

Aflatoxin Management

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Mycotoxin Contamination Food Safety



Photos by William Appaw

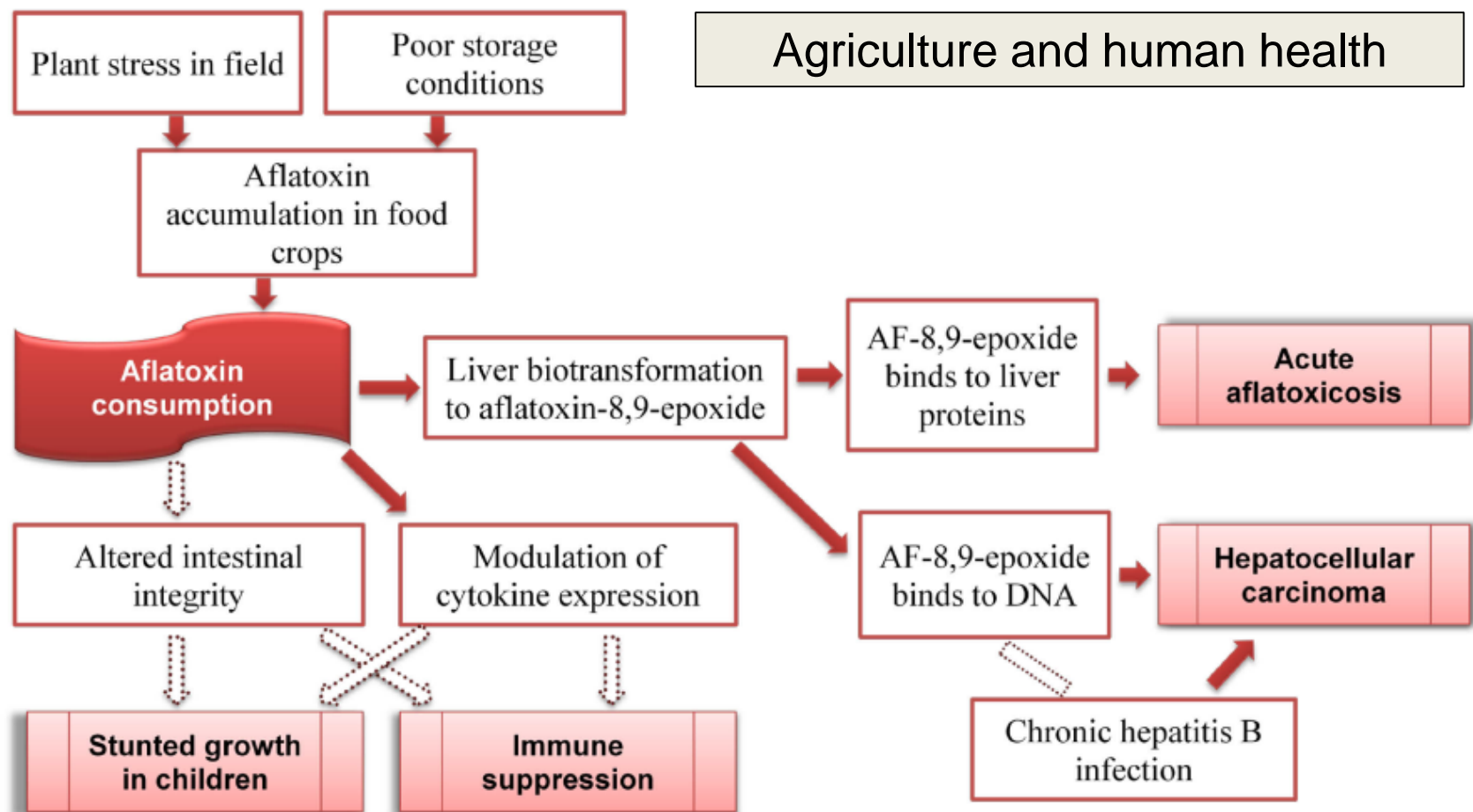


Figure 2 Aflatoxin and disease pathways in humans. Source: Wu (2010).

