PHILIPPINE NATIONAL STANDARD

PNS/BAFS 341:2022
ICS 65.060.99

Green Coffee Bean Sorter — Specifications

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Foreword

In 2020, the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARD) of the Department of Science and Technology (DOST) launched the "Testing and Evaluation of Machinery Generated from PCAARRD-funded Projects Phase 2" as a continuing funding program to develop new models of agricultural machines specifically for high-value crops. The project involved the development of standards for specific machines including Green Coffee Sorter — Specifications and Methods of Test. The development of these standards was in collaboration with the Agricultural Machinery Testing and Evaluation Center (AMTEC)-University of the Philippines Los Baños (UPLB) and the Bureau of Agriculture and Fisheries Standards (BAFS) - Department of Agriculture (DA) as the standard-setting agency for the development of Philippine National Standards (PNS) for agriculture and fisheries machinery and infrastructures under Republic Act No. 10601 (Agriculture and Fisheries Mechanization or AFMech Law).

As part of the standards development process, the PNS proposals were endorsed to the Task Force on the Identification and Prioritization of PNS/Philippine Agricultural and Biosystems Engineering Standards (PABES) for Development, Review, and Revision of the Philippine Council for Agriculture and Fisheries (PCAF)-Committee on Agriculture and Fisheries Mechanization (CAFMech) in 2021. The draft standards were officially endorsed to BAFS-DA through CAFMech Resolution No. 6, series of 2021 (Recommending to BAFS the prioritization of the development or revision of the PNS for various PCAARRD-funded machinery projects).

The Technical Working Group (TWG) tasked to develop the PNS was created through Special Order (SO) No. 617, series of 2022 (Amendment to Special Order No. 487, series of 2022 [Addendum to Special Order 103, series of 2022 entitled, "Creation of TWG for the development of PNS for Agriculture and Fishery Products, Machineries, and Infrastructures"). The TWG was composed of representatives from the relevant government agencies, academe, and research institutions. The draft PNS underwent a series of TWG meetings and stakeholder consultations via online platforms before their endorsement to the DA Secretary for approval.

The PNS were drafted in accordance with the BAFS-Standards Development Division (SDD) Standardization Guide No. 1: Writing the PNS.

Table of Contents

1 Scope

This Standard specifies the fabrication and performance requirements for green coffee bean (GCB) sorter according to size.

2 Normative References

The following documents are referred to in the text in such a way that some or all 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). (2000). Agricultural machinery – Methods of sampling (PAES 103:2000). https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/PAES-103-2000-Agricultural-Machinery-Method-of-Sampling.pdf

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AMTEC-UPLB. (2001). Engineering materials – Screws for agricultural machines – Specifications and applications (PAES 313:2001). https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/313-1.pdf#:~:text=PHILIPPINE%20AGRICULTURAL%20ENGINEERING%20STANDARD%20PAES%20313%3A%202001%20Engineering,Screws%20for%20Agricultural%20Machines%20%E2%80%93%20Specifications%20and%20Applications

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BAFS-DA. (2022). Green coffee bean sorter – Methods of test (PNS/BAFS 342:2022).

BAFS-DA. (2022). Technical means for ensuring safety – Guidelines (PAES 330:2022). https://bafs.da.gov.ph/bafs_admin/admin_page/pns_file/PNS.BAFS%20330.2022_PNS%20Technical%20Means%20for%20Ensuring%20Safety%20-%20Guidelines.pdf

Department of Labor and Employment (DOLE). (1989). Occupational Safety and Health (OSH) standards. https://www.dole.gov.ph/php_assets/uploads/2019/04/OSH-Standards-2017-2.pdf

3 Terms and Definitions

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

3.1
cleaning device
component of the green coffee bean sorter that removes impurities prior to sorting

3.2
coefficient of variation
ratio of the standard deviation to the mean, expressed in percent (%) (Everitt, 1998)

3.3
coffee cherry
fresh, complete fruit of the coffee tree (BAFS-DA, 2017). Postharvest process flow is shown in Annex A (Coffee post-harvest process flow)

