



Partnership
for Aflatoxin
Control in Africa

Partenariat pour
la lutte contre
l'aflatoxine en Afrique

Parceria para o
Controle da
Aflatoxina em África

الشراكة من أجل مكافحة
الافلاتوكسين في أفريقيا

Economic Impact of Aflatoxins to Africa: The case of Malawi, Tanzania and Uganda

First Africa Symposium of Mycotoxicology

PACA Secretariat

May 26-28, 2015

Livingstone, Zambia



The Study Teams:

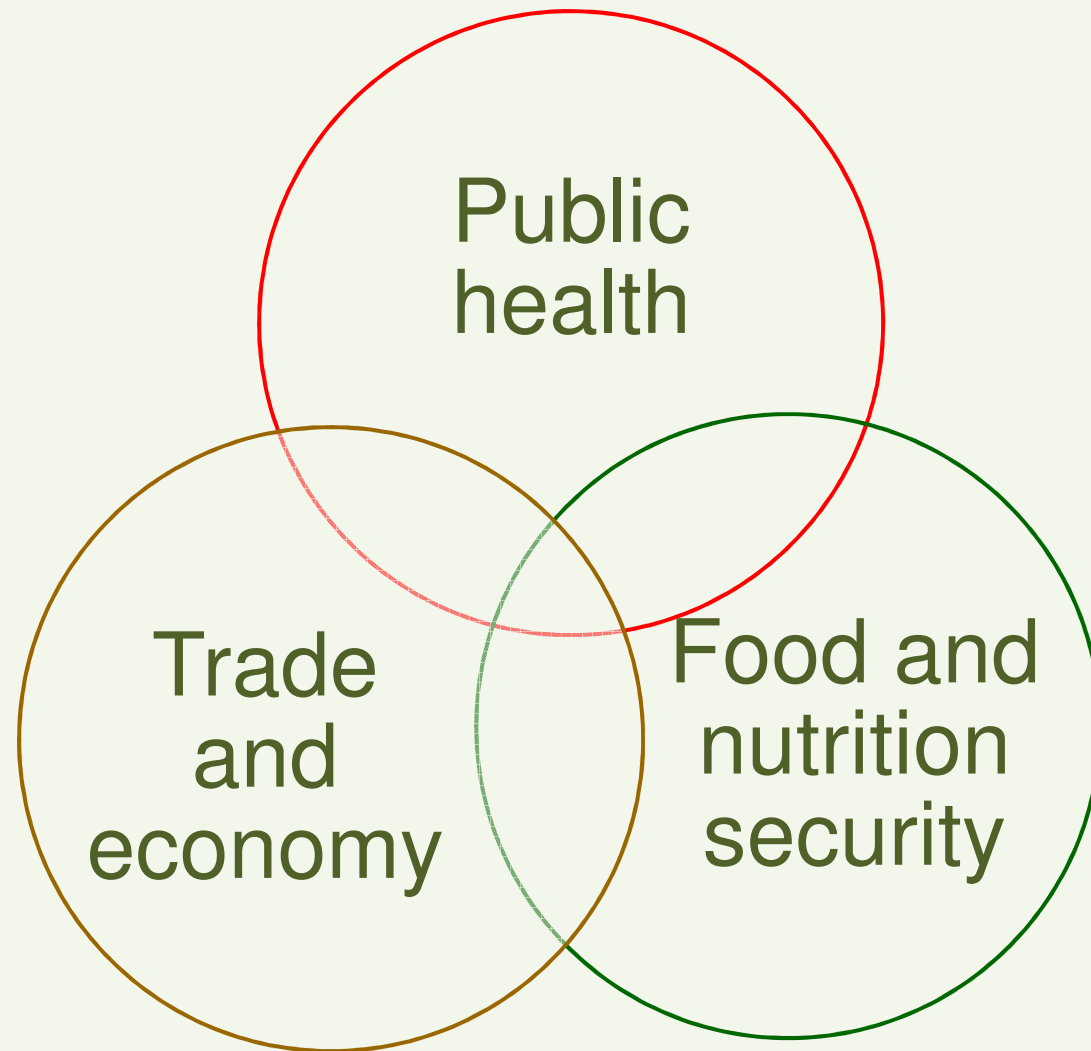
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Aflatoxin is a developmental challenge to Africa, posing triple menace



Factors Contributing to the Aflatoxin Challenge in Africa

- ❑ Conducive climatic conditions
- ❑ Traditional crop production and post-harvest practices
- ❑ Food insecurity and limited dietary diversity
- ❑ Low levels of awareness about the problem and options
- ❑ Weak institutional capacity: policy, regulations, putting research into use
- ❑ Complexity of the problem, which makes targeting interventions difficult

This situation is aggravated by poorly coordinated responses.



