Tanzania Aflatoxin Control Action Plan

21 May 2015

On 21 May 2015, stakeholders from agriculture, health, and trade met in Arusha, Tanzania to adopt the following Tanzania Aflatoxin Control Action Plan. They adopted recommendations to mainstream it into the Tanzania Agriculture and Food Security Investment Plan (TAFSIP).

The United Republic of Tanzania, in collaboration with the African Union through the Partnership for Aflatoxin Control in Africa (PACA) and other key partners convened a workshop on “Reviewing the Aflatoxin Action Plan and Mainstreaming into the TAFSIP” from 20-21 May 2015.

The delegates from the Prime Minister’s Office, Prime Minister’s Office Regional Administration and Local Government (Dodoma), Ministry of Agriculture, Food Security and Cooperatives, Ministry of Industry, Trade and Markets, Ministry of Health and Social Welfare, Tanzania Food and Drugs Authority, Tanzania Bureau of Standards, Ministry of Education and Vocational Training, Tanzania Mycotoxins Steering Committee, Nelson Mandela – African Institution of Science and Technology (NM-AIST), Sokoine University of Agriculture, Makerere University, Africa Union Commission, PACA Secretariat, Meridian Institute reviewed and, with minor amendments, validated the Tanzania Aflatoxin Control Action Plan and draft addendum to the TAFSIP. The action plan appears on the following pages.

The workshop benefited from the Country-led Situation Analysis and Action Plan (C-SAAP) prepared by national consultants, Dr. Martin Kimanya and Dr. Emmanuel Mpolya from NM-AIST and Prof. Bendantunguka Tiisekwa from Sokoine University of Agriculture (SUA), based on sampling and analysis of key crops of concern and consultations with a range of stakeholders[[1]](#footnote-1). Through this C-SAAP, the consultants updated the status of aflatoxin prevalence for maize and groundnuts, assessed aflatoxin contamination in rice, collected information on food safety systems in place for mitigation of the problem, and formulated recommendations as well as specific investment options for aflatoxin mitigation and strengthened food safety systems.

*Addendum 1*

*[Made under section 3.8 of the Tanzania Agriculture and Food Security Investment Plan]*

STRATEGIC ACTION PLAN FOR MITIGATION OF THE AFLATOXIN PROBLEM IN TANZANIA

# 1. Preamble

This addendum contains a comprehensive Aflatoxin Strategic Action Plan that was developed to support implementation of the Tanzania Agriculture and Food Security Investment Plan (TAFSIP). The Aflatoxin intervention actions complement the Food Safety and Quality component of the TAFSIP, specifically, the Key Results section under Food and Nutrition Security thematic area.

The government of Tanzania developed the Strategic Actions with support from the African Union Commission (AUC), through the Partnership for Aflatoxin Control in Africa (PACA) and using a consultative process involving a wide spectrum of stakeholders from within the country and abroad. These include the Ministry of Health and Social Welfare (MoHSW), the Ministry of Agriculture, Food Security and Cooperatives (MAFC), the Ministry of Industry and Trade (MoIT), the Prime Minister’s Office responsible for Government Business Coordination, the Prime Minister’s Office – Regional and Local Government Authority and President’s Advisor on nutrition. Other government agencies consulted were the management teams of the Tanzania Food and Drugs Authority (TFDA) (including the National Mycotoxin Steering Committee), the Tanzania Food and Nutrition Center (TFNC) and the Tanzania Bureau of Standards (TBS). District levels authorities consulted and from which rice samples were collected are Mbarali, Misungwi and Kilosa. In addition the consultants made a deep analysis of the data on aflatoxin knowledge and awareness that was collected from stakeholders in Bukombe, Njombe and Kongwa in the year 2012. Bukombe, Njombe and Kongwa are the districts from which information and samples were collected for assessment of the aflatoxin problem in maize and groundnut. The PACA secretariat, steering committee and contact points for Uganda and Malawi also contributed to the formulation of the Aflatoxin Strategic Actions.

The process of identifying concrete investment options was informed by findings of the Country Aflatoxin Assessment carried out in 2012 and the Aflatoxin Country Food Safety and Situation Analysis and Action Planning conducted in the year 2014/205 to supplement the 2012 assessment. In the latter assessment, there was a purposeful review of the existing food safety policies and those being developed to identify gaps that could be addressed to strengthen the food safety system of Tanzania.

The policies review catalyzed strategic actions in Tanzania by identifying existing programs that can integrate aflatoxin control measures, avoid duplication of efforts and provide the necessary input to align aflatoxin control with broader food safety and Sanitary and Phytosanitary (SPS) issues. In addition, the aflatoxin assessment looked at the economic burden of aflatoxins based on their impact on health.

Importantly, the supplemental aflatoxin situation analysis reviewed the TAFSIP document to identify areas into which aflatoxin measures could be mainstreamed. The analysis confirmed that, although factors related to food safety issues were mentioned in many areas of the TAFSIP document it does not explicitly mention food safety or to be more precise, the aflatoxin problem. A closely related priority investment area (Pillar III) that was identified in TAFSIP is about Food and Nutrition security whose strategic objective focused on enhanced household and national food and nutrition security. It was noted that, under the Key Results section (under Food and Nutrition Security thematic area) the need for Food Safety and Quality Policy is listed as a Policy and Institutional Consideration. It is in this context that the addendum to TAFSIP on Strategic Actions for mitigation of the aflatoxin problem in Tanzania was formulated

# What are aflatoxins and how do they occur?

Aflatoxins, a family of agriculturally and health important mycotoxins, are naturally occurring poisons produced by certain fungi, mainly *Aspergillus flavus and A. parasiticus.* These fungi produce several types of aflatoxins including B1, B2, G1, and G2. The B1 form is recognized by the International Agency for Research on Cancer (IARC) as one of the most toxic and carcinogenic substances found in nature. These aflatoxin-producing fungi can colonize several food commodities including many of Africa’s important staple crops such as maize, sorghum, millet, rice, oilseeds, spices, groundnut and tree nuts.

Countries such as Tanzania that are located between latitudes of 40ºN and 40ºS offer suitable growing conditions for the fungi. Since *Aspergillus* species originate in the soil, the biochemical risk of aflatoxins contamination begins with planting, and can be worsened later through inappropriate harvesting, handling, storage, processing, and transport practices. Contamination during crop development and after harvest depends on environmental conditions that are optimal for the growth of fungi. Damage by pests (birds, mammals, and insects) or the stress of hot, dry conditions can contribute to significant *Aspergillus* infection. Drought stressors (elevated temperature and low relative humidity) increase the number of *Aspergillus* spores in the air, increasing the chance of contamination. On the other hand, heavy rain can cause spores to splash onto fruit and grain. After harvest, high crop moisture coupled with warm temperatures, inadequate drying, and poor storage can further increase the risk of contamination.

# What are the adverse impacts of aflatoxin contamination in Tanzania?

The adverse impacts of aflatoxin contamination in food are directly tied to and measurable on three sectors of the economy: agriculture, health and trade. In most cases, these impacts are heavily felt more on one sector than the others. However, it is recommended that an aggregation of the sectoral impacts be considered in order to clearly elucidate the overall economic impact of this deadly fungal poison. Furthermore, the extent of economic impact resulting from one or all of these sectors largely depends on (1) the prevalence of aflatoxins in agricultural commodities of national importance (staples and trade crops), (2) legislations/mechanisms put in place to check violations of set local and international maximum limits tolerated in commodities, (3) available options for alternative uses of aflatoxin contaminated lots which cannot pass through trade communities, and (4) level of awareness of aflatoxin and food safety issues in the affected country. In Tanzania, all three sectors are adversely impacted but more impact is observed and estimated on the health sector; these are briefly presented below.