3.4
feeding hopper
part of the sorter where the green coffee beans are loaded

3.5
green coffee bean (GCB)
dried seed of the coffee plant, disengaged from their external envelopes (exocarp, mesocarp and endocarp) after hulling (BAFS-DA, 2012) as shown in Annex A (Coffee post-harvest process flow)

3.6
green coffee bean sorter (GCB sorter)
machine which separates the GCB into different size categories (e.g., small, medium, and large)

3.7
impurity
all matters other than GCB

3.8
input GCB
total weight of GCB before cleaning and sorting

3.9
mechanically damaged GCB
broken bean and/or scratched as a result of sorting operation (BAFS-DA, 2017, *modified*)

3.10
parchment coffee
coffee beans wrapped in the endocarp (parchment) produced after pulping (BAFS-DA, 2017, *modified*) as indicated in Annex A (Coffee post-harvest process flow)

3.11
prime mover
electric motor or internal combustion engine used to run the GCB sorter (BAFS-DA, 2021, *modified*)

3.12
purity
ratio of the weight of clean GCB (green coffee beans with 100% purity) to the total weight of input GCB, expressed in percent (%) (BAFS-DA, 2021, *modified*)

3.13
sorting capacity
total weight of the input GCB per unit total operating time, expressed in kg/h (BAFS-DA, 2017, *modified*)

3.14
sorting recovery
ratio of the total weight of sorted GCB collected at the different outlet/s to the total weight of input GCB, expressed in percent (%) (BAFS-DA, 2021, *modified*)

4 Classification

GCB sorter classification shall be based on but not limited to the following:

4.1 Sorting mechanism

4.1.1 Oscillating sieves

Green coffee beans are sorted into different sizes by passing through sieves of different mesh sizes that are arranged in parallel rows or any orientation and move in reciprocating motion. An example of a GCB sorter with oscillating sieves is shown in Figure 1.

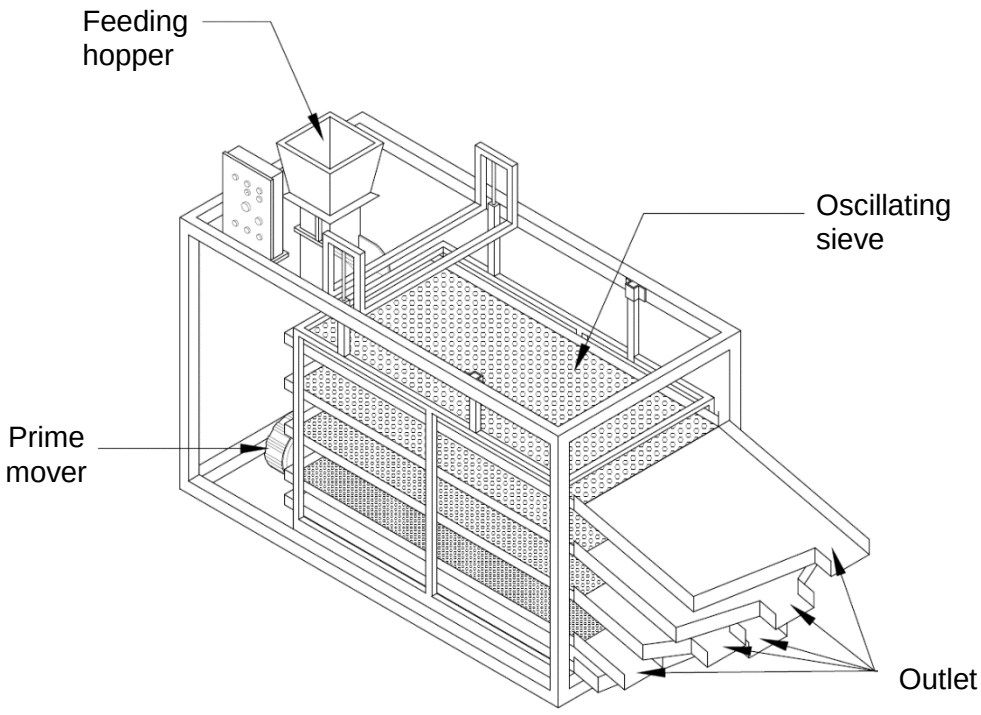


Figure 1. GCB sorter with parallel, oscillating sieves (Chungcharoen et al., 2019)

4.1.2 Rotary sieves

Green coffee beans are sorted into different sizes by passing through sieves of different mesh sizes that are arranged in series, concentric or any orientation and move in circulating motion along an axis.

