iFFED Implication Statements for aflatoxins

Summary of the concept

Climate change-related abiotic factors (especially increased temperature, elevated CO_2 and extremes in water availability) influence the infection of food crops by fungi, including mycotoxigenic (mycotoxin-producing) fungi. By modifying host–resistance and host–pathogen interactions and influence, future climate scenario will likely result in increased aflatoxin contamination levels, especially in nuts and cereals like maize. Elevated CO_2 (350–400 vs 650–1200 ppm), higher temperature (+2–5°C) and drought stress (resulting in lower water activity) may not affect the growth of *Aspergillus flavus* (the fungi responsible for producing aflatoxins) but will stimulate aflatoxins production. For the implication of future climate on maize aflatoxin contamination, are considered the parameters of the fungi (diversity, strain pathogenicity, toxigenicity, competition with other microbes), of the host plants (varieties and susceptibility of the planted maize varieties), and of the environment (temperature, drought, irrigation, use of fungicide, crop diversification). Adoption of improved farming practices including fungi-resistant varieties, fungicide application, biocontrol methods (Aflasafe), crop diversity (intercropping, rotation, etc), contribute in reducing fungal development and toxin production, and could help mitigating the effect of climate change. Besides, most of the aflatoxin production in maize grain occurring during storage, agricultural policies towards improved storage condition could mitigate grain aflatoxin contamination. The regulatory limits are 10 µg/kg for total aflatoxins and 5 µg/kg for aflatoxin B1 in maize. Higher aflatoxins in maize and maize-derived feeds (bran) will result in higher aflatoxin M1 in cow milk; its regulatory limit is 50 pg/ml.

<u>Malawi</u>

Low climate risk (RCP2.6) / ineffective agricultural policies (LT)

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<u>Implications</u>

By mid-century, moderate changes in climate if not followed by change in policy for adoption of crop diversification, resistant maize varieties, use of fungicides and biocontrol methods, and improved postharvest and storage technologies, are likely to result in small increase in maize aflatoxin contamination.

Implications

Towards the end of the century, rainfall thought likely to decrease markedly throughout Malawi by around 14%, with significant change in rainfall pattern, projected warming of +2.3 °C evenly distributed across the country, low likelihoods of longer dry spells and of intense rainfall events with the possibility of increases in the number and extent of flooding events.

By late century, high changes in climate without effective policy improvement could result in high increase in maize aflatoxin contamination.

High climate risk (RCP8.5)/ Ineffective agricultural polices (LT)

By mid-century, climate models show average temperatures warming by roughly 2-4°C throughout the year compared to 1990-2010, with a corresponding increase in the number of growing degree days during the rainy season. There is also increased occurrence and frequency of temperature extremes, including the number of days with average temperature above 35°C. Rainfall trends are much less robust; however, climate models show a tendency toward higher rainfall totals during the wettest months (December-February) accompanied by more rainfall on very wet days, increased rainfall intensity and slight reduction in the number of wet days. There are also slight trends towards longer extreme dry spells and shorter extreme wet spells during October and November. This is consistent with a general shortening of the rainy season across Malawi. The number of months experiencing drought conditions is also projected to increase. However, there is significant disagreement between climate models for projections of rainfall and related quantities.

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Tanzania

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South Africa

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