ARS GAPM 20:2018
Good Agricultural Practices Outreach Information for African Standards on Wheat

Based on ARS 465:2018, Wheat — Specification
African Organisation for Standardisation

WHEAT

ARS GAPM 20:2018
Good Agricultural Practices Outreach Information for African Standards on Wheat
The African Organization for Standardization (ARSO) is an African intergovernmental organization established by the United Nations Economic Commission for Africa (UNECA) and the Organization of African Unity (AU) in 1977. One of the fundamental mandates of ARSO is to develop and harmonize African Standards (ARS) for the purpose of enhancing Africa’s internal trading capacity, increase Africa’s product and service competitiveness globally and uplift the welfare of African communities. The work of preparing African Standards is normally carried out through ARSO technical committees. Each Member State interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, Regional Economic Communities (RECs), governmental and non-governmental organizations, in liaison with ARSO, also take part in the work.
ACKNOWLEDGEMENT

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INTRODUCTION

Wheat is the third most produced cereal crop after rice, but covers more land area worldwide than any other crop. Unlike rice, wheat is more widespread globally and enters into international trade more than any other food. It tolerates windswept areas too dry and too cold for rice and corn.

The economic stability of many nations is affected by the exchange in wheat. Wheat is utilized mainly as flour (whole grain or refined) for the production of a large variety of leavened and flat breads, and for the manufacture of a wide variety of other baking products such as biscuits, and confectionary. Fermented grains are made into various alcoholic drinks and industrial alcohol. Starch is used as cloth-stiffeners. Straws are fed to livestock, used for animal bedding and used in basketry and woven products.


REDUCING FOOD SAFETY RISKS DURING HARVEST
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DEFINITION OF PRODUCE
DEFINITION OF PRODUCE

This outreach material specifies the requirements and methods of sampling and test for wheat grains of varieties (cultivars) grown from common wheat (Triticum aestivum L.), club wheat (T. compactum Host.), intended for human consumption.
CROP PROTECTION
CROP PROTECTION

IMPACT OF PESTS ON WHEAT PRODUCTION

Insect, disease and weed pressures are one of the greatest threats to our food supply as they compete with crops for essential nutrients and rob them of their yield and quality. Farmers rely on crop protection products to prevent these pests from damaging their crops and limiting their harvest. However, as the impacts of climate change grow, these pest pressures will become more extreme – making effective use of crop protection products more important than ever before.

PEST TRENDS:
Currently, 30-40% of wheat yields are lost annually to pests. Insects, weeds and disease thrive in warm climates. As temperatures rise due to climate change, these pests will also increase in number and resiliency.
30-40% of wheat yields are lost annually to pests
MAIN PESTS AFFECTING WHEAT

Black Aphids

Brown Wheat Mite
Army Worm

Legume Pod-borer
MAIN CONTROL METHODS

All insects have natural enemies which, in addition to weather and food supply, limit their populations. This process, unaided and often unrecognized by man, is termed natural control. It is important to recognize the impact of natural control factors and, where possible, encourage their action.

Biological control does not present the human health and environmental concerns associated with chemical pesticide use. Nor is there much chance pests will develop resistance to natural enemies, as commonly occurs with insecticides.

GENERAL POINTS ON COMBATING PLANT PESTS AND DISEASES:

Successful production requires an integrated approach to managing pests and diseases. An important part of this approach involves a number of preventative strategies that minimise the likelihood of occurrence and when infection occurs, its severity. When these measures are implemented adequately, pest and disease problems will not reach economic thresholds.

A range of preventative measures are important to minimize susceptibility to pest and disease pressures. Some key preventative measures are as follows:

- **Location/regional occurrence** - Understanding the prevalence, timing and severity of specific pests or diseases for a given location is very important and can have a significant impact on production costs and reliability of production. One has to consider location, its microclimate and soils.

- **Surrounding land use** - Neglected farms or poorly managed surrounding properties can be a constant source for new outbreaks of pests or diseases, and infestation of properly managed fields.

- **Variety** - Selection of plant material with resistance characteristics should be used wherever possible. Selecting varieties that are well suited to the local growing conditions will ensure healthy growth and resilience to problems.

