



GRAINS - GRADING AND CLASSIFICATION - CORN

PNS/BAFS 10:2017

ILLUSTRATIVE GUIDE



Grains - Grading and classification - Corn
(PNS/BAFS 10:2017)

Bureau of Agriculture and Fisheries Standards (BAFS)
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Introductory Note

In 2016, the Philippine National Standard (PNS) for Grains – Grading and Classification – Corn was revised in order to account for recent scientific and technological data from local and international studies on the specifications for whole shelled grain of flint maize (*Zea mays* L. var *indurata*), dent maize (*Zea mays* L. var *indenta*) and glutinous/waxy maize (*Zea mays* L. var *ceratina*). The PNS aims to specify the minimum requirements for the said corn commodities ready for its intended use as human food or animal feed, presented in packaged form or sold or delivered loose from the package directly to the user.

This year, BAFS developed the Illustrative Guide for PNS Grains – Grading and Classification – Corn in order to further illustrate the PNS provisions, and to facilitate better appreciation and adoption of standards. The IG contains supplementary photographs or images of the adopted or draft PNS covering quality matters.

For more information, please visit our website <http://www.bafs.da.gov.ph> and Facebook page (<https://www.facebook.com/da.bafs>).

Director's Message



Food security and food availability are the current thrusts of the Department of Agriculture. The Bureau of Agriculture and Fisheries Standards (BAFS) is one with the DA in surmounting this challenge by developing standards for commodities such as corn products.

Considered as the second most important crop in the Philippines, corn is one of the major sources of livelihood for farmers, transporters, processors, and agri-input suppliers.

Thus, we need to inform our stakeholders of the Philippine National Standards (PNS) that will ensure the safety and quality of corn-related products.

With this, we are proud to share with you the Illustrative Guides (IGs) of the Philippine National Standards (PNS) for Grains - Grading and classification - Corn (PNS/BAFS 10:2017), and PNS for Corn (maize) grits - Grading and classification (PNS/BAFS 15:2018). These IGs will serve as supplementary learning materials.

The Bureau is hopeful that this document will aid the Philippine corn industry towards achieving food and feed self-sufficiency.


VIVENCIO R. MAMARIL, PhD
Director IV
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Scope

This standard applies to shelled maize (corn) ready for its intended use as human food or animal feed, presented in packaged form or sold or delivered loose from the package directly to the user. This standard specifies requirements for the whole shelled grain of flint maize (*Zea mays* L. var *indurata*), dent maize (*Zea mays* L. var *indentata*) and glutinous/waxy maize (*Zea mays* L. var *ceratina*).

Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

PNS/BAFPS 10:2004 - Grains - Corn (*Zea mays indentata* Linn, *Zea mays indurate* Linn. and *Zea mays ceritina* K. Sturt. syn *praecox*) - Grading and Classification

The standard below contain provisions, which through reference in the text form part of this national standard. At the time of publication of this PNS, the editions indicated were valid:

ISO 712: 2009 - Cereals and cereal products - Determination of moisture content - Reference method



Aflatoxin

group of highly poisonous and carcinogenic compounds which are produced by strains of the fungi, *Aspergillus flavus* and *Aspergillus parasiticus* on suitable substrate such as corn, peanuts, copra, and other oilseeds, etc. Aflatoxin content is expressed in parts per billion (ppb)

(Note: Photos indicate corn as substrates infected with *Aspergillus parasiticus* and *Aspergillus flavus*)



Broken kernels

pieces of kernels of corn that will pass through US sieve No. 4: a metal sheet perforated with round holes 4.76 mm or 12/64 inch in diameter

Damaged kernels

kernels or pieces of kernels of corn which are damaged by heat or water, sprouted, moldy, or insect-bored



Damage due to rotting



Heat-damaged kernels



Insect-bored kernels



Sprouted kernels



Source: Grain SA

Water-damaged kernels



Source: R.L. Nielsen

Shriveled and immature kernels

kernels which are not fully developed, thin and papery in appearance, except where shriveled is considered a varietal characteristic



Filth
impurities of animal origin

Foreign matter
all matters other than corn grains such as sand, gravel, dirt, pebbles, stones, lumps of earth, clay mud, chaff, straw and seeds of other crops

