AMTEC METHODS OF TEST

AM 001:2021

Agricultural and Fisheries Machinery – General Methods of Test

AGRICULTURAL MACHINERY TESTING AND EVALUATION CENTER

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Contents

Foreword

The formulation of this AMTEC Methods of Test (AM) was initiated by the University of the Philippines Los Baños-Agricultural Machinery Testing and Evaluation Center (UPLB-AMTEC). It was made in collaboration with the Bureau of Agricultural and Fisheries Engineering (BAFE)-Department of Agriculture (DA) as the regulatory agency for agriculture and fisheries machinery and infrastructures.

This standard covers the General Methods of Test for testing and inspection of Agricultural and Fisheries Machinery without existing Philippine National Standard (PNS), Bureau of Agriculture and Fisheries Standard (BAFS), or Philippine Agricultural and Biosystems Engineering Standard (PABES). It follows the basic principle of field and laboratory performance testing which requires the determination of different performance parameters which include but not limited to capacity, efficiency, fuel and/or power consumption, and noise level. Some of the agricultural and fisheries machinery shall be tested based on the existing Standards of similar or related machinery.

The draft AM underwent a series of reviews and online circulations among AMTEC engineers and stakeholders before its finalization and endorsement to the BAFE-DA.

This AM was drafted in accordance with the Bureau of Agriculture and Fisheries Standards (BAFS)-Standards Development Division (SDD) Standardization Guide No. 1: Writing the Philippine National 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.

1 Scope

This standard specifies the methods of test and inspection for agricultural and fisheries machinery. Specifically, it shall be used to:

1.1 verify the mechanism, dimensions, materials, accessories of the machine, and the list of specifications submitted by the test applicant;

1.2 determine the laboratory and/or field performances of the machine;

1.3 evaluate the ease of handling and safety features; and

1.4 prepare the report of the test results.

2 Normative References

The following document is referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies. For undated references, 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). (2021). Agricultural and fishery machinery – General Methods of test (AM 001:2021)

3 Terms and Definitions

For the purpose of this standard, the definitions given in the existing Standards shall apply. In addition, the following terms and accompanying definitions shall also apply:

3.1
actual field capacity
actual area covered per unit of time of operation, expressed in hectares per hour (ha/h)

3.2
agricultural and fisheries machinery
machinery and equipment for the production, harvesting, processing, storage, manufacture, preservation, transportation and distribution of agricultural and fisheries products and by-products
includes but not limited to tractors and their attachments; power tillers; seeders; transplanters; windmills; harvesting machines; crop protection and maintenance equipment; irrigation facilities, equipment and accessories; greenhouses and other thermal conditioning equipment; livestock equipment; fishery equipment; slaughtering equipment; meat/fishery and crop processing equipment and facilities; postharvest machines such as milling machines, dryers, threshers, grain and other strippers; agricultural transport machinery including tramlines; and storage facilities including

cold storage, reefer vans, slaughter houses, and fishing boats of three (3) gross tons or less

3.3
blower loss
ratio of the weight of grains blown with the impurities by the fan, to the weight of the total grain input, expressed in percent (%)

3.4
broken/damaged grains
grains that were broken, crushed, or dehulled (partially or fully) as a result of machine operation

3.5
bulk density
weight per unit volume of the sample, expressed in kilogram per cubic meter (kg/m^3)

3.6
coefficient of variation of particle size
statistical representation of the precision of the particle size of the sample

3.7
cracked kernels/grains
kernels or grains which show signs of fissures or fractures or splinters

3.8
dry basis moisture content
ratio of the weight of moisture to the dry weight of the sample, expressed in percent (%)

3.9
effective operating width
operating width excluding overlap

3.10
field efficiency
ratio of the actual or effective field capacity to the theoretical field capacity, expressed in percent (%)

3.11
fineness modulus
classification system that indicates the uniformity of size of the grind (e.g., ground, pulverized, milled, or crushed products) in the resultant product; sum of the weight fractions retained above each sieve divided by 100

3.12
fuel consumption
amount of fuel consumed per unit time or area covered

3.13
grain content
grain-straw ratio
grain-plant ratio
ratio of the weight of the grains present in the panicles or plant, to the total weight of the grain and straw or plant residue in the same sample

3.14
implement
any agricultural tool hitched or mounted to the tractor

3.15
input capacity
weight of input material fed to the intake hopper or pit per unit time, expressed in kilogram per hour (kg/h)

