

PHILIPPINE NATIONAL STANDARD

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**Agricultural machinery – Paddy seed cleaner –
Methods of test**



BUREAU OF PRODUCT STANDARDS*

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National Foreword

The Philippine Agricultural Engineering Standards PAES 261:2015, Agricultural machinery – Paddy seed cleaner – Methods of test was approved for adoption as Philippine National Standard by the Bureau of Philippine Standards upon the recommendation of the Agricultural Machinery Testing and Evaluation Center (AMTEC) and the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (PCAARRD-DOST).

Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled “Development of Standards for Rice Production and Postproduction Machinery” which was funded by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) of the Department of Science and Technology (DOST).

This standard has been technically prepared in accordance with PAES 010-2 – Rules for the Structure and Drafting of International Standards.

The word “shall” is used to indicate mandatory requirements to conform to the standard.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable without mentioning or excluding others.

In preparation of this standard, the following documents/publications were considered:

Agricultural engineering in development by de Lucia, M. and Assennato, D. 1994. *In Post-harvest operations and management of food grains* by FAO. Retrieved from the world wide web; August 13, 2014 (<http://www.fao.org/docrep/T0522E/T0522E00.htm>)

CIGR Handbook of Agricultural Engineering Volume III. Plant Production Engineering. 1999. United States of America

Primer on Philippine Grains Standardization Program of the National Food Authority. 2002 Edition.

Rice Postproduction Technology A Technical Reference Guide. 2003. Philippine Rice Postproduction Consortium. Japan Grain Inspection Association. National Food Authority. Quezon City.

Rice Postharvest Technology. 1995. The Food Agency Ministry of Agriculture, Forestry and Fisheries. Tokyo, Japan.

Van Ruiten, Harry. 1973. The Precleaning of Paddy in *Postharvest Rice Technology*. University of the Philippines, Los Baños, Laguna. p. 47-61

CONTENTS		Page
1	Scope	B-212
2	References	B-212
3	Definitions	B-212
4	General Conditions for Test and Inspection	B-213
4.1	Role of manufacturer/dealer	B-213
4.2	Role of the representative of the manufacturer/dealer	B-213
4.3	Test site conditions	B-213
4.4	Suspension of test	B-213
5	Test Preparation	B-214
5.1	Preparation of the paddy seed cleaner for testing	B-214
5.2	Test instruments and other materials	B-214
5.3	Test materials	B-214
5.4	Running-in and preliminary adjustments	B-214
6	Pre-test Observation	B-214
6.1	Verification of specifications	B-214
6.2	Test materials	B-215
7	Performance Test	B-215
7.1	Operation of the paddy seed cleaner	B-215
7.2	Test trial	B-215
7.3	Sampling	B-215
7.4	Data collection	B-215
7.5	Data recording and observations	B-216
8	Laboratory Analysis	B-216
9	Data Analysis	B-216
10	Formula	B-216
11	Test Report Format	B-217
 ANNEXES		
A	Minimum List of Field and Laboratory Test Equipment and Materials	B-218
B	Specification of Paddy Seed Cleaner	B-219
C	Sampling and Measurement for Test Material	B-222
D	Performance Test Data Sheet	B-224
E	Laboratory Analysis	B-227
F	Laboratory Seed Analysis Data Sheet	B-228
G	Formula Used During Calculations and Testing	B-229

1 Scope

This standard specifies the methods of test and inspection for paddy seed cleaner. Specifically, this shall be used to:

- 1.1** verify the mechanism, main dimensions, weight, material accessories of the paddy seed cleaner and the list of specifications submitted by the manufacturer/distributor/importer;
- 1.2** determine the performance of the machine;
- 1.3** evaluate the ease of handling and safety features;
- 1.4** determine the effect on seed quality through laboratory analysis of seed samples taken during the test; and
- 1.5** report the result of tests

2 References

The following normative documents contain provisions, which through reference in this text constitute provisions of this National Standard:

- PNS/PAES 102:2000** Agricultural Machinery – Operator’s Manual – Content and Presentation
- PNS/PAES 103:2000** Agricultural Machinery – Method of Sampling
- PNS/PAES 203:2000** Moisture Content Determination for Rice and Corn
- PNS/PAES 260:2015** Agricultural Machinery – Paddy Seed Cleaner–Specifications

3 Definitions

For the purpose of this standard the definitions given in PNS/PAES 260:2015 – Agricultural Machinery – Paddy Seed Cleaner–Specifications and the following shall apply.

