

PHILIPPINE NATIONAL STANDARD

PNS/BAFS 400:2024
ICS 65.060.01

Coffee Pulper — Specifications



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Foreword

In 2011, the University of the Philippines Los Baños (UPLB)-Agricultural Machinery Testing and Evaluation Center (AMTEC), through the project "Development of Standards for Agricultural and Postharvest Machinery," funded by the Department of Science and Technology (DOST)-Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD), initiated the development of the Philippine National Standard (PNS)/Philippine Agricultural and Engineering Standards (PAES) 253:2011 (Coffee pulper — Specifications) and PNS/PAES 252:2011 (Coffee pulper — Methods of test). These standards were established to define the quality parameters of coffee pulpers, aiming to improve the quality of parchment coffee produced by the machine.

In 2019, issues were raised on some major provisions of the PNS. Based on the data obtained from the tests conducted by the UPLB-AMTEC and on the morphology of the coffee cherry, the minimum pulping recovery of 93.5% cannot be met. These concerns on the PNS led UPLB-AMTEC to propose their review and amendment. As part of the standards development process, the proposal for revision of the PNS on Coffee Pulper was presented to the Philippine Council for Agriculture and Fisheries (PCAF)-Committee on Agricultural and Fisheries Mechanization (CAFMech) Regular Meeting held last August 17, 2021. During the deliberation of the PCAF-CAFMech, the committee agreed to endorse to the Department of Agriculture (DA)-Bureau of Agriculture and Fisheries Standards (BAFS) the prioritization of the revision of PNS/PAES 252:2011 and PNS/PAES 253:2011 through the issuance of CAFMech Resolution No. 6, series of 2021 (Recommending to the BAFS The Prioritization of the Development or Revision of the Philippines National Standards for Various PCAARRD-Funded Machinery Projects).

In response, the DA-BAFS in collaboration with the UPLB-AMTEC embarked on a project entitled "Amendment of PNS on Coffee Pulper — Specifications and Methods of Test". The amendment of the said standards intends to provide minimum requirements for coffee pulper, thereby ensuring its safety, durability, and market equity.

A Technical Working Group (TWG) was created to amend the PNS under Special Order No. 305, series of 2024 (Creation of Technical Working Group (TWG) and Project Management Team (PMT) for the Development of the PNS for Agricultural and Fishery Products and Machinery). The TWG was composed of representatives from relevant government agencies, academe/research institutions, Civil Society Organization (CSO), and private sector. The draft PNS underwent an extensive series of TWG meetings and stakeholder consultations, facilitated through physical and online platforms, from May 2023 to October 2024 before their finalization and endorsement to the DA Secretary for approval.

This Standard includes the following significant changes compared to the PNS/PAES 252:2011:

1. Modification on the scope limiting it for coffee pulper under wet processing method;
2. Modifications on the terms and definitions;
3. Inclusion of mode of operation and deletion of mode of feeding in the classification;
4. Modifications on the manufacturing requirements;
5. Inclusion of pulping recovery index and deletion of pulping recovery;
6. Inclusion of purity of the output under performance requirements;
7. Harmonization of noise level requirement with Department of Labor and Employment (DOLE)-Occupational Safety and Health (OSH) standards;
8. Inclusion of the provisions on safety in accordance with PNS/BAFS 330:2022 (Technical means for ensuring safety – Guidelines).
9. Modification of the After-sales Service Requirements (Previously Warranty for Fabrication and Durability); and
10. Inclusion of the coffee post-harvest process flow diagram in Annex A.

This Standard cancels and replaces PNS/PAES 252:2011 which has been technically revised. This document was written in accordance with the formatting and editorial rules of the Standardization Guide No. 1 (Writing the PNS) developed by the Standards Development Division (SDD) of the DA-BAFS.

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1 Scope

This Standard specifies the manufacturing, performance, and other requirements for coffee pulper under wet processing method.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their contents constitute the requirements of this document. The latest edition of the referenced document (including any amendments) applies.

Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB). (2001). Engineering materials – bolts and nuts for agricultural machines – Specifications and applications (PAES 311:2001). <https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2020/06/PNS-PAES-311-2001-Engineering-Materials-Bolts-and-Nuts-Specifications-and-Applications.pdf>

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3 Terms and Definitions

For the purpose of this Standard, the following terms and definitions shall apply.