4.1.2.1 Series

An example of a GCB sorter with rotary sieves in series is illustrated in Figure 2.

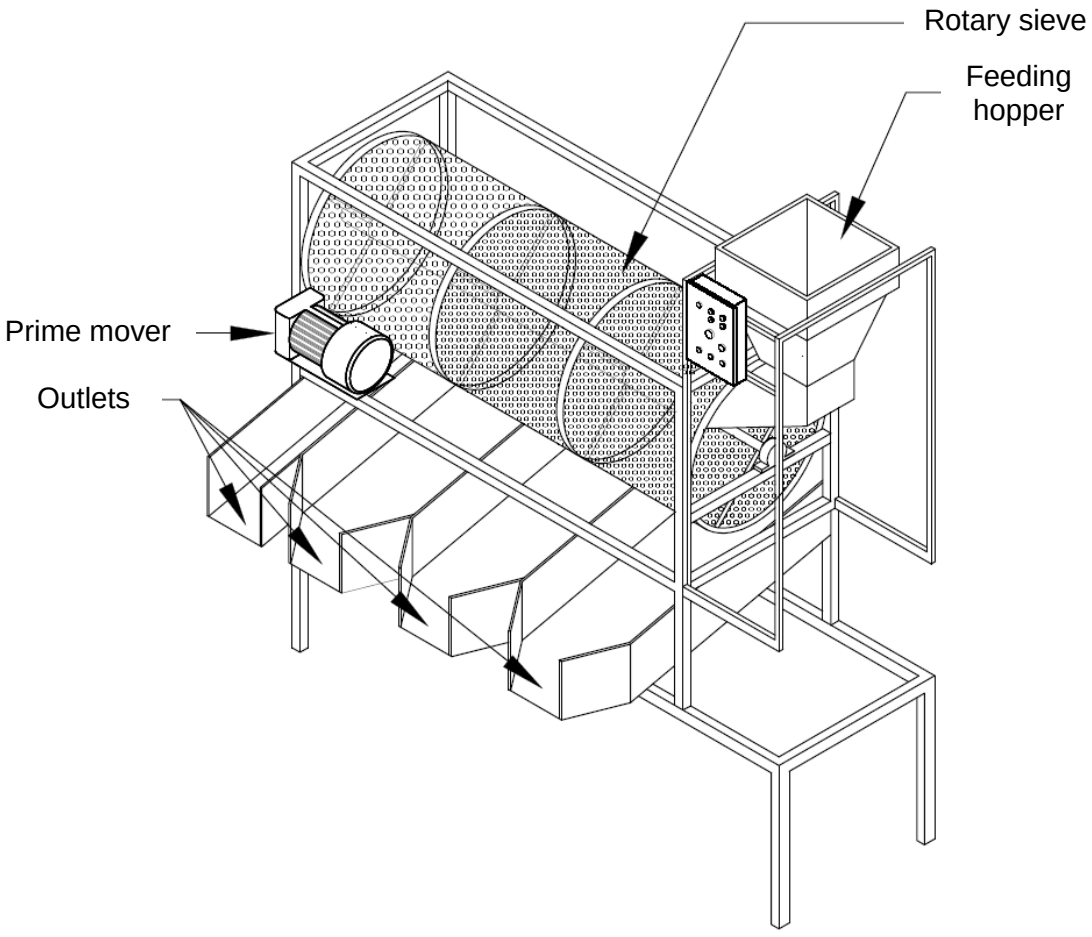


Figure 2. GCB sorter with rotary sieves in series (Chanpaka et al., 2011)

4.1.2.2 Concentric

An example of a GCB sorter with concentric rotary sieves is shown in Figure 3.

