

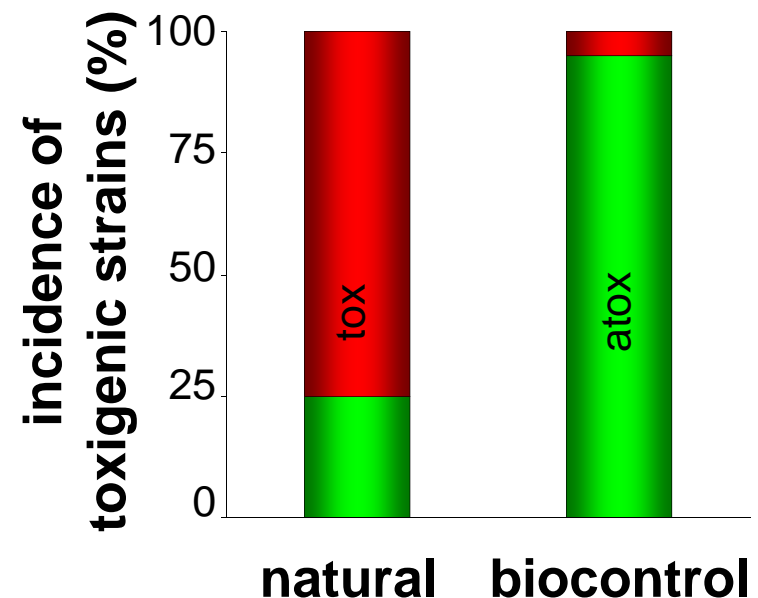
IITA and extensive partner network  
is managing project profile of over  
10 million US\$  
for aflatoxin mitigation in SSA  
technologies: breeding and biological control

# Biocontrol of aflatoxins: principle

Species/strain	B aflatoxin (B <sub>1</sub> , B <sub>2</sub> )	G aflatoxin (G <sub>1</sub> , G <sub>2</sub> )
<i>A. flavus</i> 'L-strains'	+/-	-
<i>A. flavus</i> 'S-strains'	+	-
<i>A. flavus</i> 'S <sub>BG</sub> strains'	+	+
<i>A. parasiticus</i>	+	+
<i>A. nomius</i>	+	+
<i>A. tamarii</i>	-	-

## “competitive exclusion principle”:

- field application of atoxigenic L strain that outcompetes the toxigenic ones
- shift fungal community from toxigenic to atoxigenic



## From Southern USA...

- Registered and commercialized since 2004 in the US on maize, cotton, pistachio as AF36 and Aflaguard (Syngenta)
- AF36 in Arizona: 590 ton in 2012  
82,000 ha cotton and 100,000 ha pistachio in 2012
- Routine agronomic practice across counties effective and carry-over in multiple crops over multiple years in various cropping systems



## ... to Africa

biocontrol strain    local partners    field testing    local capacity    production distribution    commercialization awareness    **Nigeria 2003**