3.1

coffee cherries

ripened fruits of coffee shrubs as shown in Figure 1 (AMTEC-UPLB, 2024)
admitted term: coffee berries

3.1.1

mucilage

slimy layer found between the pulp and adhering to the parchment (AMTEC-UPLB, 2024a)

3.1.2

parchment

endocarp of the coffee cherries, lies between the fleshy part (or pulp) of the cherries and coffee bean (AMTEC-UPLB, 2024a)

3.1.3

pulp

part of the coffee cherry composed of the external exocarp and most of the internal mesocarp (mucilaginous tissue) (BAFS-DA, 2015, *modified*)

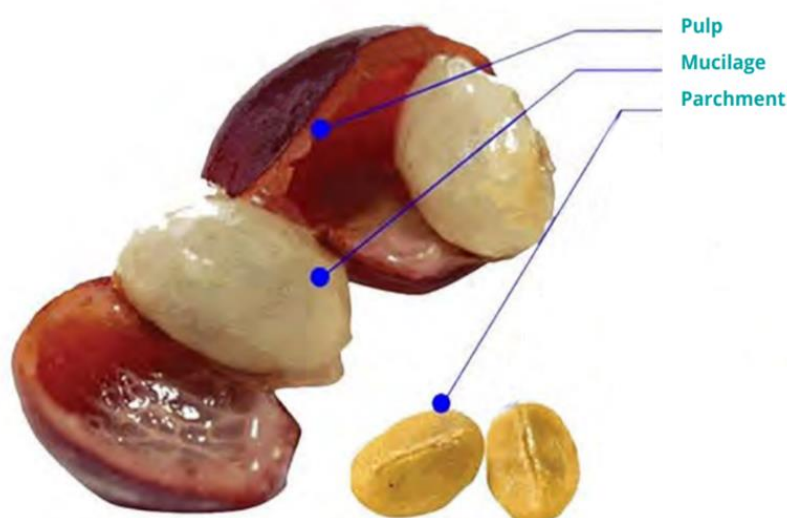


Figure 1. Parts of coffee cherries (adapted from TechnoServe, n.d.)

3.2**coffee pulper**

machine to remove and separate the soft pulp of ripe coffee cherries without making any damage to the parchment coffee (AMTEC-UPLB, 2024a)

3.2.1**chop rails**

lateral side bars that presses/squeeze against rotating disc (AMTEC-UPLB, 2024a, *modified*)

3.2.2**disc bulbs**

unique segment pattern for efficient rubbing action to chop rails (AMTEC-UPLB, 2024a, *modified*)

3.2.3**flute**

thread like component of rotating cylinder of the pulping chamber (AMTEC-UPLB, 2024a)

3.2.4**flute inclination**

angle of inclination of the coated flutes (AMTEC-UPLB, 2024, *modified*)

3.2.5**parchment coffee outlet**

part of machine where parchment coffee is collected (AMTEC-UPLB, 2024a)

3.2.6**pulp outlet**

part of machine where pulps are collected (AMTEC-UPLB, 2024a)

3.3**damaged parchment coffee**

broken parchment coffee or partially dehulled parchment coffee as a result of pulping operation (BAFS-DA, 2017, *modified*)

3.4**disc pulper**

pulper that uses rubbing action of disc bulbs and chop rails to remove the pulp from parchment coffee (AMTEC-UPLB, 2024a)

3.5**drum pulper**

pulper that uses a rotating cylinder/drum with flutes inside a fixed pressed plate with pulping channels and ribs (AMTEC-UPLB, 2024a)

3.6**fluted cylinder pulper**

pulper that uses a rotating cylinder with flutes or threads (AMTEC-UPLB, 2024a)

3.7**impurity**

any matter which is not parchment coffee (BAFS-DA, 2022a, *modified*)

3.8**input capacity**

weight of coffee cherries fed into the pulper per unit of input time, expressed in kilograms per hour, kg/h (AMTEC-UPLB, 2024a, *modified*)

3.9**mechanically damaged parchment coffee**

ratio of the total weight of damaged parchment coffee to the total weight of sample, expressed in percent, % (AMTEC-UPLB, 2024a)

3.10**other loss**

parchment coffee losses other than separation loss, unpulped loss, and scattering loss (e.g. retain loss, blower loss) (BAFS-DA, 2022b, *modified*)

3.11**output capacity**

weight of clean parchment coffee collected at coffee outlet per unit output time, expressed in kilograms per hour, kg/h (AMTEC-UPLB, 2024a, *modified*)

3.12**parchment coffee**

coffee beans wrapped in the endocarp (parchment) produced after pulping (BAFS-DA, 2017, *modified*)

3.13**pulping**

process of removing and separating the pulp of coffee cherries (AMTEC-UPLB, 2024a, *modified*)

3.14**pulping efficiency**

ratio of total weight of clean parchment coffee collected at all outlets to the total weight of clean parchment coffee collected at main outlet and total losses, expressed in percent, % (AMTEC-UPLB, 2024a, *modified*)

