PHILIPPINE NATIONAL STANDARD

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Postharvest Machinery – Mechanical Peanut Thresher – Methods of Test

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Foreword

The development of the Philippine National Standard (PNS) for Postharvest Machinery- Mechanical Peanut Thresher –Methods of Test was initiated by University of the Philippines Los Baños – Agricultural Machinery Testing and Evaluation Center (UPLB – AMTEC) under the project entitled, "Testing and Evaluation of Machinery Generated from the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD)-Funded Projects Phase 2" funded by the PCAARRD–Department of Science and Technology (DOST). This standard was developed in collaboration with the Bureau of Agriculture and Fisheries Standards (BAFS) as the standard-setting agency of the Department of Agriculture for agriculture and fisheries machineries.

A Technical Working Group (TWG) was created to develop this PNS under Special Order No. 662, series of 2021 (Amendment to Special Order 81, series of 2021, Entitled: "Creation of TWGs for the Development of PNS for Agriculture and Fishery Products, Machinery, and Equipment"), which are composed of representatives from government agencies, academe, and private sector. The standard was discussed and reviewed through a stakeholder consultation and a series of TWG meetings conducted via online platforms before it was endorsed to the DA Secretary for approval in September 2021.

This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2.

Content

1 Scope

This standard specifies the methods of test and inspection for mechanical peanut thresher. Specifically, it shall be used to:

1.1 verify the mechanism, main dimensions, materials, accessories of the mechanical peanut thresher, and the list of specifications submitted by the manufacturer;

1.2 determine the performance of the machine;

1.3 evaluate the ease of handling and safety features; and

1.4 report the results of the tests.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their contents constitute requirements 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.

Bureau of Agriculture and Fisheries Standards (BAFS) – Department of Agriculture (DA). (2021). Postharvest machinery – Mechanical peanut thresher – Specifications (PNS/BAFS PABES XXX:2021)

Philippine Agricultural Engineering Standards (PAES) Task Force (2000). Agricultural machinery – Method 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

3 Terms and Definitions

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

3.1
blower loss
ratio of the weight of pods blown with the other plant parts by the thresher fan to the weight of the total pod input of the thresher, expressed in percent (%)

3.2
clean threshed pod
threshed pods with 100% purity exclusive of the empty pods and other impurities

3.3
concave clearance
clearance between cylinder threshing elements and concave component

3.4
concave grate
concave component
iron grill frame partly surrounding the cylinder on which the threshing elements rub, shear and/or impact the peanut pegs

3.5
cylinder length
distance between the outermost points along the cylinder base axis

3.6
cylinder peripheral speed
equivalent linear speed of the outermost point of the cylinder when running at normal operating speed, expressed in meters per second (m/s)

3.7
effective cylinder diameter
outside diameter generated by the outermost point of the cylinder threshing elements

3.8
overall height
distance between the horizontal supporting surface and the horizontal plane touching the uppermost part of the mechanical peanut thresher

NOTE All parts of the mechanical peanut thresher projecting upwards are contained between these two planes.

3.9
overall length
distance between the vertical planes at the right angles to the median plane of the mechanical peanut thresher, each plane touching its front and rear extremities

NOTE All parts of the mechanical peanut thresher, in particular components projecting at the front and at the rear are contained between these two planes. Where an adjustment of components is possible, it shall be set at minimum length.

3.10
overall width
distance between the vertical planes parallel to the median plane of the mechanical peanut thresher, each plane touching the outermost point of the machine on its respective sides

NOTE All parts of the machine projecting laterally are contained between these two planes.

3.11
prime mover
electric motor, gasoline, or diesel engine used to run the thresher

3.12
running-in period
preliminary operation of the machine to make various adjustments prior to the conduct of the test until the operation is stable

3.13
scattering loss
ratio of the weight of pods that fell out from the machine during threshing operation to the weight of the total pod input of the thresher, expressed in percent (%)

3.14
separation loss
ratio of the weight of pods that come out of the threshing chamber with the plant or pegs to the weight of total pod input of the thresher, expressed in percent (%)

3.15
test applicant
manufacturer, inventor, direct importer, or any legitimate distributor, dealer, or end-user of the machine

3.16
unthreshed loss
ratio of the weight of pods that are still attached to the pegs of the plants fed into the threshing chamber to the weight of total pod input of the thresher, expressed in percent (%)

4 General Conditions for Test

4.1 Selection of mechanical peanut thresher to be tested

Mechanical peanut thresher submitted for testing shall be sampled in accordance with PAES 103:2000 (Methods of Sampling) or any other suitable method of selection.

