**Nixtamalized Maize Products — Code of Practice**

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Agriculture Sector Development Support Programme (ASDSP)

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Egerton university

Nairobi County-Division of Public Health

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**Nixtamalized Maize Products- Code of Practice**

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# Foreword

This draft Kenya Standard has been prepared by the Processed Cereals and Pulses Technical Committee under guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards..

This code stipulates the best practices for nixtamalization of maize grains to ensure that hygiene, health and safety aspects are taken into account during preparation and processing of nixtamalized maize products. This Code of Practice is intended to provide guidance to all stakeholders in the value chain in order to ensure food safety and quality, employee safety and welfare, environmental protection, and sustainability. It also intends to improve compliance with Kenyan statutory and regulatory requirements.

During the development of this standard, reference was made to the following documents:

* 1. CXC 1-1969, *General Principles of Food Hygiene*
  2. CXG 60 – 2006, *Principles for traceability/product tracing as a tool within a food inspection and certification system*

Acknowledgement is hereby made for the assistance derived from these sources.

[Contents 1](#_Toc150438733)

[Foreword 3](#_Toc150438734)

[1. Introduction 3](#_Toc150438735)

[2. Scope 4](#_Toc150438736)

[3. Normative References 4](#_Toc150438737)

[4. Definitions 4](#_Toc150438738)

[5. Acquisition and storage of raw materials 5](#_Toc150438739)

[5.1. Maize grains 5](#_Toc150438740)

[5.2. Calcium hydroxide/Lime 6](#_Toc150438741)

[5.3. Optional ingredients 6](#_Toc150438742)

[6. The nixtamalization process 6](#_Toc150438743)

[6.1. Preparation of ingredients 6](#_Toc150438744)

[6.2. Boiling 6](#_Toc150438745)

[6.3. Steeping 6](#_Toc150438746)

[6.4. Washing 6](#_Toc150438747)

[6.5. Handling nixtamalized maize products 7](#_Toc150438748)

[6.5.1. Nixtamalized maize grains 7](#_Toc150438749)

[6.5.2. Nixtamalized maize flour 7](#_Toc150438750)

[6.5.3. Nixtamalized maize dough 7](#_Toc150438751)

[6.5.4. Nixtamalized fried/baked maize products 7](#_Toc150438752)

[7. Packaging and storage of nixtamalized products 7](#_Toc150438753)

[8. Hygiene 8](#_Toc150438754)

[8.1. Personal hygiene 8](#_Toc150438755)

[8.1.1. Health status 8](#_Toc150438756)

[8.1.2. Personal cleanliness 8](#_Toc150438757)

[8.1.3. Personal behaviour 8](#_Toc150438758)

[8.1.4. Visitors 8](#_Toc150438759)

[8.2. Establishment and equipment 8](#_Toc150438760)

[9. Traceability 9](#_Toc150438761)

[10. Legal and contractual obligations 9](#_Toc150438762)

[11. Waste management………………………………………………………………………………………… 9](#_Toc150438763)

# Introduction

Maize (*Zea Mays* L.) is a key food crop in Kenya, benefitting millions of households on food security and economic development. It accounts for 31% of the total calories intake and 28% of the protein intake. Despite depending on maize as staple food in Kenya, there are limited ways of processing and utilizing maize, which reduces opportunities for trade and health, availability of key nutrients, and increases the exposure to mycotoxins. Macronutrients, minerals, and antioxidant compounds in maize can be retained and be made available through nixtamalization or fermentation methods adding nutritional benefits to the consumers of the final products.

Nixtamalization is the process of preparing maize, in which the grain is boiled and steeped in food grade calcium hydroxide (, washed, and then dehulled. Nixtamalization offers several benefits to producers and consumers: it broadens and diversifies maize utilisation, improves nutritional value, and reduces aflatoxins and fumonisins in the maize grains. Additionally, entrepreneurs have found a profitable business venture in the production of nixtamalized products.

This draft Kenya code of practice specifies and recommends the best practices for the responsible procurement of raw materials, nixtamalization process, safe production and handling of nixtamalized maize products. These recommendations when followed will enhance compliance to legal requirements.

This Code of practice for the nixtamalization of maize grains recommends practices based on Good Manufacturing Practices (GMP) and are generally consistent with Hazard Analysis Critical Control Points (HACCP) principles. These are incorporated into current food safety practices and certification schemes now in use in the production, handling, transportation, processing, storage, distribution, and trade of nixtamalized maize products.

# Scope

This Code of practice provides recommended good practices for the acquisition and storage of raw materials, nixtamalization process, packaging and handling of finished products of nixtamalized maize intended for human consumption.

This code applies to all players involved in nixtamalization of maize including but not limited to households, community, and commercial Food Business Operators (FBOs).

# Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies..