3.15**pulping recovery (actual)**

ratio between the total weight of clean parchment coffee collected at the parchment coffee outlet to the total weight of coffee cherries input to the machine, expressed in percent, % (BAFS-DA, 2020, *modified*)

3.16**pulping recovery index**

ratio of the pulping recovery obtained from actual testing to the pulping recovery obtained from laboratory test pulping (BAFS-DA, 2020, *modified*)

3.17**purity of output**

ratio of the total weight of cleaned output parchment coffee to the total weight of uncleaned output parchment coffee expressed in percent, % (BAFS-DA, 2022a, *modified*)

3.18**scattering loss**

ratio of the total weight of the parchment coffee that fell around the base of coffee pulper to the total weight of clean parchment coffee collected at main outlet and total losses, expressed in percent, % (AMTEC-UPLB, 2024a, *modified*)

3.19**separation loss**

ratio of the total weight of the parchment coffee that comes out to the pulp outlet to the total weight of clean parchment coffee collected at main outlet and total losses, expressed in percent, % (AMTEC-UPLB, 2024a, *modified*)

3.20**slotted plate pulper**

pulper machine that uses a fixed slotted screen and a rotating cylinder that serves as the pulping chamber (AMTEC-UPLB, 2024a)

3.21**unpulped loss**

ratio of the total weight of parchment coffee from unpulped coffee cherries at all outlets to the total weight of clean parchment coffee collected at main outlet and total losses, expressed in percent, % (AMTEC-UPLB, 2024a, *modified*)

3.22**wet process**

treatment of coffee cherries consisting of the mechanical removal of the exocarp (pulp) in the presence of water, alternatively followed by either a) removal of the mucilage (mesocarp) by fermentation or other methods, followed by washing to give parchment coffee, or b) direct drying of the pulped beans within their mucilaginous parchment, followed by hulling to produce

“semi-washed” green coffee. Removal of the mucilage is usually followed by drying and hulling to produce “washed” green coffee as shown in Figure 7 of Annex A (Coffee post-harvest process flow) (BAFS-DA, 2015)

4 Classification

The classifications of a coffee pulper shall be based on, but not limited to the following:

4.1 Pulping mechanism

4.1.1 Disc pulper

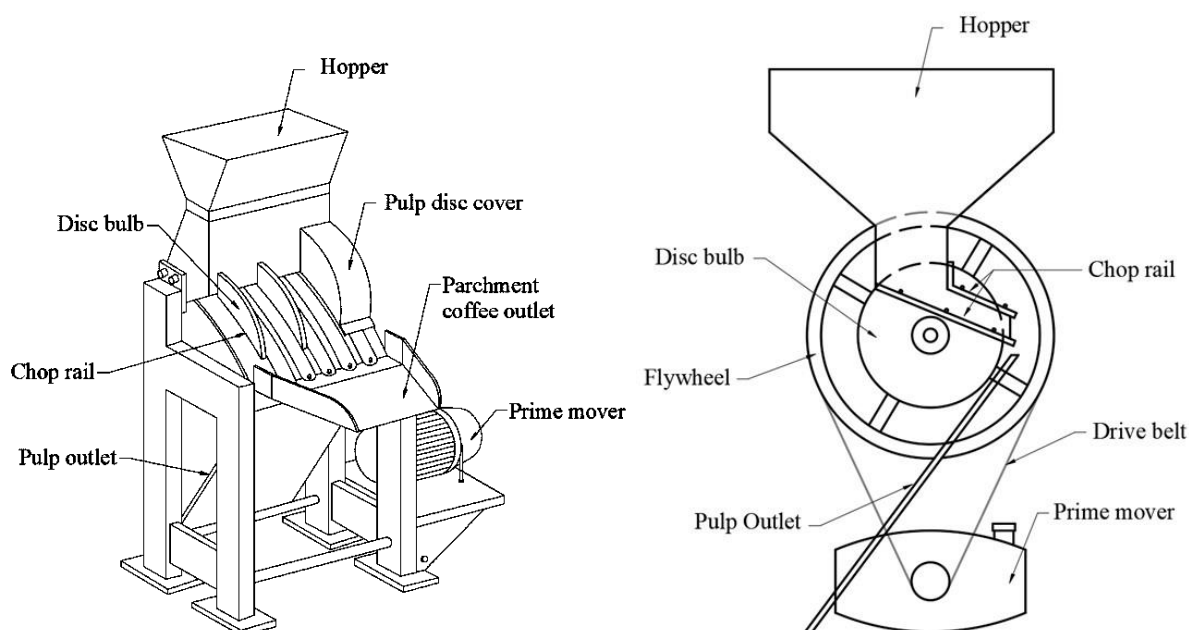


Figure 2a. Typical design of a disc pulper (adapted from AMTEC-UPLB, 2024a)