## Health impacts of aflatoxins

If humans consume crops with very high levels of aflatoxin contamination, acute poisoning known as aflatoxicosis and even death can occur. Chronic exposure to low levels of contamination in crops consumed regularly is more common in the country; this increases liver cancer risk and can suppress the immune system, particularly for populations that test positive for the hepatitis B virus (HBV). Experts have reported association between chronic aflatoxin exposure and childhood growth impairment in Tanzania, Benin and Togo. Also chronic aflatoxin exposure has been associated with chronic hepatomegaly in children, and immune modification leading to greater susceptibility to infectious diseases such as human immunodeficiency virus (HIV), tuberculosis and malarial infection.

The impact of aflatoxin on health in Tanzania was estimated on the basis of Hepatocellular Carcinoma (HCC) effects of aflatoxins. The HCC risk was estimated by combining the biomarker levels of aflatoxin exposure as reported elsewhere for Tanzanian children with specific HCC potency (weighted by HBV prevalence) in Tanzania. Specifically, the assessment used the methods of cost-of-illness and Disability-Adjusted Life Years (DALYs) in the estimation of the impact of aflatoxins on an economically productive population of 22,956,186 persons, consisting of women and men aged 15 to 63 years. Out of all those persons, a median total of 422,500 persons would be exposed to aflatoxins and a median of 183 cases of hepatocellular carcinoma (HCC) would result. This would result in a total of 546,000 DALYs being lost because of morbidity and mortality from hepatocellular carcinoma resulting from the synergistic effects of chronic hepatitis B and aflatoxin exposure.

Monetization of the DALYs estimated in the health impact assessment put an economic loss due to aflatoxin exposure at a median of US$332,500,000 annually; ranging between US$ 92,890,000 and 757,900,000. This economic loss is the amount of money that would be saved if efforts to reduce aflatoxin exposures were put in place. In other words, it is the measure of the worth of the efforts to minimize aflatoxin exposure in Tanzania

## Agriculture and trade impact of aflatoxins

Aflatoxin contamination can lead to rejections of specific export shipments and increased inspection and sampling rates. If food safety regulatory authorities perceive the contamination as chronic, they can curtail the right of countries to export susceptible products. These actions in trade result in lost revenues. Losses to producers and traders can also occur in the domestic market if consumer awareness about the problem raises or leaders in marketing channels begin to pay more attention or if regulations are tightened and more strictly enforced. Thus, aflatoxin contamination can adversely affect both individual livelihoods and agricultural sector output.

## Aflatoxins disproportionately impact the poor

Food-insecure households are more likely to consume contaminated food rather than sell it at lower prices or discard it. The poor may also not be able to adopt costly control strategies. Even a well-intentioned awareness campaign can reduce prices of aflatoxin-contaminated food, resulting in direct market losses for the poor and more severe health impacts because of farmers’ own consumption of low-price and contaminated grain.

# How prevalent is aflatoxin contamination in Tanzania?

Tanzania has set the maximum acceptable limit for cereals at 10 parts per billion (ppb) for total aflatoxins and 5 ppb for aflatoxin B1. For groundnuts, the limit is set at 15 ppb for total aflatoxins and 5 ppb for aflatoxin B1.

Aflatoxin contamination of key staples—maize and groundnuts—is above regulated levels for both total aflatoxins and aflatoxin B1 in some parts of Tanzania. Focusing on the total aflatoxins, Table 1 shows extent of violations (samples that contain aflatoxins above the Maximum limit) for maize and Table 2 the extent of violations for groundnuts, in several regions of the country. The prevalence of samples exceeding the most toxin type, aflatoxin B1, is similar to that of total afltoxins and shown below for some regions:

* In the Eastern zone (Morogoro), 43% of the maize samples were above 5 ppb and in the Western zone (Shinyanga) 40 percent of the samples were above 5 ppb, with average contamination of 50 ppb and 28 ppb, respectively.
* The contamination of maize samples was much lower in other zones: in the Northern zone (Manyara) 9% of the samples were above 5 ppb; in the Southern Highlands only 4% (7% in Iringa, 2% in Mbeya and 2% in Rukwa) were above 5 ppb; and in the Southern zone (Ruvuma) none of the samples were above 5 ppb.
* Percentages of groundnut samples from the Northern, Southern (Mtwara), and Western (Shinyanga) zones with aflatoxin B1 contamination above 5 ppb were 20%, 20%, and 18%, respectively, with respective mean contaminations at 20 ppb, 18 ppb, and 20 ppb.

In summary, prevalence data suggest that aflatoxin contamination is a major concern in the Eastern and Western zones. Prevalence testing is needed in other areas where data are not currently available to establish a more comprehensive picture for the country.

Table 1: Occurrence of Aflatoxins in maize and maize-based foods in Tanzania

|  |  |  |  |
| --- | --- | --- | --- |
| **Zone** | **Region** | **Highest contamination (ppb)** | **Percent of samples exceeding maximum limit** |
| Eastern | Morogoro | 162.4 | 43 |
| 1,081 | 85 |
| Tanga | 206 | 13 |
| Northern | Kilimanjaro | 80 | 7 |
| 386 | 5 |
| 69.5 | 23 |
| Manyara | 27.6 | 9 |
| 19 | 2 |
| Southern | Ruvuma | 26 | 3 |
| 19.7 | 3 |
| Southern Highlands | Iringa | 58 | 7 |
| Rukwa, Mbeya and Iringa | 19.7 | 2 |
| Mbeya | 8 | 2 |
| Western | Tabora | 158 | 30 |
| Shinyanga | 162.4 | 40 |

NA, Not available

Table 2: Occurrence of aflatoxins in groundnut, Tanzania

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Zone** | **Region** | **Number of samples** | **Mean contamination (ppb)** | **Samples exceeding maximum limit (%)** |
| Northern | Manyara | 20 | 38 | 20 |
| Southern | Ruvuma (Nanyumbu) | 87 | 100 | NA |
| Mtwara | 40 | 31 | 20 |
| Western | Shinyanga | 40 | 31 | 18 |
| Shinyanga (Bukombe) | 87 | 123 | NA |
| Central | Dodoma (Bahi) | 68 | 115 | NA |

NA, Not available

Samples of rice taken in 2014 from three main rice-producing districts of Kilosa, Mbarari and Misungwi were also analysed for aflatoxins. These districts are geographically distant and in different agro-ecological zones thereby providing for a more general picture for the country. In total 101 samples; 29 from Misungwi (Western zone), 39 from Mbarali (Southen Highlands zone) and 33 from Kilosa (Eastern zone) were collected and analysed for total aflatoxins. Results of the analysis suggest that aflatoxin contamination in rice grown and consumed in Tanzania is very low. Out of the 101 samples, 15 (15%) had detectable levels of aflatoxin. The levels of aflatoxins in the positive samples ranged 0.01 – 3.83 ppb (mean 1.19 ppb). Based on the maximum limit of 10 ppb set for total aflatoxins in rice for human consumption in Tanzania, all the rice stocks from which the samples were taken are fit for human consumption. Since environmental conditions determine aflatoxin prevalence it is vital for testing to be done in various regions for several years in order to draw firm conclusions about general prevalence.