Practices that minimize aflatoxin

Fortunately, practices that increase yield often decrease aflatoxin (plant health)

But, the field is just the beginning

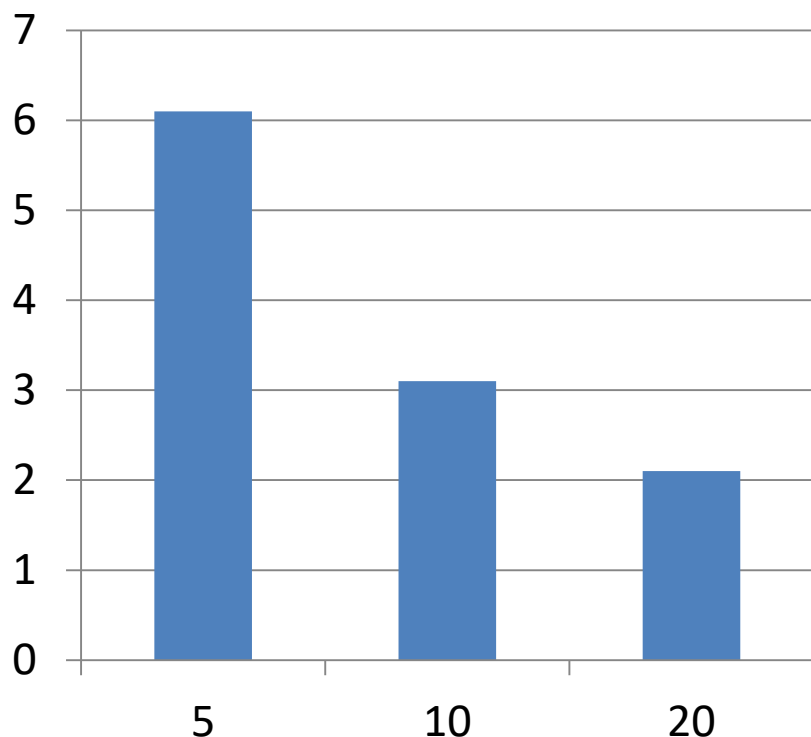
Drying and storage are critical

Influence of Intra-Row Spacing on Yield and Aflatoxin

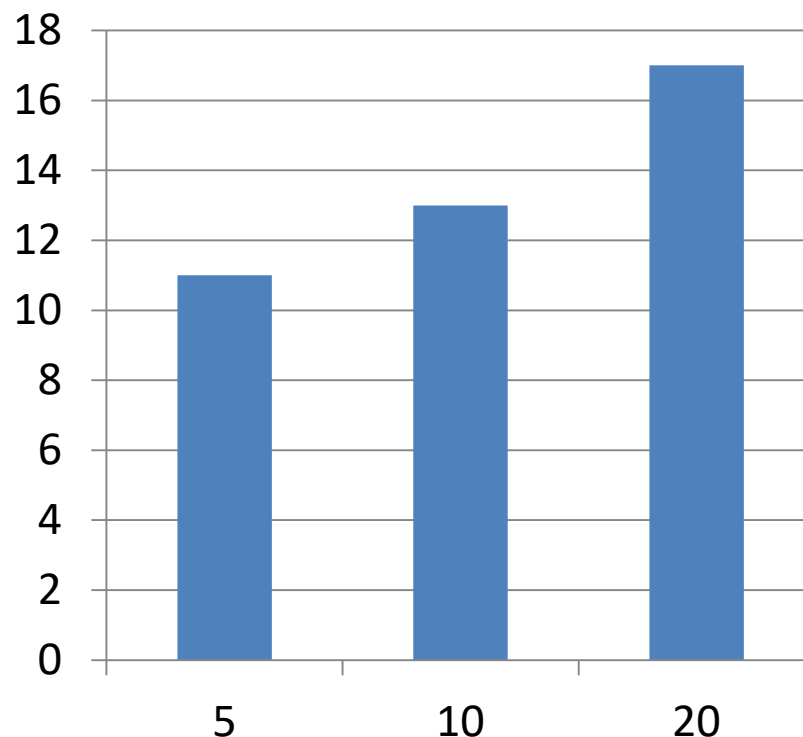
Chalwe et al., Msekera, Zambia



Yield (tons/ha)