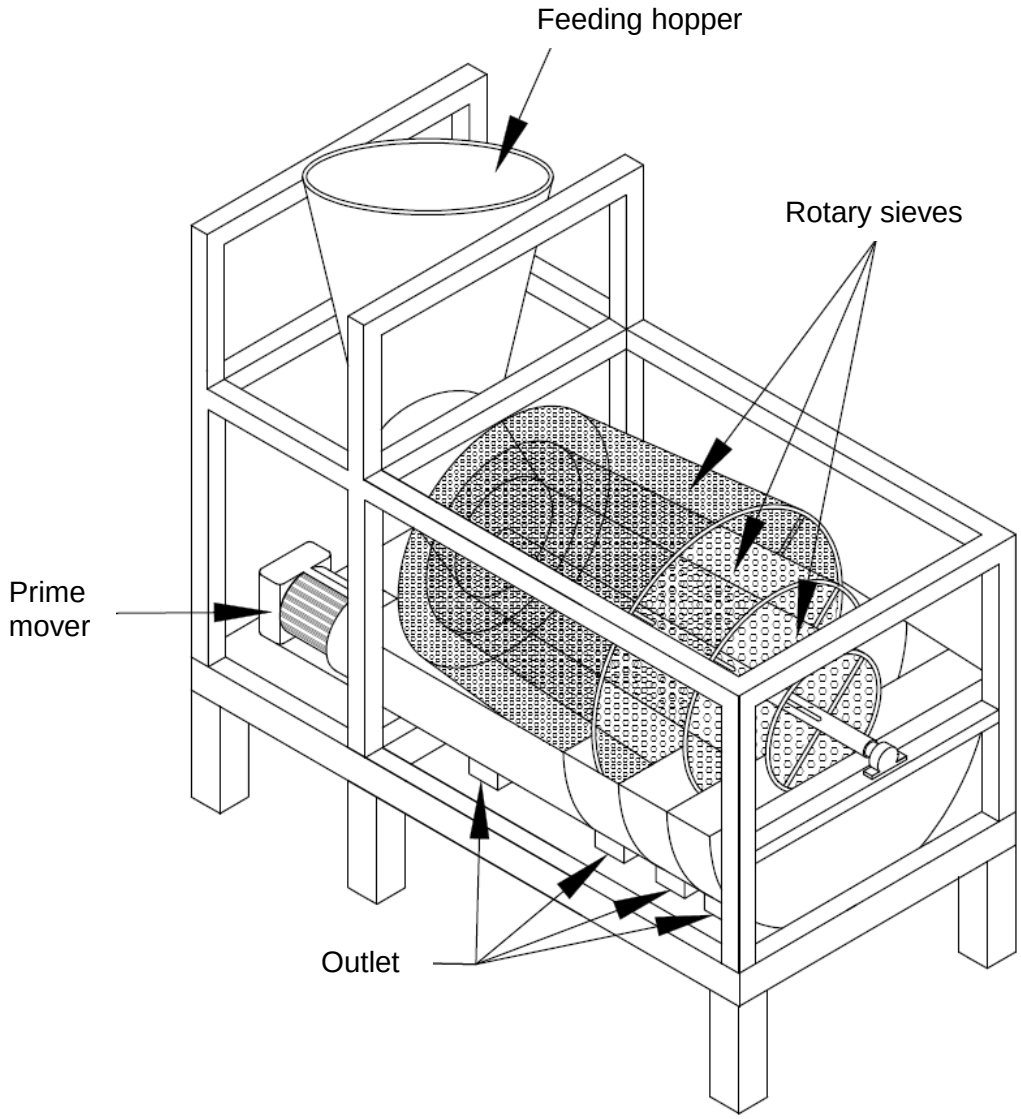


Figure 3. GCB sorter with concentric rotary sieves

4.2 Cleaning devices

GCB sorter may or may not include a cleaning mechanism based on the design requirements.

5 Fabrication Requirements

5.1 Steel bar, metal sheet or plate, and mild steel shall be generally used for the manufacture of the different components of the GCB sorter. Parts that are in direct contact with the GCB such as the sorting mechanism, feeding hopper, and outlets shall be made of corrosion-resistant and food grade materials in compliance with food safety standards.

