new country, Vietnam grew a biotech crop for the first time

by approving insect resistant/ herbicide tolerant maize (Bt/HT maize) for commercialization. Bangladesh commercialized Bt brinjal which had been approved in 2014.

Benefits of GM crops

Crop biotechnology has helped farmers produce more yields. In 2015, 321.8M tons of maize, 24.7M tons of cotton and 158.4M tons of soybeans were added in the global production. Without biotechnology, farmers would have needed 20.7 million hectares or more to get the same yield, making agricultural biotechnology a land saving technology. GM crops planting practices helped reduce tilling and greenhouse gas emissions equivalent to removing 12 million cars off the road in 2014.

Progress in Africa

Three countries in Africa, including South Africa, Burkina Faso and Sudan grew biotech cotton, maize and soybean (Figure 2).

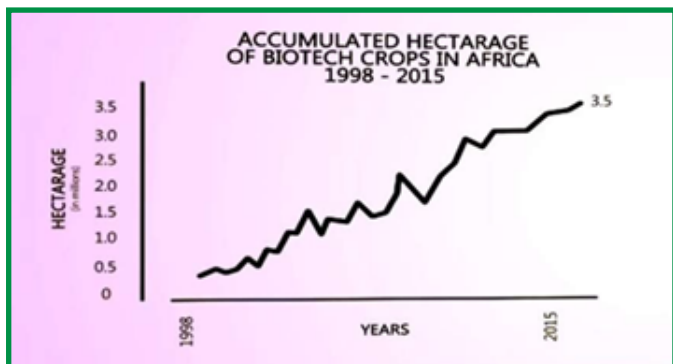


Figure 2: Cumulative heactarage of biotech crops in Africa between 1998 and 2015

South Africa, a pioneer in growing GM crops since 1998 in Africa, grew 2.3 million hectares of GM crops including maize, cotton and soybeans. Burkina Faso grew 350,000 hectares of biotech cotton while Sudan grew 120,000 hectares of biotech cotton.

Adverse climatic conditions like drought in South Africa greatly contributed to a decrease of 23% GM crops hectareage. In Burkina Faso, the government in consultation with key stakeholders from the cotton subsector agreed to reduce insect resistant cotton hectareage over the next two years to allow breeders address a short staple length observed in current Bt cotton varieties. Sudan recorded a 95% adoption rate by planting 120,000 in its 4th year of commercializing the crop. This was a 600% increase from the initial 20,000 hectares planted in 2012.

Other African countries are involved in biotech research on key crops of interest. These crops are at the Confined Field Trial (CFT) stage in the following countries:

1. Cameroon: insect resistant cotton
2. Kenya: virus resistant cassava, insect resistant cotton (CFTs completed), insect

resistant and water efficient maize, Bio fortified sorghum and weevil resistant sweet potato

3. Ghana: insect resistant cotton, insect resistant cowpea and rice
4. Egypt: virus resistant wheat
5. Uganda: Bacterial wilt resistant banana, virus resistant cassava, insect resistant maize, rice, potato
6. Malawi: insect resistant cowpea and cotton, and bunchy top virus resistant banana
7. Swaziland: Insect resistant cotton
8. Nigeria: Insect resistant cowpea, bio fortified sorghum, insect resistant maize and rice

Progress of biosafety regulations in Africa

In 1998, South Africa was the only country with a biosafety law. By 2015, 19 African countries had developed biosafety legislation. Notably, Nigeria's biosafety law was enacted by then President Goodluck Jonathan while Kenya's National Biosafety Authority received, for the first time, two applications for environmental release (open cultivation) of insect resistant (Bt) maize and cotton. The Bt maize has already obtained a conditional approval for open cultivation.

Egypt completed drafting its Biosafety Bill. Once enacted, it will help researchers move products such as rust resistant wheat into commercialization. Togo, Benin and Cote d'Ivoire are working towards reviewing their Biosafety Laws to make them functional while Ethiopia, Mozambique and Tanzania have revised their Biosafety Laws to allow research on biotech crops. A National Biosafety Authority has been launched in Zambia, which will help in regulating the long awaited Bt cotton among other crops.

Status of biotechnology research in Kenya

Kenya currently has 5 crops in confined fields including virus resistant cassava, weevil resistant sweet potato, insect resistant and water efficient maize and bio fortified sorghum. A conditional approval for insect resistant maize has been granted by the country's National Biosafety Authority. It is expected that the crop will be grown in selected areas once the remaining regulatory procedures are completed.

Missed opportunities in Africa

Farmers across Africa have been denied the choice to grow biotech crops over the last 20 years. The continent has missed out on the \$150 billion increased revenues that arose from planting biotech maize from 1996-2015. South Africa is the only African country that benefitted from this increased revenue. Even as the world awaits commercialization of new GM/ biotech crops currently under research, Africa must realign herself to accelerate the approval processes so that farmers can make their choices to adopt the crops or not. The world is now exploring New Breeding Technologies (NBT), such as genome editing which will enable breeders to create the same desired genetic variation with greater precision and efficiency than previous breeding methods, with minimal regulation requirement.