3.1

blower loss

ratio of the weight of clean seeds blown and mixed with the impurities in the fan outlet to the weight of seeds input, expressed in percent

3.2

feed rate

weight of unclean seeds fed into the cleaner per unit of time

3.3

paddy seeds output

sum of the weight of collected clean paddy seeds in the outlets

3.4

primemover

electric motor, a gasoline or diesel fed engine used to run the paddy seed cleaner

3.5

purity

ratio of the weight of clean seeds, to the total weight of unclean seed samples, expressed in percent

3.6

scattering loss

ratio of the weight of clean seeds that are displaced from the machine during cleaning operation to the weight of seeds input, expressed in percent

4 General Conditions for Test and Inspection

4.1 Role of manufacturer/dealer

The manufacturer/dealer shall submit to the official testing agency the specifications and other relevant information of the paddy seed cleaner. He/She shall abide with the terms and conditions set forth by the authorized testing agency. The interested party shall provide testing materials and shall shoulder other variable costs such as fuel, etc.

4.2 Role of the representative of the manufacturer/dealer

An officially designated representative of the manufacturer/dealer shall operate, adjust, repair and shall decide on matters related to the operation of the machine. Manufacturers/dealers should provide appropriate authorization documents.

4.3 Test site conditions

The paddy seed cleaner shall be tested as installed for normal operation. It shall be installed on a stable solid ground with sufficient working space and shall be positioned in such a way that the wind will not blow the materials and other impurities into the clean seeds. The site should have ample provisions for handling of materials and temporary storage. Adequate ventilation and lighting shall be provided in the area.

4.4 Suspension of test

If during the test run, the machine stops due to breakdown or malfunction so as to affect the machine's performance, the test may be suspended. The decision to suspend or to continue the test is at the discretion of the test engineer and concurred by the representative.

5 Test Preparation

5.1 Preparation of the paddy seed cleaner for testing

A check shall be made by the manufacturer and testing authority that the paddy seed cleaner has been assembled and installed in accordance with the instruction of the manufacturer.

In case of testing commercially manufactured paddy seed cleaner, the machine sampled for acceptance, lot, routine, and type tests in accordance with PNS/PAES 103:2000 – Agricultural Machinery – Method of Sampling shall be submitted for test.

5.2 Test instruments and other materials

The suggested list of minimum field and laboratory test equipment and materials needed to carry out the paddy seed cleaner test is shown in Annex A. These instruments should be calibrated regularly. Before and after each test, these instruments shall be physically checked for operation and shall be cleaned, respectively. A checklist of instruments and materials shall be prepared to be used before departure to and from the testing area.

5.3 Test materials

Test materials to be used shall be of a single variety. The maximum purity of the seeds shall not exceed 95% and the maximum moisture content should be 14% wet basis.

The amount of test material to be supplied shall be sufficient for one hour of continuous run. At least three test trials shall be conducted with minimum duration of fifteen minutes per trial. The excess amount shall be used for running-in prior to the actual conduct of test trials. However, if the test materials are beyond the recommended characteristics, the manufacturer has the option to pursue the test.

5.4 Running-in and preliminary adjustments

Before the start of the test, the paddy seed cleaner should have undergone a running-in period. The paddy seed cleaner shall be operated at the test site by the official representative of the manufacturer for sufficient duration with and without load. During the running-in period, the various adjustments of the machine shall be made according to the recommendation of the manufacturer.

(No other adjustments shall be permitted during the test.)

6 Pre-test Observation

6.1 Verification of specifications

The specifications claimed by the manufacturer and the physical details given in Annex B shall be verified by the testing agency. A stable and level surface shall be used as reference plane for verification of dimensional machine specifications.

6.2 Test materials

Representative test samples shall be collected from the test lot to determine its dimensions, moisture content, bulk density, percent cracked grains, and purity. Prepare the sample in such a way that test sample to be used for the running-in and in each test trial shall have identical characteristics in terms of moisture content and variety. Care should be taken so as to prevent alterations of the conditions of the test samples.

