



## DRAFT TANZANIA STANDARD

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**Production and handling of maize grains - Good Agriculture Practice (GAP)**

**TANZANIA BUREAU OF STANDARDS**

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DRAFT STANDARD FOR STAKEHOLDERS' COMMENTS ONLY

## 0. Foreword

Maize grain is produced in large quantities in Tanzania regions more than any other cereal crops. It is a major food security crop in the country, being the staple food for an estimated 50 percent of the population. Maize is an important source of carbohydrates, protein, vitamin B and minerals.

This code of practice takes into account the need to promote good agricultural practices that will enhance food and nutrition security, wider market access, involvement of small-scale traders and hence making farming a viable means of wealth creation.

It will guide producers in gaining knowledge of safe production, handling, processing and transportation in a manner that ensures keeping of quality until it reaches the consumer.

The code of practice will be implemented by multisectorial stakeholders in the cereal value chain.

In preparation of this standard considerable help was derived from ARSO 1100, Production and handling of maize grains (corn) - Good Agriculture Practice (GAP).

## 1. Scope

This Tanzania Standard provides Good Agriculture Practice for production and handling of Maize grains (*Zea mays* L.). This applies to all production steps from cultivating to post-harvest handling.

## 2. Normative references

The following referenced documents are indispensable for the application 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.

AFDC 16 (326) DTZS, *Code of practices for prevention and reduction of mycotoxin contamination in cereals*.

TZS 438, *Maize grains – Specification*

## 3. Terms and definitions

For the purpose of this standard, the following terms and definitions should apply:

### 3.1 maize ears

including the cobs, the grains and occasionally the husks and portions of the stalks, depending on the harvesting method

### 3.2 good agricultural practices

collection of principles to apply on farm production and post production processes resulting in safe and health food or non-food agriculture products, while taking into account economic, social and environmental sustainability.

### 3.2 audit

systematic, independent and documented process for obtaining objective evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled

### 3.3 biodiversity

assemblage of living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part

### **3.4 calibration**

determination of the accuracy of an instrument, usually by measurement of its variation from a standard, to ascertain necessary correction factors

### **3.5 compost**

product of controlled biological decomposition of organic material in the presence of air to form a humus-like material.

**EXAMPLE:** Controlled methods of composting include mechanical mixing and aerating in commercially available composters, or placing the compost in piles out in the open air, and mixing it or turning it periodically

### **3.6 crop-rotation**

farming system in which dissimilar types of crops are successively cultivated on the same plot according to a predefined plan. Normally the crops are changed after each crop cycle, but they can also be multi-annual. It is usually followed to increase soil fertility and maintain good yields and it also forms part of Integrated Pest Management (IPM)

### **3.7 fumigant**

gaseous pesticides that control pests in agriculture fields, structures storage houses and various other sites

### **3.8 groundwater**

all water that is below the surface of the ground in the saturation zone

### **3.9 hazard**

biological, chemical, physical agent or any other property with the potential to cause a product to be unsafe for handling and/or consumption

### **3.10 internal audit**

audit carried out by a producer on its own Management Systems

### **3.11 manure**

decomposed materials of animal and or plant origin used to enhance the physical, chemical and biological activities of the soil to maintain or improve plant nutrition

### **3.12 agrochemicals**

chemicals applied throughout the production chain to maintain / enhance produce quality; it includes detergents and pesticides, synthetic fertilizers and other chemical growth agents

### **3.13 location**

production unit or group of production units, covered by the same ownership, operational procedures and farm management

**3.14 record**

document that contains objective evidence which shows how activities are being performed and what kind of results are being achieved

**3.15 sewage sludge**

accumulated settled solids separated from various types of waste water either moist or mixed with liquid component as a result of natural or artificial processes

**3.16 sewage water**

water mixed with waste matter

**3.17 substrate**

any growing medium used for holding plants in place of soil, and that has been imported to the site, and can be removed after use. An inert substrate is one in which no life will grow

**3.18 traceability**

ability to trace and track the history, use or location of a product (that is the origin of materials and parts, the history of processes applied to the product, or the distribution and placement of the product after delivery) by means of recorded identification

**3.19 grower/worker**

person who responsible for the management of primary production and handling of food crops

**3.20 clean water**

water that does not compromise food safety in the circumstances of its use

**3.21 re-entry period**

minimum amount of time that should lapse between the moment a pesticide is applied to an area or crop and the moment that people can enter that area without protective clothing and equipment

**3.22 preharvest interval**

time between the last application of a pesticide to the first day of harvest of the treated crop

**3.23 quality seed material**

seed having required standards of purity , germination and other attributes and approved by relevant National Authority

**3.24 Integrated Pest Management (IPM)**

an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides

**4.0 Requirements**

Production and handling of maize grains should comply with the following requirements;

## 4.1 Farm environment

### 4.1.1 Location

4.1.1.1 The production area and adjoining sites or farms should be evaluated for its suitability of agricultural land use.