Challenges of biotech crops commercialization

Some of the challenges hindering widespread adoption of GM crops globally include: Unpredictable political and policy environment to support vibrant biotech research on priority African agricultural challenges; costly regulatory process beyond the reach of public and delayed policy processes are some of the hindrances to commercialization of biotech crops in the world. Gross misinformation and media sensations creating fear among members of the public is also another challenge hindering acceptance of the crops.

II. Remarks by Hon Jennifer Murogocho, farmer and Member of County Assembly, Meru County, Eastern Kenya.

Hon. Murogocho, an active maize farmer and a woman group leader has undertaken study tours in biotech growing countries in Canada and South Africa. She shared experiences of her visits to vast round-up ready soybean fields in Canada and her encounter with successful young maize and cotton farmers in South Africa. She recommended agricultural biotechnology as a tool that would make a difference for Kenyan farmers. Hon. Murogocho encouraged the youth in attendance to choose agriculture as it could be a means out of unemployment. Since returning from her tour to South Africa, she has seen the potential for replicating the success stories and has been sensitizing members of her women farmers' group to get ready to plant biotech crops. She has also been urging members of the county assembly to support fast tracking of biotech crops in the country.



III. Round table discussions- Table for Twenty

At the end of the presentation, participants held three roundtable discussions on the following issues:

1. Why have we missed the opportunity to benefit from the technology 20 years down the lane?

Initially, Kenya missed on opportunities offered by agri-biotech for lack of adequate human and infrastructural capacity. Since 2009, the country has equipped itself with a functional biosafety framework including a biosafety law, regulations that pertain to GM crops as well as a National Biosafety Authority. At the same time, the number of trained scientists in the field has increased. Several major public universities now have departments of biotechnology and biochemistry. The hindrances to adoption of the technology especially by the farmers and proposals to address are elaborated below.

2. What is the best approach to address the challenges that hinder Kenya from commercialization of the crops?

Insufficient awareness on GM crops: Government and legislators should be at the forefront to support awareness campaigns of GM crops

Lack of exposure: Legislators and opinion leaders should undertake 'Seeing is believing tours' to see where the technology is working.

Insufficient commitment by government: Lack of political will hinders acceptance. The government should support research and awareness creation on biotech crops.

Insufficient involvement of county leaders: County leaders such as agricultural heads in the wards can push a motion to be tabled in county parliaments towards adoption of GM crops. This can be taken further at the level of county executive committees for approval and support.

Lack of targeted research information materials: Information materials can be availed to stakeholders to help in asking the concerned ministries for speedy approval of biotech crops.

Missing link between farmers and scientists: Most scientists have not been able to breakdown the scientific jargon while explaining what agri-biotech entails. This has widened the gap between the two categories of stakeholders, making it hard for farmers to demand for the improved crops

Only few categories of stakeholders involved in the agri-biotech dialogue: Involving different stakeholders such as church (religious leaders), government, ministries, and political leaders would go a long way in fast tracking acceptance and commercialization of biotech crops in Kenya. The information should penetrate the counties. Scientists should be involved at all levels of awareness creation to enable understanding of agri-biotech processes by the general public.

The youth, as the largest portion of the country's population should play a special part in advocating for acceptance of biotech crops.

Misreporting by media: For the sake of attracting readership and vast audience, mass media has sensationalized agri-biotechnology and has portrayed biotech crops as strange and scary. This has elicited fears of GM crops among members of the public, who are reluctant to adopt GM crops.

3. How does Kenya reposition herself to develop and own new technologies that will address her unique challenges?

Increasing awareness creation efforts: One way of accelerating acceptance of new technology is when farmers start demanding for those technologies themselves in a bottom-up approach. Farmers should be made aware of economic aspect of adopting new technology, in terms of potential yields increase.

It is critical to identify the gaps that haven't been filled such as awareness creation for people at the grassroots. Informative advertisements by mass media, especially vernacular radio stations for farmers, together with use of TV stations to appeal to the urban dwellers. Government support is critical for successful awareness efforts on agricultural biotechnology.

Involving politicians: Leaders at grassroots level who are passionate about technology and people's development should be encouraged and supported to attend study tours in countries where biotech crops have been commercialized.

Encouraging partnerships: Private Public Partnership should be encouraged among various partners in order to increase affordability of new technologies by small scale farmers.

Outcome

Members of the East African Youth Assembly (EALA Kenya Chapter) pledged to join efforts geared at accelerating GM crops commercialization in Kenya. They assured stakeholders of becoming spokespersons among their peers and committed to champion the adoption of GM crops in the country.

On behalf of his colleagues, Mr Vincent Luka, the chairperson of the EALA-Kenya outlined the following recommendations arising from the overall discussions:

1. Government should lift ban on GM food imports.
2. There is need for awareness on the benefits of GM crops to all citizens.
3. Farmers need to be given opportunity to choose for themselves.
4. Scientists should package information in a way that improves understanding and acceptance of GM crops.



2

OFAB 83 – November 17, 2016

**Potential of WEMA Bt Maize in Countering Perennial
Adverse Effects of Drought and Insect Pests for
Farmers in Kenya**



Dr. Murenga Mwimali

Presenter's Profile

Dr. Murenga Mwimali is a Principal Research Scientist at the Kenya Agricultural and Livestock Research Organization (KALRO) and a lead scientist of Water Efficient Maize for Africa (WEMA) project. He has over 10 years of professional experience in plant breeding research. His interests include: improved crop productivity in smallholder farms, food and nutrition security and impact evaluations in the agricultural food system. He holds a PhD degree in Agricultural and Horticultural Plant Breeding from University of KwaZulu-Natal, South Africa.