Aflatoxin (ppb)

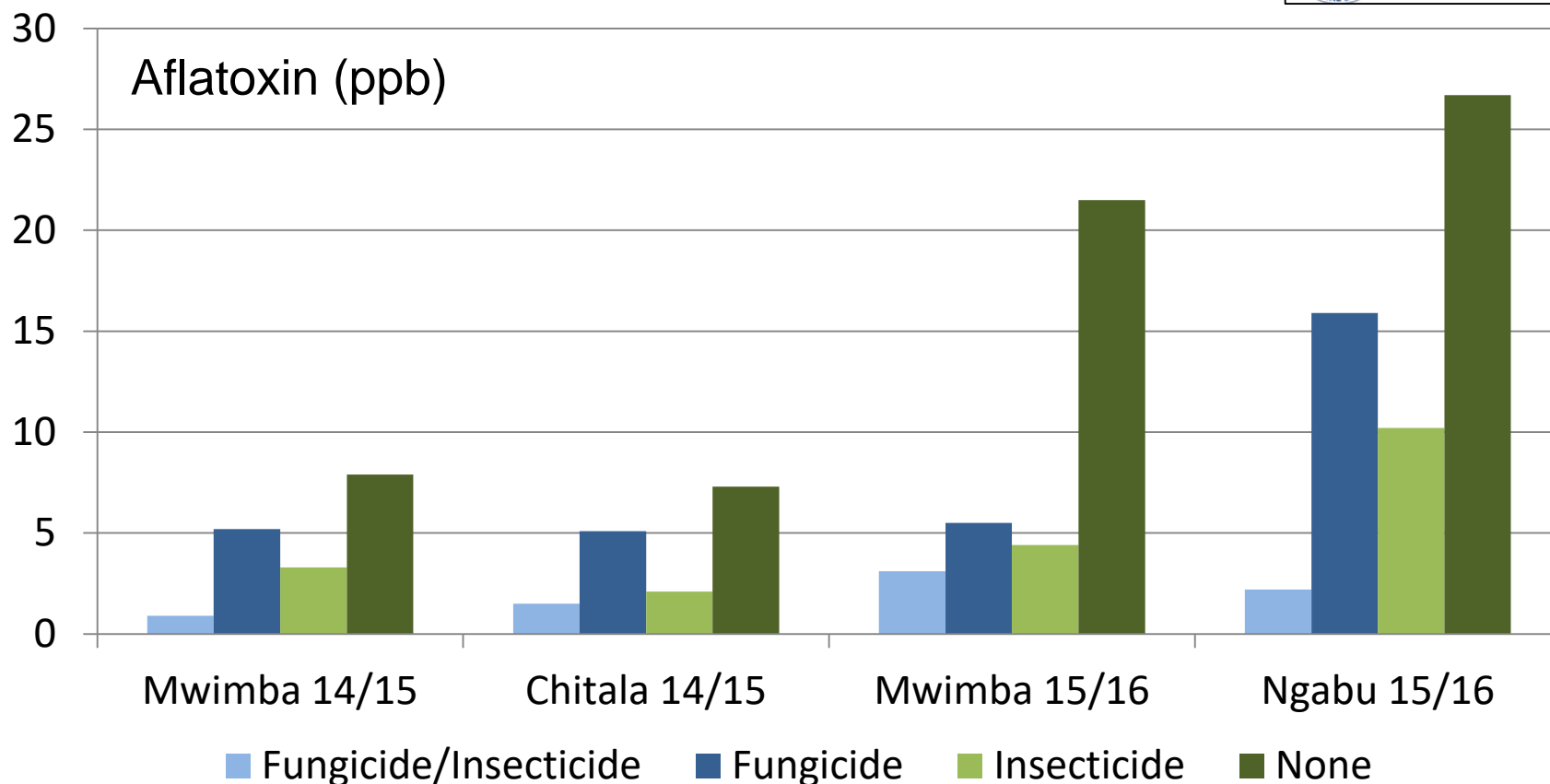


Intra-Row Spacing

Closer plant spacings maximize photosynthesis and keep soil more moist and cooler: generally greater