# How knowledgeable and aware are Tanzanians about aflatoxins?

The situation analysis also collected information on stakeholder’s awareness and knowledge on the aflatoxin problem and its control strategies. It was found that at a district level the general awareness was low amongst stakeholders interviewed in Kongwa, Njombe and Bukombe districts. The distribution of aflatoxin knowledge among stakeholders is shown in Figure 1. Even though the sampling did not allow for statistical analyses of significance, it indicates an obvious knowledge deficit among different district-level stakeholders.

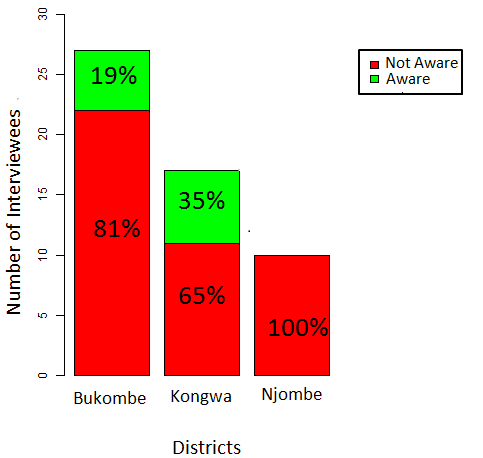


Figure 1: The distribution of stakeholders' knowledge and awareness about aflatoxins in Bukombe, Kongwa and Njombe districts

Furthermore, it was found that knowledge about Good Agricultural Practices (GAP) is not widespread and that guidelines on GAP are not available. Bukombe district had the highest number of farmers interviewed and it records the highest proportion of lack of GAP knowledge. This may mean that most farmers are not exposed to GAP in general.

Stakeholders were asked to give their opinion on the adequacy of the existing national policies related to food safety in addressing the problem of aflatoxins. Most stakeholders indicated that the national policies are not so explicit on the problem of aflatoxins. The fact that most stakeholders feel aflatoxin issues are not well addressed in national policies provides a ground to emphasize inclusion of aflatoxin-specific policy statements in different national policy documents.

# How serious are the risks of aflatoxin exposure in Tanzania?

## Risk Characterization for Agriculture and Food Security

Notwithstanding *objective findings* of prevalence and contamination, the impact of aflatoxin contamination on agriculture and food security has so far been difficult to estimate because of the following reasons:

* In the current market environment, Tanzanian farmers do not have to discard harvest because of aflatoxin contamination, nor do they face lower prices for aflatoxin-contaminated food.
* The market does not differentiate between aflatoxin-free and aflatoxin-contaminated food; therefore, farmers do not incur any costs for not mitigating against aflatoxins. This in turn results in increased risk that aflatoxin-contaminated grains leave the farmers’ fields and enter the food and feed supply.
* Farmers are not aware of aflatoxins and the measures for control in the field, which begin with GAP.
* There is no set “agenda” for agricultural extension services to include aflatoxins, mycotoxins, food safety, or GAP in their messaging, nor is there a strategy or guidelines for crop-specific GAP.
* Although the use of quality seed contributes to mitigating aflatoxin, the country and economic assessment found that nationally, only 18 percent of agricultural households use improved seeds for maize, and 3 percent use improved seeds for groundnuts.
* Since healthy plants can better resist disease, the use of irrigation, fertilizers, and crop protection chemicals also matters in aflatoxin control. Yet only 2 percent of the area cultivated under maize is irrigated, and the area irrigated for groundnuts is negligible. Use of fertilizer is at 17 percent for maize and 1 percent for groundnuts. Use of pesticides is at 11 percent for maize and 3 percent for groundnuts
* Drying of maize, groundnuts, and other crops is typically done on the ground, although there is some evidence of use of brick and mud structures that are above the ground. Storage units are often self-made, and commodities are stored without means of monitoring the temperature and humidity of such local storage units. There is little or no use of hermetic storage in the country. Hermetic storage facilities provide the best protection against aflatoxin contamination of grains.
* Farmers do basic sorting, culling out visibly damaged and moldy crops in order to realize the premium price associated with cleaner, unspoiled maize and groundnuts. However, these last defense practices cannot guarantee safe aflatoxin levels.

Livestock feed and feeding practices are not covered by agricultural extension messaging and are only weakly addressed by the private feed industry. This situation gives rise to concerns that there may be aflatoxin contamination in milk produced in urban and peri-urban areas where maize chaff makes up a large part of the utilized feed.

## Risk Characterization for Domestic Commerce and International Trade

Aflatoxin-contaminated grain can enter the domestic markets and the informal international markets (e.g., Kenya and Zambia for maize) because of lack of awareness and difficulty faced in enforcement of existing standards. These challenges were observed:

* TFDA enforces commodity standards but mostly for packaged foods and feeds bound for the formal export market; thus, the vast majority of foods consumed by the Tanzania population are not regulated for aflatoxin.
* Country assessment field research in Kongwa, Njombe, and Bukombe found no evidence of testing (monitoring and inspection) for aflatoxins in the domestic maize and groundnut markets in Tanzania. Set scene
* There is low awareness about aflatoxins and their health impact among most farmers, traders, and market sellers. Of the processors visited only one was found with an aflatoxin testing kit used on site to ensure monitoring of aflatoxin in groundnuts and none had similar kits for testing aflatxoins in grains”. Most mills usually rely on moisture content and or fungal load determinations which are not adequate means to identify aflatoxin contaminated raw materials.
* In the animal feed sector, there is aflatoxin control even though there are no regulations on aflatoxins in this sector. However, since there is no mandate for withdrawal and alternative uses or destruction of contaminated commodities, grain deliveries rejected by large commercial operations are likely to be sold by a trader to smaller feed manufacturers that do not test for aflatoxins.
* Maize chaff generated by large millers is used by the feed industry as raw material and is not regulated or tested for aflatoxins, which raises concern for aflatoxin contamination in animal products, particularly milk and possibly eggs.

## Risk Characterization for Human Health

Consumers’ level of aflatoxin knowledge is still low in Tanzania while the contribution of maize and groundnuts to calorie intake is very high. In fact, maize and groundnuts together account for about 54 percent of the calorie intake with maize having the larger contribution (per capita consumption of 356 kg/person/day). Although groundnuts do not account for a large share of calorie intake they are widely promoted as ingredients for weaning foods. The contribution of rice to calories intake is also high; it comes next to maize. This implies that even small levels of aflatoxin contamination in maize, rice and groundnuts could present a high risk of aflatoxin exposure particularly in mainland Tanzania.

# How adequate are the existing food safety policies for aflatoxins control?

A review of the Tanzania Food Safety Policies was conducted in the year 2014/2015 in order to identify areas for improvement if any, as well as policy statements for which implementation strategies can be incorporated in the TAFSIP to ensure operationalization of the policy. The policies that were reviewed are the National Agriculture Policy (NAP) of 2013 and the Agricultural Marketing Policy (AMP) of 2008. Also, two policy documents under development were reviewed; these are the Tanzania National Food and Nutrition Policy and the Tanzania Food Safety and Quality Policy. The reviews revealed the following limitations:

