Grain Standards

EAST AFRICAN STANDARD

Maize (grains) — Specification

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Second Edition 2005
Module 3: Grain Standards

Introduction to the Module

Most countries have developed national standards for their main grain crops. These have evolved to facilitate the movement of grain, providing both sellers and purchasers with guidelines to support financial transactions, and ensuring that quality will meet up with end-use requirements.

Where trading involves direct choice and price negotiation in front of the commodity, grading standards are rarely employed; quality is assessed visually and is influenced by the end-use, and the price is determined more by local rather than national factors. For transactions that involve the movement of large volumes of grain over long distances, the buyer may never meet the seller or be able to examine the whole consignment.

The standard will provide an unambiguous description of the quality of the consignment and assist in the formation of a legally-binding contract. Standards can also be seen to protect consumers’ rights through setting limits to the amount of unsuitable or noxious material.

The use of grading standards can send a clear indication of quality requirements to both producer and end-user. Although some countries have sought to support small farmers through purchase of all grain at the same price without regard to quality: under these circumstances grading standards cease to be operative by default. This may stimulate productivity but creates problems for end-users such as millers who require uniformity and consistency in quality to ensure efficient and cost-effective processing.

In Structured Markets, Grain Standards are an important consideration. The aim of this Module is therefore, to facilitate a clear understanding and appreciation of benefits of standardization in grain trading. This Module should be particularly useful to traders who in their work require to advise farmers on quality and prices. The Module is estimated to take 3 hours.
## Module 4 – GRAIN STANDARDS

### Module Summary

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<td>7. General Grain Quality Attributes</td>
<td>Presentation by Facilitator and Discussion</td>
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<tr>
<td>8. Specific Quality Attributes.</td>
<td>Presentation and Discussion</td>
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<td>10. Challenges.</td>
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<tr>
<td>11. Review of Module</td>
<td>Participants’ questions and comments Facilitator’s summary</td>
<td>Participants Handout 14: Module Summary</td>
<td>15mins.</td>
</tr>
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</table>

**TOTAL** | **3 hours** |
### 1. **Welcome and Introduction.**  
*Presentation by the Facilitator: 15 minutes*

Welcome to the Grain Standards Module.

You are all here because, as Cereal Traders, or Agrodealers and wholesalers of Agricultural Produce, your relations with smallholder farmers in the market are an essential part of your business. In this Module we will consider the question of Grain Standards. Standards are established for a variety of purposes but mainly: a) for produce grading in agricultural marketing, or, increasingly, b) for the protection of consumers.

The requirements of the two groups are not necessarily compatible.

Standard specifications provide criteria to characterize the nature of a commodity, usually on a pass or fail basis.

Whilst establishment of standards can set the guidelines and rules for sale and purchase of grains, there has to be an institutional framework for their implementation. This is much easier to establish at centres of aggregation of grain e.g. warehouses, parastatal grain depots, than in the more diffuse rural areas and markets, where control and supervision of regulations might be difficult.

The establishment of quality and grading standards for producers and users can be beneficial in the following ways:

- Graded grains are likely to be more equably priced than non-standardised grains. This will bring stability not only to market prices but also to the quality offered.
- Prices quoted against a recognised grade assist producers and traders to market their products. This will also benefit net consumers of grain in more stable prices with assured quality.
- Greater conformity in quality through standardisation will provide the millers, bakers and other processors with the consistency necessary for optimum performance.
- Standards reveal clear variations in quality and indicate the opportunities for improvement and the potential rewards to be obtained.
- The sanitary hazards associated with the inter-country
The movement of grain can be reduced if clearly-defined standards are enforced, particularly in relation to the prevention of spread of serious storage pests like the Larger Grain Borer.

The objectives of this Module, therefore, are that you will be able to understand the value of conformity to set Grain Standards in trading and to enable you to make informed decisions for the benefits to your businesses, by understanding:
1. The Benefits of Standardization in Grain Trading.
2. What are the available Standards in the Region for various Cereals?
4. The General and Specific Attributes for Grain.
5. Grading and Packaging of Grain for Structured Trading.

