



ICRISAT

Safer Food & Fair Trade



Background

- The availability of safe and nutritious foods are key components for achieving the Sustainable Development Goals on poverty and hunger. Mycotoxin contamination, caused by *Aspergillus flavus* group of fungi, *Fusarium* spp. and *Penicillium* spp., is the world's most important food safety issue. It is a key bottleneck in the trade and consumption of agricultural commodities.
- Many agricultural commodities are contaminated with mycotoxins, such as peanut, maize, and sorghum, which provide food and nutritional security to millions of smallholder farmers in Asia and Africa. For example, peanut production in sub-Saharan Africa is a significant source of livelihood for farming households by being a major source of protein and micronutrients as well as an important income source.



ICRISAT's Capability

- **Aflatoxin diagnostics in crops:** ICRISAT is the first CGIAR institution to devise cost-effective and rapid aflatoxin diagnostic techniques in the late 1990s and early 2000s. Since then, ICRISAT has established and enhanced human and diagnostic capacity through laboratories in many African and Asian National Agricultural Research Systems (NARS) and farmers' organizations. We continue to provide training to different value chain actors who monitor food safety risks along the groundnut and maize value chains. Through surveillance testing for aflatoxin contamination, the status of food safety is known and can be acted upon.
- **Aflatoxin biomarker diagnostics in humans:** ICRISAT is the first CGIAR institution to devise the Enzyme-Linked Immunosorbent Assay (ELISA) method to detect aflatoxin biomarkers from

human blood. This was used to detect exposure levels in children that guided Government efforts to reduce exposure among children in Malawi and Tanzania. This innovation can be scaled both in Asia and Africa.

- **Biotechnological solutions for aflatoxin-free groundnut and maize:** ICRISAT's groundbreaking work using overexpressing antifungal plant defensins MsDef1 and MtDef4.2, and through host-induced gene silencing (HIGS) of *aflM* and *aflP* genes from the aflatoxin biosynthetic pathway yielded almost near aflatoxin immune peanuts.
- **Good Agricultural Practices (GAPs):** Extensive on-farm demonstrations in India, Malawi and Zambia with a set of cost effective and adoptable GAPs significantly reduced pre-harvest and post-harvest aflatoxin contamination in peanut.
- **On-farm water management techniques:** ICRISAT has identified through evidence-based research that various on-farm water management techniques are critical for reducing pre-harvest aflatoxin contamination and increasing productivity in peanuts.
- **Hermetic Storage Technologies:** Storage at the farmer's level poses a challenge. Improper storage can potentially lead to post-harvest aflatoxin contamination in peanut and maize. ICRISAT's work on hermetic storage technologies specifically Purdue Improved Crop Storage (PICS) bags effectively controlled post-harvest accumulation of aflatoxins in peanuts.
- **Safe, hygienic nutritious and affordable millet – pulse based energy dense foods:** ICRISAT has formulated and commercialized food products using sorghum, millets and pulses and also established processing units which are run by rural women, trained in various aspects of food safety management systems. These food products are designed to provide supplementary balanced nutrition and boost immunity (source of vitamins, minerals, prebiotics and antioxidants) of vulnerable and malnourished rural populations.



The Way Forward

Investments in research and development are now required to advance:

- **Mapping and monitoring:** Mapping and continuous monitoring of farms/locations for aflatoxin risk, using soil health parameters and climate variables
- **Farmer's incentives:** Providing incentives to farmers for adopting technologies/GAPs and producing aflatoxin-free commodities is important. Experiences from India would immensely benefit African farming communities
- **Alternative uses of contaminated commodities and by-products:** Exploring alternative uses of contaminated commodities and by-products would create economic value. This would also remove contaminated products from the food value chain.
- **Promoting food safety across food systems:** Ensuring production and consumption of safe and nutritious 'Smart Food' (millet-pulse based diets and value-added products), through awareness creation and capacity building in food safety of local farming communities, households, entrepreneurs, and the like
- **Aflatoxin policy:** Developing a national and regional aflatoxin policy based on risk assessments.