- **Healthy crop** - Emphasis on maintaining healthy crop that is naturally able to cope with minor pest or disease problems is important. The foundation for healthy crop is healthy seeds and a healthy soil. Ensure certified disease-free seeds are used.
  If the seeds are pink, red, green or blue, they have been treated with fungicides and cannot be used for organic production. Healthy soil is achieved by creating a biologically active soil with adequate organic matter and nutrient cycling (mulch) to balance the chemical, biological and physical condition of the soil.

- **Biodiversity** - Farm floor management that involves a mix of plant species and mowing at the right time to encourage beneficial insects such as predators, parasitoids and pollinators (which like flowers). Windbreaks and shelterbelts can also be designed to encourage biodiversity.

- **Hygiene** - Vigilant and thorough farm hygiene is very important. Removal of infected fruit and other plant tissues can reduce the severity of subsequent problems.

Rapid decomposition - Infected plant material – as a source of future inoculum – can be reduced by rapid decomposition assisted with mulch from the farm floor.
Surrounding land use: Neglected farms or poorly managed surrounding properties can be a constant source for new outbreaks of pests or diseases.

Variety Selection: Selection of plant material with resistance characteristics should be used wherever possible.
PLANTING

Loam soil is the best for wheat cultivation. Clay and sandy loam soils can also be used for wheat cultivation provided there is proper system of drainage and these soils should not either be acidic or sodic.

CLIMATIC REQUIREMENTS

TEMPERATURE
Warm temperatures are suitable for summer wheat (22 °C to 34 °C) and cool temperatures are suitable for winter wheat (5 °C to 25 °C). An ideal climate for planting wheat can be described as cool and moist, followed by a warm dry season for harvesting. Such a climate is encountered mostly in winter rainfall areas.

WATER REQUIREMENTS
In dry areas where cultivation practices such as zero tillage and minimum tillage are practiced, stubble mulching is recommended for moisture conservation. Frost can damage wheat, especially after the formation of ears resulting in low yield. Hail can also result in serious damage on the summer wheat resulting in low yield. Wet weather during harvesting contributes to disease prevalence and quality deterioration of grains.

The moisture application under irrigation should be lowered during flowering, increased during pod filling and ceased during ripening.
Water Requirements: The moisture application under irrigation should be lowered during flowering, increased during pod filling, and ceased.

Irrigation: Never irrigate wheat fields with untrusted water sources.
GENERAL REQUIREMENTS
GENERAL REQUIREMENTS

Wheat grains shall meet the following general requirements/limits as determined using the relevant standards. Wheat grains:

1. shall be the dried mature grains of Triticum aestivum (bread wheat), Triticum compactum Host. (club wheat), Triticum tauschii (soft wheat) and Triticum durum (durum);
2. shall be clean, wholesome, uniform in size and shape;
3. shall not contain additives, toxic substances, pesticides residues or other contaminants which can affect human health. The maximum levels authorized are laid down by the joint FAO/WHO Codex Alimentarius Commission;
4. shall be free from abnormal flavours, musty, sour or other undesirable odour, obnoxious smell and discolouration;
5. shall be free from living insects, micro-organisms and substances originating from micro-organisms, fungi or other poisonous or deleterious substances in amounts that may constitute a hazard to human health.

(1) See Clause 4 Essential composition and quality factor, 4.3 Specific quality requirements
SPECIFIC REQUIREMENTS

GRADING
Wheat grains shall be graded into four grades on the basis of the tolerable limits established in See Table in page 16 which shall be additional to the general requirements set out in this standard.

UNGRADED WHEAT GRAINS
Shall be wheat grains which do not fall within the requirements of Grades 1, 2, 3 and 4 of this standard but are not rejected wheat grains.

REJECT GRADE WHEAT
1. Does not meet the requirements for the Grades 1, 2, 3, or 4.
2. Has a musty, sour, or commercially objectionable foreign odour except smut or garlic odour; or
3. Is heating or otherwise of distinctly low quality.

