Chapter 4

Grain Quality and U.S. Standards

One of the major strengths of the U.S. grain production and marketing system is the variety of grades, classes and prices that it can offer customers around the world. Dramatic differences in topography, soils and climate from one region to another make this variety possible. By building on these natural advantages, seed breeders, public and private researchers, farmers, grain handlers and merchandisers are continually seeking to expand both the type and quality of grain the United States can make available to its customers.

The ability to provide such a broad spectrum of agricultural products gives buyers the opportunity to purchase exactly what they want. In the U.S. marketing system, quality requirements for grain exports are governed by both contract specifications and a complex, constantly evolving government-regulated system of guidelines that cover the inspection, sampling, grading and weighing of grain. These grain standards and inspection procedures are designed to ensure a uniform product and to facilitate the trading and marketing of U.S. grain.

FEDERAL GRAIN INSPECTION SERVICE

The Federal Grain Inspection Service (FGIS) is a program of the U.S. Department of Agriculture's (USDA) Grain Inspection, Packers and Stockyards Administration (GIPSA). FGIS administers a system for officially inspecting and weighing grain and other commodities through 12 field offices and two federal/state offices in the United States and Canada. FGIS field offices also oversee the work of state and private agencies which provide official services at other domestic grain markets. Eight of these state agencies are also authorized to perform official export services at ports.

The U.S. Grain Standards Act, with few exceptions, requires official certification that export grain sold by grade has been inspected and weighed. Official services are provided upon request for grain in domestic commerce. The Agricultural Marketing Act of 1946 authorizes similar inspection and weighing services for rice, pulses and certain other commodities.

U.S. Grain Standards Act

Congress passed the U.S. Grain Standards Act in 1916 at the request of local trade and governments that wanted a national inspection program and, for the first time, a national weighing program.

The U.S. Grain Standards Act provides for the establishment of official U.S. grain standards that are used to measure and describe the physical and biological properties of the grain at the time of inspection. The grades, classes and conditions reported on official certificates are determined according to the factors defined in these standards. These factors may include test weight per bushel and percentages, by weight, of damaged kernels, foreign material, broken kernels and other factors. The certificate also notes specific conditions of the grain, such as moisture content and infestation. No seasonal adjustments are made on U.S. grades.

Standards exist for 12 grains (listed from largest to smallest volume inspected): corn, wheat, soybeans, sorghum, barley, oats, rye, flaxseed, sunflower seed, canola, triticale and mixed grain. Commodities such as rice, pulses and hops have similar standards for grade and quality factors.

Other commodities and a wide range of processed products, including flour, food mixes, edible oils and other cereal food products, have no official USDA standards. FGIS can perform the physical, chemical and microbiological tests - using the official laboratory methods of the Association of Official Analytical Chemists - requested in laboratory specifications.

Standards used to inspect grain and other agricultural commodities are updated regularly through public rule-making procedures and represent currently accepted market practices.

With a few exceptions, the official inspection of export grain is mandatory. Official personnel employed or licensed by FGIS obtain representative samples using approved equipment. The grade is reported on a certificate which represents the entire lot inspected.

Other services available upon request include the determination of protein and falling numbers in wheat, oil in sunflower seed and aflatoxin in corn. FGIS performs stowage examinations within 24 hours before loading to assure that carriers are clean, dry and fit for loading. FGIS is required by law to collect fees that cover the cost of these services.

FGIS also works closely with other U.S. government agencies. For example, if FGIS were to find excessive levels of aflatoxin in corn, this would be reported to the Food and Drug Administration (FDA) for action to prevent the cargo from entering commercial channels. FGIS also works closely with the Animal and Plant Health Inspection Service (APHIS) to report insects found during inspection when the importing country has specified phytosanitary restrictions. The cooperation between U.S. government agencies is designed to assure that overseas customers receive the quality of grain desired.

There are some unofficial, private inspection agencies in the commercial business of providing inspection services or quality information, such as trace metal analysis, mycotoxin testing for other than aflatoxin, and testing for zearalenone and T-2 toxin using methods governed by the American Association of Cereal Chemists and other similar entities. FGIS does not have any authority over unofficial agencies, and the certificates issued by unofficial agencies are not FGIS certificates.

