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Use of Biocontrol for Aflatoxin Prevention and Control in the EAC

EXECUTIVE SUMMARY

Aflatoxins are poisonous substance produced by fungus that grows and contaminates most of staple food including cereals, oils seeds, roots crops and legumes. Aflatoxin contaminates a quarter of the world's food supply and approximately 4.5 billion people are exposed to aflatoxin contamination worldwide. Aflatoxin contaminates a wide range of agricultural crops in the EAC including cereals (maize, sorghum, millet, rice wheat), oil seeds (groundnuts, cottonseed, sesame) root crops (cassava), cashew nuts, spices (particularly chilies), and products made from these crops. High aflatoxin contamination above the maximum permissible level of 10 ppb have been reported in Kenya, Tanzania and Uganda in maize which is a major staple food and the most traded in the whole EAC.

The main cause of high level of contamination includes limited use of Good Agricultural Practices (GAPs) such as use of drought and insect resistant varieties, the application of inputs to ensure plant health, the timely harvesting of crops, appropriate drying methods to discourage the growth of fungi and bacteria, storage conditions to preserve quality and integrity, and the use of innovative technologies such as biological control. Biocontrol is a component of GAPs that uses non-toxic types of fungus to inhibit the growth of the toxic fungus and its aflatoxin production. Biocontrol is able to reduce aflatoxin contamination in maize and groundnuts from 80 to 90 percent. Despite the benefits of biocontrol, there is inadequate capacity (human resources, infrastructure, regulatory framework and market incentives) to enable the uptake and scale up of the technology. In addition, the existing GAPs do not integrate adequately aflatoxin prevention and control. To resolve the problem of aflatoxin contamination in field, the East Africa region should promote the use of biocontrol as part of the GAPs. In addition, the EAC region should facilitate research and promote the production, trade and marketing for biocontrol products. Biocontrol is sustainable, cost effective and environmentally safe method that could significantly reduce aflatoxin contamination levels along the value chain of susceptible crops.

Working to Combat Aflatoxin in Kenya

THE PROBLEM

Aflatoxins are poisonous substance produced by fungus that grows and contaminates most of staple food including cereals, oils seeds, roots crops and legumes. Aflatoxin contaminates a quarter of the world's food supply and approximately 4.5 billion people are exposed to aflatoxin contamination worldwide (Williams et al., 2004). Maize is a major staple food and widely traded across the region, is among the most highly affected. Aflatoxin impacts negatively on agriculture, health, and trade sectors. High levels (exceeding permissible according to EAC standards) are common in maize and ground nuts. Such levels limit acceptability of agricultural produces to domestic and international markets. This is because aflatoxin contaminated food contributes to immunosuppression, stunting among infants and young children, and liver cancer in both humans and animals. Aflatoxin contamination starts in the fields and continues during postharvest handling and storage. This is aggravated by the use of susceptible varieties and the stressors including high temperature, high moisture, poor soil fertility, insect damage to crops, and poor harvest practices (Waliyar et al. 2015).

The best way to mitigate this problem is to tackle it right from the field by applying GAPs. However, the existing GAPs for prevention and control of aflatoxin are not able to reduce aflatoxin to the levels which are not harmful therefore there is a need of more effective measures in the region. Biocontrol is one the measures which have proved to be effective in reduction of aflatoxin contamination. Biocontrol uses non-toxic types of fungus to inhibit the growth of the toxic fungus and its aflatoxin production. Biocontrol is able to reduce aflatoxin contamination in maize and groundnuts from 80 to 90 percent (Bandyopadhyay and Cotty 2013). In addition, biocontrol is sustainable, cost effective and environmentally safe. The non-toxic fungus occurs naturally in the soil in EAC region. Despite the benefits of biocontrol measures, its uptake is low due to inadequate capacity in terms of knowledge, human resources, infrastructure and policy (registration).

SIZE OF THE PROBLEM

Aflatoxin contaminates a wide range of agricultural crops in the region including cereals (maize, sorghum, millet, rice wheat), oil seeds (groundnuts, cottonseed, sesame) root crops (cassava), cashew nuts, spices (particularly chilies), and products made from these crops. High aflatoxin contamination exceeding by far the maximum permissible level of 10 ppb have been reported in maize and ground nuts for Kenya, Tanzania and Uganda (Sebunya and Yourtee, 1990; Kaaya and Muduuli 1992, Kaaya and Warren 2005, Mutegi et al. (2010) and Kimanya et al. (2008).

CAUSE OF THE PROBLEM

There is limited use of GAPs such as use of drought and insect resistant varieties, the application of inputs to ensure plant health, the timely harvesting of crops, appropriate drying methods to discourage the growth of fungi and bacteria, storage conditions to preserve quality and integrity, and the use of innovative technologies such as biological control. Despite the benefits of biocontrol, there is inadequate capacity (human resources, infrastructure, regulatory framework market incentives) to enable the uptake and scale up of the technology. In addition, the existing GAPs do not integrate adequately aflatoxin prevention and control.

POLICY OPTIONS/RECOMMENDATIONS

Policy Option 1: The East African Community should create an enabling policy and regulatory environment for the adoption and deployment of biocontrol interventions in the prevention and control of Aflatoxin as part of GAPs. Public awareness on the potential benefits associated with the biocontrol option should be enhanced.

Biological control has been shown to successfully reduce the total aflatoxin contamination of a treated crop by up to 90 percent. Reductions achieved by the biocontrol are effectively maintained throughout the value chain from harvest to consumption because the beneficial fungi remain with the crop throughout transport, storage, and processing. Biocontrol is most effective when delivered in combination with a package of other GAPs rather than a "stand alone" vertical program.

Policy Option 2: EAC region should facilitate research and promote the production, trade and marketing for biocontrol products through harmonized regulatory frameworks.

Biocontrol agents are not currently registered as biopesticides in the EAC partner states, and there is no regionally harmonized legislation or regulation in place to facilitate either the manufacturing or trade of aflatoxin biocontrol products. Currently there are few centers of excellence to generate appropriate technologies including biocontrol, generate information for awareness creation at all levels on aflatoxin prevention and control.

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