5.2 Frame and stand shall be able to support the whole GCB sorter assembly during operation.

5.3 Bolts and nuts, belts and pulleys, chains and sprockets, screws, bearings, and bushing and seals to be used shall conform to PAES 311:2001 (Engineering materials – Bolts and nuts for agricultural machines – Specifications and applications), PAES 301:2000 (Engineering Materials – V-belts and pulleys for agricultural machines – Specifications and applications), PAES 303:2000 (Engineering materials –Roller chains and sprockets for agricultural machines – Specifications and applications), and PAES 313:2000 (Engineering materials – Screws for agricultural machines – Specifications and applications) or other international standards.

5.4 Minimum of three sieves shall be used according to the GCB variety.

5.5 The sieves shall be replaceable for easy maintenance and replacement for other sizes depending on the GCB variety.

6 Performance Requirements

6.1 Sorting capacity shall meet the specifications of the manufacturer.

6.2 The performance of GCB sorter shall be in accordance with the criteria as specified in Table 1.

Table 1. Performance criteria for GCB sorter

Criteria	Performance data, %
Coefficient of variation of GCB dimensions (L x W x t) per outlet, maximum	15
Sorting recovery, minimum	97
Net mechanically damaged GCB per outlet, maximum	3

6.3 The sorted GCB shall be classified by size according to the maximum percent beans retained using the sieve sizes based on the variety as specified in Table 2.

Table 2. Sieve sizes to be used for classifying different GCB varieties by size (BAFPS-DA, 2012, *modified*)

Size	Diameter of perforations, mm			
	Arabica	Robusta	Liberica	Excelsa
Large	7.93	7.50	9.52	7.93
Medium	6.73	6.50	7.93	6.73
Small	6.35	5.50	6.70	6.35

7 Safety, Workmanship, and Finish

7.1 There shall be earmuffs or other ear protective device provided for the operators and baggers to use when 95 dB(A) is exceeded during operation.

NOTE Allowable noise level for 4 h of continuous exposure based on Occupational Safety and Health Center, Department of Labor and Employment (2013).

7.2 The GCB sorter should be equipped with an electric motor as the prime mover. In case of engine-driven GCB sorter, there shall be provisions to avoid contamination of GCB from the engine operation (e.g., orienting the exhaust gas away from the GCB).

7.3 The GCB sorter shall be free from any manufacturing defects that may be detrimental to its operation.

7.4 The base of the GCB sorter shall be rigid and durable without any noticeable cracks and weak joints.

7.5 The parts of the GCB sorter that are not in direct contact with the GCB shall be free from rust and should be painted if applicable.

7.6 The external and internal part of the GCB sorter shall be free from sharp edges and rough surfaces.

7.7 Warning notices shall be provided in accordance with PNS/BAFS 330:2022 (Technical means for ensuring safety – Guidelines).

7.8 Mechanism for immediate disengagement of power shall be provided in accordance with PNS/BAFS 330:2022 (Technical means for ensuring safety – Guidelines).

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

7.10 There shall be provision for belt tightening and adjustments.

8 After-sales Requirements

Requirements for after-sales services shall conform to PNS/BAFS/PAES 192:2016 (Guidelines for after-sales service).

9 Maintenance and Operation

9.1 Each unit of GCB bean sorter shall be provided with a set of manufacturer's standard tools required for maintenance.

9.2 An operator's manual which conforms to PAES 102:2000 (Operator's manual – Content and presentation) and with maintenance schedule and list of the warrantable parts of the GCB sorter shall be provided.

9.3 The GCB sorter shall be easy to operate, clean and repair. Basic components of the GCB sorter shall have provision for regular and ease of cleaning.

10 Sampling

GCB sorter shall be sampled for testing in accordance with PAES 103:2000 (Methods of sampling) or any other suitable method of selection.

11 Testing

The sampled GCB sorter shall be tested in accordance with PNS/BAFS 342:2022 (Green coffee bean sorter — Methods of test).