Before FGIS can establish, revise or repeal any of its standards, rules and regulations, it is required by law to announce its intentions in the *Federal Register*. The *Federal Register* is a publication that records all changes or proposed changes in federal regulations. These changes must be published and the public offered opportunity for comment before they go into effect. FGIS sends copies of FGIS *Federal Register* notices and proposals electronically to the agricultural offices of U.S. embassies worldwide, and will send any of its *Federal Register* announcements to anyone who requests them. The agency also publishes its *Federal Register* actions in news releases.

A *Federal Register* announcement includes a description of the action, rules the action would replace or affect, the effective date, reasons for taking action, objectives and effects of the action and an impact analysis (for major regulations). The announcement also includes the identification and addresses of FGIS contacts, a summary of the comments received on previous announcements and text or amending language to be used as text of the regulation or

action. The final rule includes exact language amending the regulation.

Changing the grain standards is a lengthy process, requiring at least one year from initiation until implementation. The public is given the chance to comment throughout the rule-making process, including:

1. Before rule-making at preliminary public and private meetings, or in writing to agency officials whenever an individual, company or group has a concern;
2. During the comment period published in the *Federal Register* notice to change or establish a standard;
3. During the comment period published in the *Federal Register* "Proposed Rule."

FGIS usually allows a 60-day comment period for *Federal Register* actions that would change or establish a standard, and FGIS may allow additional time for comment to parties who request an extension. Oral and written comments should be addressed to the contact identified in the *Federal Register*. FGIS has a special e-mail address, published in the *Federal Register*, which can be used for submitting comments. Changes to the standards usually take effect one year after publication.

Official Weighing Procedures

With few exceptions, official weighing is mandatory for all grain exported from the United States. During weighing operations, technicians employed or licensed by FGIS observe and verify the weighing and loading of grain and monitor scales and grain flow security. The weight may be certified separately or included on the official inspection certificate. "Class X," or official supervision of 100 percent of the weighing process, is required on export grain.

The scales used for the official weighing of grain and commodities must be installed and operated under FGIS guidelines. Scales at export elevators are tested every six months and must remain accurate to the nearest one pound per 1,000 pounds. Accuracy of the standard weights used to calibrate scales is verified every three years, or as needed.

In addition to scale testing, FGIS calibrates 13 railroad master track scales to the National Bureau of Standards' official track scale under an agreement with the American Association of Railroads. These master scales calibrate track scales across the United States.

HOW GRAIN IS WEIGHED

Most U.S. grain is weighed on an electronic weighing system. The system consists of a load receiving element (i.e., weigh hopper, platform, etc., with load cells), an indicating element (i.e., digital instrument), a printer and the associated material handling equipment. The load cell senses the amount of the applied load in the load receiving element and produces an output voltage that is sent to the digital instrument. The digital instrument converts the output voltage into a digital display. The tape printer records the digital display onto a tape or ticket for a permanent record.

Levertronic Scales

There are two types of electronic scales: levertronic and full electronic. Levertronic scales are mechanical scales that have been converted to electronic scales by inserting a load cell into the lever system. The dial used to obtain and print a weight is replaced with a digital instrument and printer.

Full Electronic Scales

In full electronic scales, the load receiving element is either supported by, or rests on, the load cells.

Digital Instrument with Printer

Digital instruments, printers and control boards are located in the control room. The control room is the operations control center for the export elevator. It may be located in the elevator or in a building separated from the elevator.

A digital instrument may have some sort of control that allows the operator to manually or automatically operate the gates of the garners and the scale. In the manual mode, the operator controls the operation of each cycle; in the automatic mode, the scale cycle repeats in succession.

Elevator personnel control equipment with computer graphical displays interfaced to equipment in the elevator. FGIS monitors grain flow with these same graphical displays. Elevator personnel can control bin selection, tripper movement, diversion points, legs, conveyor belts, slides and gates from this board. Official weighing personnel monitor export grain flow after weighing and sampling to assure that all of the grain weighed and sampled is actually delivered to the vessel.

Scale Tapes
In supervising manually operated electronic weighing systems, the official weigher continually verifies that the weight value displayed on the digital instrument is the same as the printed value on the scale tape of the ticket to assure proper system operation and to detect any printer malfunction.

The weight of each draft is added to determine the sublot total. The official weigher records the number of the sublot on the tape and initials the total weight. When the tape is removed from the printer, the official weigher records the time, carrier identification, kind of grain, tape number and scale numbers. If this information is printed on the tape automatically, the weigher verifies the accuracy of the information and initials it.

