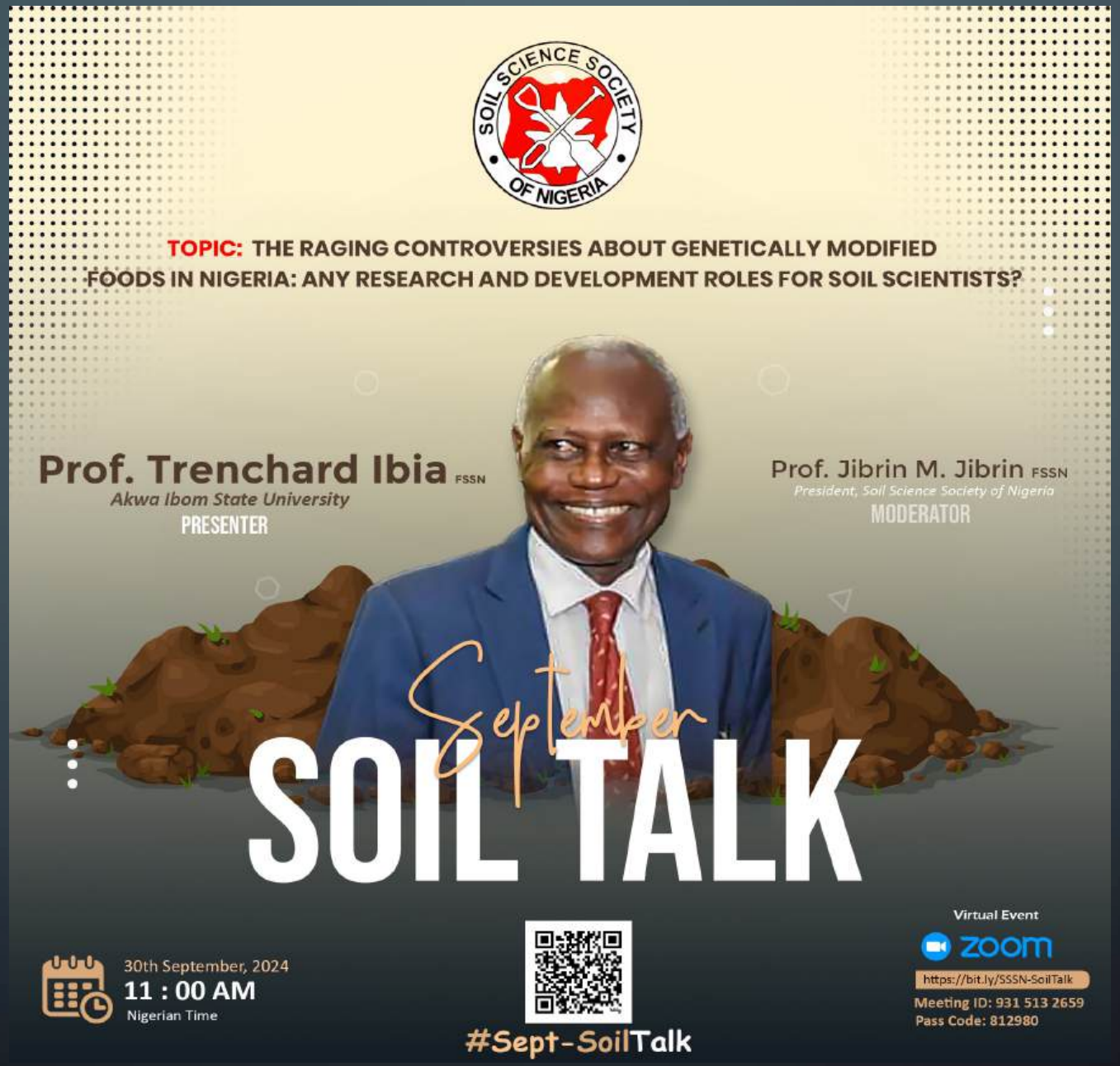
SOIL SCIENCE SOCIETY OF NIGERIA
TOPIC: THE RAGING CONTROVERSIES ABOUT GENETICALLY MODIFIED FOODS IN NIGERIA: ANY RESEARCH AND DEVELOPMENT ROLES FOR SOIL SCIENTISTS?
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THE RAGING CONTROVERSIES ABOUT GENETICALLY MODIFIED FOODS IN NIGERIA: ANY RESEARCH AND DEVELOPMENT ROLES FOR SOIL SCIENTISTS?