PACA Comprehensive Program

Food Security | Trade | Health

Policy, standards and regulations

Testing (sampling; diagnostics)

Pre-harvest including
beneficial fungi

Post-harvest
drying,
storage,
handling

Market
development:
structured
demand,
alternative uses

Consumption

Training, communication, and capacity strengthening

Economic
Assessments

Food Security
Assessments

Health
Assessments

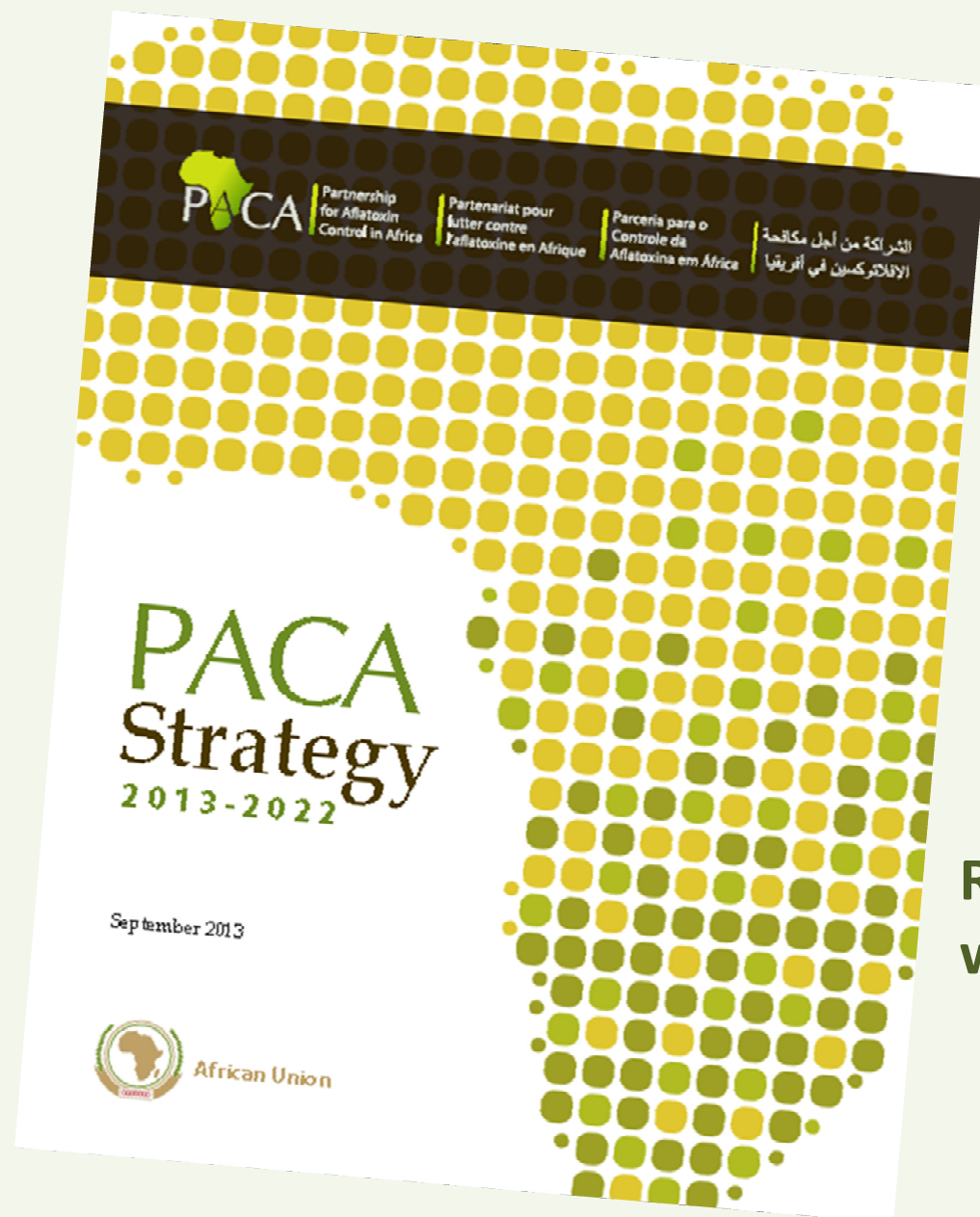
Database of Aflatoxin Activities in Africa:

Interactive map on the PACA website:

About PACA What are Aflatoxins? Activities in Africa Resources News & Events Contact Us <input type="text"/>				
Senegal				
Date	Activity	Partners	Funders	Country/Region
2014-Ongoing	The aflatoxin challenge can be addressed effectively and in a more sustainable and comprehensive fashion if it is mainstreamed in existing frameworks and structures, such as the Comprehensive Africa Agriculture Development Programme (CAADP) National Agriculture and Food Security Investment Plans (NAFSIPs). Other frameworks that can be used for mainstreaming aflatoxin issues include, inter alia, the African Health Strategy, Scaling Up Nutrition (SUN), national food safety laws and regulations, and local agricultural extension and community health programs. In 2014 and 2015, PACA will support its pilot countries' efforts to mainstream aflatoxins and other food safety challenges into their CAADP NAFSIPs and relevant health and nutrition frameworks.	PACA	Bill and Melinda Gates Foundation	Senegal
2014-Ongoing	PACA is supporting pilot countries, including Senegal, in conducting a country-led food safety system and aflatoxin situation analysis and action planning. Senegal will be creating an empirical evidence base on existing aflatoxin prevalence, legislation, policy	PACA	Bill and Melinda Gates Foundation	Senegal

Disclaimer: The Database only includes activities that have been submitted to the Secretariat.

The screenshot shows the PACA website interface. At the top, there's a navigation bar with links: About PACA, What are Aflatoxins?, Activities in Africa, Resources, News & Events, and Contact Us. Below this, the 'Activities in Africa' section is displayed. It includes a map of Africa with various countries highlighted in different colors. A legend on the left lists countries: Burkina Faso, Mali, Ethiopia, Sudan, Niger, Nigeria, Togo, Ghana, Democratic Republic of Congo, The Gambia, Uganda, Kenya, Tanzania, Malawi, Rwanda, Zambia, Mozambique, Senegal, South Africa, and South Sudan. A legend on the right lists Regional Economic Communities: COMESA, EAC, ECCAS, ECOWAS, IGAD, SADC, and UMA. The page also includes a search bar and navigation links.



PACA's Vision:
An Africa Free From the
harmful effects of aflatoxin

PACA's Mission:
To support agricultural
development, safeguard
consumer health and
facilitate trade by catalyzing,
coordinating and increasing
effective aflatoxin control
along agricultural value
chains in Africa

Read at:
www.aflatoxinpartnership.org



PACA Secretariat Roles

Long-Term Role	 Convener	Work with RECs and other stakeholders to convene continental, inter-regional, regional, and country meetings
	 Knowledge manager	Aggregate evidence, gather knowledge, and disseminate information
	 Financial Resources	Mobilize resources and fund projects aligned with country plan approach Provide catalytic grants: e.g. testing equipment to enhance gov't capacity
Short-Term Role	 Technical Assistance	Provide TA in the short-term (3 years)



PACA Secretariat Activities

- Continental:
 - Mainstreaming into continental frameworks
 - Convenings
 - Knowledge management functions
- Regional:
 - Regional convenings
 - Harmonization
 - Support country plan approach
- Country-level:
 - Country plan preparation, execution and progress monitoring



Phased Approach to Scale Country Level Activities



“If fail to plan, you plan to fail”

Implementation approach: from piloting to scaling

Pilot countries:

Gambia, Malawi, Nigeria, Senegal, Tanzania, Uganda



Maps are illustrative

**PACA initiated
situational and
economic impact
analysis in six focus
countries in 2014/15**



Objectives of situational analyses:

1. Review the country's food safety systems and effects of aflatoxin along the main agricultural value chains
2. Determine the cost of aflatoxin to health, trade and agriculture (economic impact)
3. Formulate evidence based recommendations
4. Inform the review of the National Agriculture and Food Security Investment Plans (NAFSIPs), and the development of the Africa led Aflatoxin Information Management System (AfricaAIMS)



Methodology: 6 phases

1. Identify key crops of concern
 - Maize, groundnuts, sorghum/rice
2. Determine prevalence and distribution of aflatoxin
3. Characterize risks of aflatoxin contamination and exposure along priority value chains
4. Estimate economic impact due to aflatoxin contamination
5. Identify and prioritize opportunities for aflatoxin control
6. Conduct stakeholder meeting to communicate and validate findings