KS EAS 38, *Labelling of Prepackaged Foods — Specification*

KS EAS 803, *Nutrition Labelling — Requirements*

KS EAS 2, *Maize grains - Specifications*

CXS 192, Codex general Standard for Food Additives

CXC 1, General Principles of Food Hygiene

CXG 60, Principles for traceability/ Product tracing as a tool within a food inspection and certification system

Environment Management and Coordination (Water Quality) Regulation 2006, Section 13 – Fifth Schedule

Public Health Act Cap 242

# Terms and definitions

**Nixtamalization**

the process of preparing maize in which the grain is boiled and steeped in food grade calcium hydroxide, washed, and then dehulled.

**Steeping**

Soaking of maize grain in water containing Calcium Hydroxide

**Food grade calcium hydroxide**

is high purity calcium hydroxide acceptable for use in food products.

**Nixtamalized maize grains**

maize grains obtained from nixtamalization.

**Nixtamalized maize products**

products obtained from nixtamalization of maize grains and/or processing of nixtamalized maize grains.

**Nixtamalized maize dough**

the product obtained from the wet grinding of nixtamalized maize grain or kneading of the nixtamalized maize flour. It is also known as masa.

**Dried nixtamalized maize grain**

the product obtained from the drying of nixtamalized maize grains.

**Nixtamalized maize flour**

the product obtained from the milling of dried nixtamalized maize grain or drying of nixtamalized maize dough.

**Nixtamalized fried/baked products**

fried/baked products made from nixtamalized maize dough.

**Food Business Operators**

The entity responsible for operating a business at any step in the food chain.

**Good Manufacturing Practices**

a prerequisite programme that establish the basic environmental and operating conditions that ensure production of safe and hygienic food products.

**Establishment**

any building or area in which food is handled and the surroundings under the control of the same management.

**HACCP**

a system which identifies, evaluates, and controls hazards which are significant for food safety.

**Food handler**

any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements.

**Food safety**

assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

**Contaminant**

Any biological, chemical or physical agent, foreign matter or other substances not intentionally added to food that may compromise food safety or suitability.

**Contamination**

The introduction or occurrence of a contaminant in the food or food environment.

**Traceability**

the ability to follow the movement of a food through specified stage(s) of production, processing and distribution.

**Potable water**

Water either in its original state or after treatment, intended for human drinking, cooking, food preparation or other domestic purposes, food production, regardless of its origin whether it is supplied from a distribution network, from a tanker or in bottles.

**Plasticity**

the ability of the dough to deform under applied pressure.

# Acquisition and storage of raw materials

## Maize grains

* + 1. The maize to be used for nixtamalization shall be sourced from suppliers that comply with prevailing safety and quality regulations.
    2. The specification of the raw maize grain for nixtamalization shall conform to KS EAS 2.
    3. Maize grains shall be stored hygienically and in conditions that will maintain safety and quality status prior to nixtamalization. Appropriate storage facilities include metal or plastic silos, hermetic bags or gunny bags and kept above the ground and in well-ventilated rooms.
    4. Storage facilities shall be cleaned prior to receiving grain to remove dust, fungal spores, grain/crop residues, animal and insect excreta, soil, insects, foreign material such as stones, metal and broken glass, and other sources of contamination.

## Calcium hydroxide

Calcium hydroxide used for nixtamalization shall be of food grade quality.

## Optional ingredients

Where optional ingredients such as salt, edible oils/fat, spices, herbs and condiments have been used, their quality shall comply with relevant standards.

# The nixtamalization process

## Preparation of ingredients

* + 1. Maize grains should be cleaned by sieving and sorting to remove dust, foreign materials, shrivelled, mouldy and damaged grains.
    2. The cleaned maize grains shall be thoroughly washed with potable water..
    3. Water used in steeping maize shall be potable.
    4. The ingredients should be weighed in the appropriate ratios. To steep 1 kg of maize, it is recommended to add 10-20 grams of calcium hydroxide in 3 litres of water.
    5. Care should be taken to avoid contamination of the ingredients.

## Boiling

* + 1. Boiling of maize in calcium hydroxide solution shall be done in non-reactive food grade cooking equipment.
    2. The required quantities of potable water should be brought to boil before addition of calcium hydroxide and mixed to dissolve.
    3. The cleaned maize grains should be added immediately, and the mixture boiled for approximately 20 - 50 minutes until slightly cooked depending on grain hardness and type of equipment used. The boiling time per hardness is indicated in Table 1.

**Table 1: Boiling time for different maize grain hardness**

|  |  |
| --- | --- |
| Grain hardness | Boiling time (mins) |
| Soft (flourly maize) | 20-25 |
| Medium (dent maize) | 30-35 |
| Hard (flint maize) | 40-50 |

## Steeping

* + 1. After boiling, the cooking equipment should be removed from f source of heat or source of heat put off.
    2. The maize grains should be covered and steeped for a minimum of 8 hours and a maximum of of 12 hours.
    3. A minimum of 8 hours is required for sufficient absorption of calcium hydroxide, reduction of mycotoxins, and enhanced functional properties..
    4. The steeping also softens the pericarp, making it easy to remove.

## Washing

* + 1. After steeping, the pericarp should be removed by hand rubbing the kernels or stirring the mixture using an appropriate equipment.
    2. The steeping wastewater should be drained and the grains thoroughly rinsed 2 to 3 times with similar ratios of potable water (1 kg maize: 3 litres water) to remove residual calcium hydroxide.