3.16
operating overlap
distance perpendicular to the direction of travel that an implement reworks soil previously tilled

3.17
operating width
horizontal distance perpendicular to the direction of travel within which an implement performs its intended function

3.18
output capacity
weight of output collected at the product outlet per unit time, expressed in kilogram per hour (kg/h)

3.19
overall height
distance between the horizontal supporting plane surface and the horizontal plane touching the uppermost part of the machine

3.20
overall length
distance between the vertical planes perpendicular to the median plane of the machine, each plane touching the front and rear extremities of the machine

3.21
overall width
distance between the vertical planes parallel to the median plane of the machine, each plane touching the outermost point of the machine on its left and right sides

3.22
pedestrian-operated machine
walking-type machine
machine, having an integral power unit but normally operated by a pedestrian (walking), designed to carry out agricultural operation, and which may also be operated from a seat on an attachment or trailer

3.23
prime mover
electric motor or internal combustion engine used to run or power the machine

3.24
purity
degree of the cleanliness of the samples mixed with impurities; ratio of the weight of cleaned samples to the total weight of uncleaned samples, expressed in percent (%)

3.25
running-in period
preliminary operation conducted before the actual testing of the machine to make various adjustments until the operation is stable

3.26
scattering loss
ratio of the weight of grains that fell out from the machine during operation, to the weight of the total grain input, expressed in percent (%)

3.27
separation loss
ratio of the weight of grains that came out with the by-products (e.g., straw, chaff, cob) from the by-product outlet or thrower to the weight of total grain input, expressed in percent (%)

3.28
self-propelled machine
having one or more integral power units which propel and operate the machine, designed to carry out agricultural operations while on the move

3.29
soil resistance
soil hardness
cone depth
resistance of soil to deformation, rupture, or penetration under externally applied mechanical stresses, expressed in kilogram per square centimeter (kg/cm^2)

3.30
test applicant
manufacturer, inventor, direct importer, legitimate distributor, dealer, owner, or end-user of the machine that officially applied for a machine test

3.31
test material
appropriate material or combinations thereof (e.g., crops, seeds, plant residues, wastes, additives) fed to the machine during test operation

3.32
test plot
portion of a field, compliant with the required size and shape (rectangular), used for testing implements and self-propelled machineries for farm operations such as land preparation, crop establishment, and harvesting

3.33
test site
place or location (e.g., field, AMTEC Test Laboratory) where the test is conducted

3.34
theoretical field capacity
maximum possible field capacity that can be obtained at a given traveling speed at full operating width, expressed in hectares per hour (ha/h)

3.35
wet basis moisture content
ratio of the weight of moisture to the fresh weight of the sample, expressed in percent (%)

3.36
wheel slippage
reduction in the distance traveled by a self-propelled machine due to the sliding of the wheel on the soil when operating with load

4 General Conditions for Test

4.1 Selection of machinery to be tested

The machine submitted for testing shall be sampled in accordance with PAES 103:2000 or any other suitable method of sampling.

4.2 Role of the test applicant

The test applicant shall provide the necessary information or documents on the specifications of the machine to be tested. They shall abide with the terms and conditions set forth by the AMTEC, provide test materials, and shoulder other variable costs to carry out the test.

4.3 Role of the representative of the test applicant

An official representative from the test applicant shall operate, demonstrate, adjust, repair as the case maybe, and decide on matters related to the operation of the machine.

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 and the specific AMTEC Methods of Test for the machinery. Furthermore, the test engineer shall oversee other relevant activities prior and subsequent to the conduct of the testing.

4.5 Test site conditions

Implements and self-propelled machineries for land preparation, crop establishment, and harvesting shall be tested through actual field operation and in the laboratory as the case may be. If applicable, the field shall have ample space to allow turns in the headland depending on the machine or based from the specific AMTEC Methods of Test of the machinery and existing Standards of related machine as identified in Annex F.

Post-production and other processing machineries shall be installed and tested for normal operation in an area with ample space. The site should have ample provisions for material handling and temporary storage. The site should also be suitable to normal working conditions. Adequate ventilation and lighting shall be provided in the area.