* Food safety coordination is weak and unrealistic because it relies on TFDA (a semi-autonomous body under the Ministry of Health and Social Welfare) as the agency responsible for food safety from farm to fork. The TFDA Director General and Ministerial Board are directly accountable to the Minister responsible for health. This strong alignment to the ministry responsible for health does not give TFDA the authority it deserves to be able to oversee implementation of food safety issues under other ministries such as Trade and Industry, and Agriculture. The current composition of the Ministerial Board for TFDA does not have any representative from key ministries for food safety regulation. These are the ministries responsible for agriculture, livestock, and trade and industry. A high level multi-sectorial board mandated to advise on food control services in the country is important as part of the TFDA. A good example of such a board is what was established under the then Food (Control of Quality) Act of 1978 which was composed of the Managing Director of TFNC, the Director General of TBS, the Government Chemist, and the Director of Crop protection among other government officials.
* In Tanzania, food processors and distributors do not have a coordinated voluntary mechanism for self-regulation of safety and quality. Self-regulation is more reliable and possible particularly for food processors and distributors.
* Although the NAP and AMP are comprehensive enough to provide for regulatory and institutional frameworks that are needed for effective and efficient regulation and promotion of the safety and quality of agricultural products, strategies for their implementation are yet to be developed.
* Tanzania does not have a Food Safety Policy. It is therefore necessary to improve and finalize the draft Food Safety and Quality Policy by including policy statements for improving food safety risk assessment, management and coordination as necessary. If accepted by all stakeholders, a food safety policy will possibly address all issues necessary for food safety risk analysis (Risk Assessment, Risk Management and Risk Communication).
* If the Food and Nutrition draft policy is approved it may help to improve coordination and nutrition interventions in Tanzania by putting the coordination mandate under an institution that is not aligned to one ministry

# What are the potential solutions for aflatoxin control?

The Tanzania country Food Safety and Aflatoxin Situation assessment helped identify opportunities for aflatoxin control in Tanzania in the three sectors of concern (agriculture, trade, and health) as well as in the education and research sectors.

In 2012, Tanzanian stakeholders came together at the aflatoxin stakeholders’ workshop (co-organized by TFDA and the Abt Associates Inc) to evaluate gaps in the aflatoxin control system and identify priority control strategies in these three sectors. Those strategies are included in this action plan.

In 2015 other gaps were identified (particularly related to food safety policies) and strategic actions/activities for addressing them were formulated. These challenges and those identified in the 2012 as well as the strategic action for each are shown in Table 2. Based on this, Strategic Action Plan with objectively verifiable indicators, means of verification as well as responsible ministry/institution/organization and implementation cost for each strategic action, was formulated. The Strategic Action Plan is shown in Table 3.

