

PHILIPPINE NATIONAL STANDARD

PNS/BAFS 193:2017

Good Warehousing Practices (GWP) for Bagged Grains



BUREAU OF AGRICULTURE AND FISHERIES STANDARDS

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Foreword

This Philippine National Standard (PNS) for the Good Warehousing Practices (GWP) for Grains PNS/BAFS 193:2017, intends to provide guidance on the general warehousing practices for the handling, storage and transport of grains.

A Technical Working Group (TWG) for the crafting of the said standard was created through Special Order No. 339 Series of 2015 spearheaded by the Department of Agriculture through the Bureau of Agriculture and Fisheries Standards (BAFS) with representation from other government agencies namely Bureau of Plant Industry (BPI), Central Agricultural and Fishery Engineering Division (CAFED), National Corn Program, National Food Authority (NFA), Philippine Center for Postharvest Development and Mechanization (PHilMech), academe namely Isabela State University (ISU) and University of the Philippines Los Baños (UPLB) and private sector namely Grain Retailers Confederation of the Philippines (GRECON).

This document was drafted in accordance with the editorial rules of the BPS Directives, Part 3.

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1 Objectives

This Code aims to provide specific guidance for the appropriate handling, storage and transport of bagged grains to ensure prevention and reduction of physical, biological and chemical hazards that affect the quality, quantity and safety of bagged grains during storage.

2 Scope, use and terms and definitions

2.1 Scope

This Code covers warehouse design and warehousing practices relevant to handling, storage and transport of bagged grains specifically for food and feed consumption. It also considers the provisions of the Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP) to ensure food safety, quality of produce and worker's health, safety and welfare.

2.2 Use

This Code considers the latest edition of the following references including any amendments:

- a) *Republic Act 10611: The Food Safety Act and its Implementing Rules and Regulations (IRR)*;
- b) *National Food Authority (NFA)'s Revised Rules and Regulations on Grains Business*;
- c) *Primer on Philippine Grain Standardization Program*; and
- d) *Philippine National Standard on Good Agricultural Practices (GAP) for Corn (PNS/BAFPS 20:2008) and Rice (PNS/BAFS 141:2014)*.

Moreover, this Code is consistent with the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains*. Relevant provisions that pertain to practices that ensure prevention and reduction of physical, biological and chemical hazards that affect the quality, quantity and safety of bagged grains during storage and promote agricultural product safe-keeping and quality preservation are expounded in this Code.

2.3 Terms and definitions

For the use of this Code, the following terms should apply:

2.3.1

contaminant

any substance not intentionally added to food, which is present in such food as a result of the production (including operations carried out in crop husbandry, animal husbandry and veterinary medicine), manufacture, processing, preparation, treatment, packing,

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packaging, transport or holding of such food or as a result of environmental contamination. The term does not include insect fragments, rodent hairs and other extraneous matter.

2.3.2**contamination**

introduction or occurrence of a hazard into the environment

2.3.3**farm**

any premise or area in which crops especially grains are grown and harvested

2.3.4**feed**

any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial animals (except bees)

2.3.5**fertilizer**

includes any solid or liquid substance either organic or inorganic nutrient elements – singly or in combination with other materials, applied directly to the soil, foliage or plant for the purpose of promoting plant growth, increasing crop yield or improving product quality

2.3.6**food**

any substance or product whether processed, partially processed or unprocessed that is intended for human consumption. It includes drinks, chewing gum, water and other substances which are intentionally incorporated into the food during its manufacture, preparation and treatment

2.3.7**food safety**

assurance that food will not cause harm to the consumer when it is prepared or eaten according to its intended use

2.3.8**Good Agricultural Practices (GAP)**

practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products

2.3.9**Good Manufacturing Practices (GMP)**

quality assurance system aimed at ensuring that products are consistently manufactured, packed, repacked or held to quality standards appropriate for the intended use. It is thus concerned with both manufacturing and quality control procedure

2.3.10**grains**

shall mean the shelled, hulled or unhulled, seeds or fruits of various food plants more specifically the cereal grasses

NOTE The term 'shelled' shall be used for corn while the term 'hulled or unhulled' shall be used for rice.