(2) See Clause 4.4 Wheat grades for human consumption
<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SPECIFICATION</th>
<th>METHOD OF TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GRADE 1</td>
<td>GRADE 2</td>
</tr>
<tr>
<td><strong>Variat restriction</strong></td>
<td>Approved varieties only</td>
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</tr>
<tr>
<td><strong>Moisture, max (%)</strong></td>
<td>14.0</td>
<td>14.0</td>
</tr>
<tr>
<td><strong>Standard of quality</strong></td>
<td>Minimum test weight kg/hl (g/0.5 L)</td>
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</tr>
<tr>
<td><strong>Protein, min (%) m/m</strong></td>
<td>Hard/strong white</td>
<td></td>
</tr>
<tr>
<td>N11@5.7 % moisture basis</td>
<td>Soft white</td>
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<tr>
<td><strong>Foreign matter, Max (%) m/m</strong></td>
<td>TOTAL</td>
<td>0.40</td>
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<tr>
<td><strong>Unmillable material above the screen, (% by wt)</strong></td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td><strong>Screenings, Max (% by wt)</strong></td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Falling Number, Min (sec)</strong></td>
<td>350</td>
<td>300</td>
</tr>
<tr>
<td><strong>Edible grains other than wheat (whole or identifiably broken), (% by wt)</strong></td>
<td>0.50</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Wheat of other classes or varieties (% by wt)</strong></td>
<td>Contrasting classes</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Defective grains, max (% by count, 300 grain sample, unless otherwise stated)</strong></td>
<td>TOTAL DEFECTIVE</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Bulk density kg/hl min</strong></td>
<td>70</td>
<td></td>
</tr>
<tr>
<td><strong>Other contaminants, Max</strong></td>
<td>Total Aflatoxin (AFB1+AFB2+AFG1 +AFG2), ppb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
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<td></td>
<td>Aflatoxin B1 only, ppb</td>
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<td></td>
<td>5</td>
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<tr>
<td></td>
<td>Fumonisin – Total ppm(FB1 + FB2 + FB3)</td>
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</table>

**NOTE**  Grade 4 will not be considered suitable for export.
Grade 1 - Foreign matter 0.40% - Edible grains other than wheat (whole or identifiably broken) 0.50%
GENERAL REQUIREMENTS

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Grade 2 - Foreign matter 0.70% - Edible grains other than wheat (whole or identifiably broken 1.50%.

Grade 2 - Foreign matter 0.70% - Edible grains other than wheat (whole or identifiably broken 1.50%.
Grade 3 - Foreign matter 1.30% - Edible grains other than wheat (whole or identifiably broken) 2.0 %
Grade 4 - Foreign matter 2.40% - Edible grains other than wheat (whole or identifiably broken 2.0 %
GENERAL REQUIREMENTS

Ungradable - Foreign matter exceeding 2.40%
TEMPERATURE
Moisture content of 14% maximum should be maintained.

TRANSPORTING WHEAT TO WAREHOUSE
Wheat shall be packed in a suitable container (suitable packages which shall be clean, sound, free from insect, fungal infestation and the packing material shall be of food grade quality) to protect them from normal hazards of transportation and handling. For traceability, Marking and labelling, each container shall be legibly labeled with the following information:
- product name as “Wheat Grains”;
- variety and grade;
- name, address and physical location of the manufacturer/ packer/importer;
- lot/batch/code number;
- net weight, in g/kg;
- the declaration “Food for Human Consumption” or “Animal Feed”;
- storage instruction as “Store in a cool dry place away from any contaminants”;
- crop year; packing date; expiry date or best before ___________ month ______ year;
- a declaration of the product lifespan;
- instructions on disposal of used package;
- country of origin;
- a declaration on whether the barley was genetically modified or not.

Transporting wheat to Warehouse Wheat shall be packed in a suitable sacks 50kg maximum where human loading and offloading is involved. Accepted

(3) See Clause 7 Packaging, 8 Marking or labelling
## RECORD KEEPING

Packaging and storage practice

<table>
<thead>
<tr>
<th>PLOT NUMBER</th>
<th>WEIGHT (KG)</th>
<th>TYPE OF CONTAINERS</th>
<th>CLEANING CONTAINER AND STORAGE PRACTICE</th>
<th>LOCATION OF STORAGE</th>
</tr>
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Source of produce

<table>
<thead>
<tr>
<th>PLOT NUMBER</th>
<th>GRADE OF WHEAT</th>
<th>WEIGHT (KG)</th>
<th>HARVESTING DATE</th>
<th>FARM OWNER</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
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</table>