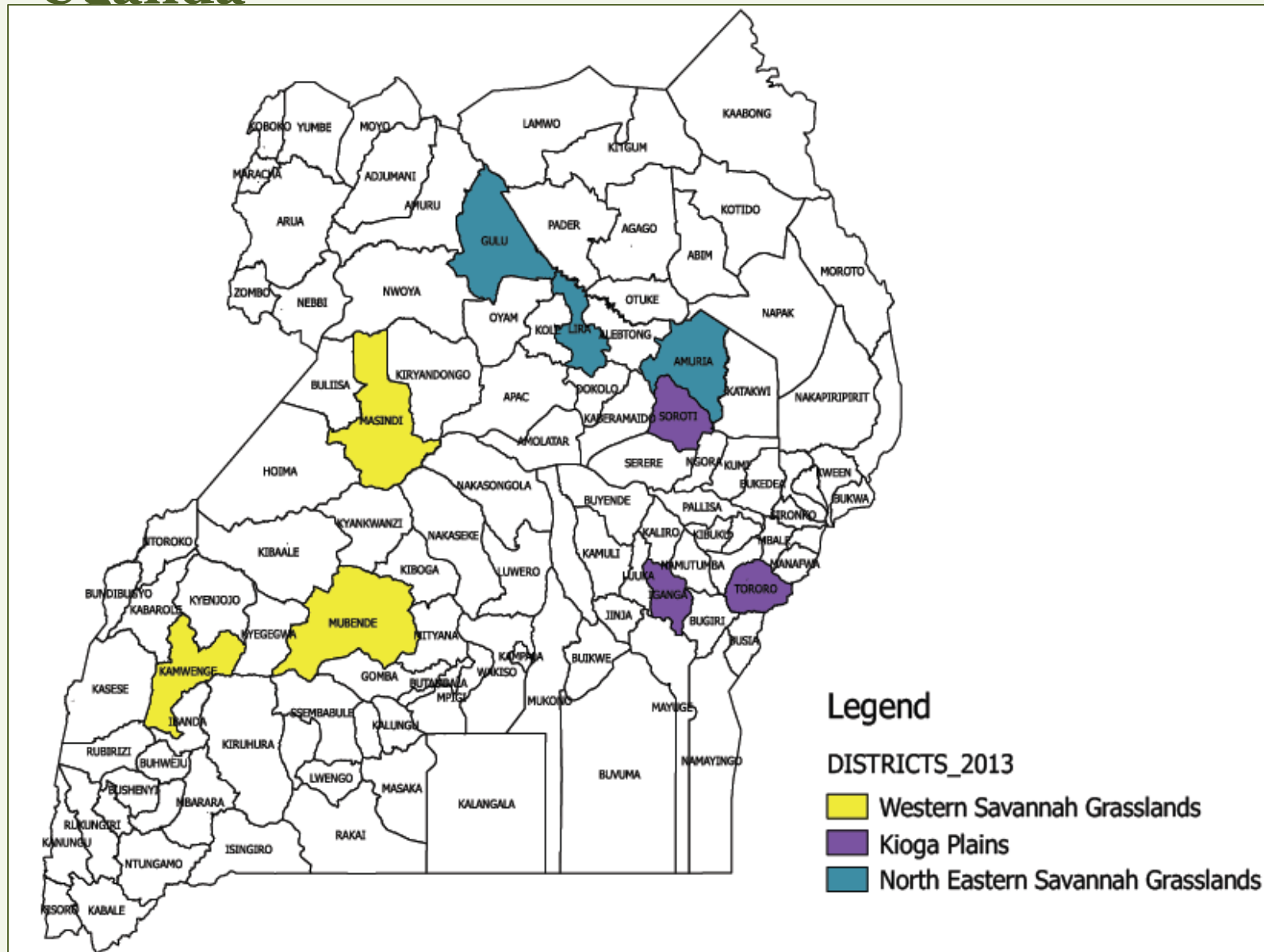


Data collection techniques

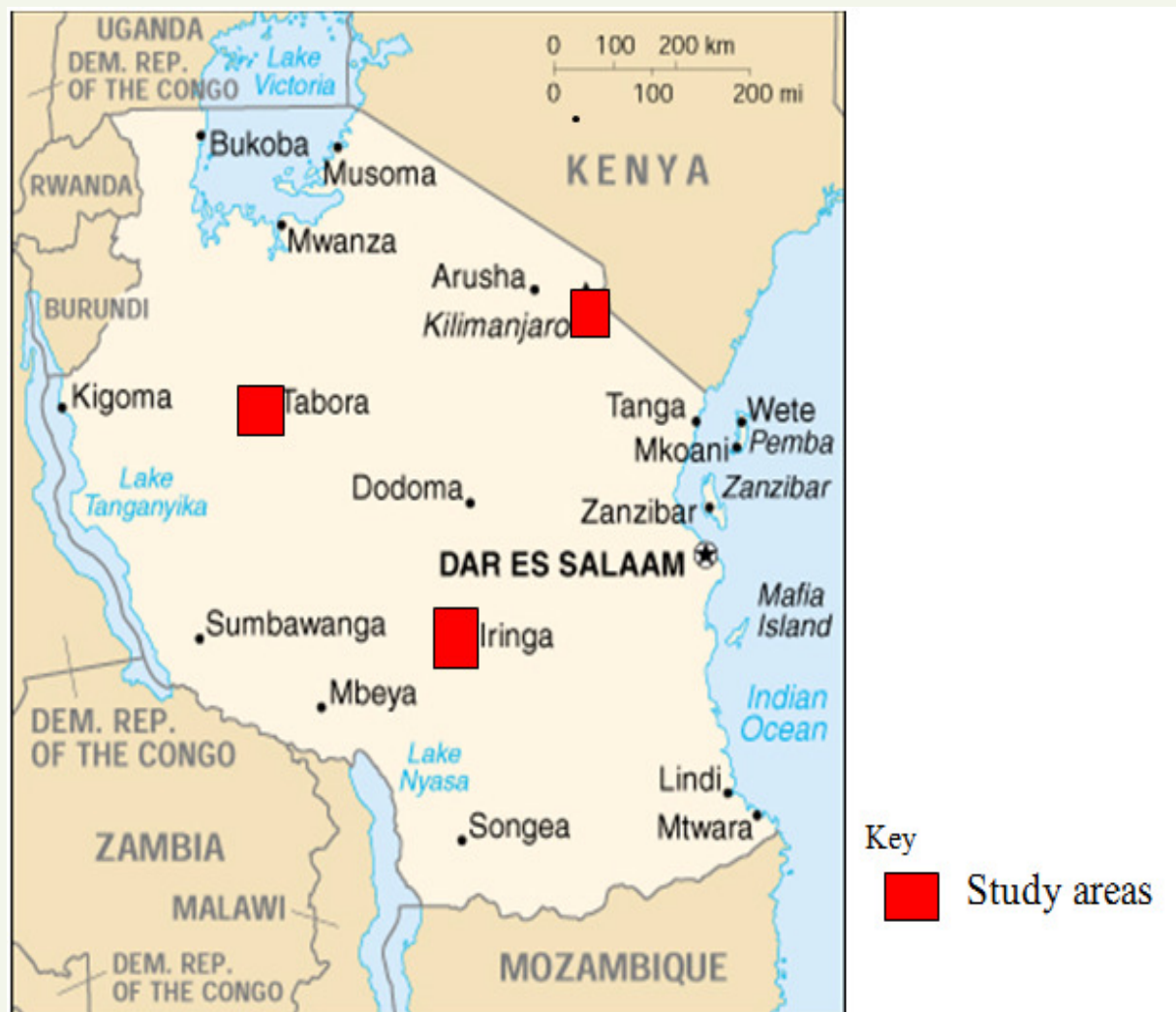
1. Desk literature review
2. Key informant interviews
3. Focus Group Discussions
4. Questionnaires (Farmers)
5. Sample collection and Laboratory analysis (Total Aflatoxins)
6. Use of Models (economic impact analysis)