After considering the objectives could each participant mention one thing they hope to learn in this Module?

2. **Grain Standards and the Agricultural and Food Marketing Chain (Discussion: 20 minutes)**

**Introduction to Grain Standards**

When people buy grain, they need to know exactly what is in the bag or silo. Is it high-quality grain, free of contaminants, and suitable to be ground into flour or meal for human consumption? If it is not suitable for human food, can it still be used as animal feed?

Grain standards help buyers know such things. They specify the characteristics for the grain and set the requirements for three things: safety, quality, and sampling and test methods.

- Safety requirements cover things that may harm the consumer: the presence of mycotoxins and other poisonous substances, pesticide residues and physical materials (like stones or pieces of metal) that can get into the grain.
- Quality requirements cover other things that processors or consumers may be concerned with, such as moisture content, broken grains, diseased grains and foreign matter.
- Sampling and test methods cover the procedures to be used in taking representative samples for analysis, as well as the

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**Participants**

Distribute Participants’ Handout 3 and 4.

Divide the group into pairs, preferably those who do not know each other well. Give them several minutes to talk in pairs as they analyse the Handout.

Participants present their views which are recorded on the Flip Chart.
procedures to follow in carrying out the analysis to confirm whether the grain meets the safety and quality requirements.

Grain safety is not negotiable and should not be compromised. If the grain is not safe for human consumption it must not be traded unless it has been treated to eliminate the hazard. For example, stones can be removed mechanically; metal can be removed using magnets. If that is not possible, the grain will have to be disposed of in an appropriate way (for example, by incinerating it).

Grain quality, on the other hand, depends on people’s preferences. Many industrial processors require certain types of grain. A miller who grinds flour, for example, needs food-quality grain with very low levels of impurities and contamination. He or she is prepared to pay a high price for such grain. A producer of animal feed, on the other hand, is likely to accept lower-quality, cheaper grain. A brewer may want broken grains, which the miller may reject.

Each type of grain has its own standards: the standard for maize is different from that for sorghum or soybeans, for example.

3. **Grades**  
*Discussion: 20 minutes*

**GRADERS**

*(What are the commonly known Maize Grades in Kenya?)*

Standards classify grain into several grades to make it easy for people in the grain business to know what they are dealing with. Grade 1 is the best grade.
It has the highest quality and is likely to fetch the highest price. Grades 2, 3 and so on are lower quality: they may contain higher amounts of foreign matter, damaged grain, etc.

Grading has many advantages for buyers and sellers.
- A farmer can get a higher price for a bag of Grade 1 grain than if the grain has not been graded.
- A buyer is confident that the grain is of a particular quality, so is willing to pay a higher price.
- A warehouse operator can check the grain when it arrives, and make sure its quality is maintained while it is in the warehouse.
- A trader can announce she wants to buy Grade 2 grain, and everyone knows exactly the quality of grain she is interested in.

Where everyone is confident about the reliability of grades, it is not necessary to inspect the grain visually. That makes it possible to buy and sell the grain without having to go to check it, and without having to transport it.

The grain can stay in the warehouse while its ownership changes. That saves enormously on costs.

To know what grade a bag of grain is, it has to be measured. Various tests and types of equipment may be needed: such as a sampler to take a sample to measure, a moisture meter to measure moisture content, and a sieve to check for broken grain and foreign matter.

The person, who runs the collection point where farmers deliver their grain, or the manager of a cooperative warehouse, should have such equipment and check every consignment of grain as it comes in. Many traders carry this equipment with them. Big warehouses and millers have laboratories to do more sophisticated tests.

<table>
<thead>
<tr>
<th>4. <strong>How do Grain Standards Help?</strong></th>
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<tr>
<td><em>(Discussion: 10 minutes)</em></td>
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</table>

**HOW DO GRAIN STANDARDS HELP?**

Grain standards are vital in structured trading systems:
- They specify the grain characteristics, the limits that are
acceptable for each characteristic, and how to measure them. That facilitates production, processing and inspection of the grain.