Introduction

Maize is a principal crop in Kenya and an important staple food for more than 80 percent of the population. It is a multi-purpose crop whose grains are widely consumed as food while the stover is fed to livestock. Kenya has the highest rates of per capita maize consumption as food in the world, at 103kg per annum. In the past few decades, however, maize production in Kenya has declined, and one of the major contributors is the stem borer pests, which are responsible for annual losses amounting to 15% i.e 417,000 tons of maize valued at US\$90 million.

The country's maize demand is currently higher than the local production. To bridge the deficit, the Kenya government has resulted to importing maize grain. This has necessitated research on an insect resistant maize variety (Bt-maize) by Kenya Agricultural and Livestock Research Organization (KALRO) and its partners.

Bt technology can help control insect pests in maize

With the advent of genetic engineering, new highly targeted strategies for pest control have become available in form of transgenic plants that are designed to have natural

defense traits. Genetic transformation offers the opportunity to insert Bt genes responsible for production of insect resistance proteins into the maize genome. As a result, the Bt maize plant becomes self protecting against chewing insect pests.

Bt genes that are effective against the *Busseola fusca* and *Chilo partellus* species of stem borer have been identified and successfully incorporated into maize. The stem borer larvae that penetrate plant tissues are killed when they ingest the insecticidal proteins produced in the Bt maize cells, thus acting as a natural defense system for plants against pests. This mechanism has been demonstrated not to have any adverse effects on human guts due to absence of receptors for the proteins. Therefore Bt-maize has been proved to be a safe and effective product, having undergone rigorous testing for food and feed safety, providing environmentally friendly and effective control of targeted pests. In Kenya, Bt maize is at the stages of national performance trials in Kiboko and Kitale. Results from the trials have shown that Bt-maize has recorded success against stem borers, and led to increase in yields.

Genetic modification offers potential to increase agricultural productivity in Kenya

The main aim of food crop research in Kenya is to contribute to the attainment of food security, reduction of poverty and increased incomes for rural people. Genetic modification technology could be the key to unlocking the potential of Kenya's agriculture by, among other things, addressing and solving the pest menace and effects of climate change that have hampered the economic production of major food and commercial crops.

Expectations from genetic engineering include high yielding, environmentally stable varieties of food crops, nutritional enhancement and resistance/tolerance to biotic and abiotic stresses. To realize these benefits, there is need for enhanced public-private-partnerships. These will provide varied set of strengths. Harmonizing diversity of partners often leads to the project's success. Lack of synergy between the partners leads do mistrust by the community irrespective of the end benefits of the project.

Conclusion

Bt-maize will be of great benefit to Kenyan farmers due to reduced cost of production and increased yields as compared to conventional maize. Cultivation of biotech maize reduces insecticides application and associated environmental and health risks. The projected increase in yields will lead to food security, increased income for small scale farmers and job creation as well as new investments in agriculture. It will also enable Kenya to venture towards generation of biofuels.

Status of the prevailing drought in Kenya. Case study of Kilifi County

Baha Nguma, Chief Officer, Agriculture, Livestock Development and Fisheries, Kilifi County

In Kilifi County, successive years of low rainfall have resulted in devastation of agriculture - crops have failed and livestock died. As a result, food insecurity has increased. These factors have impeded farm-related labor opportunities and household income. An estimated 1.25 million people in these areas faced starvation and malnutrition at the end of 2016 as a result. Kilifi north sub-county is already at an "alarm drought" level with the other five sub-counties- Kilifi South, Rabai, Kaloleni, Malindi and Ganze listed as being at an "alert" level.

The drought early warning system indicated severe deviation of vegetation condition index across the county. During the 2016 long rains assessment, the ranching zone and some areas in the marginal/mixed farming zone were classified in the stressed food security phase with minimally adequate food consumption and inability to afford essential non-food expenditures without engaging in irreversible coping strategies. Given the projected below-average short rains, other areas could move to crisis with acute malnutrition by 2017 due to growing food gaps.

The drought has also caused vegetation deficiency leading to depletion of pasture and browse in most parts of the county. With the development of WEMA's drought tolerant maize varieties, it is believed that such trends of food insecurity would be reversed. It is important for government to provide an enabling environment for eventual release and commercialization of WEMA maize so as to benefit the resource poor farmers in the drought-prone areas of Kenya.



Effect of drought on maize farms

Discussion

Question 1: How long will it take before the GM products are with the farmers and what is the major hindrance to this?

Answer: The conventionally developed drought tolerant products are already with the farmers, but for the GM products, the first cycle of stacked varieties for drought and insect tolerance have undergone confined field trials and the results are being analysed. However, for insect resistant varieties, an application for national performance trials has been made. The major hindrance is the bumpy processes of approval for field trials and the ban on GMO food imports in the country.

Question 2: Do research projects factor in value chain approaches and how can they be used to benefit the resource poor farmers

Answer: The research activities carried out in the country incorporate value chain approaches with a focus on dealing with the many economic challenges that affect farmers.