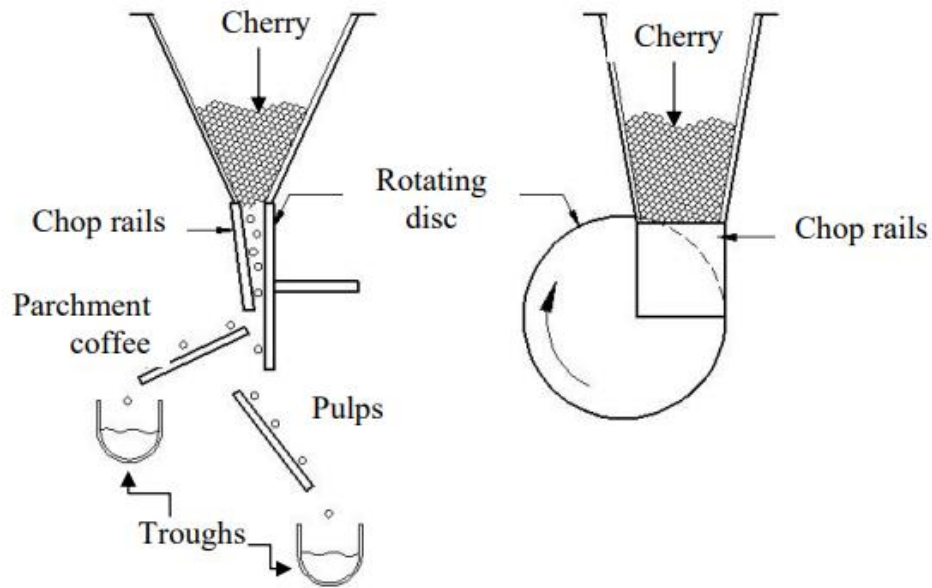


Figure 2b. Schematic diagram of disc pulper (adapted from AMTEC-UPLB, 2024a)

4.1.2 Drum pulper

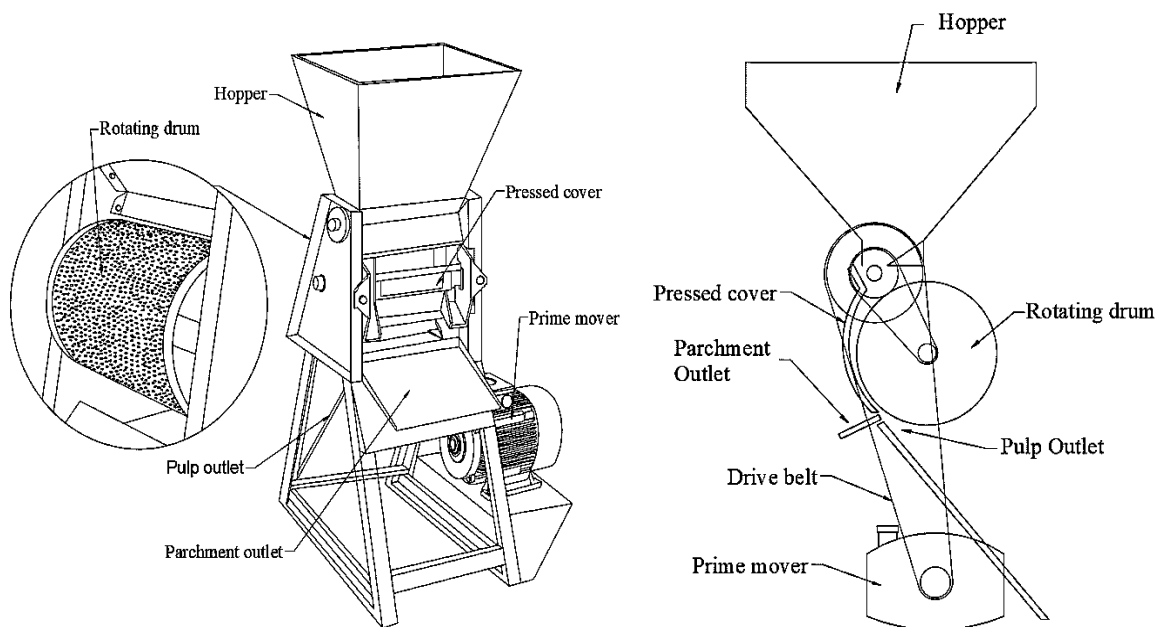


Figure 3a. Typical design of a drum pulper (adapted from AMTEC-UPLB, 2024a)