**Table 2: Challenges and recommended actions to overcome them**

|  |  |  |
| --- | --- | --- |
| **SN** | **Challenge** | **Intervention** |
| **1** | **High prevalence of maize and groundnut with aflatoxin contamination above the regulatory limit** | **Improve aflatoxins risk management capacity** |
| 1.1 | TFDA is a semi-autonomous body with a strong inclination to the MoHSW and a Ministerial Board without any representative from key ministries for food safety regulation (MAFC, MoLDF, MoIT and PMO-RALG), | Facilitate transformation of TFDA to establish an autonomous body, with a multi-sectoral food safety board, mandated to coordinate food safety and quality from farm to fork. |
| 1.2 | Low budgetary allocation for aflatoxin management activities, particularly under the MAFC, MoLDF and PMO-RALG | Set a mechanism for resource mobilization for food safety activities |
| 1.3 | The National Mycotoxin Steering Committee cannot meet regularly due to limited budget | Increase support for operations of the National Mycotoxin Steering Committee |
| 1.4 | Tanzania has regulations on treatment and disposal for unfit foods but the regulations do not contain specific directives on how to handle aflatoxin contaminated foods | Improve regulations and procedures for product withdrawal, including alternative uses for contaminated food |
| 1.5 | There are no specific regulations for aflatoxins in foods | Formulate and enforce regulations for aflatoxins contamination in maize and groundnuts |
| 1.6 | There is no regular plan or budget for monitoring of aflatoxins in the informal internal market. TFDA enforces commodity standards but mostly for packaged foods and foods bound for the formal export market; thus, the vast majority of foods consumed by the Tanzania population are not regulated for aflatoxin | Routinely monitor aflatoxins in the informal internal market, giving priority to cereal-based weaning foods |
| 1.7 | Aflatoxin analysis is centralized in Dar es Salaam (at TFDA) or Arusha (at NM-AIST) | Establish five zonal laboratories for aflatoxins screening in the country |
| 1.8 | TFDA formed a secretariat to the National Mycotoxin Steering Committee but the secretariat is also responsible for many other food safety issues | Establish a full time coordination office for aflatoxin activities; with a coordinator at TFDA and two advisors (one at TBS and another at MAFC) |
| **2** | **Tanzanian farmers cannot recognize aflatoxins contaminated harvest, nor do they face any restriction for aflatoxin-contaminated food.** | **Farmers enabled to recognize the aflatoxin problem and take measures to comply with aflatoxin regulations** |
| 2.1 | GAP guidelines with aflatoxin control measures are not available. Also farmers storage facilities are inadequate for protection of food from contamination | Integrate aflatoxin control measures in the GAP guidelines |
| 2.3 | Formulate codes for prevention of aflatoxin contamination during transportation of food crops and feeds |
| 2.4 | Empower agricultural extension officers to disseminate information on aflatoxins measures in the GAP and Codes of Practices |
| 2.5 | Support dissemination of information on aflatoxins measures in the GAP and Codes of Practices |
| 2.6 | Develop models of improved postharvest handling facilities (e.g. improved threshing, drying, storage technologies) for use at community level |
| 2.7 | Pilot and disseminate models of improved storage facilities for use at community level |
| 2.8 | The biocontrol technology which has been proven to be effective in Nigeria is not introduced in Tanzania | Develop bio-control for Tanzania, keeping in mind the cost implications for poorer farmers |
| 2,9 | Scale up biocontrol product within the country to benefit poor farmers |
| 2.10 | Develop capacity for evaluation of effectiveness and efficacy of bio-control products |
| 2.11 | There are no regulations for prevention of aflatoxin contamination in animal feed. Maize chaff generated by large millers is used by the feed industry as raw material and is not regulated or tested for aflatoxins, which raises concern for aflatoxin contamination in animal products, particularly milk and possibly eggs | Formulate specific regulations for aflatoxins in feed. |
| 2.12 | Although the National Agriculture Policy (2013) is comprehensive enough to provide for regulatory and institutional frameworks which are needed for effective and efficient regulation and promotion of the safety and quality of agricultural products, strategies for its implementation is yet to be developed | Formulate strategies for implementation of food safety related policy statements of the National Agriculture Policy (2013) |
| **3** | **No evidence of testing for aflatoxins in the domestic maize and groundnut markets in Tanzania** | **Enable processors and traders to recognize the aflatoxin problem and take measures to comply with aflatoxin regulations and access markets** |
| 3.1 | There are no incentives for testing; no difference in price between contaminated and non-contaminated food | Formulate market-based incentives for production of safer food |
| 3.2 | Disseminate market-based incentives for production of safer food |
| 3.3 | Only one food manufacturer has an HACCP based aflatoxin control plan | Develop guidelines for Good Manufacturing Practices (GMP)/ HACCP plan for aflatoxins control |
| 3.4 | Disseminate guidelines for Good Manufacturing Practices (GMP)/ HACCP plan for aflatoxins control |
| 3.5 | Although the Agricultural Marketing Policy (2008) is comprehensive enough to provide for regulatory and institutional frameworks which are needed for effective and efficient regulation and promotion of the safety and quality of agricultural products, strategies for ist implementation is yet to be developed. | Formulate strategies for implementation of food safety related policy statements of the National Agricultural Marketing Policy (2008). |
| 3.6 | In Tanzania, food processors and distributors do not have a coordinated voluntary mechanism for self-regulation of safety and quality. | Establish a voluntary mechanism for self-regulation of food safety and quality |
| 3.7 | Promote formation of cooperatives to enable processors and traders acquire improved produce handling technologies |
| 3.8 | Regulatory inspection and enforcement in the informal market is non-existent in Tanzania | Work out innovative systems and pilot regulatory enforcement for the informal internal market |
| **4** | **There is virtually no demand for aflatoxin safe foods; the risk of exposure to aflatoxins is very high.** | **Consumers enabled to minimize the risk of aflatoxin exposure and effects** |
| 4.1 |  | Incorporate aflatoxins mitigation guidelines in the Infant and Young Child Nutrition guidelines |
| 4.2 | Facilitate access to Infant and Young Child Nutrition guidelines which contain aflatoxin mitigation measures |
| 4.3 | Disseminate the aflatoxins mitigation actions through the Infant and Young Child Nutrition guidelines |
| 4.4 | Promote dietary diversification as one of the measures to minimize aflatoxin exposure |
| 4.5 | There is no routine testing for aflatoxins in patients | Build capacity for monitoring aflatoxin exposure in patients |
| 4.6 | Monitor aflatoxin exposure in humans |
| 4.7 | Hepatitis A Virus (HAV) is not part of the immunization program and HBV vaccination coverage is limited | Include HAV vaccination in the national programs and achieve universal vaccinations for HBV, since liver cancer risk is 30 times higher in HBV-positive populations |
| **5** | **Tanzania does not have a formal food risk assessment system which is independent of the risk management system** | **Establish an independent risk Assessment Institutional framework** |
| 5.1 | Tanzania does not have a policy which provides for establishment of a food risk assessment body | Finalize formulation of the Food Safety and Quality Policy in which all issues of necessary for food safety risk analysis (Risk Assessment, Risk Management and Risk Communication) will be addressed including a clear separation of risk assessment from risk management mandates. . |
| 5.2 | Establish an autonomous food risk assessment body |
| 5.3 | Hire staff for the Risk Assessment body |
| 5.4 | Provide for office space and facilities for the risk assessment body |
| 5.6 | Provide in-service training on risk assessment for aflatoxins |
| 5.7 | Develop aflatoxin risk assessment protocol for Tanzania |
| **6** | **There are very limited research activities on aflatoxins** | **Enhance research on aflatoxin risks and prevention strategies** |
| 6.1 | Tanzania has not conducted an evaluation of the safety and environmental impact of the biocontrol technology which has been proven to be effective in Nigeria | Perform independent health risk assessment for crops produced using the bio-control technology |
| 6.2 | Perform independent environmental risk assessment for crop production using the bio-control technology |
| 6.3 | Develop capacity for evaluation of effectiveness and efficacy of bio-control products |
| 6.4 | Aflatoxin hotspots and risk factors are not well understood | Map and continuously update the risks of aflatoxins contamination and exposure in Tanzania |
| 6.5 | There are no well-established alternative uses for aflatoxin contaminated foods | Develop cost effective alternative uses of aflatoxin contaminated produce |
| 6.6 | Although there are ongoing researches for aflatoxin resistant maize varieties, the efforts have not yet produced fruits | Continue research efforts for breeding maize and groundnuts with aflatoxin resistance for availability in the longer time horizon |
| **7** | **Very low level of aflatoxin knowledgeable individuals** | **Enhance knowledge on aflatoxins through targeted awareness mechanisms for focus groups** |
| 7.1 | Aflatoxin knowledge is not taught at primary or secondary level schools | Include aflatoxin related aspects in agriculture and health subjects taught at primary and secondary schools |
| 7.2 | Build capacity of teachers on aflatoxin knowledge and communication |
| 7.3 | Curricula for some agriculture and health undergraduate students do not contain specific content on aflatoxin risk and management | Review curricula for undergraduate and graduate programs on agriculture and health to incorporate components of aflatoxin prevention and control |
| 7.4 | Conduct short courses to processors and produce dealers in quality control and assurance with respect to aflatoxin contamination |
| 7.5 | Conduct short courses to district extension workers to build their capacity for training farmers on management of aflatoxins |
| 7.6 | Train at undergraduate levels, people who will perform risk assessment and management for aflatoxins in Tanzania |
| 7.7 | Aflatoxin risk assessment experts are very few in Tanzania” | Train at postgraduate levels, people who will perform and build a career on risk assessment and management for aflatoxins in Tanzania |
| 7.8 | Low level of awareness of the aflatoxin problem among health practitioners (e.g. doctors, nurses, public health officers and laboratory technologists) | Conduct periodic trainings for medical experts to enable effective preventive strategies for aflatoxin monitoring via the health sector (e.g. free testing or monitoring of serum Af-alb levels in pregnant mothers and children as well as on-point/early aflatoxin screening for patients showing early signs of liver problems); this will inform early preventive or remedial measures (counseling for dietary restrictions and diversification). |
