Policy Brief

If it works for Cotton, why not for maize? The untapped potential of agricultural Biotechnology in Malawi

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Executive Summary:

Agricultural biotechnology holds immense potential in addressing agricultural production challenges faced by Malawi. This policy brief outlines the significant contributions that agricultural biotechnology has made to the cotton value chain in enhancing productivity by improving resilience to pests and diseases with specific emphasis on the cotton bollworm. It is expected that the application of biotechnology in maize will boost productivity by helping to address production challenges specifically the infestation of the Fall Army Worm (FAW) and the high cost of managing weeds.



Introduction:

Malawi faces numerous agricultural production challenges, including low yields, pests and diseases, and climate change impacts. Agricultural biotechnology, including genetically modified (GM) crops, offers innovative solutions to overcome these challenges. This policy brief highlights the potential contribution of agricultural biotechnology in addressing Malawi's agricultural production challenges.

Maize (*Zea mays L.*) is a primary cereal crop grown in over 50% of the countries in sub-Saharan Africa (SSA). The crop is a major staple for over 300 million people in the region, and it is cultivated on over 40 million ha of land (FAO, 2021). In fact, maize production in SSA increased by 534% from 1961 to 2017, largely due to increases in the area under cultivation rather than grain yield per unit area which remained low. Abiotic and biotic constraints are known to cause about 15 to 100 % losses in maize yield despite the pursuit to achieve sustainable maize productivity in Africa (Kfir et al., 2002). Current population estimates predict a double increase in human population over the next 30 years, which would require a three-fold increase in cereal production (Prasanna et al., 2021). Therefore, effective management strategies to combat stresses that reduce yield are urgently needed.

The Fall armyworm (FAW) (*Spodopterafrugiperda*) has unarguably become the most damaging pests of maize in SSA. Its occurrence on the African continent was first reported in 2016 (Tindo et al. 2017). Maize area under Special Maize Programme (Command Agriculture) affected by FAW was 21 687ha which translates to 14% of total maize area of 158 252ha planted for the 2017/2018 season. Small grains area affected by FAW was 5 289 ha (2%) of national area planted for the 2017/18 season (FAO, AGRITEX 2018). The FAW has the potential of causing yield losses of up to 100% in maize crop if not controlled (Abrahams et al., 2017). Across Africa, economic losses of over USD13 billion per year have been reported due to FAW infestations (Tambo et al., 2020).

CABI estimated economic loss of (between 4.5 and 11.3 % of Malawi Agricultural GDP due to FAW damage assuming the pest will continue to spread throughout all areas where it is predicted to survive (CABI, 2017). The FAW thus remains a serious threat to food security and sustainable crop productivity in the region. Judicious use of cultural, chemical, and biological methods as part of integrated pest management (IPM) in combination with the use of resistant varieties provide viable options for combating FAW.

Cultural methods are time consuming and impractical on a large scale and use of chemical pesticides though effective and fast, pests may develop resistance and are costly and unaffordable by most smallholder farmers (Van den Berg 2022). In addition, chemical pesticides pose a threat on the environment and leaves residues in the grain that are detrimental to human health. Currently, there are no FAW resistant maize varieties in Malawi and is currently in the process of developing FAW resistant maize varieties (DARS, 2022).

Biological control methods, which include the use of natural biocontrol agents like microbial pathogens (fungi, virus, bacteria) and arthropods, and plant extracts, have proven effective, environmentally and human friendly, and cheap.

Policy Implications:

a) Enhanced Crop Productivity:

Agricultural biotechnology, specifically genetic modification, has the potential to improve crop productivity in Malawi. By incorporating traits such as drought tolerance, disease resistance, and increased nutrient content, GM crops can help farmers achieve higher yields and improve food security. The graph below depicts the performance of the Bt cotton compared to convention varieties. The results indicate that Bt cotton was performing much better under all trial conditions, than the convention variety.