4.2 Role of the test applicant

The test applicant shall submit specifications, operator's manual and other relevant information about the mechanical peanut thresher. They shall abide with the terms and conditions set forth by the official testing agency and provide testing materials to carry out the test.

4.3 Role of the representative of the test applicant

An officially designated representative of the test applicant shall operate, demonstrate, adjust, repair (as the case maybe), and decide on matters related to the operation of the mechanical peanut thresher.

4.4 Role of the test engineer

The certified test engineer shall lead the conduct of the performance testing in accordance with the provisions of this standard. Furthermore, the test engineer shall oversee other relevant activities prior to and subsequent to the conduct of the testing.

4.5 Test site conditions

The mechanical peanut thresher shall be tested and installed according to the operating parameters as specified in the operator's manual. The site should have ample provisions for material handling, temporary storage, and workspace and suitable for normal working condition. Adequate ventilation and lighting shall be provided in the area.

4.6 Suspension/Termination 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. If the machine will not be able to continue operation, the test shall be terminated.

5 Test Preparation

5.1 Preparation of the mechanical peanut thresher for testing

The representative of the test applicant and official testing agency shall check the mechanical peanut thresher to ensure that the machine has been assembled and installed in accordance with the instruction of the test applicant. The official testing agency will test the mechanical peanut thresher according to the specifications of the manufacturer.

5.2 Test instruments and other materials

The suggested list of minimum field and laboratory test equipment and materials needed to carry out the mechanical peanut thresher test is shown in Annex A (Minimum List of Field and Laboratory Test Equipment and Materials). These instruments shall 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 to be used before going to and leaving from the testing area shall be prepared.

5.3 Test materials

Peanut plants to be used shall be commonly or locally grown, matured and harvested not more than three (3) days prior to threshing. The amount of test material to be supplied shall be sufficient for the required test trials, running-in, and laboratory analyses. The sample shall be prepared in such a way that the test sample to be used in each test trial have identical characteristics in terms of variety. If the test materials are not conforming to the recommended quantity and characteristics, the test engineer shall not pursue the test.

5.4 Running-in and preliminary adjustments

The mechanical peanut thresher shall have undergone a running-in period before starting the test. The machine shall be operated for sufficient duration with or without load at the test site by the official representative of the test applicant. During the running-in period, various adjustments of the machine shall be made according to the recommendation of the manufacturer.

6 Pre-test Inspections

6.1 Verification of specifications

The specifications claimed by the manufacturer and the physical details given in Annex B (Specifications of Mechanical Peanut Thresher) 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 samples

Representative test samples shall be collected by the testing agency from the test material for analysis. The sampling procedure is shown in Annex C (Sampling Procedures and Measurements).

7 Performance Test

7.1 Operation of the mechanical peanut thresher

The mechanical peanut thresher shall be operated at the manufacturer's recommended setting of its components. The same recommended setting shall be maintained during the test run. The official testing agency shall make all measurements, which form part of the test and take the prescribed samples. After the test run, the area shall be cleaned and then prepared for the next test trial. This procedure shall be repeated for the succeeding test trials. No other adjustments shall be permitted during the test.

7.2 Test trial

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

7.3 Sampling

Samples shall be collected at different outlets during each test trial. The sampling procedure is shown in Annex C (Sampling Procedures and Measurements).

7.4 Data collection

7.4.1 Duration of test

The duration of each test trial shall start with the initial feeding of the harvested peanut plants and end after the final feeding of the last bunch of plants. However, all discharge pods from the different outlets shall be included after the time cut-off.

7.4.2 Noise level

7.4.2.1 The noise emitted by the mechanical peanut thresher, with or without load, shall be measured using a sound level meter at the location of the operator/s. The noise level, expressed in decibel [dB (A)], shall be measured 50 mm away from the ear level of the feeding operator/s standing near the edge of the machine's feed-load area or feed board and the bagger/s.

7.4.2.2 For each data to be taken, there shall be a minimum of five (5) observations. Before taking 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 trial.

7.4.3 Speed of components

The speed of the rotating shafts of the mechanical peanut thresher's major components shall be taken using a tachometer with and without load. Requirements for each data to be taken shall conform to 7.4.2.2.