4.6 Suspension/Termination of test

4.6.1 During the testing operation, the test may be suspended if the machine stops or cannot operate or cannot be tested due to the following. At such instances, the AMTEC may allow the representatives of the test applicant to repair and/or replace with similar specifications an assembly of a machine and to change a test material or test plot with a new one that conforms to the recommended size, characteristics, quality, and/or conditions. The AMTEC may also await such instances until they are resolved to continue the test operation.

Item No.	Conditions for Suspension
4.6.1.1	Minor breakdown or malfunction
4.6.1.2	Insufficient amount of test material
4.6.1.3	Nonconformity of the test material to the recommended characteristics and quality
4.6.1.4	Insufficient area of test plot
4.6.1.5	Nonconformity of the test plot to the recommended characteristics and conditions
4.6.1.6	Unmatched prime mover or tractor used
4.6.1.7	Clogged or choked part/s of the machine
4.6.1.8	Absence of power source for the machine due to power outage or brownout
4.6.1.9	Accident and injury of the personnel/representatives of test applicant or AMTEC
4.6.1.10	Poor and severe weather conditions that may affect the test

4.6.2 During the testing operation, the test shall be terminated if the machine cannot continue its operation due to the following:

Item No.	Conditions for Termination
4.6.2.1	Three breakdowns during the whole duration of all test trials
4.6.2.2	Three clogging or choking during the whole duration of all test trials
4.6.2.3	Major malfunction, breakdown, or damage affecting performance of the machine

5 Test Preparation

5.1 Preparation of the machine for testing

The official representatives of both the test applicant and AMTEC shall check the machine to ensure that it has been assembled and installed in accordance with the instruction of the manufacturer. The AMTEC shall test the machine according to the specifications and conditions set by 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 general performance tests and measurements given in Annex C is shown in Annex A. 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 departure to and from the testing area shall be prepared.

5.3 Test plots and materials

5.3.1 Test plots

Test plots shall be rectangular with sides in the ratio of 2:1 as much as possible. The size shall not be less than the required area depending on the machine. In general, the test plot shall not be less than 1000 m^2 for implements attached to four-wheel tractors and 500 m^2 for implements attached to two-wheel tractors for each test trial. For manually operated machines, the area of the test plot shall be sufficient for 15 minutes of operation for each test trial. Equal size and conditions of test plot should be used for all test trials. The total size of the prepared test plots shall be sufficient for the required number of test trials and running-in period. However, if the test plots are not compliant with the recommended characteristics, the AMTEC shall not proceed with or shall suspend the test.

5.3.2 Test materials

Appropriate materials for testing shall be used. Crops should be common or locally grown and of single variety. The qualities of the test materials are stipulated in the specific AMTEC Methods of Test of the machinery or may be based on the existing Standards of related machine as identified in Annex F. The quantity of test material to be supplied shall be sufficient for the required test trials, running-in period, and laboratory tests. Specifically, the quantity of test material shall be sufficient for at least 15 minutes of operation per test trial. Equal quantity of test material shall be used for all test trials. The test materials shall be prepared in such a way that they shall have identical characteristics when they are used for running-in period and in each test trial. However, if the test materials are not compliant with the recommended quantity and characteristics, the AMTEC shall not proceed with or shall suspend the test.

5.4 Running-in and preliminary adjustments

The machine shall have undergone a running-in period before starting the test. During the running-in period, the various adjustments of the machine shall be made accordingly to the recommendation of the manufacturer. No adjustments shall be permitted during the test proper.

6 Pre-test observation

6.1 Verification of specifications

The specifications claimed by the manufacturer and other physical details (e.g., overall length, width, and height) shall be verified by the AMTEC. A stable and level surface shall be used as a reference plane for the verification of dimensional machine specifications.

6.2 Initial test site and crop or test sample conditions

For implements and self-propelled machineries for land preparation, crop establishment, and harvest, test site and crop conditions prior to test operation shall be observed and measured. Representative samples (e.g., soil) shall be collected by the AMTEC for analysis

For post-production and other processing machineries, representative test samples shall be collected by the AMTEC from the test material for analysis.

Sampling procedure is shown in Annex B.

7 Performance Test

7.1 Operation of the machine

The machine shall be operated with and, if applicable, without load by the official representative of the test applicant using the recommended setting of the manufacturer and/or test applicant. As part of the test, the AMTEC shall make all measurements and take the prescribed samples. No other adjustments shall be permitted during the test. The items to be inspected or measured shall be recorded in the corresponding performance test data sheets.