Since 1989, FGIS has been encouraging export elevators to install automated systems to monitor grain flow paths, maintain weight records, and activate alarms and shut-down devices, if necessary. Such systems can monitor flow paths more diligently than humans and are less likely to record erroneous weights. In addition, they can prompt personnel to perform scale checks and reduce the need for inspection personnel to visit sites inside the elevator. As entering the elevator always involves some risk, an automated system improves safety. The elevator benefits because a properly functioning automation system allows FGIS to operate with a smaller inspection team, and hence charge smaller fees. The elevator is responsible for contracting for the design and installation of the official automated system because it must be integrated with the elevator's own control system. FGIS advises the elevator and contractors during the development of the system, and carefully checks out the system for security and functionality before approving its use. FGIS assumes control of the automated system after its approval. Repairs and upgrades are made by the elevator's automation contractor, but must be approved beforehand and checked out afterward by FGIS.

Official Inspection Procedures

In order to be officially graded, grain must be inspected according to the provisions of the U.S. Grain Standards Act. This means that the equipment and procedures used must be approved and checked regularly for accuracy and that inspectors must be tested for proficiency in carrying out their inspection duties. The U.S. Congress has given FGIS responsibility for carrying out this work. There are five basic operations performed when officially inspecting and weighing grain going aboard a ship: stowage examination, sampling, weighing, inspection and certification.

STOWAGE EXAMINATION

A stowage examination is an inspection that determines if a carrier is fit to receive grain. To be considered fit, the carrier's stowage area must be clean, dry, free of odor and infestation and otherwise suitable for receiving or storing grain, insofar as the suitability may affect the quality, quantity or condition of the grain.

To determine cleanliness, stowage space is examined for:

1. **Previous Cargo**. If the stowage space contains fertilizer, old grain, loose cement, coal, lime, dunnage, refuse or other debris, the space is declared unfit for loading.

2. **Rust Scale and Paint Scale**. Rust scale and paint scale must be checked to see if they could become dislodged from the carrier and contaminate the grain. Loose scale will break when struck with a fist or when light pressure is applied with a knife blade under the edge of the scale. The use of safety goggles is recommended when scraping rust or similar material. Rust scale should not be confused with oxidation rust, which forms on exposed metal surfaces. Oxidation rust will not flake off when light pressure is applied. For ships, the area is declared unfit when a single area of loose rust scale or paint scale is more than 25 square feet (approximately 2.3 square meters), or several patches of loose rust scale or paint scale together exceed 100 square feet (approximately 9.3 square meters).

3. **Unsanitary conditions**. If the stowage space contains any animal filth, rodent excreta, bird excreta, decaying animal or vegetable matter, sewage or any other unsanitary conditions, the space is declared unfit for loading. Sites close to the hatch (e.g., ship deck, top side of the hatch cover) also must be clean.

4. **Unknown substances**. If any unknown substances are found, the space is declared unfit for loading. All unknown substances are considered contaminating. FGIS does not try to identify them but, if possible, FGIS will take samples of the substance and show them to the supervisor for future reference.

To determine dryness, the stowage space is examined for hydraulic fluid, standing water, puddles or any amount of leaking water; if any of these are present, the space is declared unfit for loading.

Condensation, commonly called "sweating," can form on bulkheads or lower decks. This is unavoidable and poses no threat to the grain.

If the stowage space is contaminated with the odor of petroleum, an oil-based chemical, decaying animal or vegetable matter, or any other commercially objectionable foreign odor, the space is declared unfit for loading.

Finally, the stowage space is examined for infestations of rodents and/or insects. The discovery of any live rodents or more than two live insects injurious to stored grain will result in the space being declared unfit for loading.

Inspection Equipment

Moisture: The moisture content in the grain is determined by a standardized DICKEY-john Grain Analysis Computer GAC2100. Moisture does not influence the numerical grade or any special grades. However, it is determined on all shipments and reported on the official certificate.

The sample requirement is approximately 350 grams, but the GAC2100 does not require weighing a portion size. Pour the sample through the divider at least once (to mix the sample) before filling the hopper.