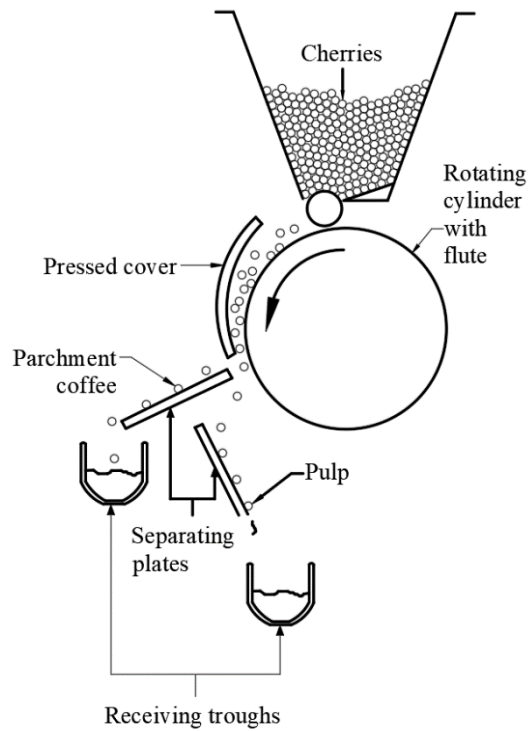


Figure 3b. Schematic diagram of drum pulper (adapted from AMTEC-UPLB, 2024a)

4.1.3 Fluted cylinder

Fluted cylinder pulper shall be classified according to flute inclination.

4.1.3.1 43° Flute inclination

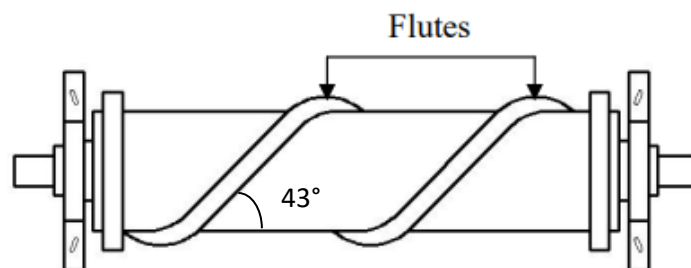


Figure 4a. Pulping cylinder with 43° flute inclination (adapted from AMTEC-UPLB, 2024a)

4.1.3.2 50° Flute inclination

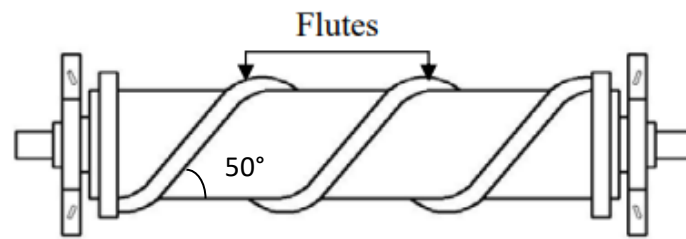


Figure 4b. Pulping cylinder with 50° flute inclination (adapted from AMTEC-UPLB, 2024a)

4.1.3.2 60° Flute inclination

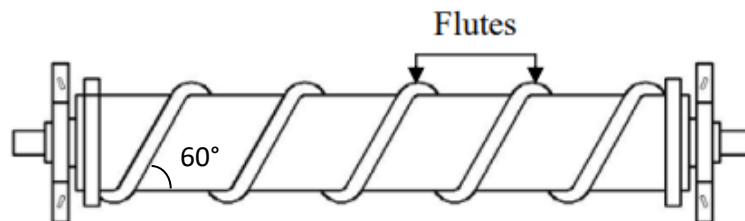


Figure 4c. Pulping cylinder with 60° flute inclination (adapted from AMTEC-UPLB, 2024a)

4.1.4 Slotted plate pulper

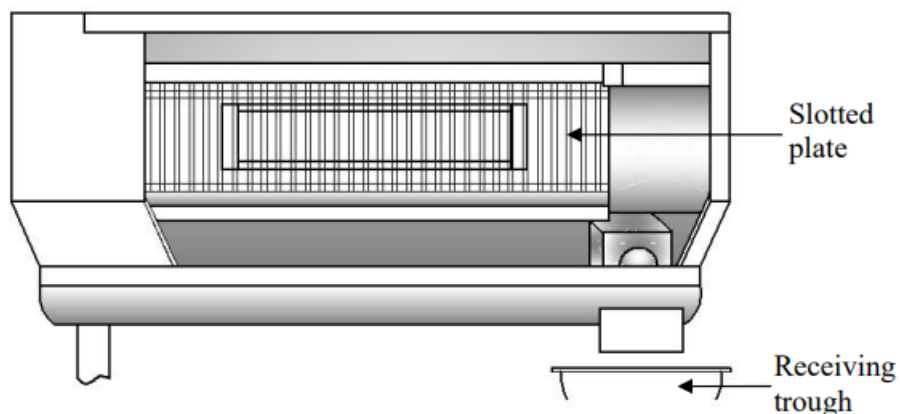


Figure 5a. Typical design of slotted plate coffee pulper (adapted from AMTEC-UPLB, 2024a)