7.4.4 Air velocity

The air velocity generated by the thresher fan without load, shall be measured using an air velocity meter in m/s. Requirements for each data to be taken shall conform to 7.4.2.2.

7.4.5 Power requirement/ Fuel consumption

7.4.5.1 For mechanical peanut thresher using engine as prime mover

To get the amount of fuel consumed for every test trial, the tank shall be filled to a certain marked level before the test. After the test, the tank shall be filled to the same level before the test. The amount of fuel used to fill the tank is the amount of fuel consumed. When filling up the tank, careful attention shall be paid to keep the tank horizontal and not to leave empty space on the tank.

7.4.5.2 For mechanical peanut thresher using electric motor as prime mover

A power meter shall be used to measure the voltage, current, and the total power requirement of the mechanical peanut thresher. Requirements for each data to be taken shall conform to 7.4.2.2.

7.5 Data recording and observations

The record sheet for all data and information during the test is given in Annex D (Performance Test Data Sheet). 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, pod-plant ratio, plant length, purity, mechanically damaged pods, and losses (blower, separation, unthreshed, and scattering). The laboratory procedure to be followed in the analysis is given in Annex E (Laboratory Analysis), while the data sheets are given in Annex F (Laboratory Analysis Data Sheet).

9 Presentation of results

The machine specifications and the results of the test shall be presented in tabular form in which data shall be taken from Annexes B (Specifications of Mechanical Peanut Thresher) and D (Performance Test Data Sheet). A schematic diagram of the power transmission system and arrangement of the threshing elements shall also be included. Observations made on the machine while in operation shall be supported with photographs.

10 Formula

The formulas to be used during calculations and testing are given in Annex G (Formulas Used During Calculations and Testing).

11 Test report

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

11.1 Name of Testing Agency;

11.2 Test Report Number;

11.3 Title;

11.4 Summary of Results;

11.5 Purpose and Scope of Test;

11.6 Methods of Test;

11.7 Description of the Machine;

11.8 Specifications;

11.9 Results;

11.10 Observations (include pictures); and

11.11 Names, Signatures, and Designation of Test Engineers.

Annex A
(Informative)

Minimum List of Field and Laboratory Test Equipment and Materials

Table A.1 – Field Test Equipment and Materials

	Field Test Equipment and Material	Quantity
A.1.1	Air velocity meter Range: 0-30 m/s	1
A.1.2	Tachometer (contact type or non-contact type)	1
A.1.3	Sound level meter Range: 30 dB(A) to 130 dB(A)	1
A.1.4	Stopwatch Minimum Resolution: 0.1 sec	2
A.1.6	Measuring tape (at least 5m)	1
A.1.7	Camera	1
A.1.8	Weighing Scale Capacity: at least 100 kg Resolution: 0.5 kg	1
A.1.9	Graduated Cylinder Capacity: at least 500 mL	1
A.1.10	Clamp-on type Power meter/Multimeter	1
A.1.11	Canvas Sheet Dimensions: 4 m × 8 m	1
A.1.12	Nylon-Catch Bag Dimensions: 1.5 m × 1.5 m × 0.5 m	1
A.1.13	Nylon Net Dimensions: 1.5 m × 1.5 m	1
A.1.14	Vernier Caliper	1
A.1.15	Sample Bags	42

Table A.2 – Laboratory Test Equipment and Materials

	Laboratory Test Equipment and Materials	Quantity
A.2.1	Digital Weighing Scale Resolution: 0.01 g	1
A.2.2	Aluminum Cans	18
A.2.3	Convection Oven	1
A.2.4	Magnifying Lens (minimum of 10 magnifications)	1
A.2.5	Grain Sample Cleaner	1
A.2.5	Labeling Tags which include: Date of Test Mechanical peanut thresher on test (brand and model) Sample source Variety Trial Number	20

Annex B
(Informative)

Specifications of Mechanical Peanut Thresher

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

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

GENERAL INFORMATION

Make : _____ Type : _____
Serial No. : _____ Brand/Model : _____
Date of Manufacture: _____
Testing Agency : _____ Test Engineer: _____
Location of Test : _____ Date of Test : _____