# Drying of nixtamalized maize grains

6.5.1 The nixtamalized maize grains should be dried using appropriate methods to a moisture content of not more than 13.5% within a maximum of two days.

* 1. **Milling nixtamalized maize grains**
     1. **Wet Milling**
        1. The nixtamalized maize grains shall be ground in an appropriate wet milling equipment.
        2. Controlled amounts of water should be added during grinding to increase the nixtamalized maize dough moisture to the desired level, and to prevent excessive generation of heat that may lead to starch over gelatinization.
        3. Kneading is required, to ensure plasticity and cohesiveness of the nixtamalized maize dough.
     2. **Dry Milling**
        1. Dried nixtamalized maize grains should be milled using appropriate milling equipment depending on the required particle sizes.

## Handling nixtamalized maize products

### Nixtamalized maize grains

Nixtamalized maize grains should be handled hygienically to prevent contamination and/or deterioration during storage or handling in later processing stages.

### Nixtamalized maize flour

* + - 1. Nixtamalized maize flour should be prepared from properly dried nixtamalized maize grains.
      2. The flour can be prepared through hammer or roller milling to ensure the particle sizes are attained as per the flour standard KS EAS 768.
      3. Flour may absorb water on exposure to air and should therefore be protected from air and moisture using appropriate methods. This will prevent mould growth and enhance shelf life of the flour.

### Nixtamalized maize dough

* + - 1. Nixtamalized maize dough should be prepared from the nixtamalized maize grain through wet milling immediately after nixtamalization or kneading of nixtamalized flour
      2. The dough should be handled hygienically to prevent any contamination from the handler and environment.

### Nixtamalized fried/baked maize products

The fried or baked products may be prepared from nixtamalized maize grain, flour or dough. The raw material should be sound and of good quality.

# Packaging and storage of nixtamalized products

* 1. Nixtamalized products should be packaged in food grade materials and sealed in a manner that will safeguard the hygienic, nutritional, and organoleptic properties of the products.
  2. The packaging materials should comply with environmental legislation Act Cap 387.
  3. The nature of the packaging material should ensure the quality, safety and integrity of the product and should conform to KS EAS 38.
  4. Nixtamalized maize products should be stored at the recommended storage conditions. The grains and flour should be stored in cool dry places off the floor while the dough should be stored under refrigerated conditions to avoid spoilage.
  5. Packaged products should be labelled in accordance with KS EAS 38 and KS EAS 803.

# Hygiene

## Personal hygiene

### Health status

* + - 1. Personnel working in a food facility should have full medical check-ups as per the Public Health Act Cap 242 and the records of the examination well documented.
      2. People known, or suspected, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted through produce, should not be allowed to enter the food handling area. Any person so affected should immediately report illness or symptoms of illness to the management.

### Personal cleanliness

* + - 1. Food handlers should maintain a high degree of personal cleanliness and, where appropriate, wear protective equipment.
      2. Cuts and wounds, where personnel are permitted to continue working, should be covered with suitable waterproof dressings.
      3. Personnel should always wash their hands with soap and running water before and after handling foods.

### Personal behaviour

Food handlers should refrain from behaviour which could result in contamination of products. These may include but not limited to:

1. Smoking;
2. Spitting;
3. Touching body parts;
4. Chewing or eating;
5. Sneezing or coughing over unprotected food products and;
6. Wearing jewellery, watches, pins or other items.

### Visitors

* + - 1. Access to food handling areas shall be restricted and no unauthorised person shall be allowed access to the Food stores.
      2. Visitors to food facilities should wear protective clothing and adhere to the other personal hygiene provisions in this section.
      3. A record of visitors to the food processing establishment shall be maintained.

## Establishment and equipment

* + 1. Establishment and equipment used for nixtamalization should be maintained in an appropriate condition to:

1. facilitate cleaning and disinfection procedures;
2. function as intended; and
3. prevent food contamination.
   * 1. Cleaning products approved for food contact surfaces should be used in food preparation and storage areas.
     2. Cleaning and disinfection chemicals should be handled and used carefully and in accordance with manufacturers’ instructions, for example, using the correct dilutions and contact times, and stored , separate from food, in clearly identified containers to avoid contamination.

# Traceability

* 1. The FBOs should put in place a traceability system by way of designing, implementing, and monitoring a detailed process flow.
  2. The system should help the food business operator to trace the product a step before and after.

# Legal and contractual obligations

* 1. The production of nixtamalized maize products shall comply with relevant existing laws and regulations.
  2. FBOs shall comply with all applicable licenses, permits and other legal requirements.

# Waste management

* 1. Waste from nixtamalization process may include but not limited to residual calcium hydroxide, waste water, grain pericarp, unwanted grains, organic and inorganic materials.
  2. An establishment should have adequate provisions for waste management. The FBO shall ensure that wastewater from nixtamalization should be pretreated before disposal.
  3. Construction of wastewater treatment facilities should be environmentally acceptable and subject to National Environmental Management Authority (NEMA) regulations.