| **8** | **There is very low awareness on the aflatoxin issues** | **Improve communication on aflatoxins issues** |
| **8.1** | **There is no standardized way for communicating the aflatoxin risk without scaring the public** | **Enhance capacity for a holistic communication about aflatoxins** |
| 8.2 |  | Train communication specialists (media presenters, journalists, farmers organizations, youth volunteer groups or undergraduate interns) on the economic and health risks of aflatoxin exposure and best practices for aflatoxin control for information dissemination to farmers. Enable communication experts to select most appropriate communication mechanism. |
| 8.3 | Develop information, education and communication materials |
| 8.4 | Conduct advocacy and public awareness raising campaigns | Conduct programs for advocacy about aflatoxins through a coordinated effort involving the trade, health and agricultural partners. |
| 8.5 | Conduct programs for raising public awareness about aflatoxins through a coordinated effort involving the trade, health and agricultural partners. |
| 8.6 | Conduct annual scientific forum for sharing aflatoxin information |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 4: Strategic action plan for mitigation of the aflatoxin problem in Tanzania** | | | | | | | | | |  | |  |
| **SN** | **Intervention (output)** | **Objectively Verifiable Indicator ( OVI)** | | **Means of Verification (MOV)** | **Term (Short, Medium or Long)** | **Beneficiary Sector** | | **Estimated cost (TZS, Million)** | **ResponsiblMinistry/Institution)** | **Lead Ministries/institutions** | | **Important assumption** |
| **1** | **Improved regulatory system for aflatoxins in food** | **At least 50% increase in the rate of aflatoxin compliant products in the market by 2020** | | **TFDA and TBS annual reports** | **Medium** | **Health/trade** | |  | **MoHSW** | MAFC, PMO-RALG  MoLDF | | **The government and Development partners are willing to support the actions** |
| 1.1 | Facilitate transformation of TFDA to establish an autonomous body, with a multi-sectoral food safety board, mandated to coordinate food safety from farm to fork. | An autonomous multi-sectoral food safety control board in place by July 2016 | | TFDA and MoHSW annual reports | Short | Health | | 50 | MoHSW |  | |
| 1.2 | Set a mechanism for resource mobilization for food safety activities | At least 10% of annual collections from food control services allocated to aflatoxin control activities, from July 2016 | | TFDA and TBS annual reports | Short | Health | | 100 | TFDA | MAFC, PMO-RALG  MoLDF | |
| 1.3 | Support operations of the multi-sectoral Aflatoxins advisory committee (National Mycotoxin Steering Committee) | TFDA budget contains a budget segment for support of at least 4 meetings, annually, from July 2015 - June 2020 | | TFDA annual budget | Short | Health | | 150 | TFDA |  | |
| 1.4 | Improve regulations and procedures for product withdrawal, including alternative uses for contaminated food | The Treatment and Disposal of Unfit food regulations being enforced by TFDA, reviewed to provide for specific regulations on disposal and treatment of aflatxoin contaminated food, by July 2016 | | TFDA annual report | Short | Health | | 20 | TFDA | **MAFC, MoLFD, TBS** | |
| 1.5 | Formulate regulations for aflatoxins contamination in maize and groundnuts | Specific regulations for aflatoxins in foods formulated, by July 2016 | | TFDA annual report | Short | Health | | 30 | TFDA | **TBS, MAFC, MoLFD** | |
| 1.6 | Work out innovative systems and pilot regulatory enforcement for the informal internal market | A workable framework for monitoring of aflatoxins in the informal sector established by July 2017 | | TFDA annual reports, PACA annual reports | Medium | Health/agriculture | | 300 | TFDA | NM-AIST, PMO-RALG | |
| 1.7 | Routinely monitor aflatoxins in cereal-and groundnut based weaning foods and national grain reserves | Reports of aflatoxins in all brands of cereal and groundnut based foods in the market, released annually, from July 2015 - June 2020 | | TFDA annual report | Short | Health | | 100 | TFDA | **GRA** | |
| 1.8 | Establish at least five zonal laboratories for aflatoxins screening in the country | Aflatoxin screening capacity established , by July 2020 | | TFDA annual reports, GCLA reports | Medium | Health | | 200 | TFDA | TBS, GCLA, TVLA, TAFIRI | |
| 1.9 | Establish a full time coordination office for aflatoxin regulatory activities | Three staff, expert in aflatoxin issues in TFDA, TBS, and MAFC and an administrative secretary recruited by July 2015 | | TFDA reports | Short | Cross-cutting | | 500 | TFDA | TBS, and MAFC | |
|  | **Sub-total** |  | |  |  |  | | **1,550** |  |  | |
| **2** | **Farmers are enabled to comply with aflatoxin regulations** | **At least 50% increase in the rate of produce reaching processors or traders gate complying with regulatory limits** | | **MAFC, farmers associations and traders reports** | **Medium** | **Agriculture** | |  |  |  | |
| 2.1 | Formulate strategies for implementation of food safety related policy statements of the National Agriculture Policy (2013) | Strategies for implementation of food safety related policy statements of the National Agriculture Policy (2013) formulated by July 2016 | | MAFC annual reports | Short | Agriculture | | 80 | MAFC | **MoHSW, TBS, TFDA** | |
| 2.2 | Enable access of GAP guidelines and codes for prevention of aflatoxin contamination | Aflatoxin control measures integrated in the Guidelines on good agricultural practices (GAP), good animal husbandry practices, for all cereal crops and oil seed produce by July 2016 | | MAFC annual report, TBS annual reports, MoLFD | Short | Agriculture | | 50 | MAFC | TBS, TFDA | |
| 2.3 | Codes for prevention of aflatoxin contamination during transportation of food crops and feeds formulated by July 2016 | | MAFC and MoLDF annual reports | Short | Agriculture and Livestock | | 200 | TBS | **MoLFD and** MAFC | |
| 2.4 | All districts agricultural extension officers and phytosanitary inspectors trained on the new GAPs and Codes of Practices by July 2018 | | MAFC and MoLDF annual reports | Medium | Agriculture and Livestock | | 200 | MAFC | MoLFD and PMO-RALG | |
| 2.5 | Agricultural extension officers in all the districts access GAPs in which aflatoxin measures are integrated, by July 2020. | | District annual reports, MAFC annual reports | Medium | Agriculture | | 250 | MAFC | PMO-RALG/MVIWATA | |
| 2.6 | Develop and construct models of improved storage facilities (e.g. improved threshing, drying and storage technologies) for use at community level | Regional friendly models of improved storage facilities developed for each agro-ecological zone, by July 2018 | | and MAFC reports | Medium | Agriculture | | 300 | MAFC | **NFRA, PM-RALG** | |
| 2.7 | Disseminate models of improved storage facilities for use at community level | Models of improved storage facilities deployed to each agro-ecological zone, by July 2018 | | MAFC, National Food Reserve Agency (NRA), Crop and other Cereal Board annual report | Short | Agriculture | | 1,000 | NRA | **MAFC** | |
| 2.8 | Develop bio-control for Tanzania, keeping in mind the cost implications for poorer farmers | Bio-control technology adopted for maize and groundnuts by July 2020 | MAFC annual reports, IITA annual reports | | Long | | Agriculture | 700 | MAFC | | **NM-AIST, NARIS and IITA** |
| 2.9 | Scale up biocontrol product within the country to benefit poor farmers. Disseminate biocontrol product/technology and facilitate adoption amongst farmers | At least 8 regions of the main maize and groundnuts producing zones the applying the biocontrol product, by July 2018 | IITA, MAFC reports | | Medium | | Agriculture | 2000 | MAFC | | **IITA and Other research institutions** |
| 2.10 | Develop capacity for evaluation of effectiveness and efficacy of bio-control products | At least one staff trained, and evaluation guidelines developed for effectiveness and efficacy of bio-control products July 2018 | TPRI reports | | Medium | | Agriculture | 75 | TPRI | | **MAFC** |
| 2.11 | Formulate specific regulations aflatoxins in feed | Specific regulations for aflatoxins in feed formulated by July 2016 | MoLDF annual reports | | Short | | Livestok | 50 | MoLFD | | **TBS, TFDA** |
|  | **Sub-total** |  | |  |  |  | | **4,835** |  |  | |
| **3** | **Processors and traders enabled to comply with aflatoxin regulations and access markets** | **All international markets (e.g. Kibaigwa), maize millers and groundnuts processors screen incoming produce for aflatoxins, by July 2020** | | **TBS and MoIT annual report** | **Medium** | **Trade** | |  |  |  | |
| 3.1 | Formulate market-based incentives for production of safer food | Market-based incentives for production of safer food formulated by July 2016 | | MoIT, MAFC annual reports | Short | Trade | | 50 | MoIT | **MAFC** | |
| 3.2 | Disseminate market-based incentives for production of safer food | Market-based incentives disseminated to all international markets (e.g. Kibaigwa), maize millers and groundnuts processors by July 2018 | | MoIT, MAFC annual reports | Medium | Trade | | 100 | MoIT | **MAFC** | |
| 3.3 | Develop guidelines for Good Manufacturing Practices (GMP)/ HACCP plan for aflatoxins control | Guidelines for Good Manufacturing Practices (GMP)/ HACCP plan developed to control aflatoxins in manufacture of cereal and oil seed based products aflatoxins by July 2016 | | TBS annual report | Short | Trade | | 100 | TBS | **TFDA** | |
| 3.4 | Disseminate guidelines for Good Manufacturing Practices (GMP)/ HACCP plan for aflatoxins control | Quality control managers from all the cereal and oil seed based products trained on application of the Guidelines for Good Manufacturing Practices (GMP)/ HACCP plan for aflatoxins control by July 2020 | | TBS, MAFC annual report a | Medium | Trade | | 200 | TBS | **TFDA, MAFC** | |
| 3.5 | Develop strategies for implementation of food safety related policy statements of the National Agricultural Marketing Policy (2008) | Strategies for implementation of food safety related policy statements of the National Agricultural Marketing Policy (2008) developed by July 2016 | | MoIT annual reports | Short | Trade | | 100 | MoIT | **MAFC** | |
| 3.6 | Establish a voluntary mechanism for self-regulation of food safety and quality | A voluntary mechanism for self-regulation of food safety and quality established July 2017 | | MoIT annual reports, TPSF annual reports, TCCIA annual reports | Medium | Trade | | 100 | TPSF | **TCCIA, TFDA, TBS** | |
| 3.7 | Promote formation of cooperatives to enable processors and traders acquire improved produce handling technologies | At least two farmers’ cooperative societies established by July 2016 | | TCCIA, Cooperatives Commission annual reports | Medium | Trade | | 50 | TCCIA |  | |
|  | **Sub-total** |  | |  |  |  | | **700** |  |  | |