No.	Items*	Manufacturer's Specification	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	Overall weight without prime mover (kg)		
B.2	**Rated threshing capacity (kg/batch or kg/h)**		
B.3	**Rated threshing cylinder speed, without load (rpm)**		
B.3.1	Cylinder		
B.3.1.1	Shaft speed (rpm)		
B.3.1.2	Peripheral speed (m/s)		
B.3.2	Fan or blower shaft (rpm)		
B.3.3	Oscillating screen shaft (rpm)		
B.4	**Prime mover**		
B.4.1	Engine		
B.4.1.1	Brand		
B.4.1.2	Model		
B.4.1.3	Serial Number		
B.4.1.4	Make or Manufacturer		
B.4.1.5	Type (cycle and ignition)		
B.4.1.6	Rated power (kW)		

No.	Items*	Manufacturer's Specification	Verification by the Testing Agency
B.4.1.7	Rated speed (rpm)		
B.4.1.8	Weight (kg)		
B.4.1.9	Cooling system		
B.4.1.10	Starting system		
B.4.2	Electric motor		
B.4.2.1	Brand		
B.4.2.2	Model		
B.4.2.3	Serial number		
B.4.2.4	Make or manufacturer		
B.4.2.5	Type		
B.4.2.6	Rated power (kW)		
B.4.2.7	Rated speed (rpm)		
B.4.2.8	Electrical service requirement		
B.4.2.9	Voltage, V		
B.4.2.10	Current, A		
B.4.2.11	Frequency (Hz)		
B.5	**Power transmission System**		
B.5.1	_____ to _____		
B.5.2	_____ to _____		
B.5.3	_____ to _____		
B.5.4	_____ to _____		
B.5.5	Others (specify)		
B.6	**Type of clutch system**		
B.7	**Threshing chamber**		
B.7.1	Threshing cylinder		
B.7.1.1	Type		
B.7.1.2	Dimension, L x D (mm)		
B.7.1.3	Vine-thrower paddles		
B.7.1.3.1	Number		
B.7.1.3.2	Material		
B.7.1.3.3	Other features		
B.7.2	Threshing element		
B.7.2.1	Type		
B.7.2.2	Dimension, L x W (mm)		
B.7.2.3	Number		
B.7.2.4	Distance between teeth (mm)		
B.7.2.5	Arrangement		
B.7.2.6	Material used		
B.7.2.7	Means of attachment		

No.	Items*	Manufacturer's Specification	Verification by the Testing Agency
B.7.2.8	Other features		
B.7.3	Cylinder cover		
B.7.3.1	Shape		
B.7.3.2	Material		
B.7.3.3	Louver		
B.7.3.3.1	Number		
B.7.3.3.2	Inclination with respect to the vertical axis (°)		
B.7.4	Concave		
B.7.4.1	Material		
B.7.4.2	Spacing between grills		
B.7.4.3	Clearance between concave and cylinder teeth (mm)		
B.8	**Feeding mechanism**		
B.8.1	Type		
B.8.2	Feeding table/Hopper (if applicable)		
B.8.2.1	Dimensions, L x W x H (mm)		
B.8.2.2	Height from the ground (mm)		
B.8.2.3	Dimensions of feeding opening, L x W (mm)		
B.8.2.4	Angle of inclination (°)		
B.8.2.5	Means of attachment		
B.8.2.6	Material		
B.8.3	Feeding conveyor (if applicable)		
B.8.3.1	Type		
B.8.3.2	Rated capacity (kg/h)		
B.8.3.3	Dimensions, L x W (mm)		
B.8.3.4	Height from the ground (mm)		
B.8.3.5	Material		
B.9	**Oscillating screen/sieve**		
B.9.1	Dimensions, L x W (mm)		
B.9.2	Size of perforations (mm)		
B.9.3	Length of stroke (mm)		
B.9.4	Angle of inclination (°)		
B.9.5	Material		
B.10	**Blower/Aspirator**		
B.10.1	Type		
B.10.2	Total Length (mm)		
B.10.3	Diameter (mm)		
B.10.4	Number of blades		
B.10.5	Size of inlet port (mm)		
B.10.6	Material		

No.	Items*	Manufacturer's Specification	Verification by the Testing Agency
B.10.7	Adjustment (if any)		
B.11	**Pod outlet chute**		
B.11.1	Material		
B.11.2	Dimensions of opening, L × W (mm)		
B.11.3	Angle of inclination (°)		
B.11.4	Height from the ground (mm)		
B.12	**Transport device**		
B.12.1	Type		
B.12.2	Dimensions of tire, L x W (mm) (if any)		
B.13	Adjustment (if any)		
B.14	**Safety device(s)**		
B.15	**Special feature(s)**		

*The parameter will be checked upon availability

B.15 Illustration of transmission system

Annex C
(Normative)

Sampling Procedures and Measurements

C.1 Sampling Procedures for Peanut Plant Input

The conditions of the harvested peanut plant such as moisture content of pod, pod-plant ratio, and length of the peanut plant to be used in each test trial shall be taken using three (3) "representative samples", each weighing 2 kg. This is done by randomly taking samples at the top, middle and bottom portions of the pile.