- They identify economic factors that are important to end-users.
- They establish a common language and set of rules between trading partners. If everyone knows what is meant by “moisture content” or “aflatoxin”, and knows how to measure it, they can be confident they are talking about the same thing when they buy or sell grain.
- They ensure food safety because they cover some of the main factors that can reduce food quality and harm consumers.
- They reflect storability: poor-quality grain can be stored only for a short time.
- They facilitate trade: grain products can be readily accepted in other parts of the country, in other countries or regions. The common language makes domestic, regional and international trade easier and prevents technical barriers to trade.

They support food security by making it easier to import and export grain and transport it to where it is needed.

- They promote quality by providing incentives to grain producers and handlers for ensuring that grain is good quality, and by setting requirements for packaging and transport.
- They form a basis for pricing. Because people know what grade the grain is, they can decide how much to buy and sell it for.

### 5. Who Sets Standards?
*(Presentation and Discussion: 15 minutes)*

**WHO SETS STANDARDS?**
Standards for grain in Africa are set by national governments.

Regional organizations attempt to harmonize these, and it is up to each government to implement them in their national standards. The relevant regional organizations are:

- COMESA: the Common Market for Eastern and Southern Africa
- EAC: the East African Community
- ECOWAS: the Economic Community of West African States
- CEEAC: the Economic Community of Central African States
- SADC: the Southern Africa Development Community.

Grain Standards Help in Structured Trading Systems; ahead of time.

The Facilitator should ensure that there is discussion with participants on each point.

Facilitator to lead this process with Participants making their contribution and the role of facilitator mainly being to provide clarity.

List points on the Flip Chart.
These standards are mostly based on international standards published by:

- Codex: the Codex Alimentarius Commission of the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO)
- SO: the International Organization for Standardization

Efforts are also taken to review standards published by the major trading partners like the European Union, the United States, and Japan.

It is not possible to impose a common standard for all regions because the appropriate levels depend on factors such as the climate, which differs from place to place. Temperate countries, for example, all store and trade in grain at up to 15% moisture content; such a high level is not suitable for the tropics, where ambient temperatures are higher. International standards are recognized under the World Trade Organization (WTO) Sanitary and Phyto-sanitary Measures Agreement as the benchmarks for food trade. That allows them to form the basis for negotiations and for resolving disputes between buyers and sellers at national, regional or international levels.

Normally warehouses apply standards as required by the buyers. Some buyers use national standards while others use their own specific standards, for example to ensure they get a specific type of grain suitable to make specialized products like infant foods. Grain graded using different standards is stored separately. Where the buyers have not specified otherwise, the national standard is followed.

6. **Grain Safety Requirements**  
*(Presentation and Discussion: 20 mins)*

**GRAIN SAFETY REQUIREMENTS**

**Mycotoxins**

Myco = fungus, toxin = poisonous substance

Discuss each of the Organisations as enumerated by Participants.  
*(Alternatively, use small groups to work through the same process and report back to plenary).*

Distribute Participants’ Handout 5.

Distribute and walk through in turn.
Mycotoxins are substances produced by fungi (moulds) and are harmful to consumer health. They include aflatoxins and fumonisins.

The fungi may infect the crop in the field or in the store. Uninfected grain can be contaminated without the fungi being visible.

Mycotoxins are more likely to be a problem if the weather is hot before the harvest, if the crop suffers from drought, if the weather is wet at harvest time or afterwards, or if the crop is attacked by insects. They may also be a problem if the grain is mechanically damaged or is not dried to the correct moisture level in good time.

**Aflatoxins**

Aflatoxins are a type of mycotoxin produced by many species of aspergillus fungus, the most important being *Aspergillus flavus* and *Aspergillus parasiticus*.