Agro-ecological zones and districts targeted in Uganda



Regions from which aflatoxin exposure data were obtained, Tanzania

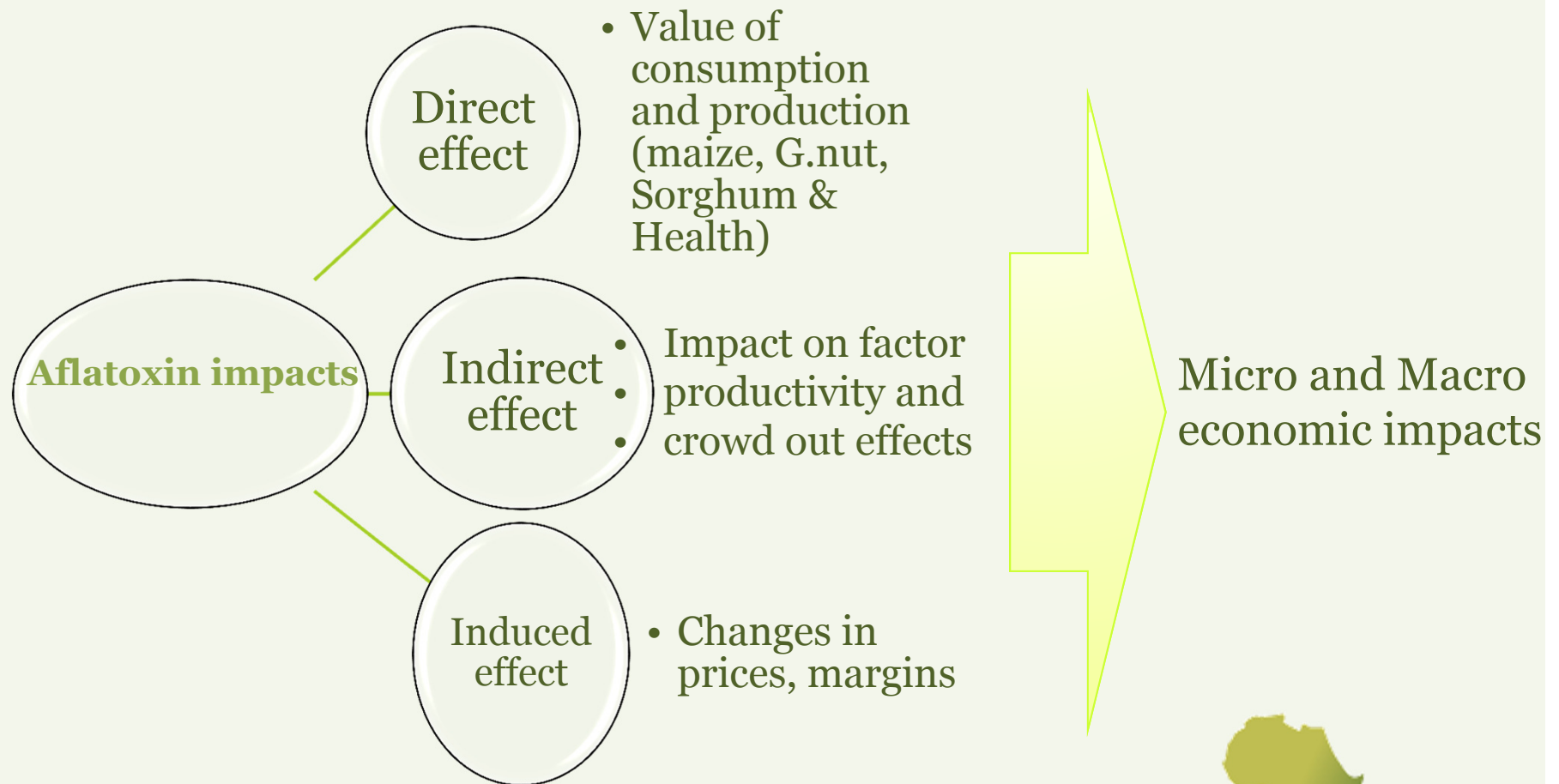


Economic assessment for TZ:

- **Cost-of-illness (COI) approach**
 - Selected a healthy Tanzanian population for exposure
 - Estimated exposure to aflatoxin using bio-marker based exposure data
 - Estimated the population risk to HCC
 - Estimated the case-fatality ratio
 - Used DALYs for estimation of productivity losses
 - Estimated various costs of illness based on a Korean study approach
 - Estimated the total economic impact



Economic assessment for UG: Aflatoxin transmission mechanism + CGE model



Model used for economic impact assessment, Uganda:

- Aflatoxin Customised Recursive Dynamic Computable General Equilibrium (CGE)
 - i) Market frictions: Sadoulet and de Janvry (1995) & Devarajan et al., (1997)
 - ii) Production: Aflatoxin contaminated agricultural commodities are produced by local firms following a CES production function.

$$Z_G = \left(\sum_i \delta_i X_i^{-\rho} \right)^{-1/\rho}$$

$$G \in \{z_{afxn}, z_0\}$$

$$X_K = Z \delta_K^{1/(\rho+1)} \left[\frac{P_K}{P_{ave}} \right]^{-1/(\rho+1)}$$

$$i \in \{L_{sick}, L_{ok}, CAP\}$$

- iii) Sale of aflatoxin commodities: The producer's choice between the domestic and export market is captured by the Constant Elasticity of Transformation (CET).

