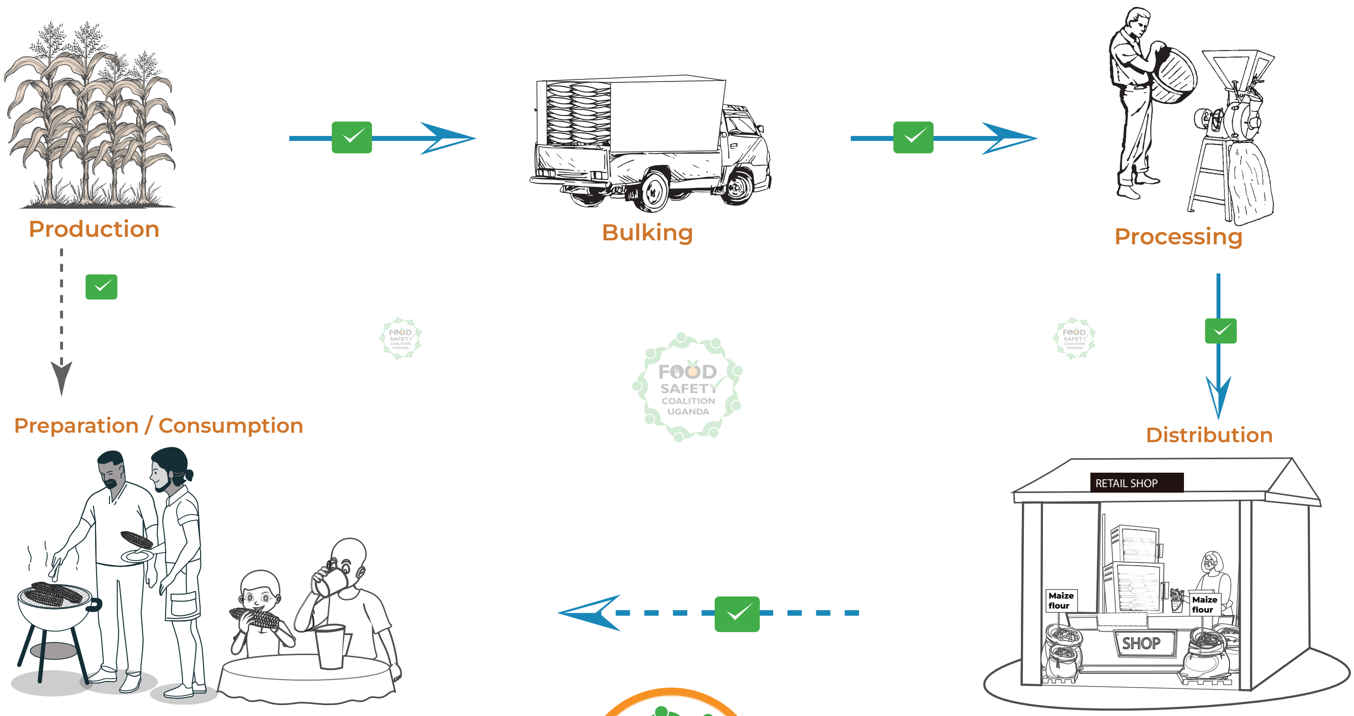
Maize Value Chain



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Acronyms and Abbreviations

FBIs	Food-Borne Illnesses
FoSCU	Food Safety Coalition Uganda
HACCP	Hazard Analysis Critical Control Point
HHP	Highly Hazardous Pesticide
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
IPM	Integrated Pest Management
MDAs	Ministries Departments and Agencies
MoFPED	Ministry of Finance Planning and Economic Development
MoH	Ministry of Health
MT	Metric Tonnes
MTIC	Ministry of Trade Information and Cooperatives
NDA	National Drug Authority
NDP	National Development Plan
PPP	Public Private Partnership
SPS	Sanitary and Phytosanitary
TBT	Technical Barriers to Trade
UBOS	Uganda Bureau of Statistics
UNBS	Uganda National Bureau of Standards
USAID	United States Agency for International Development
USD	United States Dollar

Introduction

Maize is an important food and income security crop in Uganda and the region. In Uganda, it is the third most important food in terms of caloric intake after plantain and cassava (Mugume et al., 2023), representing up to 50% of the caloric intake in academic institutions (USAID, 2018). However, its yields have remained low (2.2-2.5 MT/ha vs potential of 8 MT/ha) and its quality increasingly questionable. Poor quality and unsafe maize raise concerns over food-borne illnesses (Sujayasree et al., 2022), lowers economic value leading to loss of incomes and the country's trade credibility in the international market (Ankwasa et al., 2021). Although recent food safety literature on maize has focused on aflatoxin contamination, it is worth noting that there are other hazards, that compromise the safety and general quality of maize along its supply chain- from farm to the table.