Handle all cold samples quickly to reduce the possibility of condensation in a warm room. Samples on which snow or ice has melted or which contain snow or ice, are unsuitable for moisture testing. The built-in GAC2100 instrument temperature range limit is 10-40 degrees Celsius (50-104 degrees Fahrenheit). The sample temperature range limit is 0-40 degrees Celsius (32-104 degrees Fahrenheit). The sample-to-instrument temperature difference limit is 20 degrees Celsius (36 degrees Fahrenheit). If the instrument finds any of these limits exceeded, it will not display moisture results.

Keep all samples in sealed moisture-proof containers if they cannot be tested within approximately 15 minutes. Do not use paper bags, fiber cartons, or similar containers that allow moisture losses. Use metal cans, plastic containers and plastic bags to preserve the sample integrity. Do not file samples with paper identification inserted in the grain. Paper absorbs moisture and lowers the moisture of the grain.

Paper bags, fiber cartons and so forth are not used as moisture sample containers. Containers found to be the most practical for use in determining moisture are moisture-proof, plastic 475-ml

containers with openings of approximately 45 mm. Paper identification should not be inserted in the grain samples.

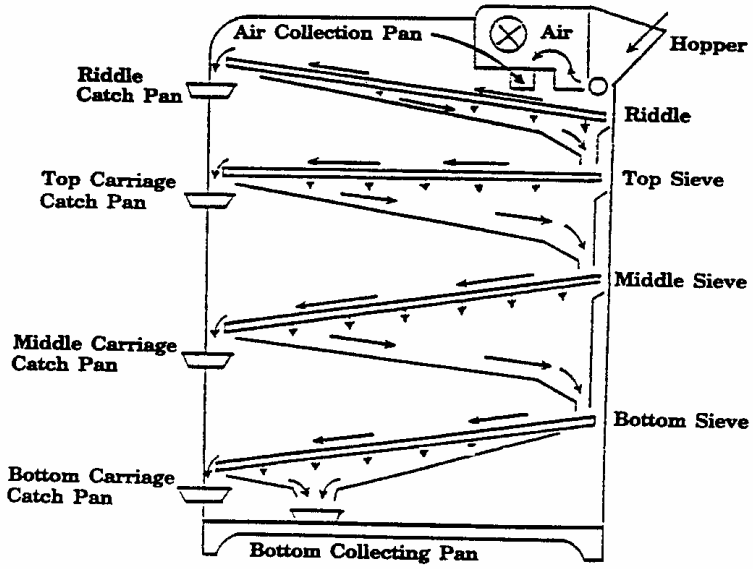
Because of wide variations between room and grain temperatures throughout the year, it is not possible to predict exactly how long after the thermometer has been inserted into the grain that the temperature should be read. Generally, three to five minutes is sufficient to obtain an accurate temperature.

Dockage: Dockage is a factor determined for barley, flaxseed, rye, sorghum, triticale and wheat, but not for other grains. Dockage consists of material which can be easily removed by machine and includes material lighter than, larger than and smaller than the grain.

Dockage is determined with a special machine called the Carter Dockage Tester, which uses aspiration (air) and a combination of riddles and sieves to remove materials lighter or of a different size than the grain. The flow chart below describes the testing process.

Like moisture, dockage does not influence the numerical grade of the grain, but it always is determined and reported on the certificate.

After dockage is removed, a portion of the sample is manually examined for foreign material, which is all material remaining in the sample other than the predominant grain. Foreign material includes materials which could not be separated mechanically, such as seeds and other grains similar in size and weight to the grain.



The Dockage Tester also is used to determine the percentage of broken corn and foreign material in corn. Broken corn and foreign material is a grading factor in corn.

Test weight per bushel: Test weight per bushel is the weight of the grain required to fill a level Winchester bushel measure (approximately 35.2 liter capacity). The factor "test weight per bushel" is determined using an approved apparatus which has a kettle capacity of 1 dry quart (approximately 1.1 liters). This determination is made on a representative portion of grain, not less than 1 1/8 to 1 1/4 quarts (1.2 to 1.4 liters) cut from the representative sample using a Burner divider.

Test weight per bushel is a grading factor. Generally, it is expressed in pounds per Winchester bushel, but upon request it will be converted to kilograms per hectoliter.