7.2 Test Trials

A minimum of three (3) test trials should be conducted except for the ones mentioned hereafter.

A maximum of one (1) test trial shall be conducted in the case of Dryer, Dehydrator, Solar-Powered Irrigation System, and Incubator for practical purposes.

7.3 Sampling

Samples shall be collected from the test materials during each test trial. Sampling procedure is shown in Annex B.

7.4 Data collection

7.4.1 Duration of test

For implements and self-propelled machineries for land preparation, crop establishment, and harvesting, the duration of each trial shall last until the field operation in the required area is finished or shall be at least fifteen (15) minutes. For post-production and other processing machineries, the duration of at least fifteen (15) minutes per trial shall be adopted. However, duration per trial may change depending on the set-up in consideration of machine capacity and field condition among others.

7.4.2 Tests and measurements

Different tests and measurements shall be carried out to obtain actual data on the overall performance of the machine. In general, performance of a given machine shall be determined based on its main or intended function.

For implements and self-propelled machineries for land preparation, crop establishment, and harvest, tests for and measurement of different parameters including but not limited to the following shall be conducted: field capacity, field efficiency, noise level, operating/traveling speed, and fuel consumption.

For post-production and other processing machineries, tests for and measurement of different parameters including but not limited to the following shall be conducted: input and output capacities, fuel consumption or power requirement, noise level, product recovery, pulse rate, speed of components, quality of output, and losses.

The procedures for some of the general performance tests and measurements are given in Annex C. Additional guidelines for the performance tests and measurements of some machines without Standards are given in Annex F which may be revised from time to time.

7.4.3 Data recording and observations

Corresponding record sheet for all data and information shall be used during the test. Necessary observations to be taken during the performance test should be recorded in this sheet.

8 Laboratory Analysis

Laboratory analyses shall be conducted to determine test material and test site conditions, and other performance data.

Determination of test material conditions including but not limited to the following should be conducted: bulk density, moisture content, purity, and average size and dimensions.

Determination of test site conditions including but not limited to the following should be conducted: soil bulk density, soil moisture content, and soil resistance.

Determination of other performance parameters including losses (for grain threshing or processing machineries) and sieve analysis (for size reduction machineries) should be conducted.

The laboratory procedures for some of the analyses are given in Annex D.

9 Presentation of Results

Machine specifications and the results of the test shall be presented in tabular form. A process flow chart for a machine composed of different processing components shall also be included. Observations made on the machine while in operation shall be supported with corresponding photographs.

10 Formula

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

11 Test Report

The AMTEC test report shall include the following information in the order given. The test report format is given in Annex G.

11.1 Name of Testing Agency

11.2 Test Report Number

11.3 Title

11.4 Summary of Results

11.5 Observations

11.6 Purpose and Scope of Test

11.7 Methods of Test

11.8 Description of the Machine

11.9 Specifications

11.10 Results

11.11 Other Observations with Pictures

11.12 Names, Signatures and Designation of Test Engineers and AMTEC Director

Annex A
(informative)

Minimum List of Field and Laboratory Test Equipment and Materials

A.1	Field Test Equipment and Material	Quantity
A.1.1	Depth and width gauge/meter	1
A.1.2	Moisture meter (duly calibrated using the standard method) Range: 10% to 60%	1
A.1.3	Air velocity meter Range: 0-30 m/s	1
A.1.4	Tachometer (contact type or non-contact type)	1
A.1.5	Sound level meter Range: 30 dB(A) to 130 dB(A)	1
A.1.6	Stopwatch Minimum resolution: 0.1 sec	2
A.1.7	Measuring tape (at least 50 m)	1
A.1.8	Steel tape (at least 5 m)	1
A.1.9	Marking poles (at least 2 m)	8
A.1.10	Camera	1
A.1.11	Weighing scale Capacity: at least 100 kg Resolution: 0.5 kg	1
A.1.12	Graduated cylinder Capacity: at least 500 mL	1
A.1.13	Clamp-on type power meter/Multimeter	1
A.1.14	Canvas sheet Dimensions: 4 m × 8 m	1
A.1.15	Nylon-catch bag Dimensions: 1.5 m × 1.5 m × 0.5 m	1
A.1.16	Nylon net Dimensions: 1.5 m × 1.5 m	1
A.1.17	Sample bags	