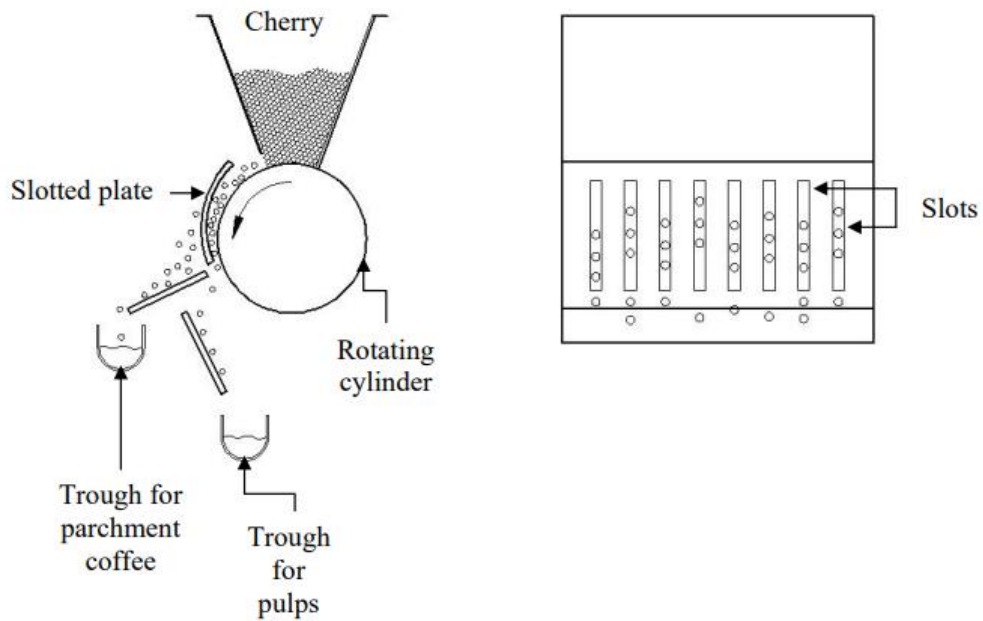


Figure 5b. Schematic diagram of slotted plate coffee pulper (adapted from AMTEC-UPLB, 2024a)

4.2 Mode of operation

4.2.1 Mechanically operated

Coffee pulper powered by a prime mover (e.g. electric motor and engine).

4.2.2 Manually operated

Coffee pulper manually operated by the operator/s as shown in Figure 6.

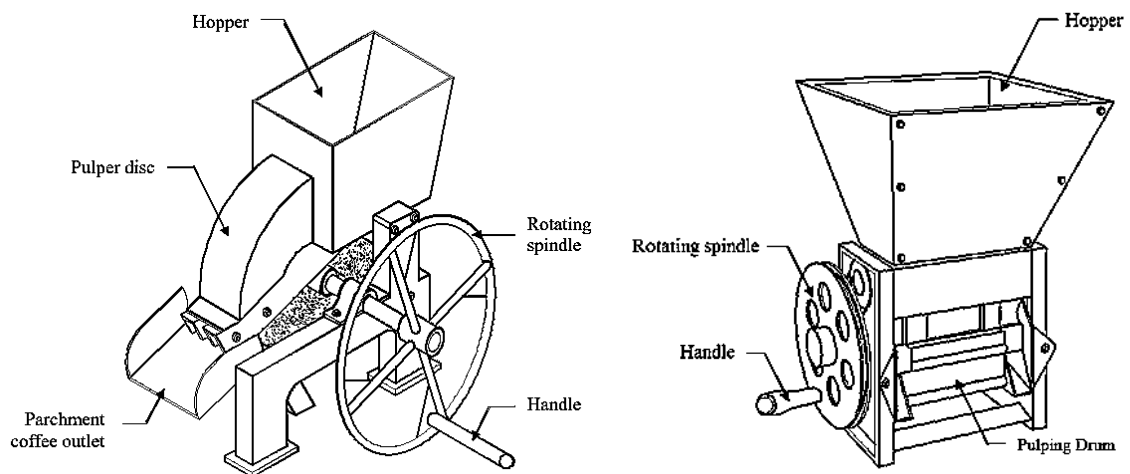


Figure 6. Manually operated disc pulper (left) and drum pulper (right) (adapted from AMTEC-UPLB, 2024a)

