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Disposal and Alternative use of Aflatoxin Contaminated Food

EXECUTIVE SUMMARY

Agricultural commodities, including maize, groundnuts, and cassava, milk, and cotton seed contaminated with aflatoxin pose serious threat to human and animal health, and to the economies of the EAC Partner States. It is, therefore, desirable that contamination should be prevented to the greatest extent possible. Given that eradication of aflatoxin contamination in foods is not feasible at the moment, alternative uses should be considered with disposal being the last resort. The EAC, however, doesn't have established and functional mechanisms for disposal of aflatoxin-contaminated agricultural commodities.

Some of the contaminated commodities may be appropriately placed for alternative uses, such as animal feed and production of energy. This is possible because the severity of risk from aflatoxin differs substantially between humans and animals and among animals. It further differs significantly within species of animals and among humans relative to their age and health status. Commodities unfit for human consumption can often be selectively used as animal feed for the appropriate type and category of livestock. Through chemical and physical processing, contaminated commodities can also be processed to yield by-products that become fit for animal consumption, including production of energy, industrial products such as glue and ethanol. Similarly products that may be classified as unsafe for infants may be tolerable by adults. Further, the options suggested for disposal of the contaminated consignments are burying and incineration.

This policy brief calls for the establishment of regional policy framework to guide and provide options for alternative uses of contaminated commodities and disposal of contaminated commodities.

THE PROBLEM

Major food commodities in the EAC such as maize, groundnuts, cassava, milk, and cotton seed are under sustained threat of aflatoxin contamination thereby posing serious human and animal health implications, and to the economies of the EAC Partner States.

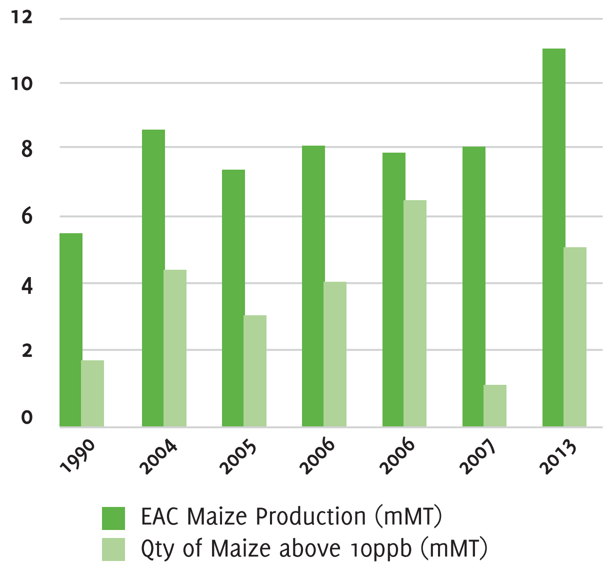
The heightened sampling and testing of aflatoxin susceptible commodities followed by regulatory recalls and withdrawals of aflatoxin contaminated commodities has led to confinement of contaminated stocks in institutions of learning, food manufacturing premises, business operator premises, cereal depots, amongst other government and non-government institutions pending an amicably agreed decision on alternative uses and/or mode of disposal.

Part of the 13,992 MT of aflatoxin contaminated maize waiting for destruction at a cement kiln in Kenya

SIZE OF THE PROBLEM

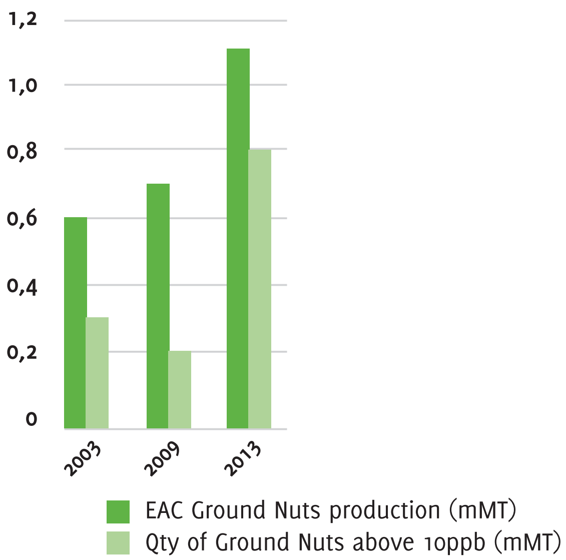
Figure 1 shows the trend of aflatoxin contamination of maize compared to the production in EAC Partner States between 1990 and 2013. The trend has been increasing over the years. However, there is no documented mechanism for disposal of the contaminated produce. For example the Republic of Kenya in 2014, while destroying 13,992 metric tonnes of aflatoxin contaminated maize, faced enormous challenges in terms of collection, transportation, safe destruction of the contaminated consignment (Personal Communication, Kenya, 2014) (Photo page 1).