| **4** | **Consumers enabled to minimize the risk of aflatoxin exposure and effects** | **Emergence and increase of consumers enquiring about aflatoxin safety of foods, from July 2016** | | **TFDA, TBS and Consumers associations reports** | **Medium** | **Health** | |  |  |  | |
| 4.1 | Incorporate aflatoxins mitigation guidelines in the Infant and Young Child Nutrition guidelines | Guidelines on Infant and Young Child Nutrition contain aflatoxin prevention/avoidance measures, by July 2016 | | TFNC annual reports | Short | Health | | 50 | TFNC | **TBS, TFDA, MAFC** | |
| 4.2 | Facilitate access of guidelines through Infant and Young Child Nutrition guidelines which contain aflatoxin mitigation measures | New guidelines on Infant and Young Child Nutrition distributed to all districts, by July 2018 | | TFNC annual reports | Medium | Health | | 100 | TFNC | **TBS, TFDA, MAFC** | |
| 4.3 | Disseminate the aflatoxins mitigation actions through the Infant and Young Child Nutrition guidelines | All district nutrition officers trained on aflatoxin issues and aflatoxin measures of the infant and young child Nutrition by July 2018 | | TFNC annual reports, District councils annual reports | Medium | Health | | 200 | TFNC | **TBS, TFDA, MAFC** | |
| 4.4 | Promote dietary diversification as one of the measures to minimize aflatoxin exposure | At least one radio program aired weekly on the importance of dietary diversification as one of the measures to minimize aflatoxin exposure, from July 2016 | | TFNC annual reports | Long | Health | | 400 | TFNC | **TBS, TFDA, MAFC** | |
| 4.5 | Build capacity for monitoring aflatoxin exposure in humans | At least one referral hospital in each of the five zones equipped with facilities for screen patients for aflatoxin exposure, by July 2018 | | MoHSW annual reports | Medium | Health | | 100 | MoHSW | **PMO-RALG** | |
| 4.6 | Monitor aflatoxin exposure in humans | At least 500 individuals tested for aflatoxin exposure annually, from July 2018 | | MoHSW annual report, Identified hospital reports | Long | Health | | 200 | MoHSW | **NM-AIST** | |
| 4.7 | Include HAV vaccination in the national programs and achieve universal vaccinations for HBV | Universal vaccinations for HAV and HBV performed annually, from July 2016 | | MoHSW annual report | Long | Health | | 1,000 | MoHSW | **PMO\_ RALG** | |
|  | **Sub-total** |  | |  |  |  | | **2,050** |  |  | |
| **5** | **Risk Assessment Institutional framework established** | **Aflatoxin risk information and mitigation technologies accessible at one point, from July 2019** | | **MoHSW annual report** | **Medium** | **Health** | | **MoHSW** | **MAFC and MoIT** |  | |
| 5.1 | Finalize formulation of a Food Safety and Quality Policy in which Risk Assessment administration is clearly separated from risk management. | A legal instrument for establishment of an autonomous food risk assessment body, in place by July 2017 | | MoHSW reports | Long | Health | | 200 | MoHSW | **MAFC , MoIT and MoLFD** | |
| 5.2 | Hire staff for the Risk Assessment body | At least six individuals employed by July 2018 | | MoHSW reports | Medium | Health | | 240 | MoHSW |  | |
| 5.3 | Provide for office space and facilities for the risk assessment body | Office and facilities in place by July 2019 | | MoHSW reports | Medium | Health | | 2,000 | MHSW |  | |
| 5.4 | Provide in-service training on risk assessment for aflatoxins | At least 6 staff of undertake a short course on risk assessment by July 2018 | | MoHSW annual reports | Short | Health | | 60 | MoHSW |  | |
| 5.5 | Develop aflatoxin risk assessment protocol for Tanzania | A protocol developed by July 2017 | | MoHSW annual reports | Medium | Health | | 50 | MoHSW |  | |
|  | **Sub-total** |  | |  |  |  | | **2,550** |  |  | |
| **6** | **Enhanced research on aflatoxin prevention strategies** | **At least 50% increase in outputs of aflatoxin risk and mitigation technologies, by July 2020** | | **Research institutions annual reports, International journals** | **Medium** | **Cross-cutting** | |  |  |  | |
| 6.1 | Perform independent health risk assessment for crops produced using the bio-control technology, taking into control all bio-control technologies | Risk of CPA contamination and exposure from biocontrol produced maize and groundnuts, determined by July 2018 | | NM-AIST and IITA annual reports, assessment report | Medium | Health | | 200 | NM-AIST | **NARIs** | |
| 6.2 | Perform independent environmental risk assessment for crop production using the bio-control technology | The impact on environment, of atoxigenic fungi biocontrol application determined July 2018 | | NEMC annual reports, assessment report | Medium | Environment | | 75 | NEMC | **NARIs** | |
| 6.3 | Map and continuously update the risks of aflatoxins contamination and exposure in Tanzania | Hot spots and risk factors of aflatoxin contamination and exposure determined in all regions of Tanzania by July 2018 | | NM-AIST and PACA annual reports, assessment report | Medium | Health | | 1,000 | NM-AIST | **NARs** | |
| 6.4 | Develop cost effective alternative uses of aflatoxin contaminated produce | At least two alternative uses of aflatoxin contaminated produce identified July 2018 | | NM-AIST, University of Dar es Salam and relevant research institutions  annual reports | Medium | Trade | | 100 | NM-AIST | **NARIS** | |
| 6.5 | Continue research efforts for breeding maize and groundnuts with aflatoxin resistance for availability in the longer time horizon | At least two aflatoxin resistant maize or groundnut varieties identified by July 2025 | | SUA and Uyole annual reports, research progress reports | Long | Agriculture | | 200 | Uyole Agricultural Research centre | SUA, NM-AIST, OUT | |
| 6.7 | Establish and promote home based substitutes (food crops, products and formulations) for aflatoxin susceptible foods | At least two types and proportion of cereals that can be used to substitute for maize in family and complementary foods established and incorporated in the national food and nutrition guidelines by July 2018 | | Research reports, TFNC reports | Medium | Health | | 200 | SUA | NM-AIST, TFNC | |
|  | **Sub-total** |  | |  |  |  | | **1,775** |  |  | |
| **7** | **Enhanced knowledge on aflatoxins** | **At least 30% increase in public knowledge on aflatoxin issues, by July 2020** | | **PACA annual report, project report** | **Medium** | **Education** | |  |  |  | |
| 7.1 | Include aflatoxin related aspects in agriculture and health subjects taught at primary and secondary schools | Science books for primary and secondary schools reviewed to incorporate aflatoxin materials, by July 2018 | | MoEVT annual reports, the books | Medium | Education | | 100 | MoEVT | **PMO- RALG** | |
| 7.2 | Build capacity of teachers on aflatoxin knowledge and communication | Science teachers for primary and secondary level education trained on food safety issues, including mycotoxins, and aflatoxins and fumonisns particularly, by July 2020 | | MoEVT annual reports and Training reports | Medium | Education | | 200 | MoEVT |  | |
| 7.3 | Review curricula for undergraduate and graduate programs on agriculture and health to incorporate components of aflatoxin prevention and control | Curricula for undergraduate and graduate programs contain components of aflatoxin prevention and control, by July 2017 | | NM-AIST/SUA/MUHAS annual reports, | Medium | Education | | 200 | SUA | MUHAS and other NARIs | |
| 7.4 | Conduct short courses to processors, traders, stockists and produce dealers in quality control and assurance with respect to aflatoxin contamination | Two week course to processors and produce dealers in quality control and assurance with respect to aflatoxin contamination conducted annually, from July 2016 | | NM-AIST report | Medium | Trade | | 200 | MoIT | TBS, SIDO | |
| 7.5 | Conduct short courses to district extension workers to build their capacity for training farmers on management of aflatoxins | Two week course to district extension workers  conducted annually, from July 2016 | | MAFC report | Medium | Agriculture | | 400 | NM-AIST | **MAFC, PMO-RALG** | |
| 7.6 | Conduct short course to health practitioners (doctors, nurses and laboratory technologists) on how to test for aflatoxin exposure, provide counselling and recommend early testing and referral of patients. | A minimum of 30 health practitioners undergo a two week course annually, from 2016 | | MuHAS report, MoHSW reports, NM-AIST reports | Medium | Health | | 200 | MuHAS | **NM-AIST, SUA** | |
| 7.7 | Train at undergraduate levels, people who will perform risk assessment and management for aflatoxins in Tanzania | 30 undergraduates on aflatoxin management for aflatoxins in Tanzania from July 2016 - 2020 | | SUA and MUHAS annual reports | Medium | Education | | 300 | SUA | **MuHAS** | |
| 7.8 | Train at postgraduate levels, people who will perform risk assessment and management for aflatoxins in Tanzania | Two higher Education institutions supported to improve aflatoxin risk assessment training capacity | | NM-AIST annual reports, MoEVT/MoSCT | Short | Education | | 3000 | NM-AIST | **SUA, MuHAS, UDSM** | |
| 7.9 |  | 15 post graduates on aflatoxin risk assessment and management from July 2016 - 2020 | | NM-AIST | Medium | Education | | 1,500 | NM-AIST | **SUA** | |
|  | **Sub-total** |  | |  |  |  | | **5,900** |  |  | |
| **8** | **Enhanced awareness on aflatoxin issues capacity** | **At least 50% increase in awareness about Aflatoxins across the food cahain, July 2020** | | **PACA annual report, project report** | **Short** | **Cross-cutting** | |  |  |  | |
| 8.1 | Develop a communication strategy for aflatoxin matters | A strategy for communication of aflatoxin developed by July 2016 | | , MAFC  annual reports | short | Cross-cutting | | 30 | TFNC | **MAFC** | |
| 8.2 | Train communication personnel on the economic and health risks of aflatoxin exposure and best practices for aflatoxin control for information dissemination to farmers. | Training offered, annually, for four years from July 2016  Number of stakeholders trainings conducted. | | Training report | Medium | Cross-cutting | | 200 | NM-AIST | MAFC, TFDA, TBS, MoLFD | |
| 8.3 | Develop Information, education and communication materials | Leaflets, posters and feature stories prepared from 2016  Type and number of communication material developed | | MAFC annual reports | Medium | Cross-cutting | | 100 | TFNC | **MAFC, TBS, TFDA** | |
| 8.4 | Conduct programs for advocacy about aflatoxins | Two advocacy campaigns conducted annually for policy makers and politician by June 2016 | | TFNC, TFDA and MAFC annual reports | Short | Cross-cutting | | 200 | TFDA | TBS/MAFC  **PMO-RALG, NARIs** | |
| 8.5 | Conduct programs for raising public awareness about aflatoxins | Seminars, workshops, meetings, exhibitions, Road shows, 10 radio , 10 TV programmes and 20 cinema shows on aflatoxins aired by June 2020 | | annual reports | Medium | Cross-cutting | | 200 | TFDA | TBS,  MAFC  NM-AIST, NARIs | |
| 8.6 | Conduct annual scientific forum for sharing aflatoxin information | Number of fora organized by June 2020 | | Scientific publications | Medium | Cross-cutting | | 250 | NM-AIST | **NARIS** | |
|  | **Sub-total** |  | |  |  |  | | **980** |  |  | |  |
|  | **Grand Total** |  | |  |  |  | | **20,230** |  |  | |  |