7 Performance Test

7.1 Operation of the paddy seed cleaner

The paddy seed cleaner shall be operated at the manufacturer's recommended setting of its components. The same feeding rate recommended by the manufacturer shall be maintained during the test run. The testing authority shall make all measurements, which form part of the test and take the prescribed samples. An instruction manual which conforms to PNS/PAES 102:2000 – Agricultural Machinery – Operator's Manual – Content and Presentation shall be provided.

After the test-run, the testing area shall be cleaned and then prepared for the next test trial(s). This procedure shall be repeated for the succeeding test trial(s).

7.2 Test trial

A minimum of three (3) test trials, with duration of at least 15 minutes per trial, shall be adopted.

7.3 Sampling

Samples shall be collected at different outlets during each test trial. Sampling procedure is given in Annex C.

7.4 Data collection

7.4.1 Duration of test

The duration of each test trial shall start with the feeding of the test materials into the hopper (first drop) and ends at the last drop of the test materials into the hopper. However, all discharge from the different outlets shall be included after the cut-off time.

7.4.2 Noise level

The noise emitted by the machine, with or without load, shall be measured using a noise level meter both at the location of the operators and baggers. The noise, expressed in dB (A), shall be taken approximately 5 cm away from the ear level of the operators and baggers.

7.4.3 Speed of components

The speed of the rotating shafts and the primemover of the machine's major components shall be taken using a tachometer.

Note – Measurements shall be taken with and without load for sub-clause 7.4.2 and 7.4.3 as specified in Annex D.

7.4.4 Fuel/Electric energy consumption

Before the start of each test trial, the fuel tank shall be filled to its capacity and after each test; the fuel consumed shall be measured. In case an electric motor is used as a primemover, a power meter shall be used to measure electric energy consumption.

7.4.5 Air Velocity

The air velocity generated by the blower, with and without load, shall be taken using an air velocity meter measured in m/s.

7.5 Data recording and observations

Record sheet for all data and information during the test is given in Annex D. Observations to be taken during the performance test shall be recorded in this sheet.

8 Laboratory Analysis

Laboratory analysis shall be made to determine the moisture content, bulk density, dimension, percent cracked grains, purity and losses. The laboratory procedure to be followed in the analysis is given in Annex E while the data sheet is given in Annex F.

The quality of clean seed samples from the machine shall be compared to the quality of clean seeds using the laboratory seed cleaner.

9 Data Analysis

9.1 Presentation of results

Machine specifications and the results of the test shall be presented in tabular form in which data shall be taken from Annex B and D. A schematic diagram of the power transmission system and arrangement of the sieves shall also be included. Observations made on the machine while in operation shall be supported with photographs.

10 Formula

The formula to be used during calculations and testing are given in Annex G.

11 Test Report Format

The test report shall include the following information in the order given:

- 11.1** Title
- 11.2** Summary of Results
- 11.3** Purpose and Scope of Test
- 11.4** Methods of Test
- 11.5** Conditions of the Machine
- 11.6** Description of the Machine
- 11.7** Results and Discussions
- 11.8** Observations (include pictures)
- 11.9** Names and Signatures of Test Engineers

Annex A

Minimum List of Field and Laboratory Test Equipment and Materials

A.1	Equipment	Qty.
A.1.1	Field	
A.1.1.1	Grain Moisture Meter (duly calibrated using the standard method) Range: 12% to 24% (for paddy)	1
A.1.1.2	Air Velocity Meter Range : 0 – 30 m/s	1
A.1.1.3	Tachometer (contact or photoelectric type) Range: 0-5000 rpm	1
A.1.1.4	Timers Range : 60 minutes Accuracy: 0.1 second	2
A.1.1.5	Measuring tape (Capacity: 5m)	1
A.1.1.6	Noise level meter Range: 30 to 130 dB(A)	1
A.1.1.7	Weighing Scale Capacity: 100 kg; scale divisions: 0.5 kg	1
A.1.1.8	Graduated cylinder (for engines) 500 mL capacity or watt-hour meter (for electric motors) 60 Hz, 220 V	1
A.1.1.9	Camera	1
A.1.1.10	Bulk density meter	1
A.1.1.11	Indented trays of laboratory grader	1
A.1.2	Laboratory test	
A.1.2.1	Weighing scale (Sensitivity: 0.1 g)	1
A.1.2.2	Magnifying lens (minimum of 10 magnifications)	1
A.1.2.3	Grain Sample Cleaner	1
A.2	Materials	
A.2.1	Field	
A.2.1.1	Canvass Sheet (4m x 8m)	1
	Nylon-catch bag (1.5m x 1.5m x 0.5m)	1
	Nylon Net (1.5m x 1.5m)	1
A.2.2	Sample Bags	20
A.2.3	Labeling tags which include:	20
A.2.3.1	Date of test	
A.2.3.2	Machine on test	
A.2.3.3	Sample source	
A.2.3.4	Variety	
A.2.3.5	Trial number	