A.2	Laboratory Test Equipment and Materials	Quantity
A.2.1	Digital weighing scale Resolution: 0.01 g	1
A.2.2	Magnifying lens (minimum of 10 magnifications)	1
A.2.3	Grain sample cleaner	1
A.2.4	Bulk density tester/meter	1
A.2.5	Moisture meter (duly calibrated using the standard method) Range: 10% to 60%	1
A.2.6	Air oven	1
A.2.7	Aluminum moisture cans	
A.2.8	Desiccator	1
A.2.9	Set of standard screen sieves	1
A.2.10	Laboratory sieve shaker	1
A.2.11	Grain caliper	1
A.2.12	Labeling tags which include: Date of test Machine on test (Brand and Model) Sample source Variety Trial number	

Annex B
(normative)

Sampling Procedures

B.1 Sampling Procedures for Input Test Material

The condition of the test material shall be determined using three (3) representative samples. The minimum amount of sample to be taken shall be 1 kg or twice as much as what is needed for all the laboratory analyses. These represent the different conditions of the material in the bulk. This is done by randomly taking samples at the top, middle, and bottom portions of the bulk. Half of the sample shall be used for laboratory analysis and the other half shall be used for reference purposes or for eventual second check in case of review.

B.2 Sampling from Product Outlet

During each test trial, representative samples from all outlets with product which requires laboratory analysis shall be collected. The minimum amount of sample to be taken shall be twice as much as what is needed for all the laboratory analyses. The excess sample shall be used for reference purposes or for an eventual second check in case of review.

B.3 Sampling from Blower Outlet for Blower Loss

During the test, three (3) samples shall be randomly taken from the fan or blower outlet to collect grains mixed with the impurities. The duration of sampling shall be at least 10 seconds.

B.4 Sampling from By-Product Outlet for Separation Loss

During the test, three (3) samples shall be randomly taken from the by-product (e.g. straw, chaff, cob) outlet to collect grains mixed with the impurities. The duration of sampling shall be at least 10 seconds.

B.5 Collection of Scattered Pods

For testing purposes, scattered grains shall be gathered since these are part of the total grain input. These are grains collected beyond 1.0 m from the base of the machine. Spread canvas sheets around the threshing floor area to catch these grains after each test trial. The collected grains shall be placed in appropriate containers and labelled as scattered grains.

B.6 Handling of Samples

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

Annex C
(normative)

General Tests and Measurements

C.1 Measurement of Soil Resistance Before Tillage

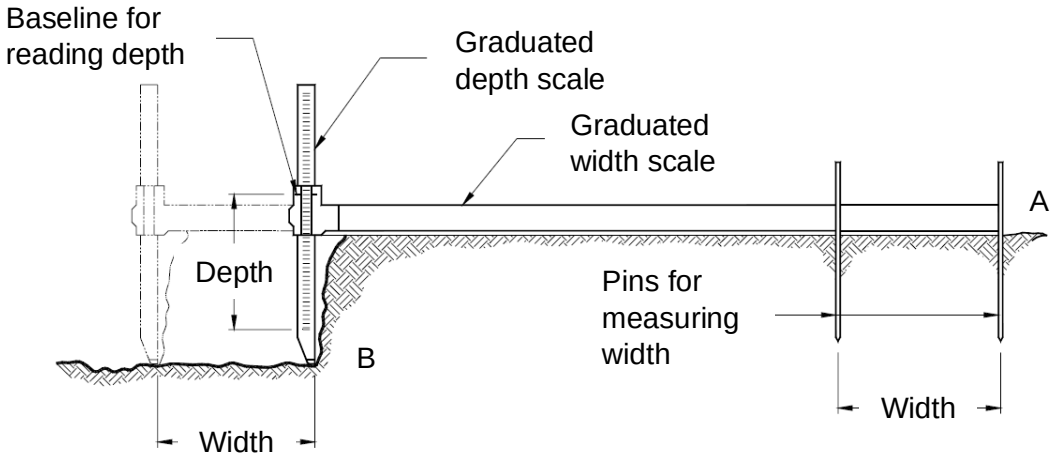
Soil resistance shall be measured using cone penetrometer. There shall be at least ten (10) trials conducted.

C.2 Measurement of Average Working Width and Depth of Tillage

C.2.1 A depth and width meter, as shown in Figure 1, shall be used in measuring the width and depth of tillage simultaneously.