These moulds occur widely on inadequately dried food and feed grains in subtropical and tropical climates. Maize and groundnuts can be particularly affected.

In the field, aspergillus is a cause of ear rot of maize. This appears as an olive-green powdery mould when the husks on the ears (Figure 14) are peeled back. On maize grain, it appears as an olive green or grey-green colour on the kernels. However, it is not possible to visually identify aflatoxin-infected grain: tests are necessary to detect it.

Not all mouldy grain has aflatoxins, but the risk of aflatoxin contamination is greater in damaged, mouldy grain than in grain with little mould.

Aflatoxins are dangerous poisons, and high levels can be lethal (Box 8).

Animals fed with contaminated grain do not grow well, and their embryos may be affected.

Aflatoxin contamination can be prevented by stopping the aspergillus fungus from attacking the crop when it is in the field, after harvest and in storage:

<table>
<thead>
<tr>
<th>Participants</th>
<th>Handouts 6, and 7.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The facilitator will have made flip charts with the key points for discussion from this presentation and the handouts and walk participants through, allowing time for questions and clarifications.</td>
<td></td>
</tr>
<tr>
<td>Distribute and walk through in turn Participants Handouts 8, and 9.</td>
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</tbody>
</table>
In the field. Farmers should control insects that damage the ears and that allow them to be infected by mould. They should check the ears for aspergillus ear rot from the “dent” stage in maize (when the maturing grains start to harden, about a month after silking) up to harvest-time. They should check 5 to 10 locations in a field. This is done by peeling back the husks of 10 ears and inspecting them for olive-green powdery mould. If more than 10% of the ears show signs of aspergillus ear rot, the grain should be harvested early.

Harvesting. Farmers should avoid damage to the kernels during harvesting.

Before storing the grain they should clean the bins and grain-handling equipment, and remove broken kernels from the grain.

Storage. The moisture content should be at or below 13.5% to prevent the development of moulds and toxins. Storage insects should be controlled.

The stored grain should be checked every 2 weeks for temperature changes, crusting, hot spots, moisture and mould. If any of these conditions are found, the temperature must be reduced by aerating the storage bin, breaking up hot spots, or removing spoiled grain.

The East African Community has set a maximum acceptable level of 5 parts per billion for aflatoxin B1, and a limit of 10 parts per billion for total aflatoxins.

Grain that is contaminated at levels greater than 10 parts per billion may not be traded. Blending aflatoxin-contaminated grain with clean grain is not allowed, and blended grain may not be traded.

Fumonisins

Fumonisins are another type of mycotoxins, produced by a fungus called Fusarium. They cause diseases of the alimentary canal – the mouth, gullet, stomach and intestines. The East African Community sets a limit of 2 parts per million for fumonisins. The procedures used to control aflatoxins also control the growth of Fusarium.
### Physical materials

Some physical materials may harm consumers’ health: they include pieces of glass, metal and sand. They may also damage milling equipment. They should not be present in the grain.

### Toxic and noxious seeds

Some weeds and plants that grow in cereal fields, like *Datura*, have poisonous seeds. Their seeds may get into the grain, especially if it is machine-harvested.

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#### 7. General Grain Quality Attributes  
(*Presentation and Discussion: 10 mins*)

**GENERAL GRAIN QUALITY ATTRIBUTES**

A healthy grain has certain characteristics: its shape, size, structure, natural colour, flavour and smell. These characteristics determine the type and description of the grain. They make it possible to identify it and check it for purity.

Different varieties of the same crop have different features. For example:

- Maize varieties may be flint (with hard grains) or dent (soft and floury grains, with a dent in the surface when they are dried). The grain may be yellow, white or red (though this is rare).
- Rice may be one of several varieties, each of which has different cooking and eating characteristics.

Such physical characteristics are very important. They determine the use of the grain, consumer preferences, and prices. They must also be taken into account when designing grain-handling equipment, storage management and quality analysis systems.

