

# Direct market costs of aflatoxins in Kenyan dairy value chain

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# Dairy industry in Kenya

- Contributes 3.5% of Kenya's GDP
- Highest per capita milk consumption in East Africa (around 100 kg/capita/year)
- Large and small scale production systems (the latter contributes 80% of milk output)
- Dairy production improves the livelihoods of households producers through nutrition, income and employment, use of organic fertilizer, as well as assets and savings

# Dairy industry in Kenya

- Of the total annual cow milk production (3.6 billion litres) only about 15% is processed (formal) (FAO, 2012)
- Processing prevents a number of hazards in milk
- However, other hazards persist such as drug residues, pesticide residues, heavy metals, and biological toxins e.g. aflatoxin M1 (AFM1)

# Aflatoxins

- Aflatoxins are by-products of fungal metabolism synthesized by fungus of the genus *Aspergillus*

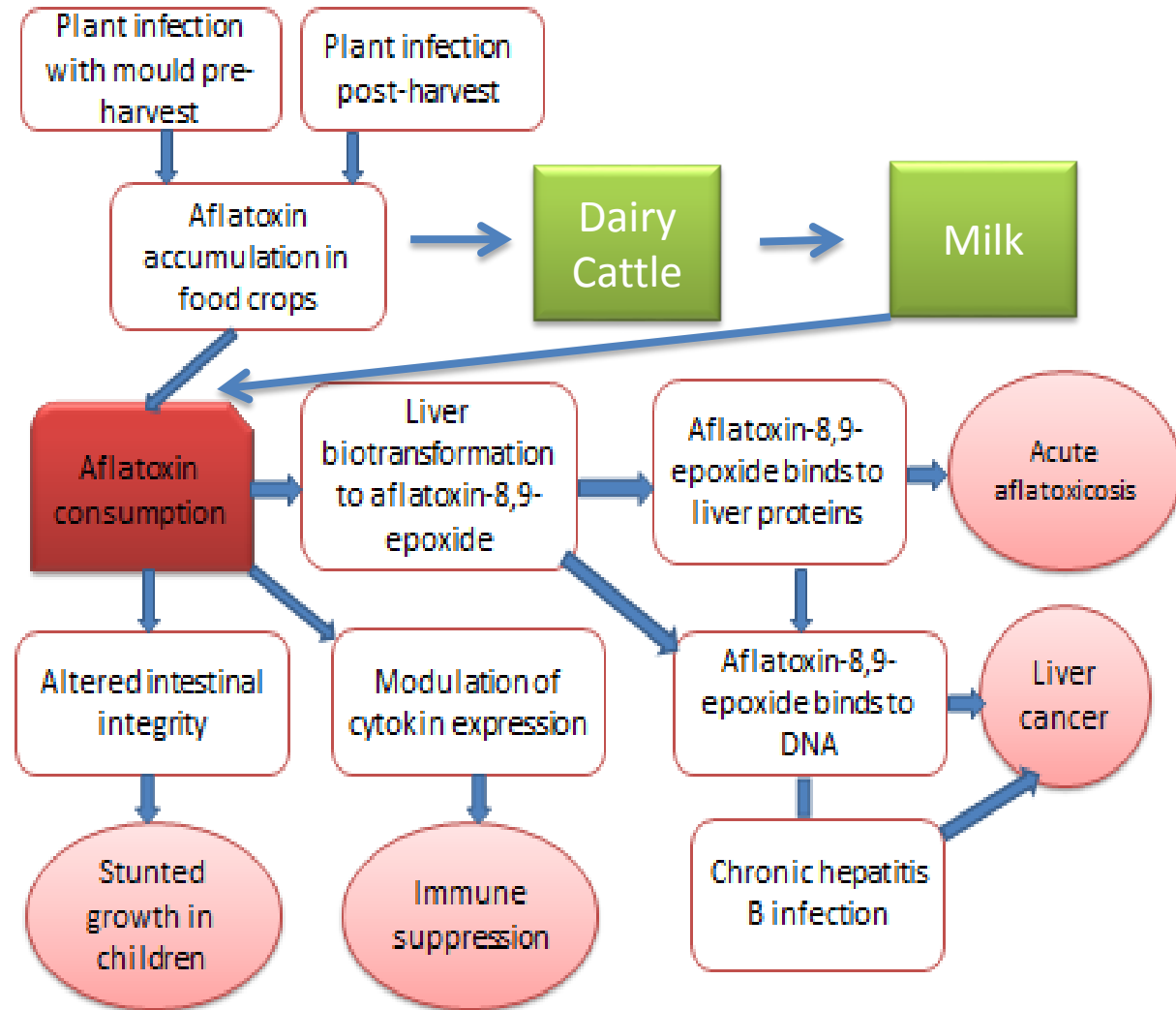


Figure 1. Aflatoxins potential disease pathways in humans

# Aflatoxin B1/M1

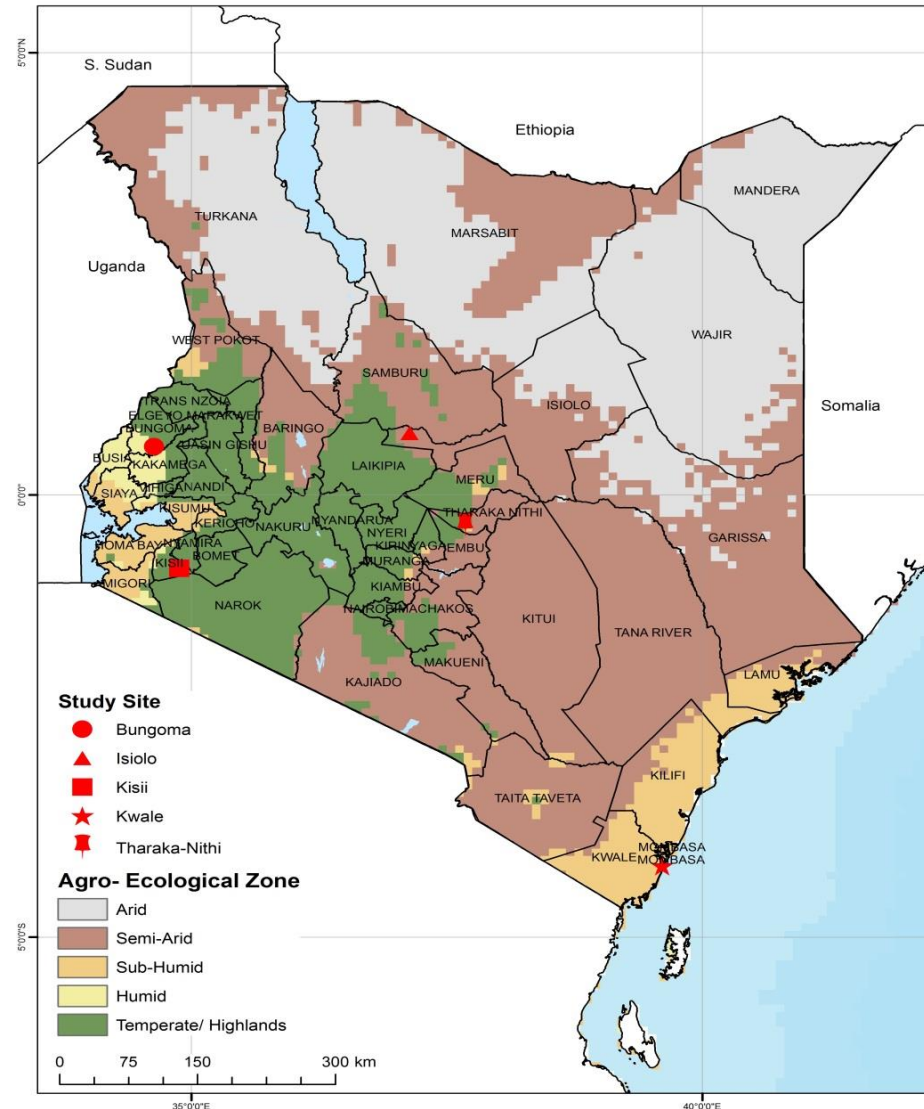
- Aflatoxin B1 consumed in dairy feeds is converted to aflatoxin M1 and secreted in milk
- Aflatoxin B1 in dairy feeds causes a decrease in milk production, reduced feed efficiency and reduced cows fertility
- Aflatoxin B1 is a class 1 human carcinogen (definitely carcinogenic) and aflatoxin M1 a class 2b (possible) human carcinogen

# Study sites

- Random selection of study sites in agro-ecological zones (IIASA/FAO, 2012)