Worker Profile

<table>
<thead>
<tr>
<th>PLOT NUMBER</th>
<th>WORKERS NAME</th>
<th>AGE</th>
<th>AREAS OF WORK</th>
<th>HEALTH REPORT</th>
<th>FARM OWNER</th>
<th>ADDRESS</th>
</tr>
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Name……………………………………………… Recorder………………….Date …………………

*Keep records at least for five years*
FOOD SAFETY CONCERNS
FOOD SAFETY

Food hygiene is regularly cited as a cause of food poisoning. Those who produce and distribute papayas must respect rules of hygiene, but individuals should also be concerned about the food they eat.

Food poisoning is not caused solely by insufficient hygiene but also by various types of contaminants which, at certain concentrations, can be toxic for the consumer. Despite the recognized health benefits of regular fruit and vegetable consumption, recent studies on consumer exposure to pesticide residues point to an identifiable risk of poisoning for some groups such as children. (Claeys., 2010).

Risks for the average consumer, however, remain low, but they can be reduced further when simple and efficient hygiene rules are applied and all operators implement food safety management systems based on an analysis of the hazards linked to their professional practices and the type of product they handle.

In order to meet food quality and safety requirements, agricultural businesses must identify all aspects of their activities that are decisive factors for the safety of their products. They must be able to control all hazards at all stages of product life cycle (development, production, storage, transport, marketing) in order to meet specifications (regulatory and market) and assure consumers that their food is safe.

The farmers and the producers must be able to identify all hazards (physical, biological or chemical) that can potentially contaminate their products at different stages of production. They must also be able to assess the level of each risk (probability) according to their working conditions, procedures and practices. On the basis of these analyses, the appropriate control measures, adapted to the type and level of risk, can be adopted. The company must then make sure that these measures are effectively implemented, complied with and regularly reviewed.

(4) See Clause 6 Hygiene
REDUCING RISKS FROM ANIMALS AND MANURE
Animal manure is a significant source of human pathogens. Dangerous pathogens such as E. coli 157:H7, Listeria, and Cryptosporidium are found in cattle, sheep, and deer feces. These pathogenic bacteria can be transferred from wheat to wheat by human hands or contaminated processing equipment. Droppings from poultry, wild birds, and even pets are a potential source of Salmonella bacteria. When raw manure is not handled and applied correctly or if wild or domestic animals have access to growing areas, wheat could be contaminated.

WILD AND DOMESTIC ANIMALS
It is not possible to exclude all animal life from wheat growing areas. But it is important that you consider the risks and set up procedures to limit potential contamination.

- Take measures to limit wild/domestic animal access to growing areas.
- Do not locate growing areas adjacent to dairy, livestock, or fowl production facilities unless adequate barriers exist.
- Fence in livestock to exclude them from wheat growing areas.
- If using working animals, confine them to lanes outside growing areas close to harvest.
- Have procedures in place to remove and dispose of droppings.
- Make sure workers in animal holding areas check their shoes for contamination before entering wheat growing areas.
- Monitor for signs of animal entry such as the presence of feces, damage to the crop, or evidence of animal trails in or wheat growing areas.
FOOD SAFETY CONCERNS

Pets are a potential source of Salmonella bacteria

Take measures to limit wild/domestic animal access to wheat growing areas
Take measures to limit wild/domestic animal access to wheat growing areas

Do not locate wheat growing areas adjacent to dairy, livestock, or fowl production facilities
Droppings from poultry, birds, and even pets are a potential source of Salmonella bacteria.
Shoe Disinfection Mat: Visitors shall disinfect their shoes before entering the production area.

Disinfectant Basin: Farm workers in animal holding areas must check their boots for contamination before entering wheat growing areas.
FOOD SAFETY CONCERNS

Boot Wash and Disinfect Machine: Farm workers must wash their boots to avoid contamination before entering wheat growing areas.

Farm workers in animal holding areas must not enter wheat growing areas with muddy boots.
ANIMAL MANURE AS A SOIL SUPPLEMENT

The best fertilizer are the foot prints in the field. Plant nutrition should constantly be monitored and needed fertilizer is applied on time. The best fertilizer is the organic compost mixed with the soil during land preparation.