Maize or corn grain

whole shelled grain of the species defined in the scope and it is also alternatively called kernel

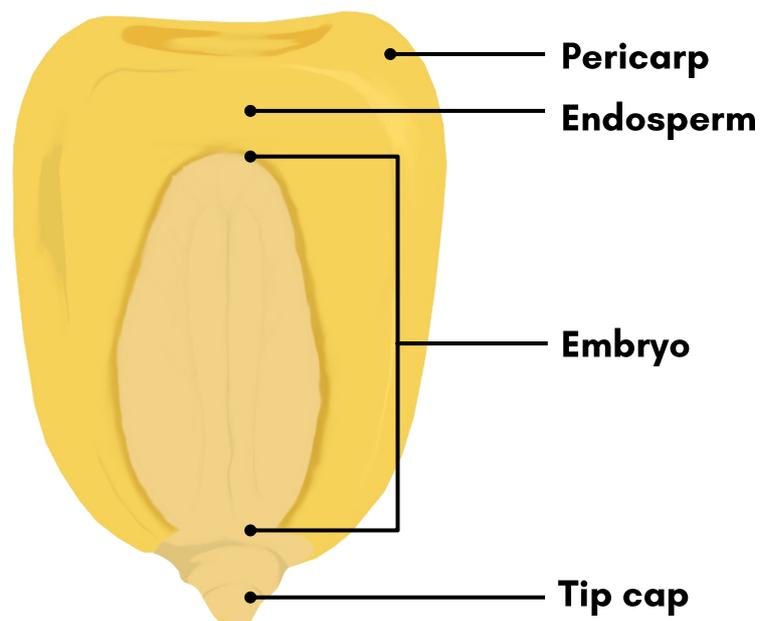
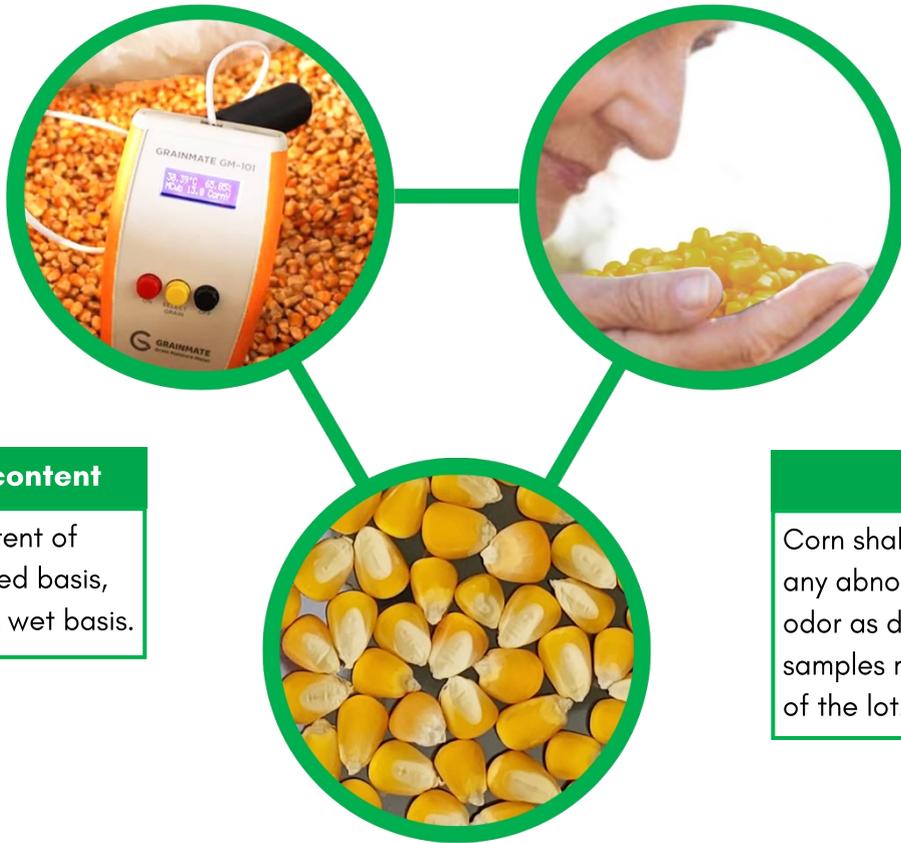


Figure 1. Parts of a corn grain



Moisture content

The water content of corn, as received basis, expressed in % wet basis.