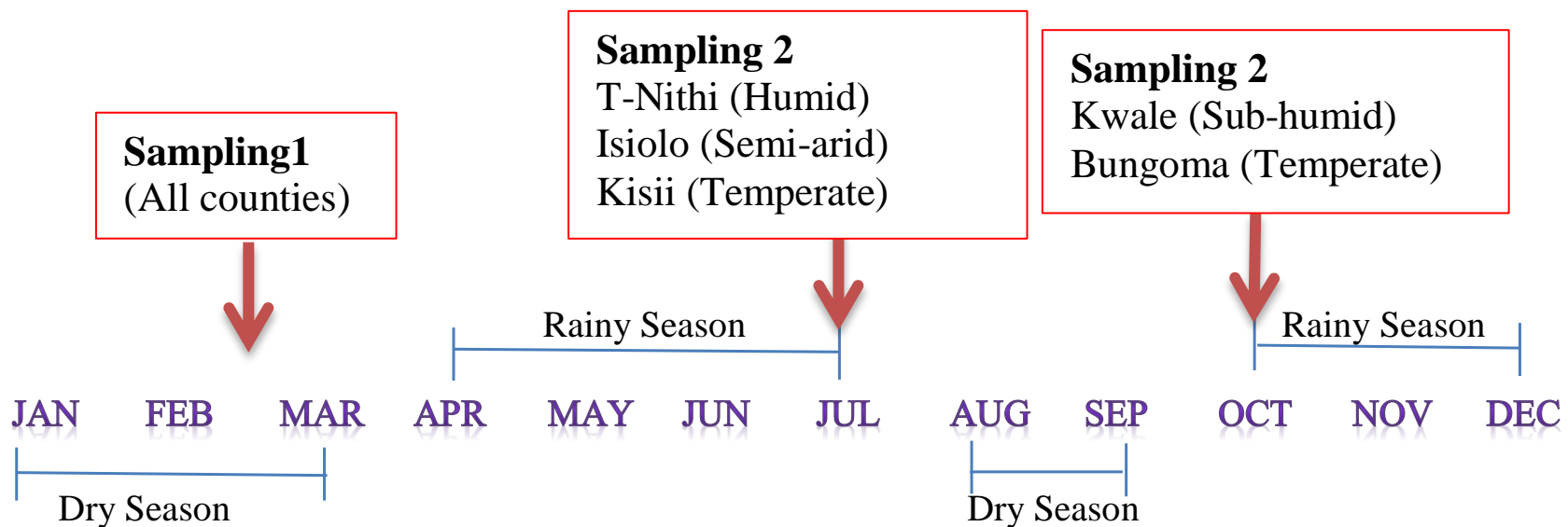
AEZ	Research county
Semi-arid	Isiolo
Sub-humid	Kwale
Humid	Tharaka Nithi
Temperate	Bungoma Kisii

Kenya Counties: Agro- Ecological Zones



# Sampling strategy

- Cross sectional study with two time visit: dry and rainy seasons



# Analysis

- Laboratory analysis: determination of aflatoxins using competitive ELISA
- Aflatoxins cause two types of economic losses:
  - ✓ Human health costs
  - ✓ Direct market costs
- This presentation considers direct market costs (economic losses)
- Human health losses were also assessed but are not presented here



# Analysis

- Direct market costs were estimated using the annual feed and milk production, market costs of feeds and milk and the proportion of samples exceeding the aflatoxin limits
- Use of Stata<sup>®</sup> 13 (StataCorp LP, Texas, US) for statistical analysis

# Estimation of direct market costs of aflatoxins

- Kenya/FAO/WHO limit for AFB1 in feeds is 5ppb
  - Cost is calculated base on if all feed exceeding levels at feed manufacturer level would be discarded
- AFB1 levels above 120 ppb in dairy feeds cause a reduction in milk production up to 25% (Guthrie and Bedell, 1979).
  - Cost is calculated based on a 25% decrease in milk production when the AFB1 concentration in farmers dairy feeds exceeds 120 ppb
- FAO/WHO AFM1 limit is 50ppt
  - Cost is calculated assuming all milk above 50 ppt was discarded

# Estimation of direct market costs of aflatoxins

Aflatoxin limits	Proportion of samples exceeding aflatoxin limits	Annual production	Estimated economic costs in US\$
Feed AFB1> 5 ppb (feed manufacturers)	62/101 (61.4%)	10,982 tones of feed	22.2 million
Feed AFB1>120ppb (dairy farmers)	17/118 (14.4%)	3.8 billion liters of cow milk	37.4 million
Milk AFM1>50ppt(dairy farmers)	29/283 (10.3%)	3.8 billion liters of cow milk	113.3 million

# Conclusions

- There is need to create public awareness on presence of aflatoxins in dairy feeds and milk
- Aflatoxins are contributing to economic losses, and would contribute even more if regulations were strictly enforced
- Aflatoxin costs in dairy value chain could be reduced by focusing on aflatoxin management strategies aimed at reducing aflatoxin contamination in the dairy feed value chain

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# Thank you!

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