Annex B

Specification of Paddy Seed Cleaner

Name of Applicant (or Distributor) : _____
 Address : _____
 Tel. No. : _____

Name of Manufacturer : _____
 Address : _____
 Tel. No. : _____

General Information:

Serial No.: _____ Brand/Model : _____
 Classification: _____ Make : _____
 Production date of the machine to be tested: _____

Items to be inspected

ITEM*	Manufacturer's specifications	Verification by the testing agency
B.1 Main structure		
B.1.1 Overall dimensions (mm)		
B.1.1.1 Length		
B.1.1.2 Width		
B.1.1.3 Height		
B.1.2 Weight (kg), if applicable without the engine		
B.2 Crop(s) for which machine is suitable		
B.3 Rated output capacity (kg/h)		
B.4 Recommended sieve assembly speed (rpm)		
B.5 Engine		
B.5.1 Brand		
B.5.2 Model		
B.5.3 Serial Number		
B.5.4 Make		
B.5.5 Rated power (kW)		
B.5.6 Rated speed (rpm)		
B.5.7 Type		
B.5.8 Weight		
B.5.9 Starting System		
B.5.10 Cooling System		
B.6 Type of Power Transmission		
B.6.1 Engine to _____		
B.6.2 Cylinder shaft to _____		

ITEM*	Manufacturer's specifications	Verification by the testing agency
B.6.3 Fan shaft to _____		
B.6.4 Oscillating sieve/screen to _		
B.6.5 Others (specify)		
B.7 Sieve Assembly		
B.7.1 Type		
B.7.2 Size (D), mm		
B.7.3 Number/row		
B.7.4 No. of rows		
B.7.5 Arrangement		
B.7.6 Length of stroke, mm		
B.7.7 Means of attachment		
B.7.8 Material		
B.8 Hopper		
B.8.1 Overall dimensions (mm)		
B.8.1.1 Length		
B.8.1.2 Width		
B.8.1.3 Height		
B.8.2 Height from the ground, mm		
B.8.3 Material		
B.8.4 Location		
B.8.5 Means of attachment		
B.9 Output Chute		
B.9.1 Overall dimensions (mm)		
B.9.1.1 Length		
B.9.1.2 Width		
B.9.1.3 Height		
B.9.2 Height from the ground, mm		
B.9.3 Material		
B.9.4 Location		
B.9.5 Means of attachment		
B.10 Return Chute (Optional)		
B.10.1 Overall dimensions (mm)		
B.10.1.1 Length		
B.10.1.2 Width		
B.10.1.3 Height		
B.10.2 Height from the ground, mm		
B.10.3 Material		
B.10.4 Location		
B.10.5 Means of attachment		
B.11 Fans		
B.11.1 Type		
B.11.1 Overall dimensions (mm)		
B.11.1.1 Length		
B.11.1.2 Diameter		
B.11.2 Number of blades		
B.11.3 Material		

ITEM*	Manufacturer's specifications	Verification by the testing agency
B.11.4 Location		
B.11.5 Means of attachment		
B.12 Others		
B.12.1 Rated power (kW)		
B.12.2 Rated speed (rpm)		

* The parameter will be checked upon availability

B.13 Illustration of transmission system

Annex C

Sampling and Measurement for Test Material

C.1 Sampling procedures for seeds input

The conditions of the seed input such as moisture content, bulk density, percent crack grains and purity of seeds to be used in each test shall be taken using three (3) “representative samples” which represent the different conditions of seeds input in the bulk. This can be done by taking samples each at the top, middle and bottom portions of the bulk. Samples representing the materials for each test trial shall be placed in appropriate containers for laboratory analysis.