yield and less aflatoxin

Influence of Pest Management on Aflatoxin

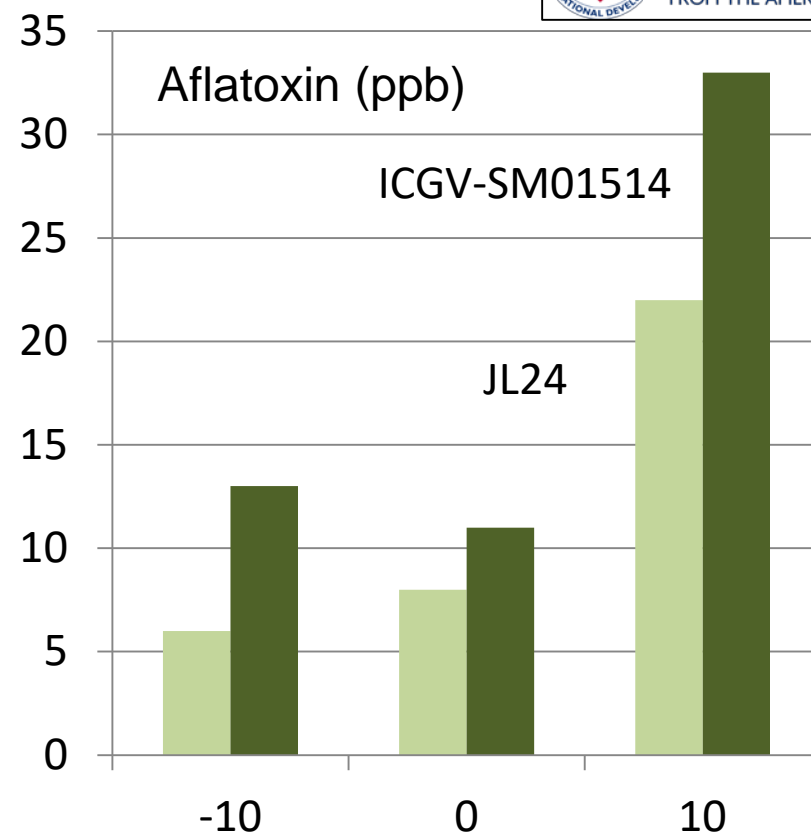
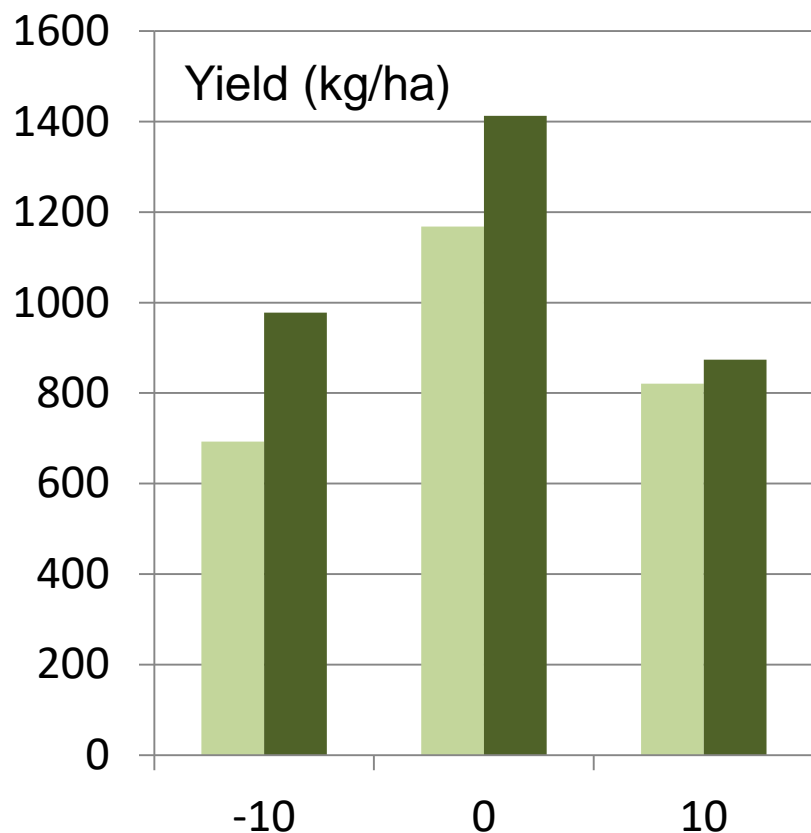
Sibakwe et al., Malawi