biocontrol strain    local partners    field testing    **Senegal 2007**

biocontrol strain    local partners    field testing    **Burkina Faso 2009**

biocontrol strain    local partners    field testing    **Kenya 2004**

biocontrol strain    local partners    **Zambia 2011**

local partners    **Tanzania 2012**

**Mozambique 2013**

**Ghana 2013**

**Mali 2013**

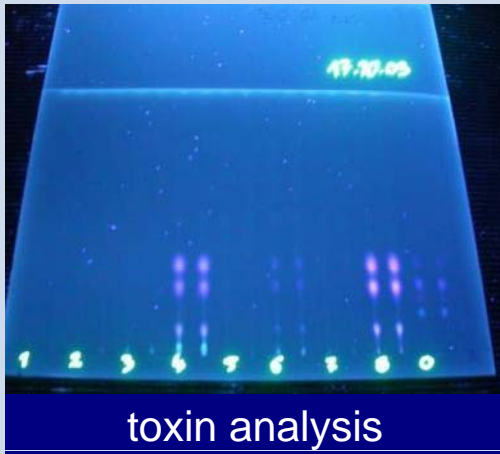


# Strain selection prior to field testing

## step 1

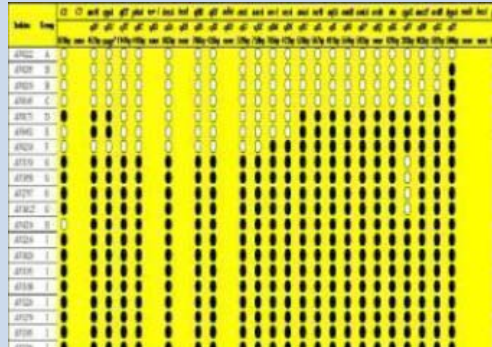


isolation

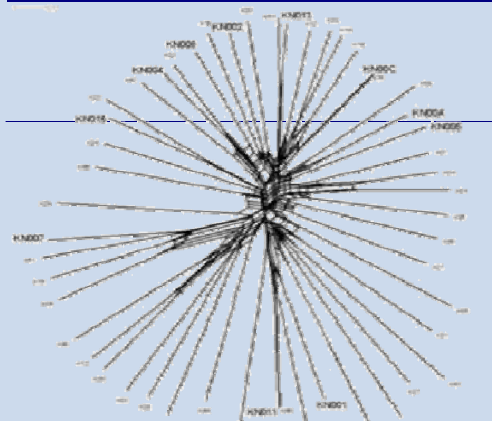


toxin analysis

## step 2



sequencing  
(aflatoxin and CPA)



genetic profiling (SSR)

## step 3



competition bioassays



VCG profiling

## Pre-field selection criteria

- does not produce aflatoxin
- can genetically not produce aflatoxin
- can genetically not produce CPA
- outcompetes toxigenic strains
- belongs to different clonal lineages (SSR)
- VCG with wide geographic distribution in country
- VCG does not contain a single toxigenic member

**~12 native strains are tested in the field**



## Selection of 4 strains

### selection criteria:

- superior aflatoxin reduction
- superior capacity to outcompete toxigenic ones

**4 native strains formulated  
into a registered product: 10 kg ha<sup>-1</sup>**



## Performance of Aflasafe in farmers' fields

### B-aflatoxin reduction in maize at harvest, Senegal (2010)

village	fields	aflatoxin conc (ng/g)		reduction
		Aflasafe	control	
Diourbel	19	1.9	29.7	<b>93%</b>
Nioro	19	4.4	17.6	<b>75%</b>
<b>Mean</b>				<b>87%</b>

### B-aflatoxin reduction in maize at storage, Nigeria (2010)

village	fields	aflatoxin conc (ng/g)		reduction
		Aflasafe	control	
Maigana	22	17	646	<b>99%</b>
Pampaida	10	9	171	<b>95%</b>
Lere	9	49	271	<b>82%</b>
Birnin	10	14	96	<b>85%</b>
<b>Mean</b>				<b>90%</b>