C.2 Sampling from Different Outlets

C.2.1 During each test trial, samples shall be randomly collected from different outlets of the mechanical peanut thresher to be analyzed in the laboratory for losses, purity, and pod 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 thresher outlets:

C.2.1.1 Main pod outlet/s

Using a plastic bag or an appropriate container, three (3) or more samples of approximately 0.5 kg each from the different pod outlets shall be collected. A final sample of approximately 1.5 kg shall be taken to the laboratory for analysis.

C.2.1.2 Vine thrower outlet

In the collection of samples in this outlet, a rectangular box-shaped nylon catch with a dimension of 1.5 m x 1.5 m x 0.5 m open at one end of the small side shall be used. Three (3) samples shall be collected from this outlet with 10-second duration per collection. The free pod mixed with the vine and the pods that are still attached to the pegs shall be separated. The free pods shall be put in a container and labeled as separation loss while the pods that are still attached to the pegs shall be placed in a separated container and labeled as unthreshed loss.

C.2.1.3 Blower outlet

During the test, three (3) samples shall be taken from the vine outlet for a duration of 10 seconds per collection by using a nylon net with a dimension of 1.5 m x 1.5 m x 0.5 m held by two persons at both ends. These samples shall be placed in appropriate containers and labeled as blower loss.

C.3 Collection of Scattered Pods

For testing purposes, scattered pods shall be gathered since these pods are part of the total pod input. These are pods collected beyond 1.0 m from the base of the machine. Spread canvas sheets around the threshing floor area to catch these pods

after each test trial. The collected pods shall be placed in appropriate containers and labelled as scattering loss.

C.4 Handling of Samples

All samples to be taken to the laboratory shall be placed in appropriate containers and properly labeled. If the sample is to be used for determining moisture content, it shall be kept in dry and airtight containers. Care should be taken to prevent alterations of the conditions of the test samples.

Annex D
(Informative)

Performance Test Data Sheet

Test Trial No.: _____ Date: _____
Test Engineers: _____ Location: _____
Assistants: _____ Machine: _____
Test Requested By: _____ Manufacturer: _____

No.	Items	Trial 1	Trial 2	Trial 3	Average
D.1	**Crop condition**				
D.1.1	Variety				
D.1.2	Days after harvest				
D.1.3	Source				
D.1.4	Plant length (mm)				
D.1.5	Pod moisture content ($\%_{wb}$)				
D.1.6	Pod-plant ratio				
D.2	**Performance test**				
D.2.1	Operating time (min)				
D.2.2	Threshed pods (kg)				
D.2.3	Actual threshing capacity (kg/h)				
D.2.4	Corrected threshing capacity (kg/h)				
D.2.5	Speed of components				
D.2.5.1	Prime mover				
D.2.5.1.1	Without load				
D.2.5.1.2	With load				
D.2.5.2	Threshing cylinder shaft				
D.2.5.2.1	Without load				
D.2.5.2.2	With load				
D.2.5.3	Fan shaft				
D.2.5.3.1	Without load				
D.2.5.3.2	With load				
D.2.5.4	Oscillating sieve/screen shaft				
D.2.5.4.1	Without load				
D.2.5.4.2	With load				
D.2.5.5	Fan air velocity, without load (m/s)				
D.2.6	Noise level [dB(A)]				
D.2.6.1	Feeding operator				
D.2.6.1.1	Without load				
D.2.6.1.2	With load				
D.2.6.2	Bagger				
D.2.6.2.1	Without load				
D.2.6.2.2	With load				
D.2.7	Fuel consumed (L)				

No.	Items	Trial 1	Trial 2	Trial 3	Average
D.2.8	Fuel consumption (L/h)				
D.2.9	Power consumption				
D.2.9.1	Input power (kW)				
D.2.9.2	Line voltage (V)				
D.2.9.3	Load current (A)				