BY

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30th September, 2024

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INTRODUCTION

- The increase in world population (approaching 8.5bn) continue to challenge food availability, sufficiency and security;
- The breakthroughs in Genetically Modified Organisms (GMOs) and food production systems have shown advantages such as increased yields, food quality, nutrient composition and reduced costs for food and drug production, etc.
- While these advantages are being promoted, there have been contrary views, concerns, raging controversies and disapprovals on GMOs even here in Nigeria arising from perceived negative impacts of GMOs on the soils, the environment and human health.
- Issues raised about GMOs and soil health, environment, climate change aroused my interest;
- The objective of this Soil Talk is to consider GMOs and highlight the need for research and development roles by the Nigerian Soil Scientists in ensuring and enhancing food security at this stage of biotechnology breakthroughs in Nigeria and globally

WHAT ARE GMOS?

- A Genetically Modified Organism (GMO) is a plant, animal or microbe whose characteristics have been altered via genetic engineering.
- We have **non-transgenic GMOs** created via gene editing and **transgenic GMOs** obtained by introduction of genes from a different species and all have targeted characteristics such as bacterium fortified (Bt) and herbicide tolerance (HT);
- **Bt:** indicates GMO obtained by a bacterium that produces a toxin, harmful to certain pests such as corn borer, cotton bollworms, etc;
- **HT:** indicates Herbicide tolerant GMO crops engineered to withstand specific herbicides. This allows farmers to apply herbicides directly to the field without damaging the GMO crop;
- **GMO crops are mainly developed to be resistant to Insect(s) and Virus(es) as well as being tolerant to Herbicide(s)**

GMO VS HYBRID CROPS

- All genetically modified organisms (plant, animal or microbe) have the gene altered by introducing new gene or targeted changes in the gene;
- Hybrid crops are produced by the crossing of different varieties of the same or different species (hybridization) to obtain desirable traits without gene introduction or gene alteration;
- Hybridization aims to combine desirable characteristics or traits (improved yield, better quality or disease resistance, etc) by crossing two different varieties of same species or different species
- GMOs are not organic foods because organic foods are produced by farming methods without the use of synthetic chemicals or genetically modified components.

USES OF GMOS

GMOs are used in various fields of human endeavours including

- **Research:** to understand the functions of genes, regulation of processes, etc;
- **Agriculture**: longer shelf life; improvement in yields, quality, resistance to diseases and pests, and tolerance to environmental conditions;
- **Medicine and pharmaceuticals**: production of vaccines, insulin, antibiotics; in biopharmaceuticals for the production of therapeutic proteins, enzymes and hormones, etc;
- **Biotechnology**: production of biofuels, industrial enzymes, etc;
- **In industries**: food processing; domestic products, textiles, paper and pulp industries, environmental remediation,, etc.

EXAMPLES OF GMOS

- **Examples of GMO Crops**
- Herbicide-tolerant crops; Insect-resistant crops: such as Bt Corn; Bt Cotton; Virus-resistant Crops; Drought-resistant Crops (Corn; Soybeans); Nutritionally enhanced crops such as Rice; Vitamin A-enriched Sweet Potatoes, the popular GMO Sugar Beet, etc.
- **Examples of GMO Animals**
- AquAvantage Salmon (fast growing); Glofish (fluorescent fish); GMO cattle (improved milk yield and disease resistance); GMO pigs (with better growth rates or reduced environmental impacts); GMO chickens (with disease-resistance and high egg production).