To determine test weight, the work sample is poured into the closed hopper which is centered over the kettle. The valve is opened to allow the grain to fill the kettle. A standard stoker held in both hands with the flat sides in a vertical position is used to remove the excess grain from the top of the kettle with three full-length, zigzag motions. The kettle is hung on the beam, and the beam weights are moved until the beam is perfectly balanced. Then the test weight per bushel is read.

Official U.S. Standards: Barley

Detailed grades and standards for barley ensure that importers receive exactly the type and quality of barley that they want. There are over 100 varieties of barley grown commercially in the United States and an importer can specify an order detailed as to an individual variety if needed.

For most importers, simple grade specifications will suffice to guarantee the buyer gets exactly what is needed. A typical barley requirement will define the grade (No. 1 through sample grade), the type (two-row or six-row barley), the minimum or maximum protein level, moisture levels, test weight and foreign material tolerances. If the barley is being purchased to make malt, germination and plumpness levels should be contractually stipulated.

Barley is an excellent feed grain for growing and finishing livestock animals. The relatively high protein content in barley reduces the need to supplement feed rations with high protein additives, which reduces the cost of that ration. Differences between barley varieties

have little effect on animal performance; both feed and malting varieties have proven to be excellent animal feed. Barley is divided into three classes based on kernel characteristics: six-row barley, two-row barley and barley. The class barley has no subclasses; six-row barley and two-row barley are divided into subclasses based on their malting qualities.

Six-row malting barley is divided into three numerical grades, and two-row malting barley is divided into four numerical grades. All classes on barley not designated as "malting" are divided into five numerical grades and U.S. Sample grade. Special grades are provided to emphasize special qualities or conditions affecting the value of barley and are added to and made a part of the grade designation. They do not affect the numerical or sample grade designation. In general, a kernel of barley is considered damaged for inspection and grading purposes only when the damage is distinctly apparent and recognized as damaged for commercial purposes.

Blight-damaged kernels are kernels and pieces of barley kernels that are covered at least one-third or more with fungus or mold. Blight discolorations should not be confused with badly stained, weathered or water-stained kernels or kernels that have black discoloration on the tip of the germ end due to weather conditions. Barley containing more than 4 percent of blight-damaged kernels is designated "blighted."

Malt-damaged kernels are kernels and pieces of barley kernels that have undergone the malting process and show any degree of sprout.

Frost-damaged kernels are kernels and pieces of barley kernels that are badly shrunken and/or distinctly discolored black, brown or green by frost.

Germ-damaged kernels (sick and/or mold) are kernels and pieces of barley kernels that have discolored germ due to heat or mold from respiration. This includes barley injured by heat.

Heat-damaged kernels are kernels and pieces of barley kernels that are damaged by heat. The determination for heat-damaged kernels is made on a pearled portion.

Weevil or insect-bored kernels are kernels and pieces of barley kernels that have been bored or tunneled by insects.

Mold-infected kernels are whole kernels of barley that are covered 50 percent or more with a mold-like substance.

Sprout-damaged kernels are kernels and pieces of barley kernels that have sprouted, that have swelling over the germ and that show sprout after examination.

Dockage (DKG) in barley is non-barley matter removed from the sample by the Carter Dockage Tester. Dockage is recorded to the nearest hundredth percent, unless it is 1 percent or more.

Foreign material (FM) in barley is all matter that remains in the sample after the removal of dockage. FM is determined on 25 grams of dockage-free barley and is recorded on the official certificate to the nearest tenth.

To read the U. S. standards for barley issued by the Grain Inspection, Packers and Stockyards Administration, see Appendix C. Or visit :
www.usda.gov/gipsa/reference-library/standards/standards.htm

Officials U.S. Standards: Corn

There are six grades or standards for U.S. yellow corn: Grades No. 1 through 5 and Sample grade. No. 1 is the most desirable, followed by No. 2, down on to Sample grade. The vast majority of commercial trade within the United States is traded as U.S. No. 2 or No. 3. The corn milling and livestock industries use these grades as a standard, but routinely utilize grain of lower grades at a discount without difficulty. Along these lines, exports also are generally traded as U.S. No. 2 and No. 3.

Buyers should remember that these are guidelines the industry uses to facilitate trade and handling efficiency. The existence of these standards does not preclude the buyer from specifying, by individual factor, exactly what product the buyer wishes to buy. The U.S. grain handling industry is capable of providing, at a cost, nearly any level of tolerance the buyer is willing to pay for.