2.3.11**hazard**

biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect

2.3.12**milled rice**

product obtained after the removal of hull and bran

2.3.13**pest**

can be unwanted animals or insects that affect the quality and safety of grains

2.3.14**pesticide**

any substance or product, or mixture thereof, including active ingredients, adjuvants and pesticide formulations, intended to control, prevent, destroy, repel or mitigate directly or indirectly, any pest

2.3.15**shelled corn**

corn kernels, either dent or flint varieties of the plant *Zea mays*. It is also known as 'maize' or 'corn grain'

2.3.16**warehouse**

building used for storing paddy, milled rice and other grains in bags

2.3.17**warehousing practices**

system or procedure of storing goods to ensure that these are always available, accessible and in good condition

3 Site Location and Construction

3.1 This Section shall conform to the provisions of the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains*.

3.2 In addition to the requirements specified in PNS/PAES 419: 2015, the following are additional considerations:

3.2.1 The warehouse should be constructed away from sources of potential hazards that may affect the quality of produce and pose risk to the worker's health and safety.

3.2.2 The warehouse should be located away from:

3.2.2.1 environmentally polluted areas;

3.2.2.2 sources of industrial activities;

3.2.2.3 flood prone areas;

3.2.2.4 zones that may encourage insect infestation and entry of stray animals; and

3.2.2.5 places where waste either solid or liquid cannot be removed effectively.

3.2.3 The warehouse should be constructed where there is accessible road.

3.2.4 The load-bearing capacity, resistance to compaction and drainage characteristics of soil in which the warehouse is to be constructed should be considered.

3.2.5 The location and distance of the warehouse from other farm structures or the production area should also be considered during construction.

3.2.6 Other factors that may be taken into account are the following: accessibility, ease of movement of stocks, and provision for vehicle movement and maneuvering.

4 Warehouse Design and Specification

This Section shall conform with the provisions of the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains and Food and Agricultural Organization (FAO): The Purposes of Warehouses, and Basic Requirements*. The succeeding sections provide additional parameters that should be taken into account.

4.1 Ventilation

Ventilation and/or insulation systems shall be designed and constructed to provide proper aeration and to maintain the desired temperature. Moreover, these should be maintained in normal conditions and cleaned regularly.

Low temperature storage is recommended for unpolished rice.

4.2 Flooring and drainage

The floors should be constructed to be adequately strong, sufficiently above ground level, smooth, easy to clean, and free from cracks where moisture from the ground may affect and/or contaminate the stored grains. It should be made from durable, impervious, non-toxic, and non-adsorbent materials.

Proper drainage system should be installed to prevent water stagnation. The drainage canals should be protected by a grille.

4.3 Walls

Walls should be constructed and finished so as to prevent condensation, leakage and formation of mold. The walls should be painted white or any light colored material. Moreover, it should be made of smooth, durable, impervious, crack-resistant materials that can be cleaned easily.

Partition walls should be constructed to separate the stored bagged grains from other postharvest facilities installed in the warehouse.

4.4 Openings/Doorways/Windows

Openings leading to the exterior should be installed with mesh screen windows and tight-fitting doors, to prevent entry of unauthorized persons, and stray animals and pests.

Secondary grilled doors are recommended for aeration and security.

4.5 Lightings

Lightings should be provided to allow adequate and effective cleaning of the warehouse facility and to ensure that storage operations can be carried out in a hygienic manner. Shatterproof materials should be used to enclose the lightings fixtures inside the warehouse to ensure that the grains are protected from contamination due to breakages.

4.6 Roof

Roof frames should be designed in a way that it can transfer the weight of the roof to the supporting columns (in framed buildings), or to the walls for small warehouses. The

materials to be used in the construction of roof frames should be made of steel or wood that is well dried and chemically treated.

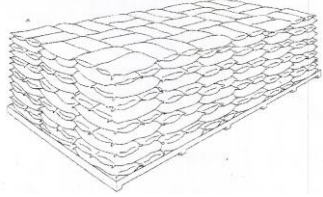
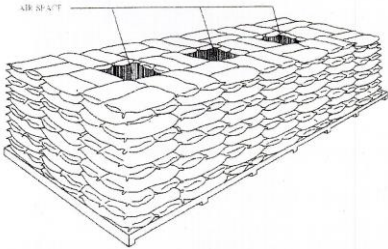
There should be no opening between the wall and the roof to avoid entry of pests and to minimize contamination. In the event that the existing warehouses have gaps between the roof and the wall, a mesh should be installed to prevent entry of animals, and pests.

5 Piling system

To provide aeration and avoid contamination, pallets, square timbers or any local substitute shall be used as the base of all the stocks of grains. The pallets may be covered with clean empty sacks or plastic sheets to prevent accumulation of spilled grains beneath the pallets. The floor sheets may be used for fumigation purposes.