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#### 8. Specific Quality Attributes  
(*Presentation and Discussion – 30 mins.*)

**SPECIFIC QUALITY ATTRIBUTES**

These are characteristics of the grain that are caused by outside factors. They may have positive or negative effects. They affect the grading of the grain (Table 2).

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Distribute Participants Handouts 10.  
Facilitator should lead the discussion from the handout. In doing so be sure to ask participants if they are involved Farming activities and can differentiate Maize Varieties.  
Facilitator should lead the discussion on this session.
Moisture content

When it is harvested, grain contains a certain amount of water. It can also absorb liquid water (if it is left out in the rain) or water vapour from the air.

When it does this, its weight increases.

Grain can also release water into the air (when it is dried or aerated). When this happens, its weight goes down. So the weight of a bag of grain depends partly on how much water it contains.

Understanding this is important because most commercial transactions are made on the basis of weight.

If the moisture content is too high, the grain may be damaged by mould or attacked by insects. Millers will get less flour per unit weight of grain.

Drier grain will last longer in the store. The moisture content of dry grain ranges from 6% to 15%, depending on the type of grain and the climate conditions where the grain is stored. In cool, temperate areas, maize can be stored at 15% moisture. As noted, this is not possible in the tropics where the temperature and humidity are high: here the grain must be drier.

Regulatory authorities have standardized the moisture content of the major grain products traded (see Box 4 in the previous chapter). Dry grain absorbs moisture from the air easily, so its moisture content may drift upwards over time.

That would push it into a lower grade (or, in the East African standard for maize in Table 2, out of the grading scheme altogether), even though it fulfils all the other criteria for a particular grade.

Foreign matter

This is any inedible material in the grain. It may include:
• Earth, sand, soil, dust, stones, metal and glass.
• Organic matter from plants: seed coats, parts of stem, seed husks, pods,
• leaves and weed seeds
• Organic matter from animals, alive or dead: insects, mites, rodent and bird droppings, insect excretions. This material is often called filth (see below)

Foreign matter is not just a quality issue. It is also a safety concern because it may be harmful to health (see Grain safety requirements above).

Other grains

These are other edible grains, whole or broken, that are not of the crop in question.

These are other edible grains, whole or broken, that are not of the crop in question. For example, a bag of maize may contain some grains of sorghum or soybeans, particularly if it is machine-harvested.

Filth

This is impurities of animal origin, such as animal waste, dead worms, insects, insect wings, animal hair or fur and skins.

Contaminants

These are any substances not intentionally added to the grain. They may have got into the grain as a result of the production, processing, packaging, transport and storage of the grain, or they may be the result of environmental contamination. They do not include insect parts or rodent hairs (“filth”) or other extraneous matter (“foreign matter”).

Physical damage

This refers to the physical damage to the grain, such as breaking, splitting or cracking. It may lead to changes in the composition of the grain and expose it to attacks by fungi or insects.

Broken grains

These are fragments of grain below a certain size. They can lead to the grain quality declining more quickly than if the grains are carried any)
whole. They are caused mostly by poor handling – such as using a poorly adjusted sheller or threshing the grain by beating it with a stick. There are tests to measure the amount of broken grains. For example, according to the ISO 5223 standard, which specifies test sieves for cereals, broken grains of maize are those that pass through a 4.50 mm round metal sieve.

**Defective grains**

These are grains that are damaged by pests, discoloured, diseased, germinated, mouldy, immature or shrivelled, or otherwise materially damaged (see the items below). They do not include broken grains.

**Blemished or damaged grains**

These are grains that are damaged by insects or vermin, stained, diseased, discoloured, germinated, frost-damaged, or otherwise materially damaged.

**Stained grains**

These are grains whose natural colour has been altered by external factors such as the soil or weather. These factors can cause dark stains or discolorations and a rough appearance.

**Discoloured grains**

These are grains that are discoloured by heat but are not obviously damaged by mould. They may be darkened, wrinkled, blistered, puffed or swollen, and often have discoloured, damaged germs. The seed coat may be peeling or may have peeled off completely, giving kernels a checked appearance. This colour change may happen in unfavourable storage conditions.