D.3 Other Observations

D.3.1 Safety, workmanship and finish

	Item	Yes	No
D.3.1.1	Provision of ear protection device		
D.3.1.2	Presence of manufacturing defects		
D.3.1.3	Presence of noticeable cracks and weak joints on the base of the mechanical peanut thresher		
D.3.1.4	Provision of safety guards		
D.3.1.5	Statistically and dynamically balanced rotating components		
D.3.1.6	Rust-free and properly painted metal surfaces		
D.3.1.7	Presence of sharp edges and rough surfaces		
D.3.1.8	Provision of warning notices		
D.3.1.9	Provision of immediate power transmission disengagement mechanism		
D.3.1.10	Provision for the operators' safety in the feeding port		

D.3.2 Ease of transporting the machine

_____
_____
_____
_____
_____
_____

D.3.3 Ease of adjusting and repairing of parts

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_____
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_____
_____

D.3.4 Presence of pods that are blown back at the feeding port during threshing operation

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D.3.5 Ease of cleaning the cylinder and concave

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_____
_____
_____

D.3.6 Ease of cleaning the fan and housing assembly

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_____
_____
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D.3.7 Labor requirement

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_____

D.3.8 Failure or abnormalities that shall be observed on the thresher or its component parts during and after the threshing operation.

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_____
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_____
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_____

D.3.9 Others

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_____

Annex E
(Normative)

Laboratory Analysis

E.1 Measurement of Plant Length

Randomly take at least 10 representative samples of peanut plants and measure the length from the tip of the roots to the tip of leaves.

E.2 Measurement of Pod-Plant Ratio

Take three (3) 1-kg representative samples of peanut plants from the test materials. For each sample, manually thresh the pods from the vines. Determine the weight of the threshed pods. After weighing, store the threshed pods in a clean plastic bag for moisture content analysis. Record and calculate the pod-plant ratio using the formula in Annex G. The average of the three (3) samples shall be taken as the pod-plant ratio.

E.3 Determination of Moisture Content of Input Pod by Air Oven Method

E.3.1 Manually remove all foreign matter from the sample. Randomly obtain three (3) 100 g of threshed pods previously stored after manual threshing.

E.3.2 For each sample, manually shell the peanut pods to separate the shells and the kernels. Weigh them separately and place each sample in separate moisture can. Ensure that no moisture is lost or gained by the sample between the time it was collected until it is weighed in a moisture can. Weigh and record all the initial weights.

E.3.3 Dry the samples in the oven with a temperature of 100 °C ± 3 °C for 72 hours.

E.3.4 After removing the samples from the oven, place the moisture can with samples in a desiccator and allow them to cool to the ambient temperature.

E.3.5 Weigh the moisture can with the dried sample. Record the final weight of the shells and the kernels. Calculate the moisture content of shell, kernel, and whole pod using the formulas in Annex G.

E.4 Purity Determination of Threshed Pods

Randomly take three (3) 500-g sample from the representative samples taken from the main pod outlet. Clean the pods to remove the impurities and other foreign matters. The clean pod shall be weighed and recorded. Calculate the purity using the formula in Annex G.

E.5 Determination of Losses

E.5.1 Blower loss

Three (3) samples shall be taken at the blower outlet for 10 seconds per collection to gather pods mixed with the vines. Each sample shall be cleaned and weighed. The

total weight of the clean pods and the total time of collection shall be recorded for the computation of blower loss using the formula in Annex G.

E.5.2 Separation loss

Three (3) samples shall be taken at the vine thrower outlet for 10 seconds per collection to gather loose pods mixed with the vines. The total weight of the clean pods collected and the total time of collection of the three (3) samples shall be taken and recorded for the computation of separation loss using the formula in Annex G.

E.5.3 Unthreshed loss

Unthreshed pods collected at the vine thrower outlet and blower outlet for 10 seconds per collection or from the threshed peanut plants after threshing operation shall be hand threshed and weighed. The total weight and time of collection shall be taken and recorded for the computation of unthreshed loss using the formula in Annex G.

E.5.4 Scattering loss

Pods scattered beyond 1.0 m from the base of the machine shall be collected after each trial, cleaned and weighed for the determination of scattering loss using the formula in Annex G.

E.6 Determination of Percent Mechanically Damaged Pods

Three (3) samples from cleaned, threshed pods shall be taken for analysis. Each sample shall consist of 500 g. Separate those pods that were broken, crushed or shelled (partially or fully) and weigh. Compute for the percentage of mechanically damaged pods using the formula in Annex G.