Yield Performance kg/ha of three cotton varieties under Spray and no spray conditions at Bunda

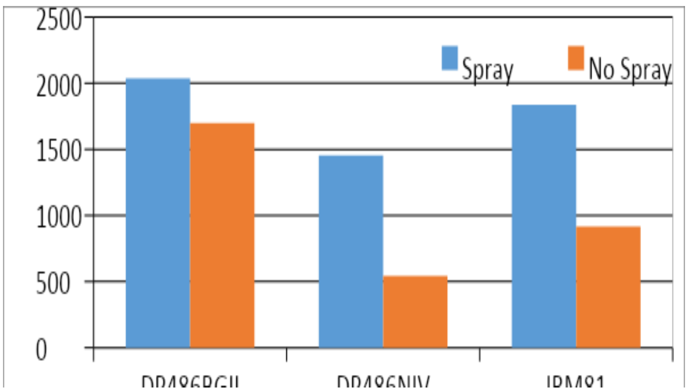

Table1: Yield performance of three cotton varieties under spray and no spray conditions

b) Climate Change Resilience:
Agricultural biotechnology can play a crucial role in enhancing the resilience of crops to climate change impacts in Malawi. Through genetic modification, crops can be engineered to withstand drought, and other extreme weather conditions, reducing vulnerability and ensuring stable agricultural production.

c) Pest and Disease Management:
Agricultural biotechnology offers effective solutions for managing pests and diseases that cause significant yield losses in Malawi. By incorporating genetic traits for pest resistance, crops can reduce their dependence on chemical pesticides, minimize crop losses, and protect farmer livelihoods.

d) Sustainable Agricultural Practices:
Agricultural biotechnology supports sustainable farming practices by reducing the use of agrochemicals, conserving water resources, and promoting soil health. Through biotech innovations, such as bio fortification, nitrogen-fixing crops, and enhanced shelf life, Malawi can enhance agricultural sustainability while addressing nutritional deficiencies and soil degradation.

Conclusion:

Agricultural biotechnology offers transformative solutions to address agricultural production challenges in Malawi. Since commercialization of Bt cotton, farmers' yields have almost doubled, and others tripled. Adoption of the new variety is now over 95% all thanks to the performance of the variety.

By embracing GM crops and fostering an enabling environment through regulatory frameworks, capacity building, and stakeholder engagement, Malawi can unlock the potential of agricultural biotechnology and pave the way for food and nutrition security.

The case of Bt cotton has demonstrated potential benefits to farmers and the country can reap from embracing agricultural biotechnology as one of the options to tame food insecurity and boost income for farmers.

To that effect it is evident that if farmers are to address maize production challenges, then adoption of agricultural biotechnology will adequately contribute to the achievement of farmers' needs.

Policy Recommendations:

To harness the potential of agricultural biotechnology in tackling agricultural production challenges in Malawi, the following policy recommendations are proposed:

1. Establish a favourable regulatory framework:

- Develop science-based and risk-proportionate regulations for the approval and commercialization of GM crops.
- Strengthen regulatory institutions to ensure transparent, evidence-based based and efficient decision-making processes.

2. Build capacity and awareness:

- Invest in scientific research and training programmes to enhance the capacity of Malawian scientists and policymakers in agricultural biotechnology.
- Conduct public awareness campaigns to educate farmers, consumers, and stakeholders about the benefits and safety of GM crops.

3. Foster stakeholder engagement:

- Facilitate multi-stakeholder dialogues and consultations to ensure inclusivity and transparency in decision-making processes related to agricultural biotechnology adoption.
- Engage with farmers, farmer organizations, and civil society to address concerns, promote understanding, and build trust in agricultural biotechnology.

Reference:

- Confined Field Trials: Application, Review and Decision-Making workshop. 16-19 October 2007. Hippo View Lodge, Liwonde. Malawi-Resource Person
- Biotechnology Communicators Training workshop. 3-7 April 2006. Centurion Hotel, Tswane, RSA- Participant

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