Increasing plant health through improved pest management:
generally greater yield and less aflatoxin

Influence of Harvest Date on Yield and Aflatoxin

E. Zuza Jnr et al., Mozambique

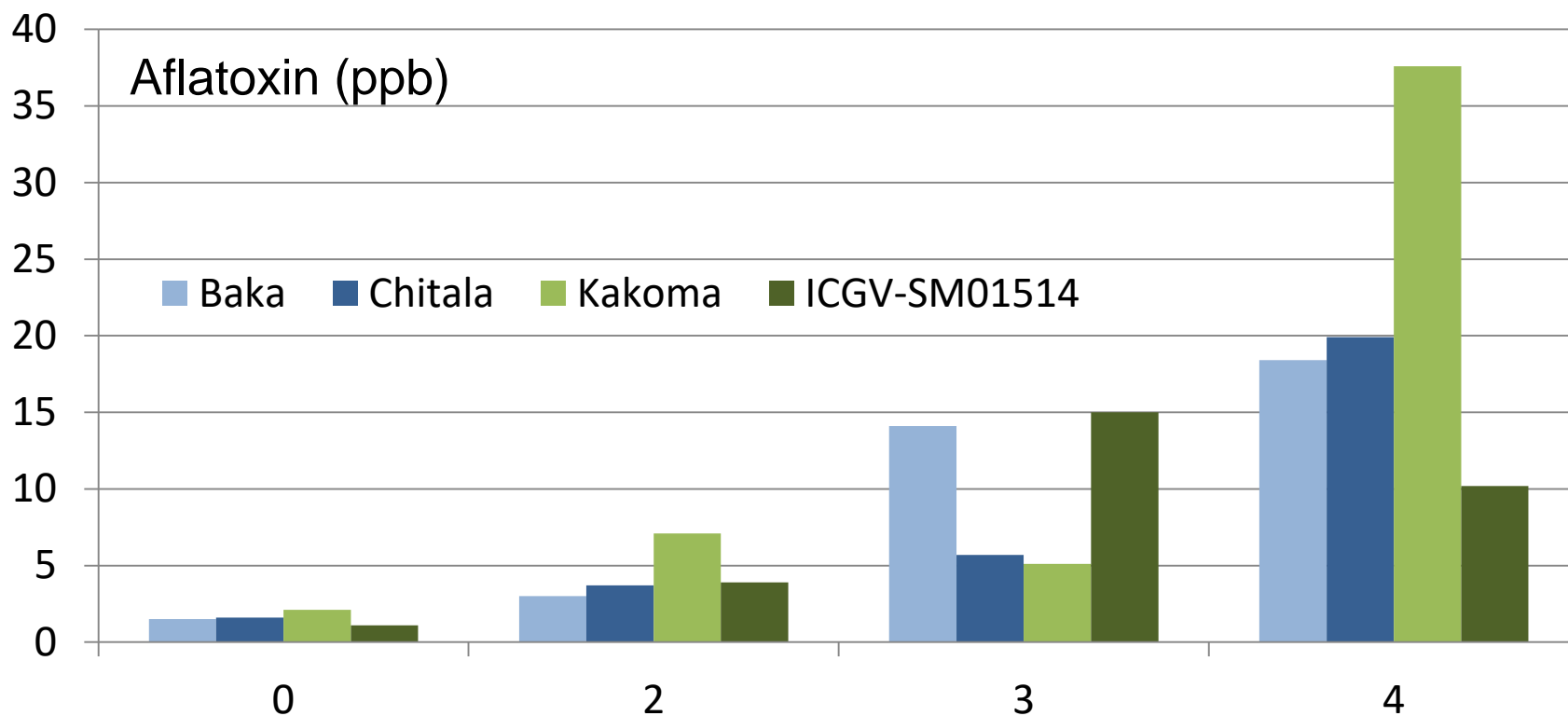


Days before or after optimum digging date

Digging prior to or after optimum pod maturity can decrease yield.
Digging after optimum maturity can increase aflatoxin.

Influence of Variety and Drought Duration on Aflatoxin

Sibakwe et al., Malawi



Weeks of continuous drought starting at pod fill through physiological maturity

A longer duration of drought increases aflatoxin.
Variety can impact aflatoxin.

Preventing mycotoxin contamination in groundnut cultivation

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- 3 Prediction models for aflatoxin development
- 4 Minimizing aflatoxin contamination
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Table 1 Aflatoxin contamination of peanut in Zambia as influenced by seeding date in relation to drought stress during the latter part of the growing season*

	Rainfall during final 30 days of the season	Mean aflatoxin B ₁ concentration in farmer stock peanut
Planting date	cm	µg/kg
31 December 2014	9.90	4 c
8 January 2015	2.73	37 b
15 January 2015	0.00	89 a

*Means for aflatoxin contamination followed by the same letter are not significantly different according to Fisher's protected LSD at $P \leq 0.05$.

Planting late in the rainy season can result in a longer period of time at the end of the growing season for aflatoxin to develop

Table 2 Mean aflatoxin concentrations in farmer stock peanut from fields treated with the nonaflatoxogenic product Alfa-Guard® compared with non-treated peanut at 7 locations in the south-eastern United States during 2004