# Aflasafe plant in Nigeria

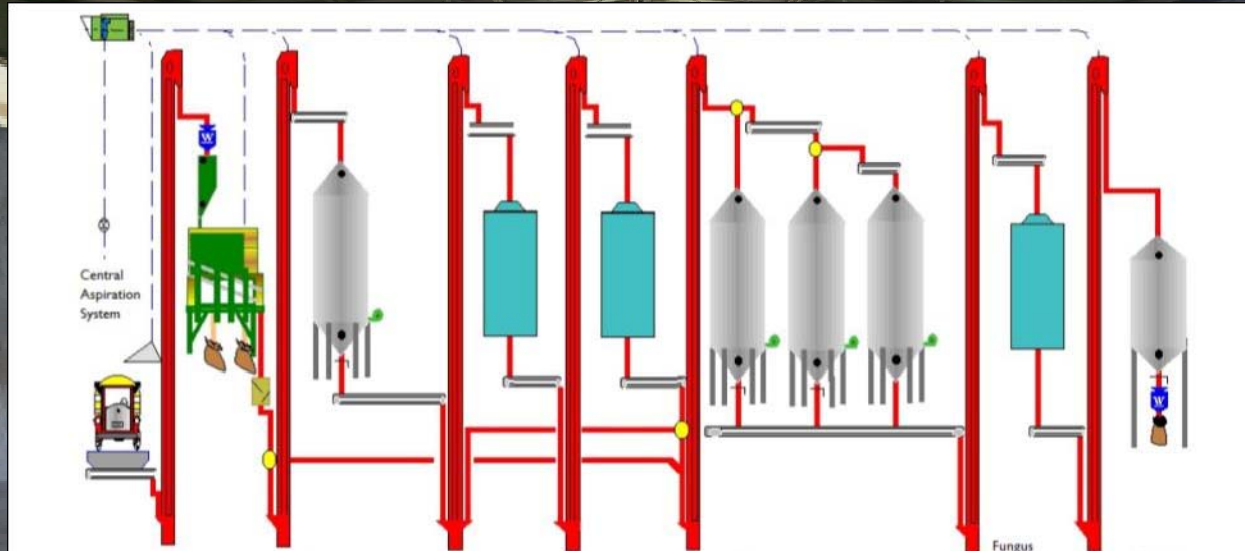


Partnership  
for Aflatoxin  
Control in Africa

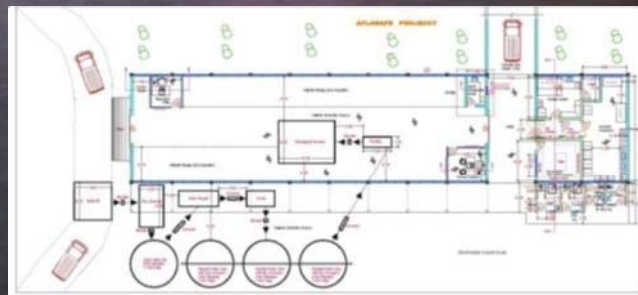
Partenariat pour  
lutter contre  
l'aflatoxine en Afrique

Parceria para o  
Controle da  
Aflatoxina em África

الشراكة من أجل مكافحة  
الافلاتوكسين في أفريقيا



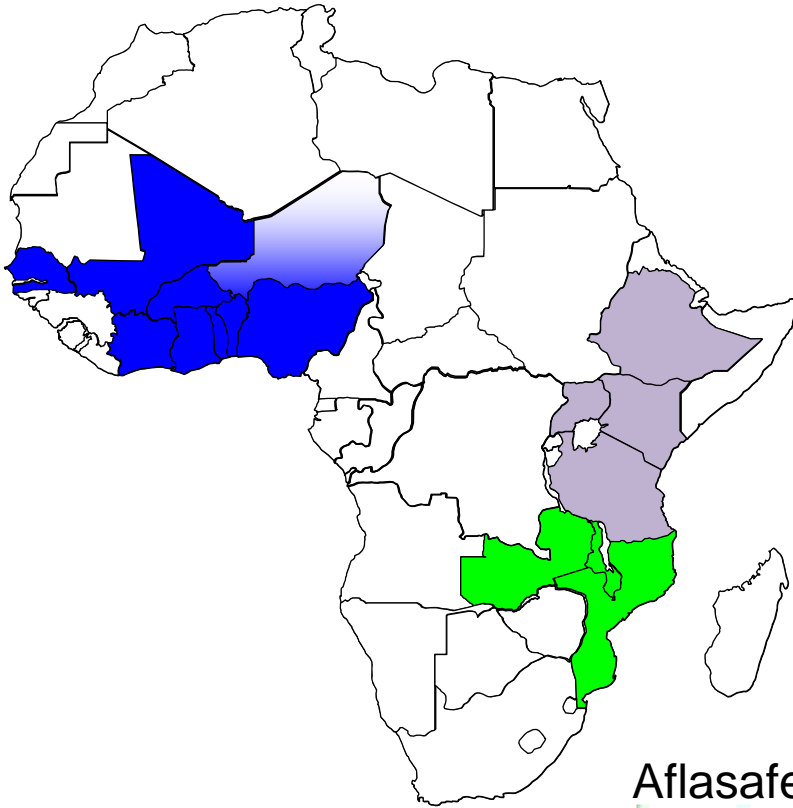
5 t h<sup>-1</sup>



Develop cheaper, more effective formulations and manufacturing methods compatible with Africa that can be transferred to private sector



# Regionalization



- **strains:** regional strains (PACA)
- **manufacturing:** regional hubs
- **registration:** regional protocols