4.1.1.2 The area should have a history of prior land use (e.g., sanitary landfill, cemetery, etc.) in order to identify possible potential hazards specifically chemical (heavy metals) and physical hazards (broken glass, plastics, etc.).

4.1.1.3 The land used for cultivation should not have been previously used as a landfill and for industrial dumping.

### 4.1.2 Hazard Identification

Identify potential hazards and provide corresponding preventive or mitigating measures.

## 4.2 Production area

### 4.2.1 Sanitation

Field sanitation practices should always be ensured.

### 4.2.2 Soil analysis

Prior to land preparation, soil samples should be analysed for heavy metals, pH, nutrient status for appropriate fertilizer recommendation, identification of soil characteristics and prevention of crop contamination. Soil analysis should be done at least after every crop cycle and carried-out by an recognised laboratory.

Where applicable, soil mapping may be established to plan crop rotation and/or production programs.

### 4.2.3 Water

Identify the location of water sources and if possible, clean water should be made available throughout the maize production cycle. Clean water is recommended for agricultural purpose. In case where there is any indication of contamination from hazardous substances in the water, clear evidence should be provided to clarify that the water can be used for its purpose.

## 4.3 Farm structure and facility maintenance

Farm structures such as warehouse for the maize produce, storeroom for fertilizer, pesticide and other farm supplies and materials including protection shed of farm machineries should be appropriately designed to the intended purpose. These should be constructed in a considerable distance from each of the farm structure and in the production area to minimize contamination.

All farm structures should be kept clean at all times. Farm equipment used in cultivation, harvesting and post-harvest operations of maize should be attuned and well- maintained for optimal operating conditions.

Sewage, waste disposal and drainage system should be appropriately constructed to minimize the risk of contaminating the production area and water supply with chemical hazards such as pesticides and heavy metals.

Irrigation system should be maintained to provide effective delivery of water. Remove litters, wastes and weeds in the waterways and dispose them properly to prevent blockage.

## 4.4 Farming practices

### 4.4.1 Pre-harvest practices

#### 4.4.1.1 Land preparation

Proper land preparation practices should be observed to ensure healthy and uniform plant growth and provide advance effective and efficient weed control measures.

#### 4.4.1.2 Planting and seed materials

**4.4.1.2.1** Use quality seed materials. Use high-yielding varieties or hybrids that are adaptable to the locality and approved by relevant National Authority.

**4.4.1.2.2** Record the sources of seed materials including product identity (i.e., company name, lot number, variety, germination percentage, date tested).

**4.4.1.2.3** Exercise timely planting depending on the agro-ecological zone.

**4.4.1.2.4** Follow the appropriate planting distance and seeding rate as recommended.

#### 4.4.1.3 Use of pesticides and other agrochemicals

Pesticide (insecticide, fungicide, bactericide, rodenticide, etc.) and agrochemical (adjuvant, detergent, disinfectant, plant growth regulators, etc.) usage during maize production and post-harvest handling should comply with the following;

- i. Only trained/certified pesticide applicators are allowed to carry out pesticide applications on the farm;
- ii. Use registered pesticides and agrochemicals according to the manufacturer's recommendation;
- iii. Pesticide and agrochemicals should be clearly labeled and stored in the original container and kept under lock and key. A warning sign should be displayed in the storage area;
- iv. Disposal of pesticides and agrochemical containers and residues should be done according to instructions included on the manufacturer's label. Empty pesticide containers should not be recycled for other usages;
- v. Records of purchase, application and disposal of the pesticides and agrochemicals should be kept (log records, procedures, or instruction manual);
- vi. Spraying equipment should be regularly maintained to ensure that the equipment operates at its optimum condition so that the right application rates are delivered and unnecessary leakage is avoided;
- vii. Withholding periods or preharvest intervals should be strictly observed; and
- viii. Farm personnel involved in the use of pesticides and agrochemicals should wear appropriate protective clothing and safety gadgets.

#### 4.4.1.4 Fertilizer management

**4.4.1.4.1** Use only fully decomposed organic materials. Raw and/or slightly decomposed animal manure should be confined in a designated area for treatment.

**4.4.1.4.2** Use only the registered commercial fertilizers. Observe the appropriate method and time of application of the recommended combination and amount of fertilizers based on the result of soil analysis.

**4.4.1.4.3** Seed inoculant may be used to supplement part of the maize plant nutrient requirement.

**4.4.1.4.4** Fertilizers should be stored separately from pesticides in a clean and dry area

(Preferably slightly elevated above the ground on pallets).

**4.4.1.4.5** Storage area of fertilizers should be isolated from maize drying and storage areas to prevent contamination due to leaching, runoff, or wind drift.

**4.4.1.4.6** A complete set of records of fertilizers and fertilizer preparation should be kept. Information includes source of fertilizer materials, details of the composting procedures, dates, amounts and methods of applying the fertilizer as well as the person responsible for the application.

#### **4.4.1.5 Pest and disease management**

**4.4.1.5.1** A pest and disease management programme should be put in place taking into account historical data, trends, and current conditions.