C.2.2 Measure the depth and width by placing the tip of graduated depth scale to the plowed surface (point B) and putting a pin at point A of the width scale. This procedure shall be repeated for the succeeding passes. The distance between two adjacent pins is the width of tillage, and the distance between point B and baseline for reading depth is the depth of tillage. However, a plowed surface is not always leveled depending on the feature of the implement. Therefore, the tip of the depth scale shall be placed at relatively the same point in each pass.

C.2.3 Determine the mean of the measured width and depth for the average width and depth of tillage.



SIDE VIEW

Figure 1 - Measurement of width and depth of tillage

C.3 Determination of Field Capacity

C.3.1 Determination of Actual Field Capacity

Area covered (A_t) and total operating time (T) shall be recorded for each trial. Actual field capacity shall be computed using the formula in Annex E.

C.3.2 Determination of Effective Field Capacity and Percent Overlap/Untilled

C.3.2.1 Operating width of implement (w), test plot's length (L), width (W) and area (A_t), and number of rounds (N) during operation shall be recorded for each trial. Actual width of swath (S), total distance traveled (D), effective area (A_e), and effective field capacity shall be calculated using the formulas in Annex E.

C.3.2.2 Percent overlap or untilled shall be calculated using the formula in Annex E. If actual width of swath is less than the actual width of implement, the operator has to pass over part of the area twice to secure better coverage. If the actual width of swath is greater than the actual width of implement, the operator has to leave part of the area untilled.

C.3.3 Determination of Theoretical Field Capacity

With the operating width (w) recorded and operating speed (S_o) computed, the theoretical field capacity shall be obtained using the formula in Annex E.

C.4 Measurement of Fuel and Power Consumption

C.4.1 Determination of Fuel Consumption When Using Engine as Prime Mover

C.4.1.1 Total operating time of the engine from the time it started until the time it stopped (T_e) shall be recorded.

C.4.1.2 To get the amount of fuel consumed (F_v), refill method shall be used. Fill the tank to full capacity or to a certain level before the test. After the test, fill the tank with measured fuel to the same level before the test. When filling up the fuel tank, extra attention shall be paid to keep it horizontal and to ensure that empty space is not left inside.

C.4.2 Determination of Input Power Requirement When Using Electric Motor as Prime Mover

Connect a power meter to the input terminals or wires of the motor to measure the voltage, current, and the total electric power requirement of the machine. There shall be three (3) sets of data with a minimum of five (5) observations per set taken with and without load.

C.4.3 Determination of Fuel Consumption of Liquified Petroleum Gas-Fed Burner

C.4.3.1 Total fuel consuming time of the burner from the time it started until the time it stopped (T_{fb}) shall be recorded.

C.4.3.2 To get the amount of LPG fuel consumed, record the initial weight of the LPG tank (F_{0w}) before each test trial. After each test trial, record the final weight of the tank (F_{1w}).

C.4.4 Determination of Fuel Consumption of Biomass Fuel-Fed Burner

C.4.4.1 Total fuel consuming time of the burner from the time it started until the time it stopped (T_{fb}) shall be recorded.

C.4.4.2 Record the total weight of biomass fuel consumed (F_w) during each test trial.

C.4.5 Determination of Fuel Consumption Liquid Fuel-Fed Burner

C.4.5.1 Total fuel consuming time of the burner from the time it started until the time it stopped (T_{fb}) shall be recorded.

C.4.5.2 To get the amount of fuel consumed (F_v), refill method shall be used. Fill the tank to full capacity or to a certain level before the test. After the test, fill the tank with measured fuel to the same level before the test. When filling up the fuel tank, extra attention shall be paid to keep it horizontal and to ensure that empty space is not left inside.

C.5 Measurement of Noise Level

C.5.1 The sound emitted by the machine, with and without load, shall be measured using a sound level meter at the zone of the operator/s' ear level. The designated zone for measurement of noise level will vary for every machine for testing.

C.5.2 For each data to be taken, there shall be a minimum of five (5) observations. Before taking data, it should be ensured that the operations and other functional characteristics have stabilized. The time of recording shall be properly spaced during the whole duration of the test trial. There shall be at least ten (10) data or readings obtained.

C.6 Determination of Operating/Traveling Speed

C.6.1 Outside the longer side of the test plot, place two (2) poles (A, B) approximately in the middle of the test plot as shown in Figure 2 to mark the traveling distance. On the opposite side, place another two (2) poles (C, D) in similar position so that all four (4) poles form corners of a rectangle, parallel to at least one long side of the test plot. For test plot with an area less than 750 m^2, the traveling distance should be at least

10 m. For test plot with an area greater than 750 m^2, the traveling distance should be at least 20 m.