In terms of moisture content expressed in percentage (%), grains shall be stored and piled following the recommendations given on Table 1:

Table 1- Storage and piling system for grains in reference to its moisture content

Moisture Content (%)	Storage and Piling System	Description	Remarks	Illustration
≤14	Block or Chinese Method	1 layer over the other	None	 <p>Figure 1 - Block or Chinese Method</p>
14.1 - <15	Japanese Method	1 layer over the other with hole in the middle for aeration	Piling with prioritization in milling. NOTE 1 Applicable only for rice.	 <p>Figure 2 - Japanese Method</p>
15-18	Japanese Method		Temporary piling should be done for not more than 7 days. NOTE 1 Applicable only for rice.	

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All grains above 14% moisture content should be subjected to further drying operations prior to storage.

Special packaging and handling are recommended for unpolished rice.

The piles shall be stacked in a tight, neat and squared off manner. The stack heights and stacking density should conform with the recommended provisions of the *Philippine Agricultural Engineering Standard (PNS/PAES) 419:2015, Agricultural Structures – Warehouse for Bag Type Storage for Grains*.

At least one-meter space shall be provided between piles, between piles and walls, and between piles and posts to facilitate cleaning and application of pest control measures. An updated bin card shall be attached to every pile. The standard information in the bin card shall be the following:

- a. Date received or date procured
- b. Source of stock
- c. Moisture content
- d. Quantity of bags
- e. Variety or code
- f. Pest control measures applied and date of application
- g. Traceability details

6 Good Warehouse-keeping

6.1 Warehouse maintenance

There should be a monthly scheduled inspection of roofs for the presence of any holes, leakages or damages in the roofing system. The Warehouse officer shall immediately act upon any report of leaks or damage. Structural defects in gutters and downspouts shall be immediately and properly repaired. In case of cracks and crevices, cement plaster shall be used to properly fill up the damage.

6.2 Warehouse hygiene and sanitation

Prior to storage, the warehouse and its immediate surroundings shall be thoroughly cleaned. The warehouse must be free from unnecessary materials like pieces of lumber and old machines. The entire warehouse structure must be cleaned and brushed down at least once a month to prevent contamination from dirt. Moreover, the surrounding areas of the warehouse should be weed-free.

A weekly cleaning of the periphery of the piles should be done to remove dust and webs and to eliminate the possible breeding place of rats, birds, and insects. Warehouse, as well as, pallets (used or unused) and machines must be cleaned immediately upon grain disposal to remove accumulated grain residues, dust, and cobwebs.

After cleaning, residual spraying shall be applied to the entire storage structure, which includes walls, floors and posts.

Torn or gnawed sacks should be immediately mended to avoid spillages, collapse of the pile, and further attack from pests. If possible, bags or containers should not be re-used since use of returned sacks is a serious source of insect infestation. Unserviceable empty sacks and totally damaged grains should be properly disposed.

A separate room should be provided for pesticides and cleaning materials. Sacks and pallets should be properly stored in a separate portion of the warehouse and stacked neatly and orderly and provided with a physical separator. Proper signage should be provided for all rooms. Moreover, no portion of the warehouse should be used as living quarters.

6.3 Stock maintenance and preservation

Representative samples shall be taken randomly from a batch of bagged grains and measured using calibrated moisture meters. Newly received grains with moisture content above 14% MC shall be temporarily stored and subjected to drying to 14% MC and below. Dried stocks may be grouped according to their varietal characteristics.

Laborers shall be discouraged and prevented from using hook or "*gancho*" to maintain the integrity of the bags and avoid spillages. The spillages shall be immediately collected. These collected grains may either be placed into bags (sacks) and piled separately or cleaned and added to busted bags.

At least 100 gram sample of every variety of stocks of milled rice or shelled corn stored in the warehouse should be maintained at the warehouse office for easy reference. It shall be packed in plastic containers or sample bottles with proper identification.

The recommended relative humidity (RH) for a warehouse is 65%. Thus, warehouse temperature/humidity as well as grain temperature must be checked and measured daily. Grain thermometer and thermohygrometer should be installed for monitoring purposes. Warehouse atmosphere must be controlled by either opening or closing windows/doors or installing ventilation fans. Windows and doors must be opened during daytime for proper aeration of stocks. All windows and other openings except doors must be screened to avoid pilferages and entry of pests.

Damaged grains that are no longer fit for consumption shall be disposed immediately. Daily inspection of stocks shall be done to detect signs of infestation so that pest control measures can be recommended and effected.

6.4 Pest control administration

A pest monitoring and inspection program must be in place to prevent harborage and breeding of pests on the grounds and within the warehouse facility. Whenever stocks are disposed and the warehouse is vacated, residual spraying of the whole or sections of the storage structure with chemical pesticides should be carried out after thorough cleaning. Space treatment (fogging) should be conducted at dawn or dusk when flying insects are most active. For crawling insects, external stock treatment consisting of spray application of pesticides to the four sides and the top surface of the pile should be conducted regularly. For heavily infested stocks, fumigation, conducted or supervised by certified fumigators only, should be done as a remedial measure to control internal infestation. Rodent control through the use of traps or poison baits should be carried out regularly.