Quotes by participants

"The government is in discussion to ensure GM crops are with the farmers" Mrs. Jane Otado, Assistant Director of Agriculture, Ministry of Agriculture, Livestock and Fisheries

"We believe that agri-biotech needs to be given a chance because it has a big role to play in mitigating the challenges of food security that we are facing in most parts of our country" Baha Nguma, Chief agricultural Officer, Kilifi County.

"Climate change is affecting the country, Kilifi is an example, that's where technology comes handy, therefore we ask the government to allow scientists to help us mitigate the challenges of climate change" Anthony Aseto, Program Manager, Africa Harvest

"Science & GMOs can help fight climate change & food shortages in future" Amos Musyoki, PhD student, Kenyatta University

OFAB-Kenya activities



Study tour to KALRO Kitale, Trans Nzoia



Exhibitions at Kagio Township, Kirinyaga

GM Crops Research and Field Trials in Kenya by 2016



1. KIRINYAGA - MWEA

Bt Cotton (completed)

2. MURANGA – KANDARA (THIKA)

Virus Resistant Cassava (VIRCA)

3. MAKUENI – KIBOKO

Water Efficient Maize for Africa (WEMA)
African Biofortified Sorghum (ABS)

4. NAKURU – NAIVASHA

Purple Gypsophilla flower

5. BUSIA -ALUPE

GM Banana

6. KAKAMEGA

Virus Resistant Sweetpotato

7. KITALE

Stacked Insect resistance and drought tolerant maize

Counties visited in 2016

A: Trans Nzoia

B: Meru

C: Kirinyaga

D: Kilifi



OFAB County Events

Study Tour to Bt maize CFT at Kitale, Trans-Nzoia County, Western Kenya, Confined Field Trial (CFT) on July 22, 2016



Introduction

OFAB-Kenya in collaboration with Kenya Agricultural and Livestock Organization (KALRO), the International Maize and Wheat Improvement Center (CIMMYT), African Agricultural Technology Foundation (AATF) and Program for Biosafety Systems (PBS) organized a study visit to a Bt and DT maize Confined Field Trial (CFT) for regulators (National Biosafety Authority Board and National Biosafety Appeals Board). The visit was meant to show-case the country's capacity for research on GM crops and the progress made in the insect resistant maize trial to regulators.

Background on the CFT by Dr. Stephen Mugo, Principal Scientist, CIMMYT

Scientists under the Water Efficient Maize for Africa (WEMA) project drawn from KALRO, CIMMYT and AATF have for the first time

established a confined field trial for genetically modified maize resistant to African maize stem borer (*Busseola fusca*). The pest, which is endemic to African uplands, 500m above sea level causes 13 percent loss of all harvested maize grain in Kenya. Maize weakened by drought suffers more damage from stem borer attacks.



Dr. Stephen Mugo of CIMMYT explains to the participants of the study tour about the CFT

KALRO and CIMMYT through WEMA initially established a CFT for genetically modified insect pest-resistance (Bt) and drought tolerance (DT) traits at Kiboko, Eastern Kenya which is a low altitude area. Testing of single Bt and DT trait events at Kiboko showed drought tolerance and control for the spotted stem borer, *Chilo partellus*. It has been established that single trait events for insect protection and drought tolerance are effective, but stacked events are easier for farmers to adopt and manage. Only laboratory bioassays were carried out for testing the control of the African stem borer, *Busseola fusca*, because the pest is prevalent in high altitude areas. This informed the establishment of the Kitale CFT to test the Bt-DT stacks for the pest under field conditions i.e. a stack of both insect resistance and drought tolerance traits.

The CFT comprises of six sets of iso-hybrids, differing only in the presence or absence of the respective Bt or DT transgenes, grown together with a conventional resistant and three

commercial checks. They were infested with 10 neonates per plant of the respective stem borer species, 3 weeks after emergence. Leaf damage scores were then recorded.

Compliance of the CFT to Kenya's Biosafety Standards

The CFT sites were developed within the Kenya national biosafety framework and meet international biosafety standards for:

1. Isolation distance from other fields
2. Security perimeter fence, locked gates and 24 hours guard.
3. Disinfectant for machinery and human feet
4. Clear signage stating access restrictions and safety measures
5. A destruction system for plant materials and other wastes
6. Trained staff on biosafety compliance.

Towards Insect Protected and Tolerant Maize in Kenya through the WEMA Project by Dr. Murenga Mwimali- WEMA Project PI



Dr. Murenga Mwimali inspecting the maize crop during the study visit

There is a stem borer species in every maize growing region in Kenya from *Busseola fusca* to *Chilo partellus* to *Sesamia calamistis* and many others. They cause loss of photosynthetic leaf area to the maize plant, dead hearts,

lodging from damaged stems, increased ear rots and mycotoxins. The pests cause a 13 % loss in yield, equivalent to USD 90 million. Researchers with the WEMA project have been collecting data on the damage caused after

infestation of the trials with the neonates in the CFTs to find out whether the technology is working as expected in the local conditions. The project reports a 40% yield increase and 60% reduction in leaf damage in Bt maize

compared to commercial checks grown in the same conditions (fig. 3). Scientists have therefore proven that the technology can be utilized by farmers against the stem borer pest, resulting in yield increase.