Understanding of maize quality and safety concerns is therefore crucial to inform practices, further research, compliance, policy, and legislation of food safety in Uganda.

It is against this background that Food Safety Coalition Uganda (FoSCU) undertook this assessment, with the objectives:

1) To assess the process and actors in Uganda's maize supply/value chain.
2) To understand the most common food safety hazards in Uganda's maize supply chain.
3) To ascertain common unsafe practices comprising safety of maize and its products in Uganda.

Methodology

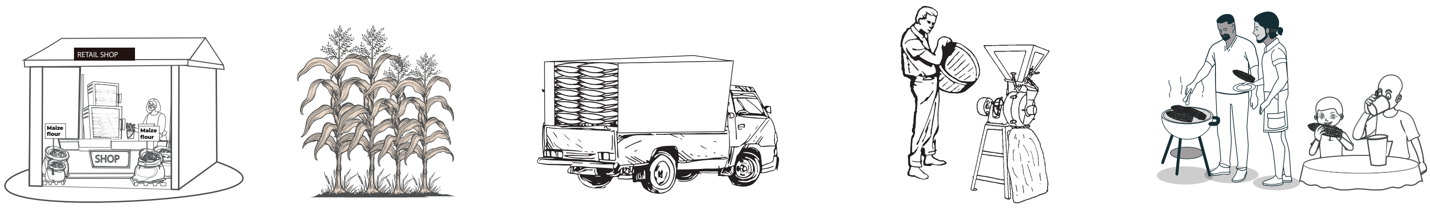
Using a document review guide, we conducted a desk-study of documented information and scientific literature on maize, relevant to Uganda's context. Category of information studied include, but not limited to:

- National and Sectoral Policies (including Strategies and Plans)
- Scientific research papers
- Research project reports
- Intervention Project reports
- Review articles
- Local newspaper articles
- Written Expert opinions
- Professional blogs

Findings

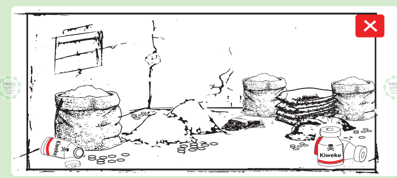
⟶ The Stages and Actors

As presented in the figure, we identified five main stages that constitute Uganda's maize supply journey. At each of these stages, at least five tasks with relevant actors were identified



Inputs	Production	Aggregation	Processing	Distribution & Marketing
• Seed • Land • Fertilizer • Pesticides • Labour • Equipment • Other	Commercial & Small-Scale famers • Growing crop • Harvesting • Transportation • Primary Processing • Drying • Shelling • Winnowing • Storage	• Wholesalers (including importes and exporters) • Retailers • Warehouse dealers • Local bulking centers • Transportation • Storage • Cleaning • Sorting	• Buying maize at farm level • Cleaning • Sorting • Grading • Milling into flour and animal feeds • Storage of grains prior to processing • Storage of processed products	• Wholesalers • Retailers • Food services • Consumer (Households) • Livestock • NGOs • Breweries • Other industries (e.g Ethanol manufacturers)

⟶ Hazards and Unsafe Practices

Hazard type (including examples)	Common poor practices
Chemical *High residue concentrations of pesticides, fertilizers, sanitary products, other public health chemicals in maize grain, flour, and prepared maize-meals.*	• Use of highly hazardous pesticides (HHPs) in the field and storage e.g. *Kiweke (aluminum phosphide)*  • Non-adherence to recommended dosage (mixing rates), pre-harvest interval, and overuse/too high application frequency.  • Roadside drying 