Only pesticides for stored products approved by the competent authority shall be used. Monitoring of the efficacy of the treatment used should be done at least one week after the application.

Fumigators should be equipped with protective gear such as gas masks. Proper disposal of pesticides/fumigants should be practiced.

6.5 Transport

The harvested grains or stored grains should be transported using clean vehicles or other appropriate mode of transportation. Transport vehicles should be cleaned before and after usage to avoid contamination and residual infestation.

7 Worker's Health, Welfare and Training

7.1 Personnel hygiene

There shall be a strict observance of the "no smoking", "no spitting" and "no eating" policy inside the warehouse since these practices will induce contamination. Any person who has or appears to have an infectious disease, open lesion, including boils, sores, or infected wounds, or any other abnormal source of microbial contamination must be excluded from any operations. Hygienic practices through established/documentated procedures including specific instructions should be made for all personnel.

Grain handlers should follow personal hygiene recommendations as indicated in the *FDA/BFAD Revised Guidelines on Current Good Manufacturing Practice in Manufacturing, Packing, Repacking or Holding Food (AO No. 153 s.2004)* or the latest issuance and the *Codex Recommended International Code of Practice General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 4-2003)* or the latest issuance. The following recommendations should include but not limited to:

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- 7.1.1 Wearing of appropriate clothing and shoes applicable to the operation and can serve as protection for food contamination and an aid on the worker's health and welfare.
- 7.1.2 Wearing of appropriate masks during handling and transport of grain.
- 7.1.3 Washing of hands thoroughly and sanitizing, if necessary, in the appropriate hand-washing facility before the start of any handling operation, after each absence from the work station, and at any given time when possible contamination can be encountered by the worker.

7.2 Personnel training

Before a job is assigned, the personnel shall be trained on good warehousing practices. Training and re-orientation of the warehouse personnel should be done at least every two (2) years. The following trainings are recommended for the personnel specific on his/her assigned task:

- 7.2.1 Inventory and management
- 7.2.2 Acquisition and purchasing
- 7.2.3 Supply chain and logistics
- 7.2.4 Transportation and freight operations
- 7.2.5 Personnel hygiene and food safety

8 Management and Supervision

Grain operators should have adequate knowledge on food hygiene principles and practices to be able to assess potential risks, take appropriate preventive and corrective action, and ensure that effective monitoring and supervision is carried out. Formal training on food safety (Good Manufacturing Practices) is necessary and further trainings in Hazard Analyses and Critical Control Points (HACCP) are extremely helpful. Trainings on food safety for grains businessmen, grains operators and warehouse personnel should be conducted.

9 Documentation and Records

All cleaning and pest management activities should be properly documented in a recommended form.

Appropriate records from all warehousing practices should be kept and retained for a period that exceeds the shelf life of the product. Records should be to facilitate recalls and product safety investigations, if required.

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10 Traceability

- 10.1 Proper packaging and labeling for grains shall conform with the provisions stated under the relevant Philippine National Standards and current edition of the National Food Authority's Primer on Philippine Grains Standardization Program.
- 10.2 The labeling information shall contain the following:
- 10.2.1 classification;
 - 10.2.2 grade;
 - 10.2.3 variety(optional except for special rice);
 - 10.2.4 net weight;
 - 10.2.5 name and address of the miller and in case of custom milling, name and address of owner; and
 - 10.2.6 date of milling (for rice).
- 10.3 Proper labeling and record keeping should be made to facilitate any forward or backward tracing of food products. Records of deliveries should be kept (delivery receipt, personnel coming in and out of the warehouse, date of delivery, and classification of goods delivered).
- 10.4 Geotagging of warehouses and farm site where the grain product came from should be considered.

11 Recall procedures

Warehouse operators should ensure that effective procedures are in place to deal with any food safety hazard and to enable the complete, rapid recall of any implicated lot of the bagged grains (finished food) from the market in case of complaint or issues regarding product quality and safety. Where a product is withdrawn because of an immediate health hazard, other products which are produced under similar conditions, and which may present a similar hazard to public health, should be evaluated for safety. The need for public warnings should be considered.

Recalled products (grains) should be held under supervision until they are destroyed, used for purposes other than human consumption, determined to be safe for human consumption, or reprocessed in a manner to ensure their safety.

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Good Warehousing Practices (GAP) for Bagged Grains

**Department of Agriculture
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Philippine National Standard (PNS) Code of Good Warehousing Practices (GWP)
for Bagged Grains**

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