**Weather-damaged grains**

These are grains that are bleached or blistered. The seed coat may be peeling. The germs may appear dead or discoloured.

**Diseased grains**

These are grains made unsafe for human consumption due to
decay, mould, bacterial decomposition, or other causes. It is possible to see the damage without cutting the grains.

Mouldy grains

These are kernels and pieces of kernels that are:
• Visibly infected by fungi and have black, blue, green, yellow or white fungal growth anywhere on the kernel, or have fungal growth under the bran layer of the kernel.
• Infected by ear-rot and have red, pink or brown discolourations. The kernels are partially to completely infected.
☞ Mould may produce aflatoxins and make the grain unsafe for consumption (see Grain safety requirements above).

Insect- or vermin-damaged grains

These are grains with obvious holes or tunnels made by insects, insect webbing or refuse. The germ or part of the kernel may be missing or chewed.
The damage may occur before or after the harvest.

(Presentation and Discussion with Facilitator taking Lead: 10 minutes)

GRADING

If the grain meets the safety requirements, it can be graded using specialized equipment that checks the specific quality attributes described above.

The grader checks a sample of the grain according to the various criteria and puts it into a grade. If it exceeds the limit on one of the characteristics in a grade, it must be classified in a higher grade. Table 2 gives an example of the maximum permitted levels for grading maize.

Packaging

Standards specify requirements for the packaging that must be used for grain:
☞ Grain and grain products must be packaged using food-grade materials to safeguard the safety, quality and nutritional

The Facilitator should lead the participants in analyzing the grading process.

Distribute
characteristics of the product. The packaging should withstand the conditions in storage, transportation and distribution.

It should prevent the grain from being damaged by impact or crushing, contaminated by insects and microorganisms, or affected by moisture, air or odours. It should prevent the grain from spoiling or losing value and volume through leakage or spillage.

If the grain is loaded and unloaded by hand, the bags may weigh at most 50 kg. Most countries have signed an International Labour Organization (ILO) agreement to this effect.

10. Challenges.
(Presentation and Discussion by Facilitator. 5 minutes)

CHALLENGES

For local trade, the buyer can inspect the grain directly, so it is not necessary for grain to comply with the standards described above.

For structured grain trading, however, it is necessary to comply with the standards. That takes expertise and money. Everyone in the chain must be aware of the standards and what they mean.

Adopting standards in a country takes time and effort. It requires the cooperation of and close coordination with the private sector, which is the main user of standards. It also involves many government agencies that regulate agricultural trade and food safety, including national standards organizations and nutrition authorities, plant-protection organizations, weights and measures agencies, customs authorities, and public health and food and drug authorities. Africa, see the African Postharvest Losses Information System (Box 6).

(Discussion: 15 minutes)

Module Review:

Participants Handouts 11, 12 and 13.
module, referring to the Flip Charts, Participant contributions and to the conclusions.

Then the Facilitator should refer back to the Flip Chart with participant objectives for the module and ensure that all participants are satisfied and all questions answered.
## Module Objectives

| What are marketing costs and why do they vary? | What are Capital costs  
What are Product losses |
| What are Produce preparation and packaging costs  
What are Handling costs | What are Storage costs  
A marketing cost calculation is done |
| What are Transport costs  
What are Processing costs | What are Marketing margins |
### WHAT DO STANDARDS AND GRADES COVER?