Performance of Bt, non-Bt and commercial checks

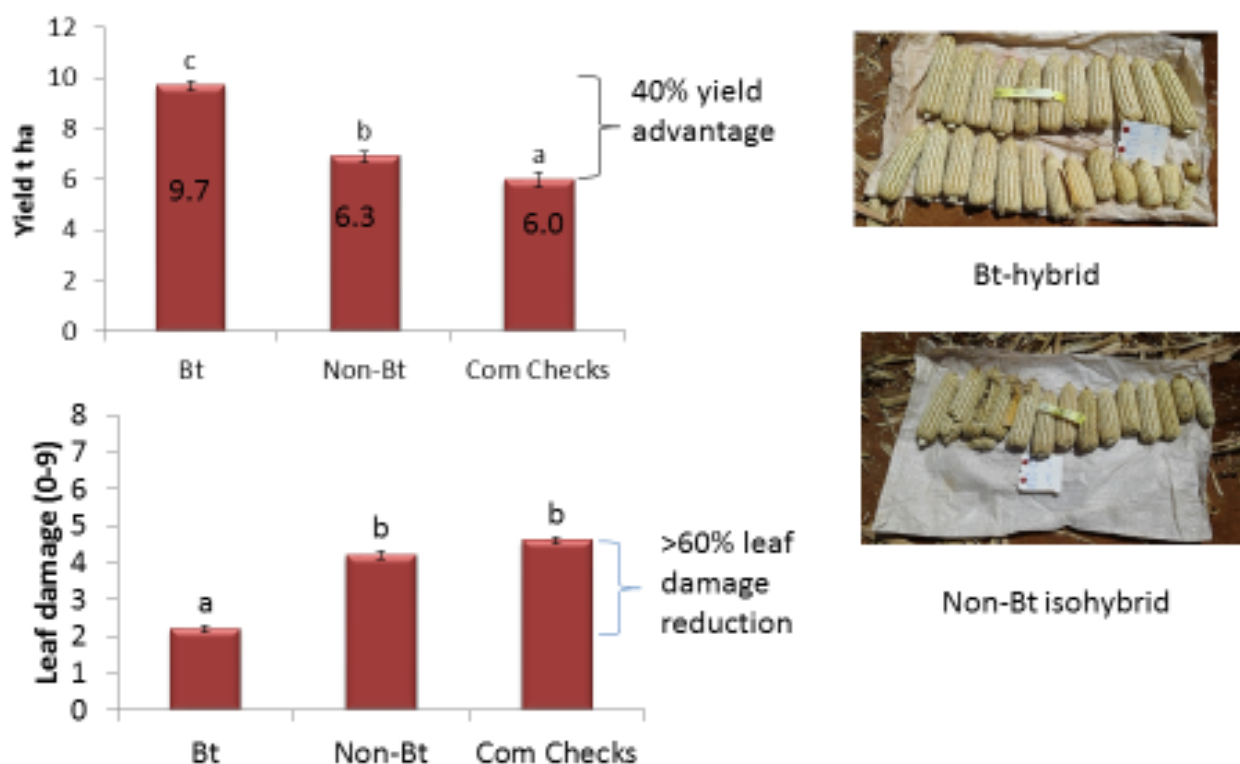


Figure 3: Yield increase in Bt compared to the commercial checks grown in the same conditions

The project team was granted conditional approval from NBA to carry out Bt maize testing under the National Performance Trials (NPT) in April 2016. One of the conditions was to conduct an environmental Impact Assessment/Environmental Social Impact Assessment (EIA/EISA) report. The EIA/EISA report was generated by National Environment

Management Authority (NEMA) accredited experts working with KALRO and AATF scientists and has since been submitted to NEMA. Six Kenya Plant Health Inspectorate Service (KEPHIS) designated sites (Embu, Mwea, Thika, Kibos, Kakamega, and Alupe) which were selected for testing and being prepared in readiness for the NPTs.

Comments and Way Forward from Various Participants

“With the first season of the trial almost out, farmers can be assured of a solution to the pest in the near future, should the approval to grow the maize commercially be granted” - Dr. Eliud Kireger, Director General of KALRO,

“The early exposure of members of the NBA board to the GM maize trial will no doubt lessen their work when the application for environmental release of the maize will be submitted” - Dr. Willy Tonui, CEO, NBA.

“Communicators and researchers need to cooperate to devise a strategy of unpacking the outcomes of the CFT to the public. Otherwise, the researchers should be supported to move the products to NPTs” - Ms. Rachel Shibalira, Biosafety Appeals Board Chairperson.

Comments from other NBA Board Members

- GM maize is similar to conventional maize save for the introduced characteristic (Insect resistance).
- This technology is important and useful to ensure food security for our nation.
- An informative study tour. Grateful to have seen a GM crop first-hand. It would be great if such study tours can be turned into feature stories for the TV stations. Consider inviting members of the public to the CFT sites to demystify the technology.
- Kenya should embrace GMO technology for enhanced food security.
- More effort should be made to create awareness about GM technology. Let us involve more stakeholders, including farmers in future forums.
- The CFT site is well managed.

- The researchers should be encouraged to apply for environmental release of the African stem borer resistant maize.
- The government needs to put more money into GM crops development.
- The concerns of the public such as effect of the technology to non-target organisms need to be addressed to allay public fear towards GMOs.