Odor

Corn shall not contain any abnormal or foreign odor as determined from samples representative of the lot.

Color

Corn shall reasonably be in uniform color according to type.

4.1 Class

**Flint corn**

Corn kernel with hard endosperm on all sides and inner portion. The color of the endosperm is either white or yellow.



Source: R. Suleiman, K.A. Rosentrater

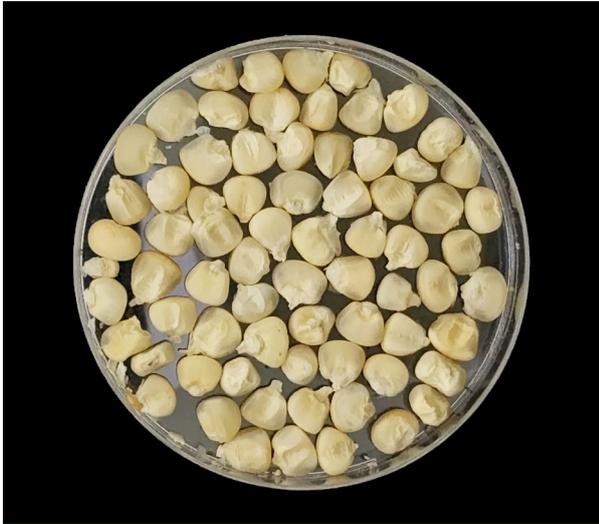
Dent corn

Corn kernels which have a dent in the broad end of the kernels caused by shrinkage of soft starch between the two layers of corneous starch at the sides of the endosperm.

**Glutinous/Waxy corn**

A type of corn which contains large proportion of amylopectin compared to amylose and is usually dull white.

4.2 Type



White corn

Corn grains of white color with not more than the permitted percentage of corn of other colors as indicated in the grade requirement for corn. A slight tinge of color other than white shall not affect their classification as white corn.



Yellow corn

Corn grains of yellow color with not more than the permitted percentage of corn of other colors as indicated in the grade requirement for corn. A slight tinge of color other than yellow shall not affect their classification as yellow corn.



Mixed corn

Consists of corn grains of the same class but of different colors.

Shelled corn shall be in accordance with the quality grade requirements specified in Table 1.

Table 1. Quality grade requirements for shelled corn

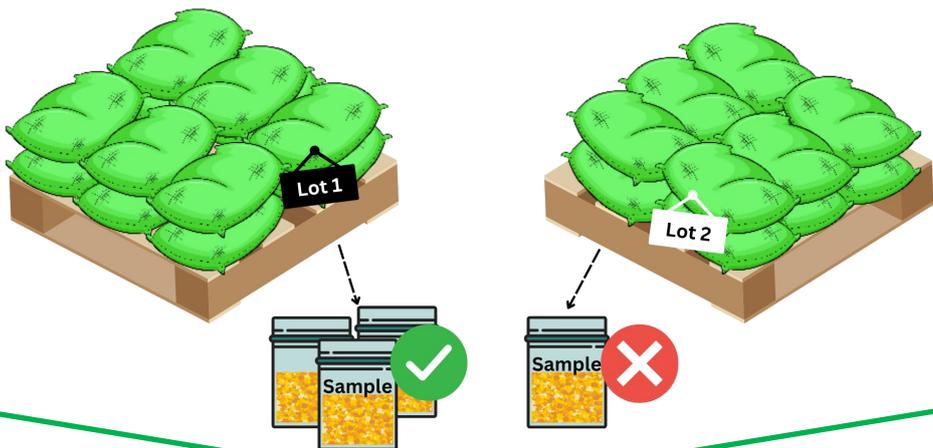
Grade factor, maximum	Grade			
	Premium	Grade No. 1	Grade No. 2	Grade No. 3
Moisture content, (% by weight)	14.00	14.00	14.00	14.00
Aflatoxin, (ppb)				
Food	20.00	20.00	20.00	20.00
Feed	20.00	20.00	50.00	50.00
Filth, (% by weight)	0.10	0.10	0.10	0.10
Corn of other colors, (% by weight)	2.00	4.00	6.00	8.00
Foreign matter, (% by weight)	0.50	1.00	1.50	2.00
Shriveled and immature kernels, (% by weight)	1.50	3.00	5.00	7.00
Broken kernels, (% by weight)	1.00	2.00	4.00	6.00
Damaged kernels, (% by weight)	3.00	5.00	7.00	10.00
Moldy kernels, (% by weight)	0.10	0.10	0.10	0.10