Raw and composted animal manure is a valuable soil conditioner and source of nutrients. However, the shorter the time between raw manure application and harvest, the greater the risk of pathogens being present in the soil at the time of harvest.

- Do not apply raw manure on wheat field during or immediately prior the harvesting.
- Never apply raw or farm-composted human feces to wheat in harvesting areas.
- Maximize the time between application of manure to production areas and harvest.
- Incorporate manure into the soil as soon as possible. Soil microorganisms can reduce pathogens.
- Consider treatment of manure by composting in order to reduce potential pathogens. To reduce pathogen loads, maintain compost at high temperatures with good aeration, moisture, and mixing.
- Properly store compost to minimize recontamination from fresh manure and bird droppings by tapping, using buffer zones.
The best fertilizer is the organic compost mixed with the soil during land preparation.
Do not apply raw manure on wheat during or immediately prior the harvesting

REDUCING FOOD SAFETY RISKS DURING HARVEST

During harvest look for ways to reduce contaminating wheat as much as possible. Harvest tools, bins, harvesters, and the environment are all potential sources of contamination.

HARVEST

Before and during harvest take time to look for conditions that might affect wheat’s safety. Be aware that harvesting involves a lot of hand contact and take measures to prevent contamination of produce by workers.

- Make sure harvesters have washed their hands before starting to harvest wheat.
- Conduct an inspection of the wheat growing area before harvest to determine if animals or animal droppings are present.
- Harvesters must reject wheat that shows decay, is damaged, or has visible signs of bird droppings.
- No wheat that comes in contact with animal or bird feces should be harvested.
- Farm workers should watch for signs of animal waste in nearby areas.
During harvest look for ways to reduce contaminating wheat as much as possible.

Conduct an inspection of the wheat growing area before harvest.
Harvesters must wash their hands with clean running water before starting to harvest.
Food Safety Concerns

Harvesters must reject wheat grains which show signs of decay.

Wheat grains shall be free from any living insects.
Post-Harvest, inculcate the stems into the soil to improve organic carbon content.
Use clean sacks for harvesting wheat

Never use sacks for chemicals to store wheat during harvesting
REDUCING FOOD SAFETY RISKS IN THE WAREHOUSE

Basic sanitation recommendations for keeping packing areas clean and appropriately sanitary.

WAREHOUSE

- An enclosed packing area is preferred.
- Keep packing area clean, orderly, and well lit.
- Have a regular cleaning schedule for all areas, including equipment, walls, floors, and overhead structures.
- Inspect interior walls and floors for signs of water entry or holes. Fill cracks with grout or other appropriate filler materials.
- Water should drain away.
- Look for overhead places where birds can perch. Prevent perching with methods such as covering rafters, installing bird spikes, or installing steep-sided pyramids on beams.
- Areas outside of the packing buildings should be cleared of tall grass, weeds, and idle equipment that can provide hiding places for rodents.
- Allow sufficient space between equipment and interior walls to make inspecting for pests easier.
- Walk the perimeter of your packing building. Check for damage to the roof and cracks or holes in exterior walls that could allow pests to enter.
- Trees provide cool shade, but they are perching sites for birds. Consider ways to reduce the risk from these birds.
- Keep pests out.
Enclosed packing area. Keep packing area clean, orderly, and well lit. Have a regular cleaning schedule for all areas, including equipment, walls, floors, and overhead structures.
Keep pests out.

Look for overhead places where birds can perch and prevent perching.
TRANSPORTATION
TRANSPORTATION

The last stage in the warehouse process is loading wheat sacks into trucks.

- Make sure you continue to consider food safety risks and take measures to prevent contamination and microbial growth.
- Before loading trucks, inspect them for cleanliness.
- There should be no signs of the previous load left in the truck.
- Never use trucks that were previously used to transport animals or other contaminated materials.
- Avoid damaging the product during loading. Not only does this lower its value, it also creates opportunities for pathogenic and spoilage microorganisms to grow.
- Properly label your boxes and keep good shipping records for traceability purposes.
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ARC-Small Grain Institute and the National Chamber of Milling (South Africa)