Corn is divided into three classes based on color: yellow corn, white corn and mixed corn. Each class is divided into five U.S. numerical grades and U.S. Sample grade. Special grades are provided to emphasize special qualities or conditions affecting the value and are added to and made a part of the grade designation. They do not affect the numerical or sample grade designation.

Broken corn and foreign material (BCFM) are determined using the Carter Dockage Tester machine. Broken corn (BC) is all matter that

passes through a 12/64-inch (4.8 mm) round-hole sieve and over a 6/64-inch (2.4 mm) round-hole sieve. Foreign material (FM) is all matter that passes through a 6/64-inch round-hole sieve and all that remains on top of a 12/64-inch round-hole sieve. All matter other than corn remaining in the sample is removed by hand (sweet corn and popcorn are considered FM.)

BCFM are recorded to the nearest tenth on the shipping log and the total of the two, BCFM, is recorded to the nearest tenth on the official inspection certificate. This information will provide the miller with the exact amount of millable and non-millable material.
In general, a kernel of corn is considered damaged for inspection and grading purposes only when the damage is distinctly apparent and can be recognized as damaged for commercial purposes.

Blue-eyed mold damage occurs when a germ is infected with blue-eye mold, regardless of the amount.

Purple plumule is a genetic or varietal characteristic which does not constitute damage and should not be confused with blue-eye mold.

Cob rot is caused by a fungus that attacks weakened plants and produces a distinct coloration or rotting.

Drier-damaged kernels are kernels and pieces of kernels which are wrinkled, discolored, blistered, puffed or swollen in appearance. They are germ-damaged, with peeled or peeling seed coats or a fractured or checked appearance. Drier damage should not be confused with heat damage.

Germ-damaged kernels are kernels and pieces of kernels damaged by respiration or heat but not materially discolored.

Heat-damaged kernels are kernels and pieces of kernels that are materially discolored by excessive respiration, with the dark discoloration extending out of the germ through the sides and into the back of the kernel.

Heat-damaged kernels (drier) are kernels and pieces of kernels that are puffed or swollen and materially discolored by external heat caused by artificial drying methods.

Insect-bored kernels are kernels and pieces of kernels with obvious insect-bored holes, tunneling insect webbing or insect refuse. Kernels that are partially eaten but entirely free of refuse, webbing or other types of damage are not considered damaged.

Mold-damaged kernels are kernels and pieces of kernels infected with mold on the exposed endosperm. When a kernel is cracked or broken, the starch is exposed and it becomes susceptible to mold. Mold is usually blue or green in color. If the surface mold penetrates the kernel, it is considered damaged. Kernels that have dirt on them should not be confused with kernels containing mold.

Discolored kernels that contain a mold-like substance are considered damaged when whole kernels are 50 percent or more covered.

Surface mold (blight) - kernels and pieces of kernels that have mold caused by corn leaf blight. While it appears to the eye only on the surface, it actually penetrates the seed coat.

Mold (Pink Epicoccum) - kernels and pieces of kernels that have a mold-infected germ.

To read the U. S. standards for corn issued by the Grain Inspection, Packers and Stockyards Administration, see Appendix D. Or visit : www.usda.gov/gipsa/reference-library/standards/standards.htm

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Official U.S. Standards: Sorghum

Sorghum is divided into four classes, based on tannin content and color: sorghum, tannin sorghum, white sorghum and mixed sorghum. The different types are identified by color but the characteristic which sets each apart from the other is tannin content.

Sorghum Classes:

1. Sorghum - Low in tannin content due to the absence of a pigmented testa (subcoat) and contains less than 98 percent white sorghum and not more than 3 percent tannin sorghum. The pericap color of this class may appear white, yellow, pink, orange, red or bronze.

2. Tannin Sorghum - Sorghum that is high in tannin content due to the presence of a pigmented testa (subcoat) and contains not more than 10 percent non-tannin sorghum. The pericap color of this class is usually brown but may also be white, yellow, pink, orange, red or bronze.

3. White Sorghum - Sorghum which is low in tannin content due to the absence of a pigmented testa (subcoat) and contains not more than 2 percent sorghum of other classes. The pericap color of this class is white or

translucent and includes sorghum containing spots that cover 25 percent or less of the kernel.