**Important notice**: Some intervention areas will be initiated in 2015 and others from 2016 and their impacts will be assessed in the short, medium and long term bases. **Short-term** interventions are those that need to be initiated in 2015 and finished by July 2017; **Medium term** interventions are those that need to be initiated in 2015 or 2016 and finished in 2 to 3 years; **Long term** interventions are those that cannot be finished before 2020.

**Abbreviations: TFDA,** Tanzania Food and Drugs Authority; **TBS**, Tanzania Bureau of Standards; **MoIT**, Ministry of Industry and Trade; **MAFC,** Ministry of Agriculture, Food Security and Cooperatives; **MoFLD**, Ministry of Fisheries and Livestock Development; **PMO-RALG**, Prime Minister’s Office- Regional Administration and Local Government; **MoIT,** Ministry of Industry and Trade**; MoHSW**, Ministry of Health and Social Welfare; **TFNC**, Tanzania Food and Nutrition Centre; **MuHAS**, Muhimbili University of Health and Allied Sciences; **SUA**, Sokoine University of Agriculture; **NM-AIST**, Nelson Mandela African Institution of Science and Technology; **IITA**, International Institute of Tropical Agriculture; **TPSF**, Tanzania Private Sector Foundation; **TCCIA**, Tanzania Chamber of Commerce Industry and Agriculture; **MoEVT**, Ministry of Education and Vocational Training; **TPRI,** Tanzania Pesticides Research Institute; **NEMC**, National Environment Management Council, **MoSCT**, Ministry of Science, Communication and Technology; NARS, National Agricultural Research Institutions; **GCLA**, Government Chemist Laboratory Agency

# Conclusions

Based on evidence compiled and analyzed under the two country and economic assessment frameworks, which was then interpreted during significant two-day workshops (in 2012 and 2015) in which stakeholders from government, industry, the farming community, civil society organizations, and academia all participated actively, **Tanzania has now reached a collective high-level understanding of the complex challenges associated with aflatoxins and has formulated informed strategies to address the same**. The main challenge now is mobilization of resources to implement the strategic actions.

Funds not sufficient

3,1.1 Develop a strategy for communication of aflatoxin

3.1.3 Develop Information, education and communication materials

3.2.2 Conduct programs for raising public awareness about aflatoxins

3.1.2 Train communication personel (on the economic and health risks of aflatoxin exposure and best practices

3.2.1 Conduct programs for advocacy about aflatoxins

General Question

* To establish coordinated system in controlling food safety issues
* We need to find better ways of soliciting more resources to make established programs sustainable
* PACA should establish monitoring system which will be adopted by all countries .

1. Officials at the Prime Minister’s Office of Business Coordination, Ministry of Agriculture, Food Security and Cooperatives, Ministry of Industry, Trade and Markets, Ministry of Health and Social Welfare, Tanzania Food and Drugs Authority, Tanzania Bureau of Standards, farmers organisations, district level authorities, and the International Institute for Tropical Agriculture. [↑](#footnote-ref-1)