5 Manufacturing Requirements

- 5.1** Steel bars and metal sheet or plate shall be generally used for the manufacture of the different components of the coffee pulper. Parts that are in direct contact to the parchment coffee and coffee cherries shall be made of corrosion-resistant materials (e.g., stainless steel grade 304, aluminum).
- 5.2** There shall be provision for adjustment of clearance between pulping assembly components to accommodate different sizes of coffee cherries.
- 5.3** Water-pulp-parchment conveyor (if available) shall be designed as to avoid pulp and parchment to get stocked on the conveyor.
- 5.4** Frame and stand shall be able to support the whole coffee pulper assembly during operation. There should be a provision for means to minimize vibration.
- 5.5** Bolts and nuts, and screws to be used should conform to the requirements of PAES 311:2001 and PAES 313:2001.
- 5.6** Parts of the coffee pulper shall conform to the manufacturer's specifications.
- 5.7** The coffee pulper should be equipped with an electric motor as the prime mover. In case of engine-driven coffee pulper, there shall be provisions to avoid contamination of parchment coffee from the engine operation (e.g., orienting the exhaust gas away from the parchment coffee).

6 Performance Requirements

- 6.1** Input and output capacity shall meet the specifications of the manufacturer.
- 6.2** The performance criteria for coffee pulper shall be attained as specified in Table 1.

Table 1. Performance criteria for Coffee Pulper

Criteria	Performance data
Pulping Recovery index, minimum	0.90
Pulping Efficiency, percent, minimum	95.0
Losses, percent, maximum	
a) Separation Loss	1.0
b) Unpulped Loss	5.0
c) Scattering Loss	0.5
Purity of output, percent, minimum	94.0
Mechanically damaged parchment coffee, percent, maximum	3.5

7 Safety, Workmanship, and Finish

7.1 There shall be earmuffs or other ear protection device provided for the operator to use when 92 dB(A) is exceeded during operation.

NOTE The 92 dB(A) is the allowable noise level for six (6) hours of continuous exposure based on Occupational Safety and Health Standards, Department of Labor and Employment, Philippines. 2020.

7.2 The base of coffee pulper shall be rigid and its rotating components should be statically or dynamically balanced.

7.3 The coffee pulper shall be free from manufacturing defects that may be detrimental to its operation.

7.4 Pulping mechanism shall be replaceable.

7.5 All surfaces that are not in direct contact with parchment coffee shall be free from rust and shall be coated with a suitable paint material.

7.6 The external part of the coffee pulper shall be free from sharp edges and rough surfaces.

7.7 The power transmission system shall be provided with guard in accordance with PNS/BAFS 330:2022 (Technical means for ensuring safety — Guidelines).

7.8 There shall be provision for belt tightening and adjustments.

7.9 Warning notices shall be provided in conformance with Clause 10.2 of PNS/BAFS 330:2022 (Technical means for ensuring safety — Guidelines).

7.10 Mechanism for immediate disengagement of power such as emergency stop button and clutch lever shall be provided in accordance with clause 12.5.4 of PNS/BAFS 330:2022 (Technical means for ensuring safety — Guidelines).

7.11 All welded parts should be water-tight and smoothly finished, and it should pass visual inspection criteria (AWS D1.1:2000) for discontinuity of materials.

7.12 Welded joints should not be less than 4 mm (1/8 inch) side fillet welded. Undercut should not exceed 2 mm (1/16 inch) for any length of weld.

8 After-sales Service Requirements

Requirements for the after-sales services shall conform to PNS/BAFS 192:2024 (After-sales service — Guidelines).

9 Maintenance and Operation

- 9.1** Each unit of coffee pulper shall be provided with a set of manufacturer's standard tools required for maintenance and operation.
- 9.2** An operator's manual which conforms to PNS/BAFS 390:2024 (Operator's manual for agricultural and biosystems power and machinery — Guidelines) which includes the maintenance schedule, and list of parts under warranty of the coffee pulper shall be provided.
- 9.3** The coffee pulper shall be easy to operate, repair and maintain.
- 9.4** Basic components of the coffee pulper shall have provision for regular and ease of cleaning.

10 Sampling

Coffee pulper shall be sampled for testing in accordance with PNS/BAFS 391:2024 (Methods of sampling for agricultural and biosystems power and machinery — Guidelines) or any other suitable/available to the method of sampling.

11 Testing

The sampled coffee pulper shall be tested in accordance with PNS/BAFS 401:2024 (Coffee pulper — Methods of test).

12 Marking and Labeling

- 12.1** Each unit of coffee pulper shall be engraved or embossed either in its body or in a metal nameplate attached at the most visible place with the following information:
- a) Brand and Model;
 - b) Serial number;
 - c) Country of manufacture (if imported)/ "Made in the Philippines" (if manufactured in the country);
 - d) Input capacity, kg/h;
 - e) Recommended pulping speed, rpm; and
 - f) Power requirement, kW.
- 12.2** Safety/precautionary markings shall be provided as per ISO 7010:2019 (Graphical symbols — Safety colours and safety signs — Registered safety signs). Mandatory precautions shall be embossed on blue background and

white graphics and warning signs shall be printed on yellow background and black graphics.