Sampling method to be used for ascertaining conformance to the requirements of this specification shall be in accordance with ISO 950: 1979.

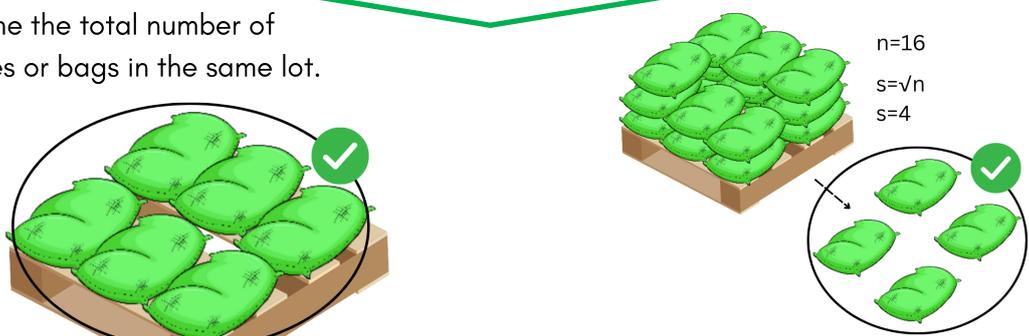
Sampling should be done by classifiers or quality assurance personnel deputized by a competent authority.

Sampling Procedure for Corn

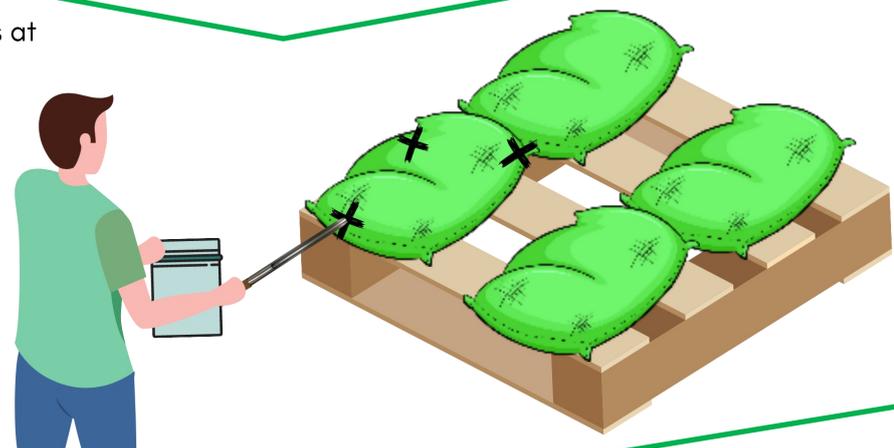
1. Make sure that the samples are from the same lot.



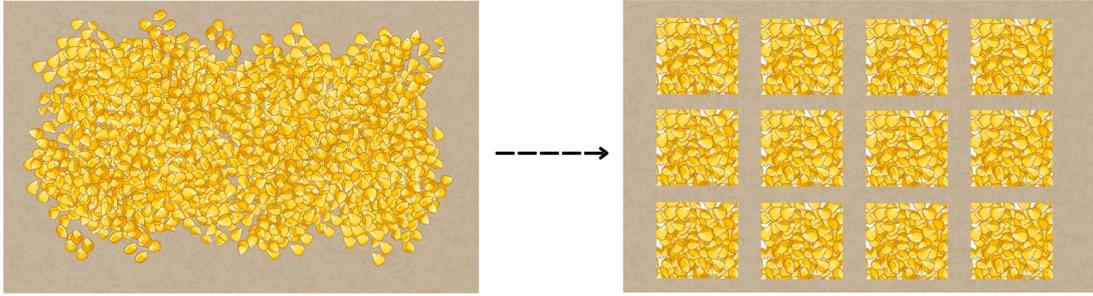
2. Determine the total number of packages or bags in the same lot.