Annex F
(Informative)

Laboratory Analysis Data Sheet

Machine Tested: _____ Date Tested: _____
Analyzed by: _____ Date Analyzed: _____

F.1 Crop Conditions

F.1.1 Measurement of Plant Length

Sample no.	Length (mm)	Sample no.	Length (mm)
1		6	
2		7	
3		8	
4		9	
5		10	
Average (mm)			

F.1.2 Determination of Pod-Plant Ratio

Sample no.	Weight of whole plant (g)	Weight of threshed pods (g)	Pod-plant ratio
1			
2			
3			
Average			

F.1.3 Determination of Pod Moisture Content (% wet basis) by Air Oven

Test Trial No.	Sam-ple No.	Pod	Kernel		Shell		Moisture Content, %
		Initial weight, g	Initial weight, g	Final weight, g	Initial weight, g	Final weight, g	
I	1						
	2						
	3						
	Ave.						
II	1						
	2						
	3						
	Ave.						
III	1						
	2						
	3						
	Ave.						

F.2 Threshed Pod Analysis

F.2.1 Purity Determination

Initial Weight of Samples (Uncleaned) = 500 g

Item	Test Trial I				Test Trial II				Test Trial III				Gen. Ave.
	1	2	3	Ave.	1	2	3	Ave.	1	2	3	Ave.	
Cleaned pods (g)													
Purity (%)													

F.2.2 Determination of Losses

Test Trial No.	Sam-ple No.	Blower Loss		Separation Loss		Unthreshed Loss		Scattering Loss
		Duration:		Duration:		Duration:		
		Sample Wt. (g)	Total (kg)	Sample Wt. (g)	Total (kg)	Sample Wt. (g)	Total (kg)	Total (kg)
I	1							
	2							
	3							
	Ave.							
II	1							
	2							
	3							
	Ave.							
III	1							
	2							
	3							
	Ave.							

F.2.3 Determination of Threshing Efficiency and Recovery

Sam-ple No.	Blower Loss		Separa-tion Loss		Un-threshed Loss		Scatter-ing Loss		Weight of Cleaned Threshed Pods	Input (kg)
	Wt. (kg)	%	Wt. (kg)	%	Wt. (kg)	%	Wt. (kg)	%		
1										
2										
3										
Ave.										

F.2.4 Determination of Mechanically Damaged Pods

Initial Weight of Samples (Uncleaned) = 500 g

Item	Test Trial I				Test Trial II				Test Trial III				Gen. Ave.
	1	2	3	Ave.	1	2	3	Ave.	1	2	3	Ave.	
Mechanically damaged pods (g)													
Percent Mechanically damaged (%)													

Annex G
(Normative)

Formulas Used During Calculations and Testing

G.1 Pod-Plant Ratio (R)

$$R = \frac{w_p}{w_w}$$

where:

R is the pod-plant ratio
w_p is the weight of pods (g)
w_w is the weight of whole plant(g)

G.2 Moisture Content

G.2.1 Percent shells

$$S = \frac{w_{is}}{w_{ip}} \times 100$$

where:

S is the percent shells (%)
m_{is} is the initial weight of shells (g)
m_{ip} is the initial weight of pods (g)

G.2.2 Percent kernels

$$K = \frac{w_{ik}}{w_{ip}} \times 100$$

where:

K is the percent kernels (%)
w_{ik} is the initial weight of kernel (g)
w_{ip} is the initial weight of pods (g)

G.2.3 Shell moisture content in % wet basis (SMR)

$$SMR = \frac{w_{is} - w_{fs}}{w_{is}} \times 100$$

where:

SMR is the shell moisture content in % wet basis (%)
w_{is} is the initial weight of shells (g)
w_{fs} is the final weight of shells (g)

G.2.4 Kernel moisture content in % wet basis (KMR)

$$KMR = \frac{w_{ik} - w_{fk}}{w_{ik}} \times 100$$

where:

KMR is the kernel moisture content in % wet basis (%)
w_{ik} is the initial weight of kernels (g)
w_{fk} is the final weight of kernels (g)

G.2.5 Whole pod moisture content in % wet basis (PMR)

$$PMR = \frac{(KMR \times K) + (SMR \times S)}{100}$$

where:

PMR is the whole pod moisture content in % wet basis (%)
SMR is the shell moisture content in % wet basis (%)
KMR is the kernel moisture content in % wet basis (%)
S is the percent shells (%)
K is the percent kernels (%)