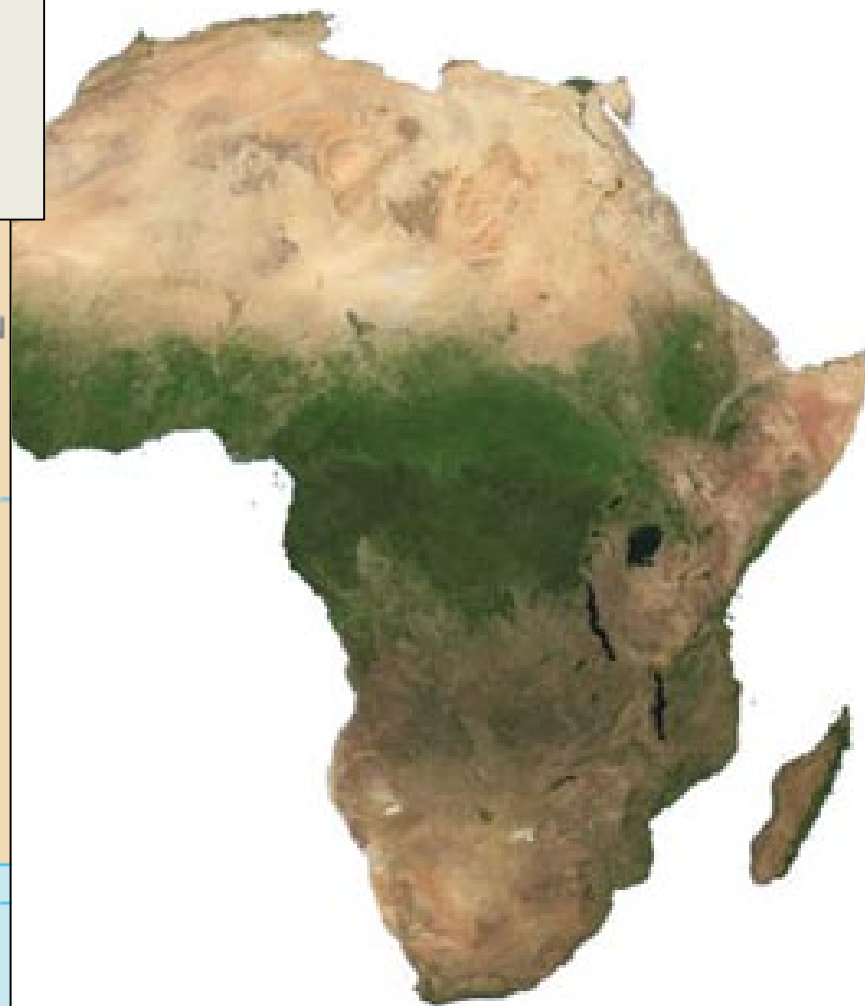
Location		Mean aflatoxin concentration	
Town	State	Control	Treated
		µg/kg	
Harford	Alabama	16.6	5.5
Newton	Alabama	319.7	49.0*
Ft. Gaines	Georgia	96.6	0.2*
Sasser	Georgia	0.0	0.0
Smithfield	Georgia	0.0	0.1
Unadilla 1	Georgia	37.4	0.0
Unadilla 2	Georgia	2.6	1.0*
Pooled	—	78.9	11.7*



*indicates significance at $P \leq 0.01$ within a location and when pooled over all locations using nonparametric Mann-Whitney rank sum test. Adapted from Dorner (2009).

Afla-Guard and Afla-Safe have potential to reduce aflatoxin in groundnut

Example of a holistic approach to minimizing aflatoxin



Ghana



Table 4 Aflatoxin concentration in farmer stock peanut from the village Dagomba in the Ashanti region of Ghana after storage following various practices in the field, during drying and in storage*

Management practices				Peanut response			
				Kernel status after storage for 4 months			
				Good	Shrivalled	Mouldy	Discoloured
Field	Drying	Storage	Aflatoxin after storage (µg/kg)	g/500 g sample			
Farmer	Ground	Poly bag	1407 a	223 f	124 ab	20 a	134 a
Farmer	Ground	Sealed bag	297 bc	264 e	129 a	2 c	106 bc