$$Afxn_Agricprod = \bar{A} \left[\delta \cdot E_{af}^{\Omega} + (1 - \delta) \cdot DS_{af}^{\Omega} \right]^{\frac{1}{\Omega}}$$

$$\Omega = 1/(\rho - 1); \quad \sim \quad 1 < \rho < +\infty$$

- Households maximize utility by maximizing revenue, minimizing cost as well as optimal allocation of resources

$$X3_SH(c) = X3SUB(c) + S3LUX(c) * V3LUX_c / P3_S(c)$$

- Households consume both imported and domestic commodities whose substitutability is captured by constant elasticity of substitution (CES).

The Malawi study:

- Supplemented and enriched the MAPAC assessments
- Used CGE model



Occurrence of aflatoxins in maize, groundnuts and rice, 2014/15, Tanzania

Food	Regions	Range of prevalence (%)	Range of highest contamin. (ppb)	Range of prevalence above regulatory limit (%)
Maize	Manyara, Morogoro, Iringa, Mbeya, Rukwa, Kilimanjaro, Tabora, Shinyanga and Ruvuma	35 - 95	8 - 1081	2 -85
Groundnuts	Manyara, Ruvuma, Mtwara, Dodoma, Shinyanga	NA	31 -123	18 - 20
Rice	Mbeya, Shinyanga and Morogoro	6 - 70	0.01 – 3.83	None



Occurrence of aflatoxin in maize, 2014/15, Uganda

Agro-ecological zone	District	Aflatoxin levels (ppb)		% samples > 10 ppb
		Range	Mean	
Western Savannah Grasslands	Mubende	0-255	71.5	45
	Kamwenge	3-110	25.4	50
	Masindi	0-550	42.6	25
Kioga plains	Iganga	0-680	45.8	65
	Soroti	0-3300	388	60
	Tororo	0-86	11.3	20

Occurrence of aflatoxin in groundnuts, 2014/15, Uganda

Agro-Ecological zone	District	Aflatoxin levels (ppb)		% samples > 10 ppb
		Range	Mean	
Western Savannah Grasslands	Mubende	0 - 15	1.5	10
	Kamwenge	0-11	1.9	10
	Masindi	0-179	16.1	10
Kioga plains	Iganga	0-850	78.7	30
	Soroti	0-141	18.9	20
	Tororo	0-12	1.7	10
North Eastern Savannah Grasslands	Gulu	0-4	1.0	0
	Amuria	0-13	3.7	10
	Lira	0-22	3.0	10

Occurrence of aflatoxin in sorghum, 2014/15, Uganda

Agro-Ecological zone	District	Aflatoxin levels (ppb)		% samples > 10 ppb
		Range	Mean	
Kioga plains	Soroti	97-260	170.1	100
	Tororo	0-240	55.1	65
North Eastern Savannah Grasslands	Amuria	25-514	11.5	100
	Gulu	0-121	66.6	95
	Lira	26-240	102.7	100

Economic impact of aflatoxins, Tanzania

- Based on monetization of the DALYs (economic loss due to mortality and morbidity)
- The total economic loss due to aflatoxin exposure in Tanzania has a median of US\$332,500,000; ranging between US\$ 92,890,000 and 757,900,000
- Only the amount of money that would be saved from DALYs, if efforts to reduce aflatoxin exposures were exercised, is captured
- Further work ongoing to analyze the trade and food security impacts based on the current aflatoxin standards of 10/15 ppb of TZ and other relevant info



Key findings for Uganda

Status of the food safety situation:

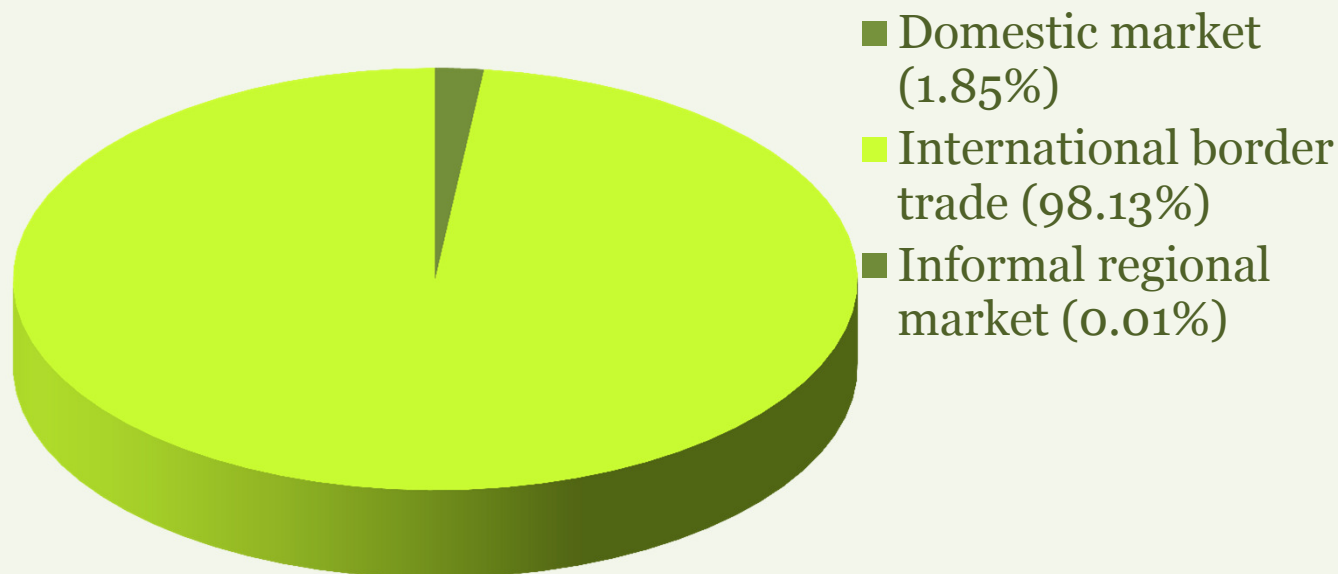
- No single agency is responsible for food safety
- Multi-agency system scattered in different ministries and/or departments
- Personnel, policies, infrastructure are rather fragmented between several ministries, departments and agencies



Key highlights on impacts of aflatoxin contaminations in foods (FY 2013/2014), Uganda

Trade & transport margins (markup) impacts			Export impacts			Impact on health sector			Impact on household welfare			Impact on production, employment and wages	
	%	US\$ mn		%	US\$ mn		%	US\$ mn		%	US\$ mn		%
Health sales (intermediate)	-0.02	-0.023	Nominal exports	-0.62	-37.56	Real household Demand domestic health services	0.25		Composite Price Index	-0.15		Economic growth	-0.26
Health sales (households)	0.12	0.47	Real export	-0.47		Real household Demand imported health services	2.83		Disposable household income	-0.33	-79.3	Production efficiency	-0.35
Health sales (government)	0.38	1.38	Export price	-0.15		Production of health services	0.61		Nominal household consumption	-0.33	-59.1	Employment demand	0.18
Aggregate health services	0.48		Exchange rate depreciation	0.1		Real consumption of domestic health services by households	0.25		Real household consumption	-0.18		Real wage	0.09
Export trade margins (grain seeds)	-1.35	-1.34	Terms of trade (TOT)	-0.15		Real consumption of imported health services by households	2.83		Household savings	-3.44	-76.54		
Export transport margins (grain seeds)	-1.35	-0.18	Agric exports	-1.09	-16.34	Health services price	0.85		Nominal grain seed consumption	0.11	2.3		
			Mining sector export	0.02	0.013	Government savings		-0.3	Real consumption of domestic Grain seeds by households	-0.27			
						Government expenditure on health services	0.87	0.91	Real consumption of imported Grain seeds by households	-2.7			

Results of Malawi Aflatoxin Impact Assessment



Net effect of aflatoxin contamination on Malawian economy

- Export bans imposed by importing countries restrict Malawi's exports resulting in general loss of foreign exchange.
- Border price and domestic price differences act like an implicit form of taxation on the economy, resulting in foreign exchange losses

Priority areas identified for intervention strategies

1. Production, postharvest handling & storage
2. Processing and marketing
3. Public health management
4. Advocacy & awareness creation
5. Policy and regulation



Conclusions

- Affected products are staples
- High levels of contamination
- Low level of awareness among consumers, traders and processors
- Inadequate regulation and enforcement
- Substantial socio-economic impact of aflatoxins in Malawi, Tanzania and Uganda
- There is moral reason and economic and social imperative to mitigate the aflatoxin challenge



PACA Vision:
An Africa Free From the Harmful
Effects of Aflatoxin

Thank you!