- **Many GMO crops are useful as ingredients in other foods, for example:**

Cornstarch (soups and sauces); corn syrup, (sweetener); oils from corn, canola/rapeseed and soybean; ingredients for dressings and bread making; sugars (sugar beets), etc;

- **The USA is the Leading Country promoting GMO crops and foods**

It is in the public domain that over 90% of the maize, cotton and soybeans cultivated in the United States are genetically engineered (GE) verities

These three GE crops (Bt cotton; Bt corn, HT corn; HT soybean) occupy the bulk of the cultivated lands in the United States

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ADVANTAGES OF GMOs

1. The advantages of GMOs include attractiveness of produce, resilience, resistance, tolerance, increased shelf-life, increased nutritional value, higher yields to guarantee food sufficiency and access to quality foods;

2. Research shows that GMOs have the potential of enabling carbon sequestration, regulating greenhouse gas emissions, reducing tillage practices, etc;

3. Genetically Engineered Microorganisms (GEMs) have the potential for biodegradation of oil spills and clean-ups.

DISADVANTAGES OF GMOS

From the global point of view, GMO foods have been tagged to have disadvantages which include:

- That the long-term effects on safety of GMOs are not yet clear;
- There are concerns that GMO's can trigger in humans: allergic reactions, cancer, antibiotic resistance and harmful effects on the human immune system;
- There are concerns about the danger of damaging effects on human liver, kidney, reproductive organs, etc, and even genetic changes in humans.

SOME GENERAL ENVIRONMENTAL CONCERNS

- There is the risk of genes from GMO crops/foods passing into wild plants and other crops;
- The concerns of negative impacts on insects and other species;
- The concerns about reduction in other plant types, leading to a loss of biodiversity and extinction of some species;
- GMO crops may cause adverse effects on non-target species, particularly parasitoids and arthropod predators;
- Due to low genetic variability, GMO crops may be prone to environmental changes and diseases stress and stressors

Banning and Restriction are some of the challenges faced by GMO crops/foods

Many countries have banned GMO foods

- Such countries include: Austria; Belgium; Bulgaria; Croatia; Cyprus; Denmark; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxemburg; Malta; Netherlands; Norway; Poland; Portugal; Romania; Russia (temporary); Scotland; Serbia; Slovakia; Switzerland; Ukraine; Wales

There is also heavily restrictions in some countries

- Strict labeling requirements or banning of GMO cultivation, but mot imports:

By Australia; Brazil; China; India; Japan; New Zealand; South Africa; South Korea; Taiwan; Thailand (Ban on GMO cultivation)

UPDATE ON GMOS IN NIGERIA

Agencies engaged in Biotechnology administration and control in Nigeria where GMOs are of primary concerns include:

* National Biosafety Management Agency (NBMA) is responsible for ensuring the safe management of GMOs;

* National Biotechnology Development Agency (NABDA): Responsible for policy and development of biotechnology;

* National Centre for Genetic Resources and Biotechnology (NACGRAB): engaged in conservation and utilization of genetic resources including naming, registration and release of crop varieties, livestock breeds/fisheries.

GMO CROPS/FOODS IN NIGERIA

GMO Crops/foods in Nigeria include: Pod-Borer Resistant (PBR) Cowpea; Bt cotton; Pest-resistant cowpea; Nitrogen-efficient GMO rice; The latest is TELA maize, characterized as insect and drought resistant

- TELA is coined as follows: T= Tolerance to drought; E= Enhanced (nutritional content); L= Livelihoods (improved for farmers); A= Africa (target region of this maize variety)
- The Nigerian market is saturated with products such as cereals, salad creams, biscuits, ice creams, sweeteners, noodles, vegetable oils and spices containing generically modified ingredients