Exhibition at 3rd National Devolution Conference in Meru County, Eastern Kenya on April 20-23, 2016

OFAB-Kenya participated in the 3rd National Devolution Conference that was held in Meru County, Eastern Kenya on April 20-23, 2016. This provided an opportunity to interact and share information on agricultural biotechnology with participants of the conference, mainly staff and leaders in county governments. The chapter distributed information materials, shared presentations on Kenya's progress towards delivery of agri-biotech products to Kenyan farmers during the exhibition.

Through the interaction several Governors called on the government to lift the ban on GM food imports. The chair of the Council of Governors, Governor Peter Munya who was also the host of the annual conference urged the national govt to adopt GM crops. “We must adopt these crops to help us improve food production and deal with some of the challenges in agriculture,” he said.

His Siaya county counterpart, Governor Cornel Rasanga appealed to the government to roll out adoption of GM crops, especially Bt cotton. “Kenya is lagging behind. GM crops have been adopted in developing countries successfully and we should adopt them ourselves. In Siaya, we would really like to grow cotton, but the

only way to grow cotton would be through GMO cotton to enable us reduce the cost of production”

Governor Kinuthia Mbugua from Nakuru county, also emphasized the importance of GM crops saying that they were a must have in order to ensure food security for the increasing population “Food production has been declining drastically. Adoption of GM crops will contribute to food security.”

See the following links for the governors’ voices

1. <https://www.youtube.com/watch?v=4LMCubjIWz0>
2. <https://www.youtube.com/watch?v=38VEW0Pi1hM>
3. <https://www.youtube.com/watch?v=2IW4Q4ddkBk>
4. https://www.youtube.com/watch?v=v6y_1jRKtcl

The OFAB Kenya exhibition tent received more than 500 visitors from various categories of stakeholders, including farmers, county officials, policy makers and youth groups. According to a survey undertaken at the exhibition tent, majority of them (>80%) had heard about GM crops but were concerned about their safety. At the end of the one-on-one discussions, they understood the potential of GM crops and called on adoption of the crops, especially Bt cotton and maize in Kenya.

The news was covered by local media as per below links:

Kenyan governors rally behind GM crops published in The Standard Newspaper on 10th May 2016

<https://www.standardmedia.co.ke/mobile/article/2000201201/governors-rally-behind-gm-crops>

Governors now back push to lift GMO ban published in The People Daily Newspaper on 11 May 2016

<http://www.mediamaxnetwork.co.ke/business/219387/governors-now-back-push-to-lift-gmo-ban/>

Exhibitions at Kagio and Kutus Townships in Kirinyaga County, Central Kenya

OFAB Kenya conducted agri-biotech awareness and sensitization during an agricultural trade fair that had been organized by one of the media houses -Royal Media Services, in Kirinyaga County, Central Kenya on March 11, 2016. During the session, information concerning Kenya’s progress with agri-biotech and biosafety was shared. The farmers received responses to the many biosafety questions concerning GMOs that they had. The event provided an opportunity to correct the misconceptions that people in the region had concerning the technology.

“Today I have understood that Bt maize is stalk borer resistant. I would like to have such seeds so that I save money that I usually spend to buy chemicals that control the pests. Besides, I am expecting to get better harvests with GM maize since it will not be attacked by stalk borers,” said Nelson Muturi, a young farmer from Kagio area, in Kirinyaga County

Mr Muturi was relieved to know that GM maize is harmless and has been eaten elsewhere for many years. “Unlike before, I now know that GM maize is like any other maize, and it has been eaten elsewhere for many years. When it is available, I will cultivate and eat it without fear.”

The event which attracted over 2000 farmers from different areas of the region aimed at show-casing innovations in agriculture that can be utilized to boost agricultural productivity. The farmers called for speedy commercialization of GM crops in the country. They are eager to adopt crops which will help them deal with pests such as stalk borer.

Elsewhere in Kutus, a township in the same county, more than 300 farmers were sensitized

on agricultural biotechnology through an exhibition. The exhibition was organized by Integrated Community Organization for Sustainable Empowerment and Education for Development (ICOSEED) in partnership with African Agricultural Technology Foundation (AATF).

The farmers who like many others in Kenya had only heard negative and false information about GMOs were grateful for the enlightening session. They called for the lifting of the ban on GM food imports and demanded for GM crops. They termed high cost of inputs, drudgery and the surge in rural to urban migration as the reasons that the government should consider in order to fast track technologies that make agriculture not only affordable but also attractive to especially the youth.

See Nelson Muturi’s testimony about changing his perception after visiting the OFAB Kenya stand at Kagio exhibition:

<https://www.youtube.com/watch?v=iXYcmZ-gRA8>



Special OFAB Activities

Workshop for CECs of Agriculture and Health in Malindi, Coast Region, Kenya on August 24-25

OFAB Kenya in partnership with PBS and National Biosafety Appeals Board organized a workshop for County Executive Committee members (county ministers) for Health, Environment and Agriculture on August 24-25, 2016 in Malindi, Kilifi County, Coastal Kenya. The objective of the workshop was to update County Executives and select government officials on the status of agri-biotech and biosafety in the country and address issues of concern from the policy makers.