C.2 Sampling from different outlets

During each test trial, three samples shall be collected from the outlets of the paddy seed cleaner to be analyzed in the laboratory for quality. The minimum amount of sample to be taken shall be twice as much as what is needed for a particular analysis. The excess sample shall be used for reference purposes or for an eventual second check in case of review. The sampling procedures shall be undertaken at the following outlets:

C.2.1 Output Chute – Using a plastic bag or an appropriate container, collect three or more samples of approximately 0.5 kg each from the outlet.

C.2.2 Fan Outlet – During the test, three samples shall be taken from the fan outlet for duration of at least 15 seconds per collection by using nylon net with a dimension of 1.5m x 1.0 m held by two persons at both ends. These samples shall be placed in appropriate containers and labeled as blower loss.

C.3 Handling of samples

All samples to be taken to the laboratory shall be placed in appropriate containers and properly labeled. If the samples are not to be immediately analyzed they should be air-dried and if necessary, treat samples with chemicals such as insecticide in order to prevent the samples from possible damage. If the sample is to be used for determining moisture content, it must be kept in dry and air tight containers.

C.4 Other measurements required during the test run

Data shall be taken for the following: speed of rotating components and noise level at operator’s and bagger’s location. For each data to be taken there shall be a minimum of five observations. These shall be taken without load and with load. Before taking of data, it should be ensured that the feed rate, speed and other functional characteristics have stabilized. The time of recording shall be properly spaced during the whole duration of the test trials. For air velocity, measurement shall be taken in at least six measuring points. The test engineer shall decide on the location of the measuring points that will provide him with a good estimate of the blower’s air velocity.

C.5 Measurement of fuel/power consumption

For seed cleaner using engine as primemover. To get the amount of fuel consumed, the tank shall be filled to full capacity before the test. After the test, fill the tank with measured fuel to the same level before the test. When filling up the tank, careful attention shall be paid to keep the tank horizontal and not to leave empty space on the tank.

Using electric motors as primemover. Use a power meter to measure the voltage, current, and the total electric power consumption of the seed cleaner. There shall be three sets of data with a minimum of five observations per set taken without load and one set of data taken with load. Data shall be taken simultaneous with the collection of samples for laboratory analysis.

Annex D

Performance Test Data Sheet

Test trial No.:		Date:	
Test Engineers:		Location:	
Assistants:		Machine:	
Test requested by:		Manufacturer:	

ITEM	Trial 1	Trial 2	Trial 3	Average
D.1 Conditions of crop				
D.1.1 Crop				
D.1.2 Source				
D.1.3 Variety				
D.1.4 Days after harvest				
D.1.5 Moisture content (%)				
D.1.6 Dimension (mm)				
D.1.6.1 Length				
D.1.6.2 Width				
D.1.6.3 Diameter				
D.2 Speed of components (rpm)				
D.2.1 Primemover				
D.2.1.1 Without load				
D.2.1.2 With load				
D.2.2 Fan shaft				
D.2.2.1 Without load				
D.2.2.2 With load				
D.2.3 Oscillating screen shaft				
D.2.3.1 Without load				
D.2.3.2 With load				
D.3 Fan air velocity (m/sec)				
D.4 Noise level, dB(A)				
D.4.1 Feeder				
D.4.1.1 Without load				
D.4.1.2 With load				
D.4.2 Bagger				
D.4.2.1 Without load				
D.4.2.2 With load				
D.5 Cleaning time (min)				
D.6 Cleaned seeds (kg)				
D.7 Cleaning capacity (kg/h)				
D.8 Fuel time (min)				
D.9 Fuel consumed (L)				
D.10 Fuel consumption (L/h)				
D.11 Power consumption				
D.11.1 Power (kW)				
D.11.1.1 Without load				
D.11.1.2 With load				

ITEM	Trial 1	Trial 2	Trial 3	Average
D.11.2 Current (A)				
D.11.2.1 Without load				
D.11.2.2 With load				
D.11.3 Voltage (V)				
D.11.3.1 Without load				
D.11.3.2 With load				

D.12 Other observations

D.12.1 Ease of transporting the machine

D.12.2 Adjustments such as belt tensions, air velocity and others

D.12.3 Ease of cleaning the fan component

D.12.4 Safety

D.12.5 Labor requirements

D.12.6 Failure or abnormalities that may be observed on the machine or its component parts during and after the cleaning operation.