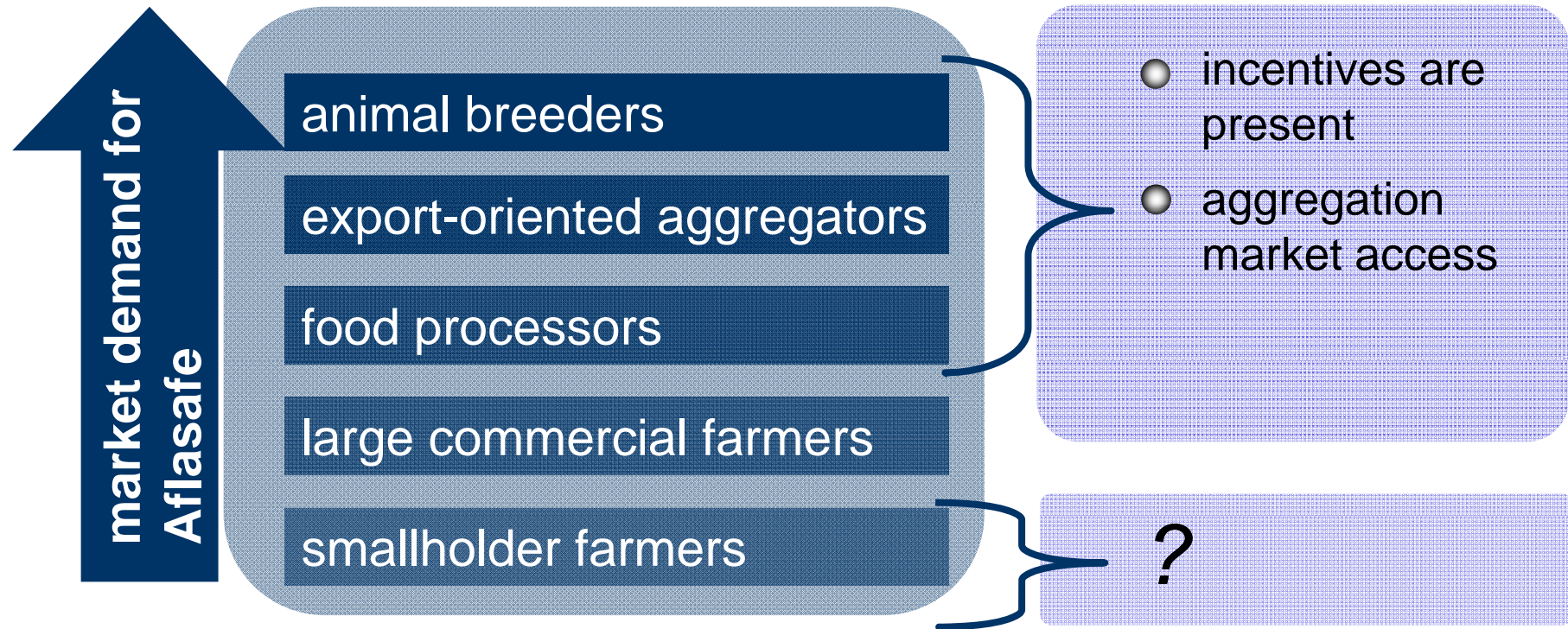
Aflasafe-Nigeria  
~~Aflasafe-Senegal~~  
~~Aflasafe-Kenya~~  
~~Aflasafe-Mali~~  
Aflasafe-Mozambique