<table>
<thead>
<tr>
<th>Safety Requirements</th>
<th>General Quality Characteristics</th>
<th>Specific Quality Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the grain safe?</td>
<td>Characteristics of the healthy grain</td>
<td>Caused by outside factors</td>
</tr>
<tr>
<td>Mycotoxins <em>poisons produced by fungi</em></td>
<td>Shape</td>
<td>Size</td>
</tr>
<tr>
<td>• Aflatoxins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fumonisins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide residues</td>
<td>Examples:</td>
<td></td>
</tr>
<tr>
<td>Physical materials</td>
<td>• Maize: dent, flint</td>
<td></td>
</tr>
<tr>
<td>(stones, glass and pieces of metal)</td>
<td>• Maize: yellow, red, white</td>
<td></td>
</tr>
<tr>
<td>Poisonous or toxic and noxious seed.</td>
<td>• Rice: long-grain, short-grain</td>
<td></td>
</tr>
<tr>
<td>Not covered by grades (Grades cover only grain that meets all safety requirements)</td>
<td>Not covered by grades</td>
<td>Covered by grades</td>
</tr>
</tbody>
</table>

*Note: Definitions of the terms used above are discussed in the text.*
The *Marketing of Agricultural Crops* involves the transfer of produce from farmer to consumer.

1. **FARM** → **LOCAL RURAL MARKET**
   - Farmer takes produce to local rural market
   - Produce is unloaded, weighed, and delivered to wholesaler
   - Retailer purchases produce from wholesaler and takes it to his/her shop
   - Retailer sells produce to consumer

2. **FARM** → **WHOLESALE MARKET** → **RETAIL MARKET**
   - Farmer takes produce to wholesale market
   - Buyer purchases produce at assembly market
   - Buyer takes produce to wholesale market and sells to wholesaler
   - Sub-wholesaler distributes produce to retail shops
   - Retail sells produce to consumer

3. **FARM** → **ASSEMBLY MARKET** → **WHOLESALE MARKET**
   - Farmer takes produce to assembly market
   - Buyer purchases produce at assembly market
   - Buyer takes produce to wholesale market and sells to wholesaler
   - Sub-wholesaler distributes produce to retail shops
   - Retail sells produce to consumer
Figure 9. Experienced storage operators can tell if the grain is dry enough for storage by listening to the sound when it is poured. Photo: Herbert Kirunda
1. How do Grain Standards Help?

Grain standards are vital in Structured Trading Systems:

- They specify the grain characteristics, the limits that are acceptable for each characteristic, and how to measure them. That facilitates production, processing and inspection of the grain.
- They identify economic factors that are important to end-users.
- They establish a common language and set of rules between trading partners. If everyone knows what is meant by “moisture content” or “Aflatoxin”, and knows how to measure it, they can be confident they are talking about the same thing when they buy or sell grain.
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**PARTICIPANTS HANDOUT 6**

### Who sets standards?

Standards for grain in Africa are set by national governments. Regional organizations attempt to harmonize these, and it is up to each government to implement them in their national standards.

The relevant regional organizations are:

- **COMESA**: the Common Market for Eastern and Southern Africa
- **EAC**: the East African Community
- **ECOWAS**: the Economic Community of West African States
- **CEEAC**: the Economic Community of Central African States
- **SADC**: the Southern Africa Development Community.

These standards are mostly based on international standards published by:

- **Codex**: the Codex Alimentarius Commission of the Food and Agriculture
- **Organization of the United Nations (FAO) and the World Health Organization (WHO)**
- **ISO**: the International Organization for Standardization
- **IPPC**: the International Plant Protection Convention.

Efforts are also taken to review standards published by the major trading partners like the European Union, the United States, and Japan.

It is not possible to impose a common standard for all regions because the appropriate levels depend on factors such as the climate, which differs from place to place. Temperate countries, for example, all store and trade in grain at up to 15% moisture content; such a high level is not suitable for the tropics, where ambient temperatures are higher.
BOX 7. WHAT’S IN A STANDARD?

A standard is a published document that establishes a common language, and contains a technical specification or other precise criteria and is designed to be used consistently, as a rule, a guideline, or a definition.

A typical standard contains these sections:

1. Scope
2. Normative references
3. Terms and definitions
4. Presentation
5. Essential composition and quality factors
6. Contaminants
7. Hygiene
8. Packaging
9. Labelling
10. Methods of sampling and analysis (testing)
11. Criteria for conformity

Annex: Method for sampling and grading of grains
Figure 14. Aspergillus growth in the field.
BOX 8. AFLATOXIN: A SERIOUS THREAT TO FOOD SAFETY

In April 2004, 317 people in rural Kenya fell ill, and 125 died of aflatoxin poisoning.