CONTROVERSIES ON GMOS IN NIGERIA

- Nigeria needs sustainable agricultural practices that prioritize environmental stewardship and not just high yields that are not sustainable.
- TELA maize was released recently along with other new varieties with the sole aim of achieving food sufficiency/Security in Nigeria;
- TELA maize with potential for high yields, present potential impacts on soil health, food security, agricultural resilience, increased reliance on external inputs and fear of erosion of our collective sovereignty

CONTROVERSIES ON GMOS CONT'D

- The controversies are raging in Nigeria particularly amongst Civil Society Organizations (CSOs)
- Controversies continue to bedevil GMOs, particularly with the TELA maize released recently which is perceived by Civil Society Organizations to be a threat to the health of Nigerians, the environment, Nigeria's sovereignty and food security.
- There has been worries, raging controversies and warnings on a range of devastating consequences of Nigeria's engagement and indulgence in GMOs

CONTROVERSIES ON ENVIRONMENTAL CONCERNS

There is the believe that the large-scale cultivation of TELA maize poses significant environmental risks such as

- Threat to ecological contamination of soil, water and organisms, etc;
- Erosion of traditional farming methods;
- Destabilization of the ecosystem and threats to biodiversity;
- Soil pollution by increased pesticides/herbicides, and fertilizers use in TELA maize farming;
- Harmful effects on beneficial organisms in the environment remain as concern;
- Accumulation of chemical residues in the soil due to intensive use of herbicides;
- Concerns on water pollution, and harm to aquatic life due to obnoxious chemical-saturated runoff waters from farms;
- Displacement of traditional crop varieties due to TELA maize monoculture farming;
- Concerns have been expressed on the impacts of TELA maize cultivation on climate change;

THE FEDERAL GOVERNMENT'S STANCE

- The Federal Government through its management and regulatory agencies- National Biosafety Management Agency (NBMA) and National Biotechnology Development Agency (NABDA) has made commitments to ensuring transparency and safety on GMOs by collaborating with experts in the academia, National Agency for Food and Drug Administration and Control (NAFDAC), Standard Organization of Nigeria (SON) and Nigerian Agricultural Quarantine Service in the certification process.

- It has been further confirmed that TELA maize based on empirical evidence has significant benefits but still the controversies are raging.
- Civil Society Organizations (CSOs) and others have continued to express disapprovals, **thus presenting new areas of challenges for Soil Scientists to join hands with others in fostering GMO Research and Development in Nigeria and the global world**

SOME CSOS AGAINST GMOS IN NIGERIA

- Health of Mother Earth Foundation (HOMEF)
- GMO-Free Nigeria Alliance
- Alliance for Food Sovereignty in Africa (AFSA)
- Nigerian's Against GMOs
- Bio Integrity and Natural Foods Awareness (BINFA)
- The Young Environmentalist Network (TYEN)
- Policy Alert (PA)
- International Climate Change Initiative (ICCDI)
- Community Development Advocacy Foundation (CODAF)
- Women and Children Life Advancement Initiative on Climate Change
- Rural Alliance for Green Environment (RAGE)
- Committee on Vital Environmental Resources (COVER)
- Gender and Environmental Risks Reduction Initiative (GECOME)
- Urban-Rural Environmental Defenders (U-RED)
- Eco Defenders Network (EDN)
- Green Alliance Nigeria
- Project SPRINT

RESEARCH AND DEVELOPMENT ON GMO'S: ROLES FOR SOIL SCIENTISTS

- **The pivotal role of soil scientists in soil, land, food and environment cannot be undermined.**
- As critical stakeholders in matters relating to soil, land, food and environment, Nigerian Soil Scientists have major roles to play in ensuring safe and acceptable standards in the **cultivation** of GMOs to guarantee food security, soil and environmental sustainability;
- Soil Science practitioners' involvement in GMO research, will contribute needed expertise to aid in understanding the impacts of GMOs on soil ecosystems, processes, soil fertility, soil productivity, soil health and sustainability as soil and land resources are put to GMO crops.