Aflasafe-West  
Aflasafe-East  
Aflasafe-South

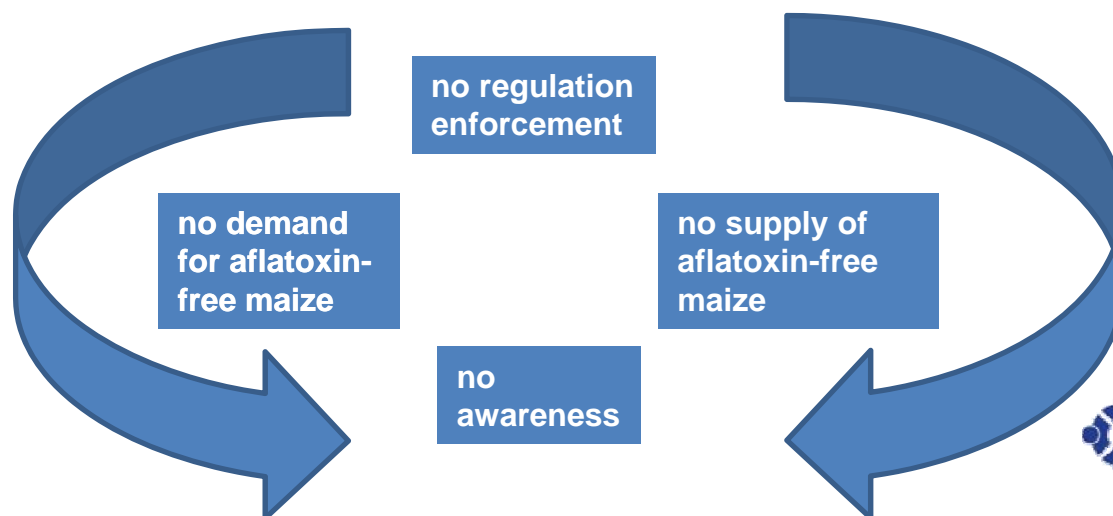
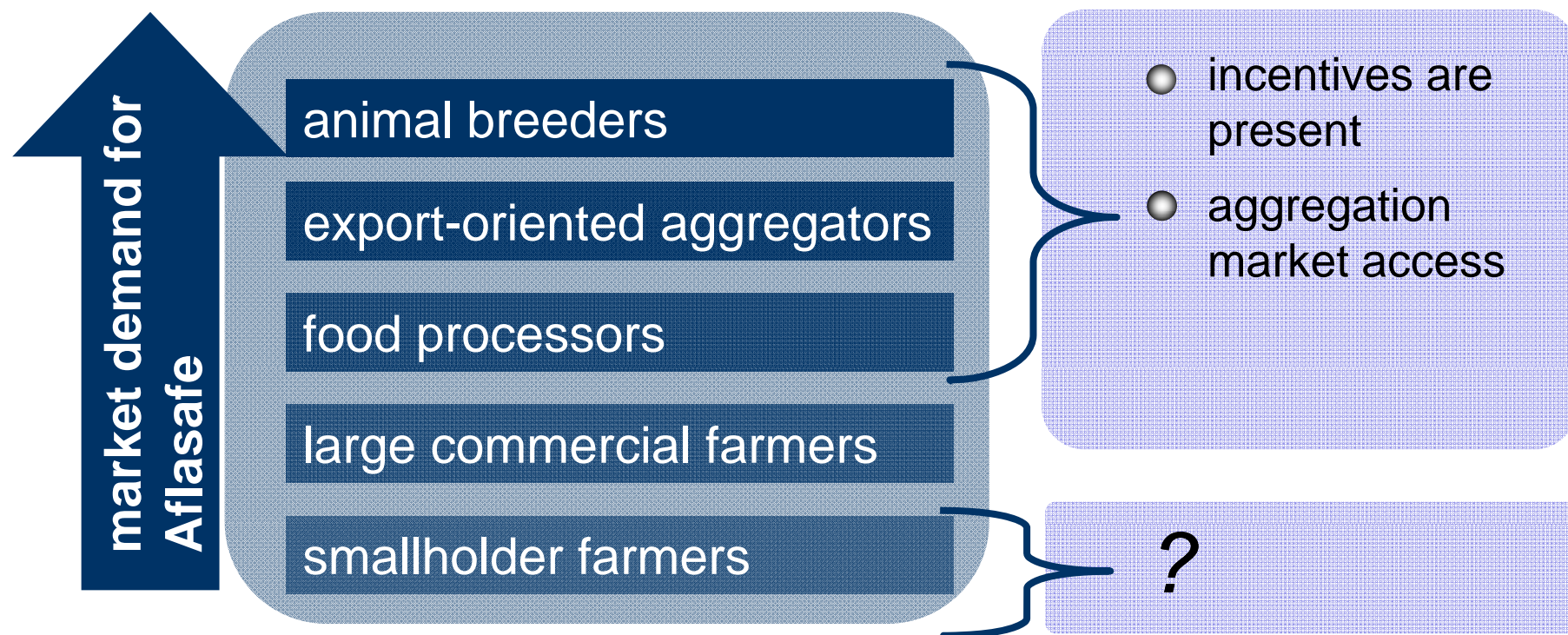


# How to get Aflasafe to market?





# How to get Aflasafe to market?



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# Aflasafe Commercialization Strategy

Improving the Health and Securing the Income of Nigeria's Small Holder Farmers

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Creating Companies | Creating Wealth | Creating Jobs