D.12.7Others

Annex E

Laboratory Analysis

E.1 Measurement of Seed Dimensions

This shall be taken using at least ten representative samples of seeds and measure the length width and thickness. A calibrated grain caliper shall be used for measuring the dimensions of the seeds.

E.2 Purity Determination

Take three 500 g samples from the main seed outlet. Clean the samples to remove the impurities and other foreign matters, the clean sample shall be weighed and recorded. The percent purity is calculated using the formula in clause G.3.

E.3 Determination of Losses

E.3.1 Cleaning loss

This shall be computed as the sum of scattering and blower loss (see Clause G.4).

E.3.1.1 Scattering loss

Seeds scattered around the machine with a maximum distance of 1.0 m away from the base of the machine, shall be collected after each trial, cleaned and weighed for the determination of scattering loss. The total weight of the clean seeds and the total time of collection shall be recorded for the computation of cleaning loss.

E.3.1.2 Blower loss

Three samples shall be taken from the fan outlet to collect the seeds mixed with impurities. Each sample shall be cleaned and weighed. The total weight of the clean seeds and the total time of collection shall be recorded for the computation of cleaning loss.

E.4 Moisture Content

At least five (5) representative samples taken randomly at 500 g each shall be taken for moisture content determination preferably using the Air-Oven Method or any calibrated moisture meter. Refer to PNS/PAES 203:2000 – Moisture Content Determination for Rice and Corn.

Annex F

Laboratory Seed Analysis Data Sheet

Machine Tested: _____ Analyzed by: _____
 Date of Test: _____ Date Analyzed: _____

F.1 Crop Conditions

F.1.1 Moisture Content, (% w.b)

Average			

F.1.2 Bulk Density

Average			

F.2 Seed Analysis

F.2.1 Purity Determination

Initial Weight of Test Samples = 500 grams

ITEM	Trial 1				Trial 2				Trial 3				Gen. Ave.
	1	2	3	Ave	1	2	3	Ave	1	2	3	Ave	
Cleaned (g)													
Purity (%)													

F.2.2 Loss Determination

Trial No.	Blower Loss		Scattering Loss		Cleaning Loss	
	Duration		Duration		Duration	
	Sample Wt. (g)	Total (kg)	Sample Wt. (g)	Total (kg)	Sample Wt. (g)	Total (kg)
1 a						
Ave.						
2 a						
Ave.						
3 a						
Ave.						
Gen. Ave.						

F.3 Cleaning Efficiency/Recovery Determination

Trial No.	Blower Loss		Scattering Loss		Cleaning Loss	
	Wt.	%	Wt.	%	Wt.	%
1						
2						
3						
Ave.						

Annex G

Formula Used During Calculations and Testing

G.1 Fuel Consumption (F_c), L/h

$$F_c = \frac{F_1}{T_o}$$

where

F_1 is the amount of fuel consumed, L

T_o is the time of operation, h

G.2 Input Capacity (C_i), kg/h

$$C_i = \frac{W_u}{T_o}$$

where

W_u is the weight of the unclean seeds, g

G.3 Purity (P), %

$$P = \frac{W_1}{W_u} \times 100$$

where

W_1 is the weight of the clean seeds, g

G.4 Cleaning Loss (C_l)

Blower loss (B_l)

$$B_l, \% = \frac{\text{Blown seeds, kg}}{\text{Clean seeds, kg} + \text{Blown seeds, kg} + \text{Scattered seeds, kg}} \times 100$$

Scattering loss (S_l)

$$S_l, \% = \frac{\text{Scattered seeds, kg}}{\text{Clean seeds, kg} + \text{Blown seeds, kg} + \text{Scattered seeds, kg}} \times 100$$

$$C_l, \% = \text{Blower loss (\%)} + \text{Scattering loss(\%)}$$

G.5 Cleaning Recovery (C_r), %

$$C_r, \% = \frac{\text{Clean seeds, kg}}{\text{Clean seeds, kg} + \text{Cleaning loss, kg}} \times 100$$

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