OUR ROLES IN RESEARCH AND DEVELOPMENT

- GMOs and Microbial ecology in the soil and land resources
- GMOs and Cycling of nutrients in the entire ecosystems
- Effects of GMOs on soil physical and chemical properties, such as structure, organic matter, soil fertility, soil health;
- Gene flow and persistence: GMO traits transfer to non-target organisms and persistence in soils;
- Understanding how GMOs affect interactions between soil organisms (micro and macro flora and fauna);
- Environmental risk and sensitivity assessments to evaluate the potential environmental risks associated with GMOs in soil ecosystems;
- Collaborative research on designing GMOs that are tailored to specific soil conditions, properties, and environment;
- Developing harmonization methods to monitor and assess the impacts of GMOs on soil health and fertility;

Other areas of interest to Soil Scientists should include

- Monitoring of greenhouse emissions from GMO farming practices/systems
- Use of GEMs in bioremediation of contaminated and polluted soils
- Monitoring of soil health indicators with GMO crop farming systems

NEED FOR CURRICULUM DEVELOPMENT AND TRAINING ON BIOTECHNOLOGY AND SOIL SCIENCE

At the undergraduate level: "Introductory Biotechnology, Soil Science, and Agriculture" – to give introductory learning and knowledge in the use of biotechnology in Soil Science and land resources management, agriculture and agricultural land use, farming systems and ecosystem functions and services.

At the postgraduate level: "Advances in Biotechnology, Soils and Agriculture" to consider aspects of

- Application of biotechnology in the soil environment
- Impacts of biotechnology in soils and ecosystem functions and services
- Biotechnology in soil fertility, soil quality and soil health improvements
- Biotechnology in soil remediation and decontamination
- Etc

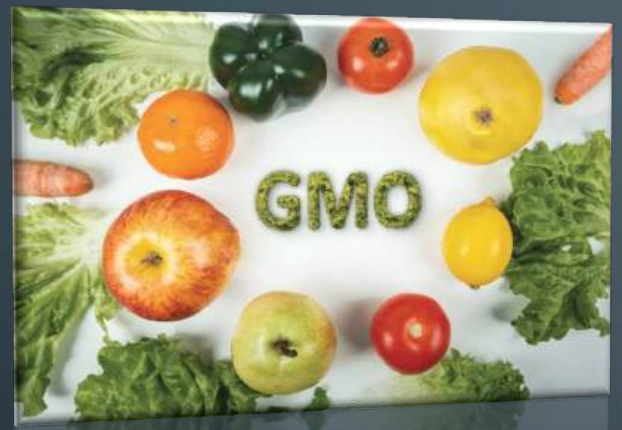
RECOMMENDATIONS

1. Prioritizing a ten-year commissioned Research and Development progrmme on the impacts of GMOs on soils, land and the overall environment;
2. There is imperative need to establish a special Fund for Research and Development on the effects of GMOs on soils and other components of the ecosystem
3. The Fund should be managed by the Agricultural Research Council of Nigeria in collaboration with cognate MDAs, Agricultural Research Institutes and the Universities.
4. SSSN and NISS should advance these recommendations from here.

CONCLUSIONS

- Like everything in nature, GMO crops/foods will certainly pose advantages and disadvantages.
- To sustain the advantages and mitigate the disadvantages for sustainable human and biodiversity survival, Research and Development hold the key
- Nigeria which is yet to guarantee her capacity for development research should be cautious and slow in adopting genetically engineered products and services;
- There is need to establish a Special fund for commissioned and dedicated development research on the impacts of GMOs on the ecosystems;
- Soil Science practitioners need to build research and development capacities to cope with the concerns of GMO food systems by taking up roles on GMOs and soil health and environmental sustainability.

THANK YOU, PRESIDENT OF SSSN; THANK YOU ALL!



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