Farmer	Tarp	Poly bag	298 bcd	306 cd	110 abc	1 c	82 c
Farmer	Tarp	Sealed bag	100 e	339 bc	103 c	0 c	59 d
Improved	Ground	Poly bag	548 b	263 e	118 abc	8 b	111 ab
Improved [†]	Ground	Sealed bag	177 cde	299 d	106 bc	0 c	95 bc
Improved	Tarp	Poly bag	149 de	366 ab	80 d	0 c	57 d
Improved	Tarp	Sealed bag	53 f	393 a	80 d	0 c	27 e

*Means followed by the same letter are not significantly different according to Fisher's protected LSD test at $P \leq 0.0001$. Actual data are presented with mean separation performed on log transformed data. Data are pooled over 12 farmers in a village cluster.

[†]Improved practice included one additional weeding, application of local soaps to aphids, the vector of rosette virus, and calcium applied at flowering.

Minimizing Aflatoxin in Malawi

Plant as soon as possible when rains begin

Establish groundnut at a distance of 5 cm apart

Protect groundnut from pests

Establish optimum pH and fertilize groundnut

Apply calcium at peak flowering

If drought is present at harvest, dig groundnut 5-7 days before optimum maturity

Dry groundnut as quickly as possible



Store groundnut at optimum moisture content