12 Marking and Labeling

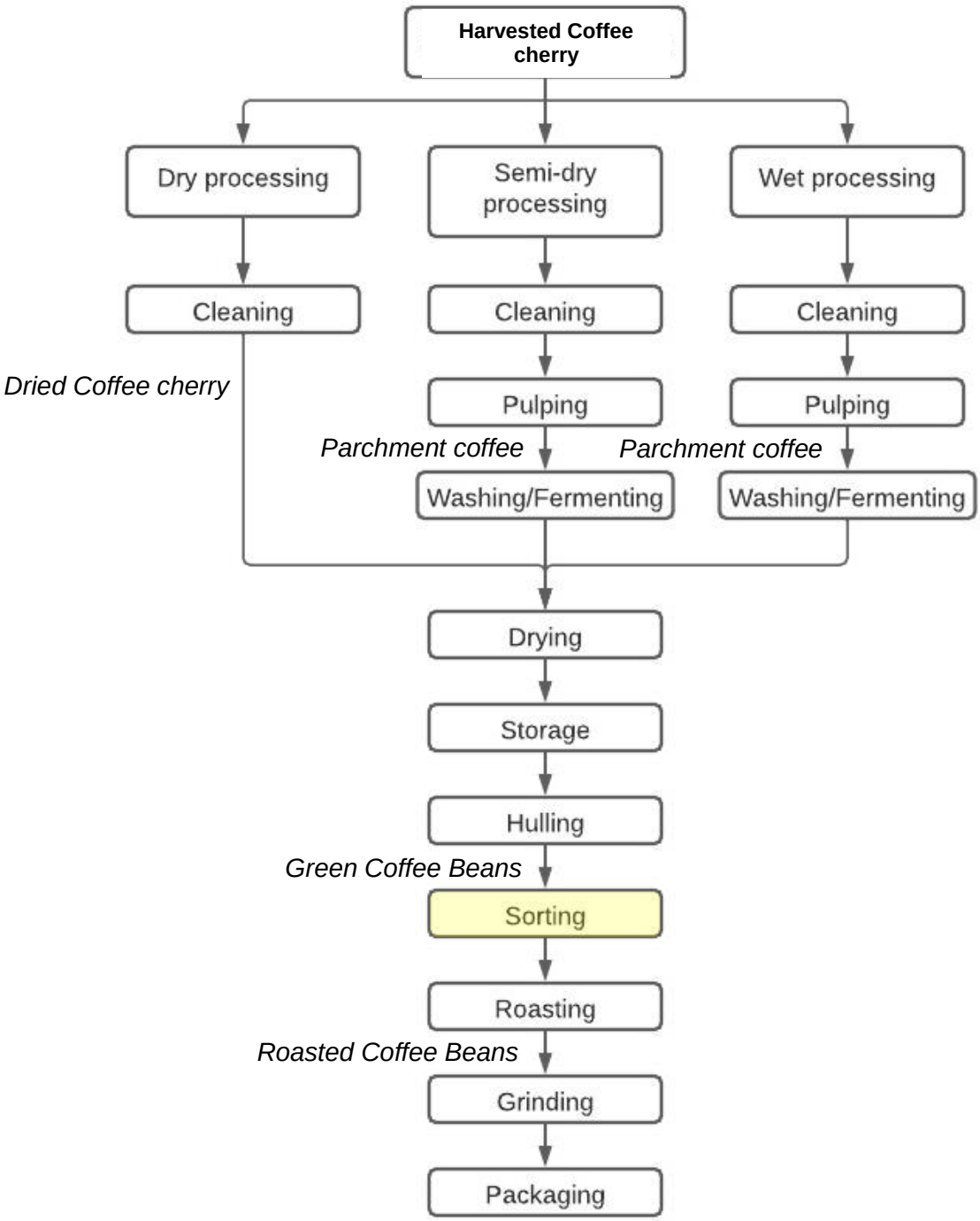
12.1 Each unit of GCB sorter shall be engraved or embossed either in its body or in a metal nameplate attached at the most visible place with the following information:

a) Model;
b) Serial number;
c) Country of manufacture/origin (if imported)/ "Made in the Philippines" (if manufactured in the country);
d) Sorting capacity, kg/h; and
e) Power requirement, kW.

12.2 Basic safety or precautionary markings shall be provided. They shall be stated in English and Filipino and printed in red color with a white background.

Annex A
(informative)

Coffee post-harvest process flow



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