G.3 Fuel or Electric Energy Consumption

G.3.1 Fuel consumption

$$F_{cr} = \frac{F_v}{T}$$

where:

F_{cr} is the fuel consumption rate (L/h)
F_v is the volume of fuel consumed (L)
T is the fuel time (h)

G.3.2 Electric energy consumption

$$E_c = P_c \, x \, T_o$$

where:

E_c is the electric energy consumption (kW-h)
P_v is the amount of power consumed (kW)
T_o is the total operating time (h)

G.4 Threshing Capacity

$$C_a = \frac{W_t}{T_o}$$

where:

C_a is the threshing capacity (kg/h)
W_t is the weight of threshed pods collected from main pod outlet/s (kg)
T_o is the total operating time (h)

G.5 Purity

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

where:

P is the purity (%)
W_u is the weight of uncleaned pods (g)
W_c is the weight of cleaned pods (g)

G.6 Losses

G.6.1 Summation of all losses, kg (L_T)

$$L_T = B_l + S_l + U_l + Sc_l$$

where:

L_T is the summation of all losses (kg)
B_l is the total blower loss (kg)
S_l is the total separation loss (kg)
U_l is the total unthreshed loss (kg)
Sc_l is the total scattering pods (kg)

G.6.2 Blower loss

G.6.2.1 Amount

$$B_l = \frac{W_b}{T_c} \times T_o$$

where:

B_l is the blower loss (kg)
W_b is the weight of blown, clean pods (kg)

T_c is the duration of collection (h)
T_o is the total operating time (h)

G.6.2.2 Percentage

$$\% B_l = \frac{B_l}{W_c + L_T} \times 100$$

where:

$\% B_l$ is the blower loss (%)
B_l is the blower loss (kg)
W_c is the weight of clean threshed pods (kg)
L_T is the summation of all losses (kg)

G.6.3 Separation loss

G.6.3.1 Amount

$$S_l = \frac{W_s}{T_c} \times T_o$$

where:

S_l is the separation loss (kg)
W_s is the weight of separated, clean pods (kg)
T_c is the duration of collection (h)
T_o is the total operating time (h)

G.6.3.2 Percentage

$$\% S_l = \frac{S_l}{W_c + L_T} \times 100$$

where:

$\% S_l$ is the separation loss (%)
S_l is the separation loss (kg)
W_c is the weight of clean threshed pods (kg)
L_T is the summation of all losses (kg)

G.6.4 Unthreshed loss

G.6.4.1 Amount

$$U_l = \frac{W_u}{T_c} \times T_o$$

where:

U_l is the unthreshed loss (kg)
W_u is the weight of unthreshed, clean pods (kg)
T_c is the duration of collection (h)
T_o is the total operating time (h)

G.6.4.2 Percentage

$$\%\ U_l = \frac{U_l}{W_c + L_T} \times 100$$

where:

$\%\ U_l$ is the unthreshed loss (%)
U_l is the unthreshed loss (kg)
W_c is the weight of clean threshed pods (kg)
L_T is the summation of all losses (kg)

G.6.5 Scattering loss

$$\%\ Sc_l = \frac{Sc_l}{W_c + L_T} \times 100$$

where:

$\%\ Sc_l$ is the scattering loss (%)
Sc_l is the weight of clean scattered pods(kg)
W_c is the weight of clean threshed pods (kg)
L_T is the summation of all losses (kg)

G.7 Threshing Efficiency

$$T_e = \frac{W_c + B_l + S_l + Sc_l}{W_c + L_T} \times 100$$

Or

$$T_e = 100 - \%U_l$$

where:

T_e is the threshing cylinder efficiency (%)
B_l is the blower loss (kg)
S_l is the separation loss (kg)
Sc_l is the weight of clean scattered pods(kg)
$\%U_l$ is the unthreshed loss (%)
W_c is the weight of clean threshed pods (kg)
L_T is the summation of all losses (kg)

G.8 Threshing Recovery

$$T_r = \frac{W_c}{W_c + L_T} \times 100$$

where:

T_r is the threshing recovery (%)
W_c is the weight of clean threshed pods (kg)
L_T is the summation of all losses (kg)

G.9 Percent Mechanically Damaged Pods

$$D_p = \frac{W_b}{W_p} \times 100$$

where:

D_p is the percent mechanically damaged pods (%)
W_d is the weight of mechanically damaged pods (g)
W_p is the weight of sample equal to 500 g

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