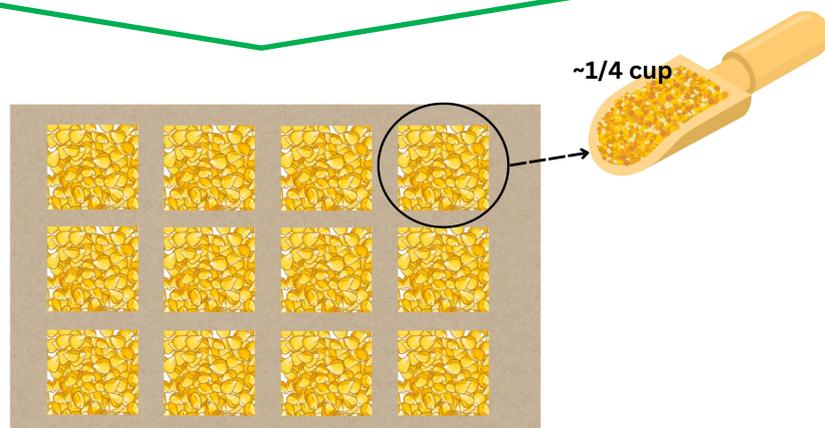
3. Probe from (n) packages at random at 3 points.



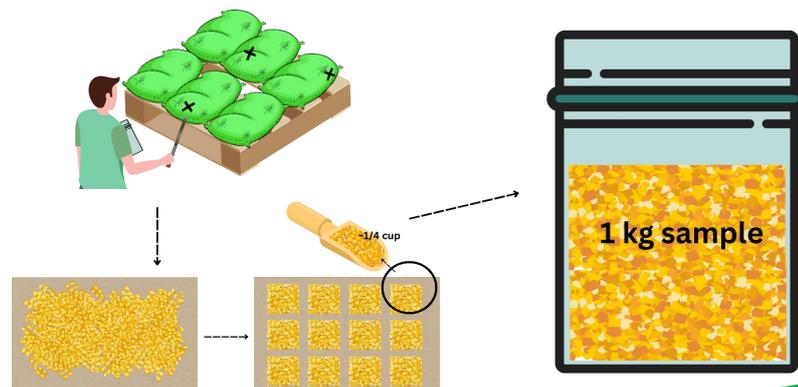
- 4.** Mix thoroughly on a clean sheet, flatten and partition into 12 divisions to 20 divisions.



- 5.** Get one scoop (approximately ¼ cup) from each partition.



- 6.** Repeat procedures 3, 4, and 5 until you get a laboratory sample of approximately 1 kg.



- 7.** Submit for laboratory analysis.



The moisture content of the grains shall be determined using officially calibrated moisture meters which are appropriate for the purpose and in accordance with ISO 712:2009 or other equivalent and validated methods.