The main presentations at the workshop focused on the basics of agricultural biotechnology, the progress that the country has made towards adoption of the technology and Kenya's biosafety regulatory landscape. Further, the Biosafety Appeals Board made a presentation focused on its mandate. Some of the board's roles described included: provision of an administrative tribunal for revising and reviewing decisions by National Biosafety Authority; and provision of a platform for those aggrieved by the decision by NBA to launch an appeal within 30 days after decision has been made.

The policymakers were informed about the progress in research of Water Efficient Maize

for Africa project (WEMA) as well as the status of Bt cotton research in the country. The sorry status of cotton ginneries in Kenya, and the role Bt cotton can play in reviving them was highlighted. "The cotton ginneries in this area have all closed down resulting in loss of hundreds of jobs and income for workers and farmers" he said. Hon. Menza added that the "government is sitting on a potential solution to the problem" and urged the NBA to fast-track the approval of Bt cotton which he said will greatly benefit his county and country at large.

Dr. Andrew Mulwa, Chair of the 47 CECs of Health, expressed concern that the country was still holding onto a ban that was informed by a flawed study. He urged all CECs to engage national government in order to enable Kenyan farmers to benefit from GM crops.

The workshop was attended by a broad range of stakeholders including some heads of intergovernmental relations, several county directors of environment from NEMA, policy directors from key ministries, members of the Biosafety Appeals Board, academia, as well as experts from KALRO, led by their Director General, Dr. Eliud Kireger.

Outcome

The importance of packaging information in simple and understandable language was highlighted. Formation of intergovernmental as well as county level forums to engage and relay information to people in the counties was recommended. This would provide a platform to communicate the correct information about the technology.

In addition, it was agreed that there is need to work with the county government technical teams led by the CECs as well as the local leaders so as to secure the political good will. The CECs committed to engage the Cabinet

Secretaries (CSs) through intergovernmental forums and ask for the lifting of the ban on GM food importation.

Creation of specific biotechnology thematic working groups in the counties was recognised as important for information flow to the grassroots.

Formation of biosafety communication desks in the counties was also recommended as a way of creating awareness of biosafety measures that are in place in the country.



Participants of Malindi OFAB workshop with CECs of Agriculture and Health

OFAB Roundtable with News Editors

The media play a crucial role in shaping public perceptions on biotechnology. The way biotech messages are tailored is very important as it can help build or reduce confidence in the technology. In this regard, OFAB-Kenya and partners organized a breakfast meeting for members of the Editor's Guild on October 27, 2016. The general objective

of the meeting was to sensitize and update the members with information on on-going agricultural biotechnology research initiatives in Kenya. Editors from Royal Media Services (RMS), Nation Media Group (NMG), Standard Group (SG), Radio Africa, Kenya Broadcasting Corporation (KBC) and People Daily participated. The members were taken

through global impact of GM crops, the status of agri-biotech research in Kenya, the status of Kenya's biosafety framework as well as challenges of communicating agri-biotech in the media.

Some of the key highlights of the meeting included: the benefits of GM crops and their potential contribution to the country's food security and economic growth. The meeting came at a time when Kenya was facing hunger in most parts of the country due to effects of drought. It provided an opportunity to address pertinent issues that impact negatively on genetic modification technology with focus on safety of GM crops. The meeting sought to build relationships among scientists, science communicators and members of the Editor's Guild that would result in increased consultative interactions on science media reporting. This would go a long way in creating a process for building public awareness about the opportunities presented by biotechnology development in the country. It is clear that, at a time when science is opening up so many new possibilities for addressing human welfare problems, there is, perhaps paradoxically, a growing distrust of science on the part of the public. The public backlash against genetically modified products has strongly reinforced the need for a more transparent process for informing and involving non-experts in biotechnological development.

Going forward, it was agreed that there is a pressing need for more balanced information to reach the public. In this regard, therefore, scientists and journalists were identified as the two key groups best suited to disseminate this information. Participants agreed that scientists must become more active in reporting details of their work to the public, both directly and through the mass media.



Hassan Kalundu, one of the editors making a presentation at the event

The public are interested in science stories, provided that they are well-written. However, improved ability on the part of scientists and journalists to communicate with each other need to be sufficient to ensure better coverage of science issues in the mass media. This is because the media, particularly editors, are first and foremost looking for "good stories".

It is important for scientists to repackage their research findings for general reading. They must nurture the ability to process technical materials and put them in simpler words for popular writing. The reading materials should contain information on benefits, to appeal to the general public and should not use scientific jargons that may not be understood.

Lack of a science desk, journalists trained in science, editors' support, existence of communication divide between scientists and journalists; and scientists' inability to translate research work into exciting stories were identified as some of the reasons for media's lack of involvement in communicating biotechnology. It was recommended that science desks need to be established in the media houses, involving reporters with background on science to cover science matters and to enable wide consultation before publishing.

Conclusion

In the year 2016, OFAB Kenya's main focus remained awareness creation among various stakeholders towards lifting of the ban on GM food imports that was imposed in 2012. During this period, the government of Kenya through the Cabinet Secretary (CS) for Health, Dr. Cleophas Mailu was seen to wrongly interpret the ban by using it as an excuse for failure to grant an Environmental Impact Assessment (EIA) certificate for a biotech crop's National Performance Trial (NPT) to commence. The minister was reported to have advised National Environment Management Authority (NEMA) not to issue the EIA approval certificate for NPTs on Water Efficient Maize for Africa (WEMA-Bt maize) to be carried out. The EIA approval was one of the conditions given to the applicants for the environmental release of both WEMA Bt maize and cotton.