4. Mixed Sorghum - Sorghum that does not meet the requirements for any of the other classes.

Each class is divided into four numerical grades and U.S. Sample grade. Special grades are provided to emphasize special qualities or conditions affecting the value of sorghum. Special grades are added to and made a part of the grade designations. They do not affect the numerical or grade designation.

Nearly all sorghum that trades in export channels today is No. 2 grain sorghum. Buyers who intend to purchase sorghum for the purpose of feeding livestock will get better results with this low-tannin sorghum, which is now 99 percent tannin free.
Broken kernels (BN) are all matter which passes through a 5/64-inch (2.0 mm) triangular-hole sieve and over a 2 1/2 by 64-inch (1.0 mm) round-hole sieve. Foreign material (FM) is all matter, except sorghum, that remains on top of the 5/64-inch triangular-hole sieve. BN and FM are each recorded to the nearest tenth percent on the shipping log, and the total of the two (BNFM) is recorded to the nearest tenth percent on the official inspection certificate.

In general, a kernel of sorghum is considered damaged for inspection and grading purposes only when the damage is distinctly apparent and can be recognized as damaged for commercial purposes.

Germ-damaged kernels are kernels and pieces of kernels of sorghum that contain dark colored germs after leaching.

Ground and/or weather-damaged kernels are kernels and pieces of kernels that contain dark stains or discolorations and have a rough, cake-like appearance. This type of damage is caused by ground and/or weather conditions.

Heat-damaged kernels are kernels and pieces of kernels of sorghum that are materially discolored and damaged by heat. It is usually necessary to cross-section the kernels to determine if the color is creamy.

Mold-damaged kernels are kernels and pieces of kernels containing surface mold and should not be confused with dark stains or discolorations caused by ground and/or weather conditions.

Sorghum with a mold-like substance is considered damaged when over half of the whole kernels of sorghum or pieces of kernels are discolored and covered with a mold-like substance.

Sprout-damaged kernels are kernels and pieces of kernels where the sprout clearly protrudes from the germ. If there is a split over the germ area but no sprout protruding, it is not considered sprout-damaged.

Insect-bored kernels are kernels and pieces of kernels of sorghum that have been bored or tunneled by insects.

To read the U. S. standards for sorghum issued by the Grain Inspection, Packers and Stockyards Administration, see Appendix E. Or visit :
www.usda.gov/gipsa/reference-library/standards/standards.htm

INTERPRETIVE FACTORS – VISUAL GRADING AIDS

The visual grading aids system was developed by the FGIS Board of Appeals and Review to assist inspectors in making subjective grading decisions and to reduce intermarket differences in inspection results. This system consists of Interpretive Line Slides and Interpretive Line Prints. Reference is made to the visual grading aids throughout the grain inspection manuals.

The Interpretive Line Slide System consists of a portable table-top viewer and photographic slide transparencies. The portable viewer uses a precisely controlled light source of desired intensity and quality. The Interpretive Line Slides are placed on the viewer at the inspection table to aid the inspector in making grading decisions.

The slides are designed for use with the special viewer only. If they are used in a normal slide projector, they will become bleached by the high intensity light, rendering them unusable for the comparative purposes for which they were intended.

Interpretive Line Prints are photographs exhibiting a particular attribute. These prints allow a more uniform application of the general appearance factors. Both the Interpretive Line Slides and Prints are available for viewing at every FGIS Field Office and are available for purchase from the manufacturer.

Fumigation and Grain Protectants

A fumigant is a gas which penetrates the grain kernels and kills insects at all life stages: eggs, larvae and adults. Also, gas grain protectants are applied to the surface of grain and kill adult insects on contact, but do not kill insect eggs.

When a portion of cargo is graded "infested," the exporter can accept the official certificate with "infested" designation, return the infested cargo to the elevator or continue to load the vessel and then fumigate it in transit, following procedures specified by FGIS. If the exporter selects the last option, the "infested" designation is not reported on the certificate because the condition is considered remedied.

The fumigation of vessels in transit with an aluminum phosphide fumigant formulation is a widespread, proven safe practice.

The fumigation is performed by a registered applicator. FGIS personnel observe the fumigation to assure that it is performed according to correct procedures. FGIS requires the applicator to sign a statement on the applicator's company's letterhead stating that the fumigant was applied according to U.S. government regulations and the manufacturer's instructions.