June 2012

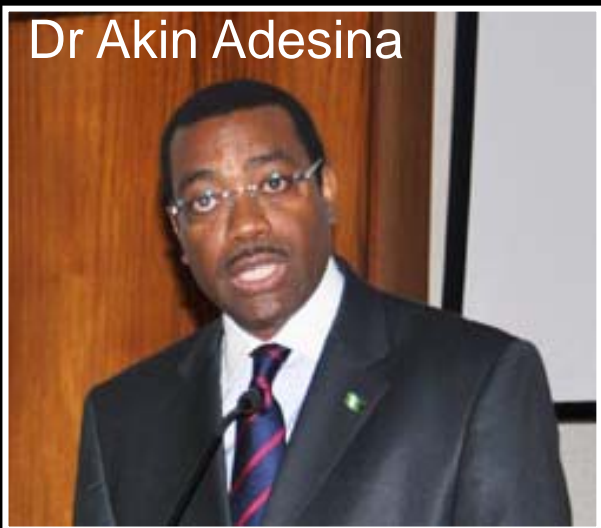
Kola Masha

Presented to the Steering Committee of PACA

# Policy Statement:

## Honourable Minister of Agriculture, Nigeria

Dr Akin Adesina



“All parties involved, led by IITA and the government, have critical roles to ensure that Aflasafe treated food crops are successfully introduced into the market in the next 5 years”



Partnership  
for Aflatoxin  
Control in Africa

Partenariat pour  
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# Partnership For Aflatoxin Control (PACA)

African Union, CAADP Pillars, RECs, NGO's, Private Sector, Consumer and Producer Groups, Technical Experts, and Development Partners

## East Africa Community

CGIAR: IITA & IFPRI

USDA-CDC-GAVI-COMESA

### Health

Standards for Food  
Impacts on Human Health  
Mycotoxins & the 1,000 Days  
Hepatitis A&B Vaccinations  
Quality Assurance Logo  
Consumer Awareness

### Agriculture

Standards for Feed  
Impacts on Animal Health  
Post Harvest Handling Protocols  
Abatement : Biocontrol  
Coordination with P4P  
Alternative Uses

### Trade

Customs & Borders  
Economic Impacts on Trade  
Regionally Harmonized Standards  
Regional Biopesticide Registration  
Miller & Wholesaler Compliance  
Disposal Systems & Environment



# Gaps and opportunities

- Durable co-ordination across SSA
  - Technical platforms (basic science)
  - Approved sampling, testing and standards
  - Communication and awareness (risk)
  - Business development capacity
  - Enabling policy environment (public health)
  - Evaluation of adoption pathways

# Asante sana:

AATF	KEPHIS, Kenya	Nigerian Mycotoxin Society
Abt Associates	KNUST, Ghana	NISIR, Zambia
ACDI/VOCA	Livestock Feed PLC, Nigeria	Obasanjo Farms, Nigeria
ADA	Maize Association of Nigeria	PASO, Burkina Faso
Ag Dev Program, Nigeria	Manufacturers Association of Nigeria	PCPB, Kenya
African Union	Maslaha Seeds, Nigeria	PQPS, Zambia
Animal Care, Nigeria	Meridien Institute	Sokoine University, Tanzania
Bill & Melinda Gates Foundation	Mikocheni, Tanzania	Sylvain Bio, France
COMESA	Millennium Village Program, Nigeria	TFDA
Crop Research Institute, Ghana	Ministry of Agriculture, Kenya	TPRI
Dalberg Associates	Ministry of Agriculture, Tanzania	UNIDO
Doreo Partners	Ministry of Health, Nigeria	Université G Berger, Senegal
DPV, Senegal	NAFDAC, Nigeria	University of Arizona, USA
ECOWAS	NEARLS, Nigeria	University of Ibadan, Nigeria
Elephant Vert, Morocco	NEPAD Business Group	University of Bonn, Germany
FEPASO, Burkina Faso	Nestle	USAID
Government of Mozambique	Nigerian Economic Summit Group	USDA-ARS
GIZ	Nigerian Export Promotion Council	USDA-FAS
ICRISAT		US Embassy, Kenya
IFA-Tulln, Austria		ZARI, Zambia
IFAR		
INERA, Burkina Faso		
KARI, Kenya		

**... and of course the farmers**