**4.4.1.5.2** Practice Integrated Pest Management (IPM) to control the incidence of crop pests.

**4.4.1.5.3** Practice crop rotation to minimize built-up of insect pests and diseases. The continuous planting of the same plant species within a piece of land leads to the build-up of insect pests and diseases.

#### **4.4.1.6 Weed management**

Practice appropriate weed control measures like using appropriate cultural practices such as proper land preparation, off-barring and hilling-up and/or using herbicides. Ensuring proper tillage operations provides head-start of maize plant against weeds.

#### **4.4.1.7 Water management**

Maintain the water requirement to avoid moisture stress particularly during flowering up to the maturation stage. At these stages, the crop is more susceptible to aflatoxin contamination.

#### **4.4.1.8 Other cultural management practices**

**4.4.1.8.1** If detopping of maize plants is to be practiced, this should be done after physiological maturity has been attained.

**4.4.1.8.2** Follow the other recommended cultural practices of maize including the maintenance of the recommended row and plant spacing to avoid overcrowding.

**4.4.1.8.3** Conduct regular monitoring at all crop stages to provide measures to problems that may arise.

#### **4.5 Harvesting practices**

**4.5.1** Harvest maize at full maturity as recommended. Harvesting should be completed in the shortest time possible especially during the rainy season. Care should be exerted to prevent damage and contamination of maize ears with soil. Use clean mats, screens, and/or other suitable underlays to prevent maize ears from soil or foreign matter contamination.

**4.5.2** Before using machines for harvesting and post-harvest operations, ensure that all the equipment to be used is functional, clean, and well-maintained.

**4.5.3** Sort out and discard maize ears that show visible signs and symptoms of insect or microbial damage.

#### **4.6 Post harvesting practices**

##### **4.6.1 Hauling**

Haul newly harvested maize ears immediately after harvest. Hauling facilities to be used for collecting and transporting the harvested maize from the farm should be clean and dry.

#### 4.6.2 Shelling

4.6.2.1 Before shelling, dry the maize ears within a range of 18% to 24% moisture content. This optimum moisture content will bring about less damage to maize kernels during shelling.

4.6.2.2 Use clean, dry and properly calibrated mechanical sheller for efficient shelling.

4.6.2.3 Use clean and dry containers of the shelled maize.

#### 4.6.3 Drying

4.6.3.1 Immediate drying of the maize grains to reduce the moisture content after harvest should be done by any available means, to minimize if not avoid grain deterioration, mould and fungi attack, and pest infestation.

4.6.3.2. If immediate drying is not possible, temporarily store the maize ears in cribs or any structure with good ventilation.

4.6.3.3. As much as possible, immediately dry the shelled maize to 13.5 % moisture. Ensure that maize has been dried uniformly to this moisture.

4.6.3.4. Use clean suitable containers for the dried maize grains.

#### 4.6.4 Transport

4.6.4.1 The maize should be transported to a suitable storage or processing area as soon as possible after drying.

4.6.4.2 Avoid grain moisture accumulation during transport by using an appropriate covering for the container. Maize grains to be transported should be properly stacked inside the transport vehicle and covered with any protection against moisture and pests.

4.6.4.3 Containers and vehicles to be used for collecting and transporting the harvested maize grain/ears from the farm to storage facility should be clean, dry, and free from infestation before use and reuse.

#### 4.6.5 Storage

4.6.5.1 The storage containers, warehouse, or silos should be properly designed and should be able to meet the following minimum requirements such as:

- i. prevent re-wetting of dry maize grains;
- ii. prevent the entry of pests such as insects, birds, and rodents;
- iii. provide good ventilation to the stored maize.

4.6.5.2 Adhere to good storage practices as follows;

- i. cleaning and pest control programmes;
- ii. first-in-first-out (FIFO);
- iii. stacking arrangement; and
- iv. ensure the recommended moisture content of maize grain is not exceeded during storage to minimize aflatoxin contamination as stipulated in TZS 438.

#### 4.7 Worker's health and safety

4.7.1. Farmworkers and/or personnel who will be involved in the production and post-production activities should wear appropriate clothing and protective gadgets.



**4.7.2.** Farmworkers should be trained and should follow the recommended personal hygienic and sanitary practices.

#### **4.8 Farm management**

##### **4.8.1 Farm records**

**4.8.1.1** There Farm records should be available and retrievable at least for the entire crop cycle when required and for traceability purposes.

**4.8.1.2** Copies of laboratory analysis and certificates that verify compliance with the relevant Authority's regulations should be filed.

##### **4.9 Traceability**

**4.9.1** Each package/bulk packed produce leaving the farm should be traceable to farm/sources.

**4.9.2** Records of the lot or batch numbers should be maintained for all products leaving the farm.

##### **4.10 Staff training**

**4.10.1** Training Records of personnel and/or farm workers should be maintained.

**4.10.2** The records should be maintained and should be available.

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