Phytosanitary Certificate

When an importing country has phytosanitary regulations prohibiting the entry of certain pests, the U.S. government will examine the cargo for the presence of the prohibited pests and issue a phytosanitary certificate. This certificate is issued by the USDA's Animal and Plant Health Inspection Service (APHIS), not by FGIS.

UNIFORM INSPECTION PLAN/CERTIFICATE

During the loading of an export grain vessel, FGIS follows a uniform plan for sampling and inspection. A shipment or "lot" of grain is divided into "sublots" for the purpose of maintaining quality. The sublot size is based on the hourly loading rate of the elevator and the capacity of the vessel being loaded. A sublot may represent up to approximately 3,000 metric tons. The grade and factors determined on each sublot must meet, within specified tolerances, the official grades and factors requested in the applicant's load order. Sublots that do not meet specified tolerances can be removed from the shipment or certified separately. Otherwise, FGIS certificates represent the entire lot of grain based on the weighted average of sublot results at the time of loading.

The uniform inspection plan for shiplots is called the Cu-Sum Plan. It establishes statistically-based tolerances known as breakpoints for accepting those occasional portions of a lot that, due to known sampling and grading variations, may grade below the desired lot quality. The Cu-Sum Plan was adopted to ensure that the entire lot is of uniform quality.

The inspector uses an inspection log to record his findings for each sublot. Each log contains all of the factor results for each sublot, plus any other observations made by the sampler and inspector. It is a complete record of all inspection information concerning the lot. This record is retained by FGIS; however, a buyer can obtain a copy by requesting it in the contract.

The product of all analyzing, grading and monitoring is the Official Export Grain Inspection Certificate. There are two options under which shiplot grain can be loaded and certified. Under Option 1, the exact grade must be loaded; with Option 2, the exact grade or a better grade can be loaded. Option 2 gives the shipper more flexibility and gives the buyer a potentially better quality of grain.

While the grain standards denote a general level of quality, more stringent criteria can be requested in a contract. For example, if a buyer contracts for U.S. No. 2 or better yellow corn and 3 percent BCFM is excessive for the enduse, the contract can specify "U.S. No. 2 or better yellow corn, maximum 2.5 percent BCFM." However, more stringent criteria may command a premium price.

It is also important to specify in the contract all of the optional testing services FGIS is to perform, such as "aflatoxin testing to be performed by FGIS." If FGIS is not specified to perform the test, then it may be done by a private laboratory.

A sample of an inspection log is included at the end of the manual as Appendix K.

Complaints

If a discrepancy between grain quality at origin and destination occurs, an importer can register a complaint with the U.S. Embassy's agricultural counselor, attaché or trade officer. The embassy will then notify the USDA's Foreign Agricultural Service (FAS) in Washington, D.C., who in turn will notify the FGIS Office of International Affairs (OIA). The OIA will review the complaint, gather information about the reported discrepancy and respond to the complaint. However, FGIS does not issue a new certificate, nor does it function as an arbitrator between buyer and seller.

File samples are held for 90 days after loading. If they are available when the complaint is filed, they will be re-examined during the investigation. If a receiver chooses to submit a sample from destination, then it will also be examined. The FGIS findings are sent in a report through the U.S. Embassy to the originator of the complaint. The facts in the response are available to any person having financial interest in the grain.

GRAIN QUALITY IMPROVEMENT ACT OF 1986

The Grain Quality Improvement Act of 1986 required FGIS to revise certain procedures in order to enhance the quality of U.S. grain exports. The act addressed three primary areas: grain handling practices, insect tolerances and the usefulness of grain standards.

Before the implementation of this act, some elevator operators removed and stored dust, dockage and foreign material during grain handling to reduce dust levels in the elevator, then recombined it before loading the vessel. This practice is no longer permitted. While the act prohibits recombining dust that has been removed and stored, it does not require dust to be removed.

More stringent insect tolerances became effective in May 1988.

Finally, FGIS is required to study the need for additional end use value tests for grain.

For further information on U.S. grading and sampling standards, contact:

Federal Grain Inspection Service, USDA/GIPSA
Room 1627 -- South
14th and Independence Avenue, SW
Washington, DC 20250
Phone: (202) 720-0226
FAX: (202) 720-1015
Email: John.B.Pitchford@usda.gov