Biological *Foodborne bacteria and viruses, pathogenic fungi, toxins, Insects…. maize grain, flour and prepared maize-meals.*	● Production: • *Mechanical damage during weeding and harvesting* • *Delayed harvest after physiological maturity* ● Drying: • *above safe moisture content of ≤14%* • *on bare ground or ground smeared with cow dung* ● Storage: • *directly on the floor and wall* • *leaking roofs, poorly ventilated and highly humid stores* • *in shelled form for a long time e.g. more than 6 months* • *damaged, discoloured, rotten, immature, sprouted kernels* • *wet processed products* • *poor packaging materials susceptible to mould and pest infestation* • *inadequate ventilation in granaries/cribs/silos* ● Transportation: • *bicycles & open trucks- predisposing produce to moisture/rain,* • *high temperature/heat accumulation when transported in big volumes,* • *opportunistic infection from mechanical injuries (…due to rough roads, improper stacking…)* ● Milling poor quality (wet, diseased, broken, soiled, unsorted) grains into flour and animal feeds.
Physical *Soil, dust, metal/plastic/wood pieces….. in maize grain, flour and prepared maize-meals.*	● Transportation • *open trucks (…sometimes with littered surfaces or old/peeling surfaces), resulting in pick-up of physical foreign contaminants.* ● Drying on bare ground (…leading to pick up of physical foreign material) ● Cleaning/sorting • *Inadequate removal of chaff, thus keeping poor quality/contaminated produce (diseased, shrivelled, broken)* ● Packaging • *Inadequate material thus allowing grains to spill and get contaminated* ● Milling • *non-food grade machines made of mild steel or fabricated mineral fragments (…that easily peel off/wear out)* • *rusty/corroded equipment* • *improper cleaning of equipment before and after processing leading to physical cross-contamination* • *low quality (soiled and poorly sorted) grains into flour* ● Selling or preparing from open spaces without proper protection from dust and other physical contaminants.

Recommendations

1. Knowledge brokers (academia, public and private research institutions…) to dedicate efforts and resources towards scientific research on …:
   a. affordable and effective Integrated Pest Management (IPM) packages for maize production.
   b. Post-harvest maize handling technologies, for instance simple and affordable devices for measurement of moisture content and testing for aflatoxins in produce at farm and trader/storage levels.
   c. alternative use of aflatoxin contaminated produce, that carries a monetary value to act as an incentive to economic agents to withdraw contaminated grains and flour from the maize supply chain.

2. Government to advance Public-Private Partnerships (PPPs) with maize value chain actors to facilitate access to and uptake of scientifically proven food safety technologies/innovations e.g. innovative communication of successful maize safety research findings to trigger action- policy and practice.

3. PPP that enhances the capacity of the warehouse receipt system to support quality improvements in the grain sector.

4. Strengthened observance of technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures for both domestic and international markets. This could be facilitated through dedicated governments efforts, with support from strategic development partners to equip regional laboratories with sufficient tools to test for key safety and quality parameters such as chemical residues and mycotoxin levels.

5. Advocacy actors to spearhead tailored behaviour change campaigns on:
   a. Negative outcomes of unsafe food on human and animal health, trade, and general livelihood of value chain actors
   b. Available of regulatory and non-regulatory quality control measures

6. Training institutions and relevant duty bearers to dedicate capacity building efforts to ensure…
   a. technical capacity of key maize value chain actors with knowledge and skills on relevant food safety aspects, including sustainable and safe agronomic and post-harvest handling practices, and compliance to standards and guidelines.
   b. infrastructural capacity at different nodes of the maize value chain- transport, storage, processing, packaging, marketing, and distribution (…quality testing)

7. State actors (MAAIF, MoH, MWE, MTIC, UNBS, NDA, DLGs, Parliament….) to:
   a. enforce existing regulatory measures relevant to grain safety.
   b. harmonise their non-regulatory food safety interventions.

8. Pursuit of concrete measures towards harmonised institutional mandate to coordinate national food safety. For instance, expediting efforts towards establishment of the prospective Food and Agriculture Authority.

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For more information, watch these videos:

1. Food safety in maize value chain: https://youtu.be/RMH5hFnoAss
2. Food safety hazards and tips: https://youtu.be/SXZvO4zAi7g

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