- 12.3** The markings and labelling shall be durably bonded to the base surface material.
- 12.4** The markings and labelling shall be all weather resistant and under normal cleaning procedures, it shall not fade, smear, discolor, crack or blister and shall remain legible.

Annex A
(informative)

Coffee post-harvest process flow

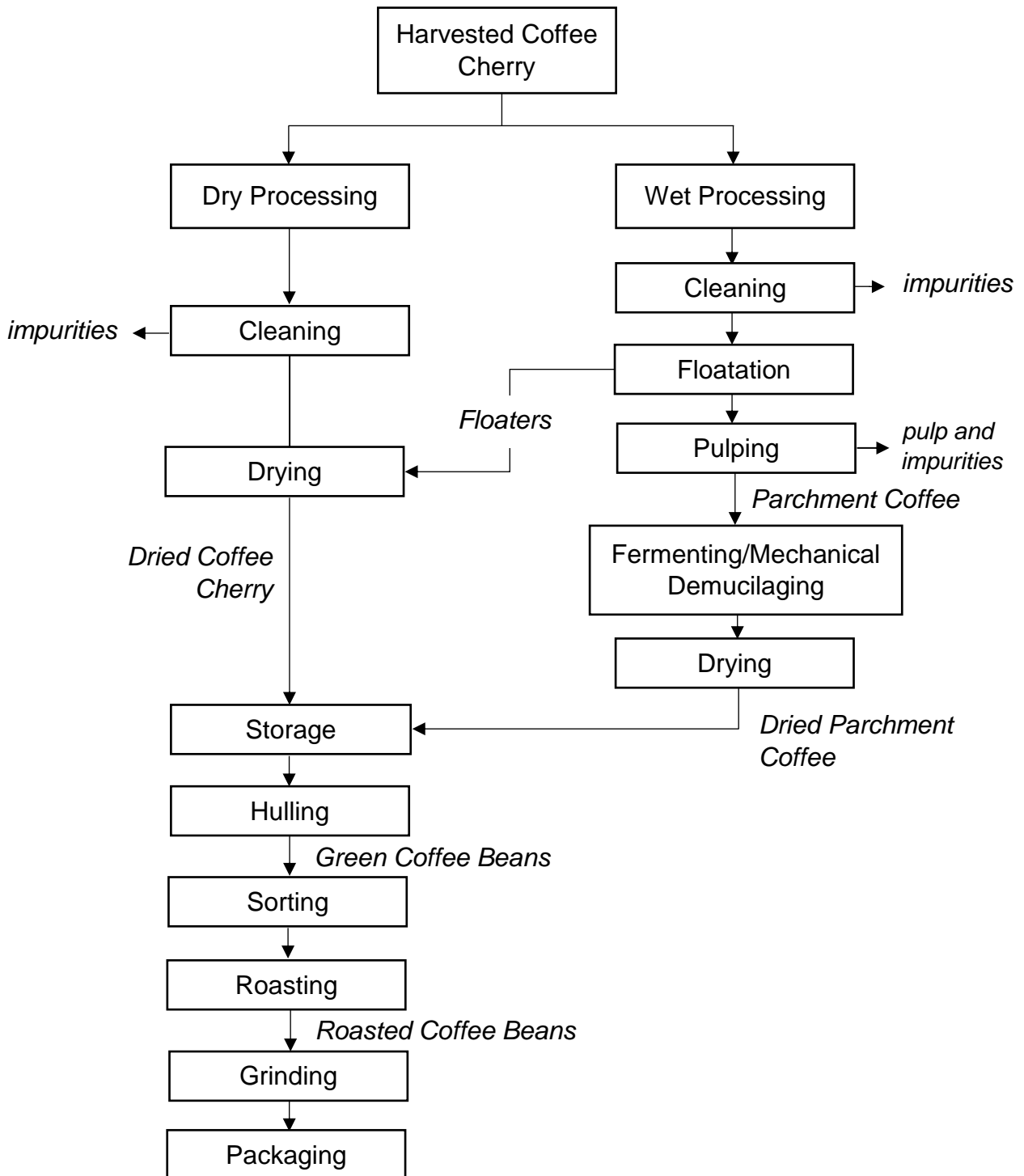


Figure 7. Coffee post-harvest process flow (adapted from BAFS-DA, 2015)

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Bureau of Agriculture and Fisheries Standards (BAFS)**

in collaboration with:

**University of the Philippines Los Baños (UPLB)
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