The source of the outbreak was contaminated maize that was grown locally.

A survey found that aflatoxin was common in maize grown in the area. The researchers tested maize from vendors and markets, and found that 55% of the maize products had higher aflatoxin levels than the official limit of 20 parts per billion (this limit has since been lowered to 10 parts per billion).

One-third of the products had more than 100 parts per billion, and 7% had levels over 1,000 parts per billion.

The maize had been harvested during unseasonable, early rains. It had been stored while it was still damp. Those are ideal conditions for the fungi that produce the toxins.

Farmers had then sold the tainted maize, and it got into the distribution system, contaminating much of the grain in the market and exposing consumers to the toxin.

Figure 15. Different types of maize

- Yellow flint maize
- Red/black flint maize
- White dent maize
- Red dent maize
Table 2. Maize Grain Grades in the East African Standards

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content</td>
<td>13.5</td>
<td>13.5</td>
<td>13.5</td>
</tr>
<tr>
<td>Foreign Matter</td>
<td>0.5</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Inorganic Matter</td>
<td>0.25</td>
<td>0.5</td>
<td>0.75</td>
</tr>
<tr>
<td>Filth</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Broken Kernels</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Rotten and Diseased Grains</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Pest-Damaged Grains</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Immature/Shrivelled Grains</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Discoloured Grains</td>
<td>0.5</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Total Defective Grains</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Aflatoxins</td>
<td>10 ppb</td>
<td>10 ppb</td>
<td>10 ppb</td>
</tr>
</tbody>
</table>

ppb = parts per billion
**EXAMPLE OF GRADING**

A bag of maize has 12% moisture, 0.4% foreign matter, 0.1% inorganic matter, 2.5% broken kernels, and a total of 3% defective grains. What grade is it, according to the East African standards?

Check Table 2 for the grade limits.

**Answer:**

Grade 2. It has too many broken kernels to qualify for Grade 1 (limit = 2%).
Packaging

Standards specify requirements for the packaging that must be used for grain:

- Grain and grain products must be packaged using food-grade materials to safeguard the safety, quality and nutritional characteristics of the product.
- The packaging should withstand the conditions in storage, transportation and distribution.
- It should prevent the grain from being damaged by impact or crushing, contaminated by insects and microorganisms, or affected by moisture, air or odors.
- It should prevent the grain from spoiling or losing value and volume through leakage or spillage.

If the grain is loaded and unloaded by hand, the bags may weigh at most 50 kg. Most countries have signed an International Labor Organization (ILO) agreement to this effect.
## PARTICIPANTS HANDOUT 14

### Grain Standards – Module Summary

<table>
<thead>
<tr>
<th>Message</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>❖ Grain Trading in Local Markets may not be quite stringent; however, grain must be of good quality.</td>
<td>❬ For local trade, the buyer can inspect the grain directly, so it is not necessary for grain to comply with the standards described above.</td>
</tr>
<tr>
<td>❖ Grain Trading in Structured Markets requires conformity to Set Standards.</td>
<td>❬ For structured grain trading, however, it is necessary to comply with the standards. That takes expertise and money. Everyone in the chain must be aware of the standards and what they mean.</td>
</tr>
<tr>
<td>❖ Public and Private Sector Involvement.</td>
<td>❬ Adopting standards in a country takes time and effort. It requires the cooperation of and close coordination with the private sector, which is the main user of standards.</td>
</tr>
<tr>
<td></td>
<td>❬ It also involves many government agencies that regulate agricultural trade and food safety, including national standards organizations and nutrition authorities, plant-protection organizations, weights and measures agencies, customs authorities, and public health and food and drug authorities.</td>
</tr>
</tbody>
</table>