Figure1
Quantity of contaminated maize
in EAC Partner States (millions of metric tonnes)



Source: Kaaya et al. 2005; Lewis et al. 2005; Daniel et al. 2011; Okoth & Kola 2012; Kilonzo et al. 2014

Figure2
Quantity of contaminated Ground Nuts in EAC Partner States (millions of metric tonnes)



Source: Kaaya et al 2006; Mutegi et al 2010; Osao 2014

The EAC has been working on mechanisms that are aimed at restricting exposure to aflatoxin, such as the development of regulations that stipulate acceptable limits or standards for aflatoxins (EAS 2:2013). However, blanket enforcement of such regulations would result in substantial quantities of staple food crops being declared unfit for consumption by either humans or livestock and hence discarded. Lack of a coordinated way of disposing off of the contaminated produce and or turning it into other safe forms for alternative use exacerbates the situation.

CAUSE OF THE PROBLEM

In the EAC Partner States, there is lack of a clear policy direction and legal provisions on approved alternative uses of aflatoxin contaminated commodities neither is there approved disposal methods.

This policy brief, therefore, provides options for alternative uses and disposal of contaminated commodities.

POLICY OPTIONS/RECOMMENDATIONS

It is recommended that the EAC develops a policy and legal framework that will provide guidance on alternative uses and appropriate methods of disposal of aflatoxin contaminated commodities. The policy and legal framework should take into consideration the following options on alternative uses and disposal methods:

1) ALTERNATIVE USES:

Policy Option 1: Cascading direct utilization: This means the use of aflatoxin contaminated foods according to level of contamination and severity. The table below indicates the category of use depending on the level of contamination;

The severity of the response to aflatoxin differs among humans and animals by health and nutritional status (Gradelet et al. 1998), with diversity of tolerance among species and various age groups (Wogan 1966; Roebuck and Wogan 1977; Pier 1992; Wild and Gong 2010). Therefore, a commodity would be considered for use if it is desired for use in a category requiring less aflatoxin contamination.

Lot No.	Total Aflatoxin contamination (µg/kg)	Proposal for Use (in the EAC)
1	Up to 5	For dog food and direct human consumption
2	Up to 10	Direct human consumption
3	Up to 20	Feed for mature animals including diary animals
4	Up to 100	Feed for mature beef animals excluding diary animals
5	More than 100	Reject for all classes or Recommend for other alternative use/disposal

POLICY OPTIONS/RECOMMENDATIONS

POLICY OPTION 2: Production of Energy – Aflatoxin contaminated maize can be used a raw material in generation of energy for manufacturing of cement.

In Kenya, 13,992 metric tonnes of aflatoxin contaminated maize was used to generate energy in a cement kiln (Personal Communication, Kenya, 2014).

POLICY OPTION 3: Production of Industrial Products – Aflatoxin contaminated foods such as maize can be used to manufacture glue, industrial alcohol (ethanol), amongst other industrial products.

Contaminated foods can provide raw materials for industries to manufacture products such as glue and industrial alcohol.

2) DISPOSAL METHODS:

Policy Option 1: Disposal by burying: Aflatoxin-contaminated agricultural commodities can be disposed of by burying, at depths below the root levels of food crops.

Soil contains numerous microorganisms, some of which have been shown to degrade aflatoxin with some strains degrading aflatoxin within 72 hours (Wu et al.2009). Aflatoxin has been shown to bind tightly to some clays (Williams et al. 2004). Evidence (Angle 1987) shows that aflatoxin B1 was rapidly converted to the less toxic aflatoxin B2 within 6 days, followed by the subsequent degradation of the aflatoxin B2 in 77 days.

Policy Option 2: Disposal by Incineration: Incineration is probably the most effective disposal process, as it completely destroys the aflatoxin molecule. Incineration can be carried out as an open air operation or in kilns.

Aflatoxin decomposes at 269 °C (Quadri et al. 2010) and incineration temperatures often reach upwards of 500°.

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