It was against this backdrop that the Chapter carried out various awareness creation activities such as Confined Field Trial (CFT) study visits, exhibitions in different counties, topical sessions, forums with the media editors and journalists among others. The activities had far reaching positive impacts to various

stakeholder groups including farmers, policy makers, regulators and the media. The reach-out to farmers at the grassroots, helped them voice their support for the technology and to dismiss misinformation that has prevented its release in order to address challenges that hinder optimal output. In the same breath, media editors promised to ensure increased frequency and prominence of agricultural biotechnology stories as the technology is aimed at solving food security challenges and improving the livelihood of rural populations.

Going forward, the Chapter will strive to forge new partnerships, especially with stakeholders linked with industrialization and trade in commodities such as textile. Sector players such as farmers and industrialists should endeavor to adopt agricultural biotechnology which assures reduced cost of production, quality produce and increased yields. OFAB-Kenya realizes the need to have onboard young farmers as the drivers of information dissemination in the grassroots. Finally, the Chapter must captivate an amenable policy environment and strive to sustain the political goodwill that exists for the technology.

OFAB Kenya Programming Committee Members

Dr. Margaret Karembu-ISAAA, Chair OFAB Kenya



Dr. Karembu is the Director of ISAAA AfriCenter and also the Chair of OFAB Kenya chapter Programming Committee. She has vast experience in managing, implementing and coordinating technology transfer projects as well as diffusion studies on modern biotechnology. A science communications specialist, Margaret holds a PhD Degree in Environmental Science Education from Kenyatta University, Kenya.

Mrs. Nancy Muchiri – AATF

Mrs. Muchiri is the Communications and Partnerships Manager at AATF. She is responsible for managing the Foundation's public and partnership relationships through strategic communications to enhance visibility and positioning of the Foundation and its projects. Nancy has an MSc Degree in Organisational Development from the United States International University, Kenya



Dr. Dan Kiambi-ABCIC



Dr. Kiambi is the Executive Director of African Biodiversity Conservation and Innovations Centre (ABCIC). He has vast experience in agrobiodiversity and plant genetic resources conservation and sustainable utilization. Dan holds a PhD in Biological Sciences (plant molecular diversity and ecogeographic survey) from the University of Birmingham UK.

Dr. Simon Gichuki- KALRO

Dr. Gichuki is the head of KALRO Biotechnology Centre. He is an active participant in biotechnology and biosafety policy development at the national, regional and international levels. Simon holds a PhD in Molecular Genetics and Plant Breeding from the University of Agricultural Sciences, Vienna (Austria).



Prof. Eucharia Kenya- Embu University College



Prof. Kenya is the Deputy Principal in charge of Planning, Administration and Finance, at Embu University College, a constituent of the University of Nairobi. She holds a PhD in Applied Entomology from the Rivers State University of Science and Technology, Nigeria.

Dr. Fred Kanampiu- IITA

Dr. Kanampiu is a project coordinator at IITA. He has vast experience and interest in striga weed management, natural resource management and capacity building. Fred has a PhD Degree in Soil Fertility from Oklahoma State University, Stillwater, USA.



Mrs. Jane Otadoh - Ministry of Agriculture, Livestock and Fisheries



Mrs. Otadoh is an Assistant Director of Agriculture in the Ministry of Agriculture, Livestock and Fisheries. She currently represents the Principal Secretary of Agriculture in the National Biosafety Authority Board and in the OFAB Programming Committee. She holds an MSc Degree in Plant Biotechnology from the University of Nairobi.

Mr. Paul Chege - ISAAA, Liaison Officer OFAB Kenya

Paul is the Program Officer in charge of OFAB-Kenya secretariat at ISAAA AfriCenter. He holds an MSc Degree in Agricultural Biotechnology from Szent Istvan University in Gödöllő, Hungary.



Mrs. Doris Wangari, PBS



Doris Wangari is the PBS Kenya Country Coordinator. She was previously a Biosafety Officer at the National Biosafety Authority (NBA). She holds a Masters degree in Biotechnology from Jomo Kenyatta University of Agriculture and Technology.

About OFAB

The Open Forum on Agricultural Biotechnology in Africa (OFAB) is a platform that brings together stakeholders in agricultural biotechnology for frank discussions on all aspects of the technology. It aims at enhancing knowledge sharing and awareness creation that will raise understanding and appreciation of agricultural biotechnology, thus contribute to building an enabling environment for decision making. OFAB is currently operational in eight countries: Burkina Faso, Ethiopia, Ghana, Kenya, Nigeria, Tanzania, Uganda and Zimbabwe.

OFAB Kenya is the pioneer chapter of the Open Forum on Agricultural Biotechnology in Africa. It is currently hosted by the International Service for the Acquisition of Agri-biotech Applications (ISAAA), *AfriCenter*, under a collaborative agreement with the African Agricultural Technology Foundation (AATF).

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Open Forum on Agricultural Biotechnology - Kenya Chapter



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