Grain moisture meters

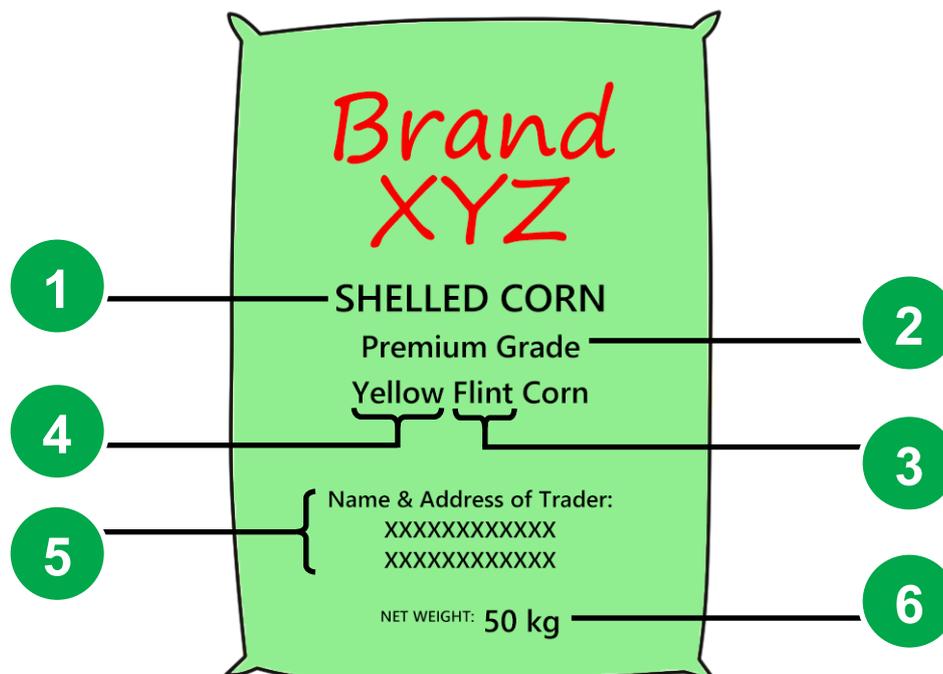
8.1 Packing

Shelled corn shall be properly packed in new 50 kilogram capacity light green woven polypropylene sacks to protect them against mechanical damage and to facilitate handling, and transport.

8.2 Labelling

Each sack shall have a label or legible characters grouped on the same side, stamped in indelible ink to provide the following:

1. Name of product;
2. Grade;
3. Class;
4. Type;
5. Name and address of the Trader; and
6. Net weight in kilograms.



Sample packaging for shelled corn

Additional note:

For shelled corn intended as feed ingredient, additional labeling information is required per Section 5 of the Bureau of Animal Industry (BAI) Administrative Order No. 12 Series of 2007 – the Revised Implementing Rules and Regulations on the Registration of Feed Establishments and Feed Products.

9.1 Contaminants

Aflatoxin

The aflatoxin level for shelled corn shall comply with the allowable levels established by this standard and by the Codex Alimentarius Commission.



Heavy metals

The maximum residue levels of heavy metals for shelled corn shall comply with the Codex Alimentarius General Standard on Contaminants and Toxins in Food and Feed.

Pesticide residues

Shelled corn shall comply with those maximum residue levels established by the Codex Alimentarius Commission for this commodity.

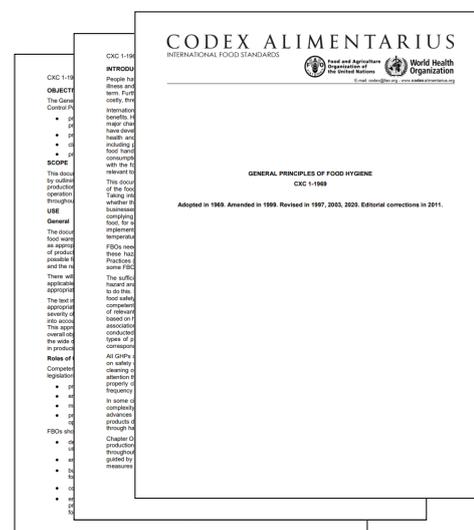


Other mycotoxins

Shelled corn shall comply with those maximum levels of other mycotoxins established by the Codex Alimentarius Commission for this commodity.

9.2 Hygiene

It is recommended that the provisions of this Standard for Corn be implemented in accordance with appropriate sections of the Recommended International Code of Practice General Principles of Food Hygiene (CAC/RCP 1 - 1969, Rev. 4 - 2003) and other relevant Codex texts such as Codes of Hygiene practice and Codes of Practice.



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An Illustrative Guide (IG) serves as a supplementary Philippine National Standards (PNS) learning material to aid stakeholders to have uniform understanding and interpretation of the PNS for its efficient adoption and implementation.

The development of IG for PNS/BAFPS 10:2017 Grains - Grading and Classification - Corn was initiated in 2022 in view of the promotion and adoption of standards. Specifically, this IG for Shelled Corn provides supplementary photographs or images pertaining to some provisions of the end-product quality standard for shelled corn.

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