C.6.2 Calculate the speed from the time required for the machine to travel the distance between the assumed line connecting two (2) poles on opposite sides AC and BD. The reference point (e.g. pneumatic wheels) of the machine should be selected for measuring the time.

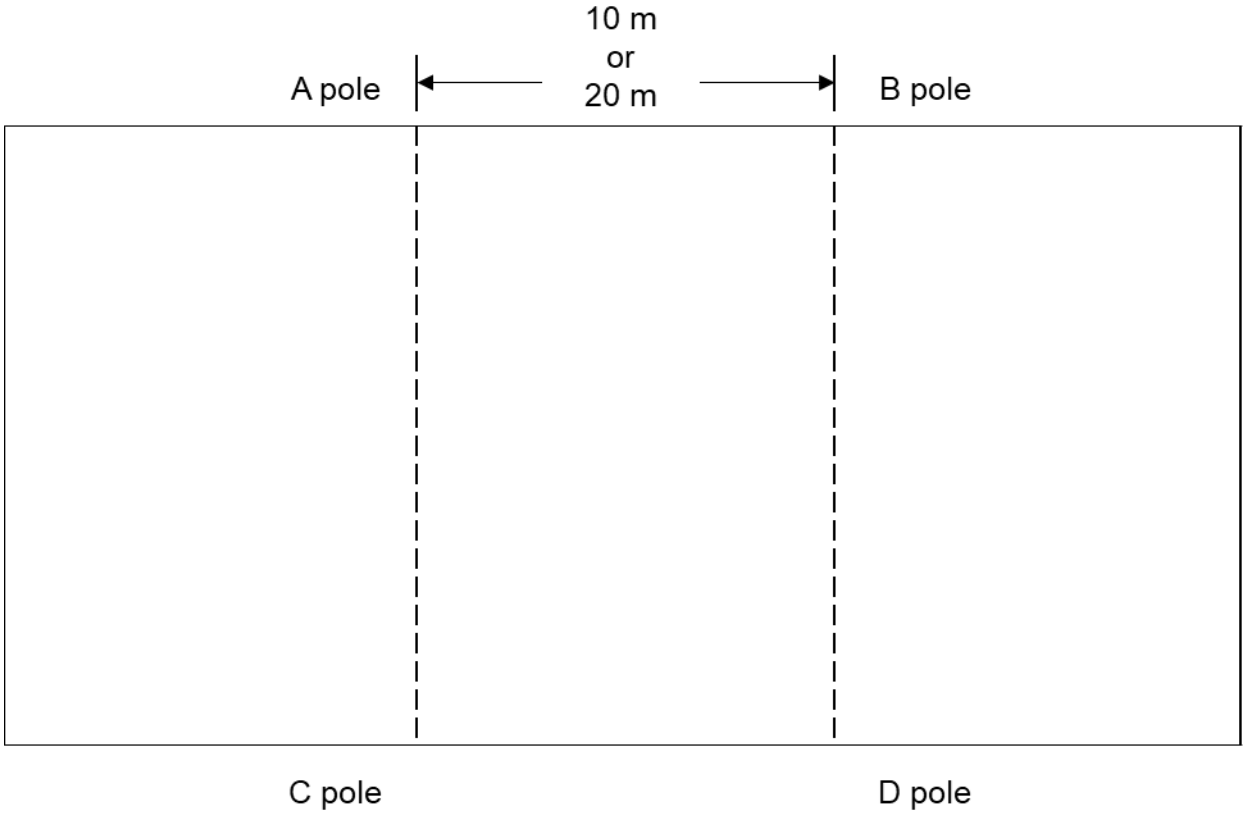


Figure 2 - Measurement of operating/traveling speed

C.7 Determination of Percent Wheel Slip or Travel Reduction

C.7.1 Place a visible mark on the driving wheel for obtaining the number of revolutions.

C.7.2 Measure the distance travelled for 10 revolutions of the driving wheels without load or at level field, and with load or during operation. In both conditions, similar traveling speed shall be maintained.

C.7.3 Percent wheel slip shall be calculated using the formula in Annex E.

C.8 Post-production Processing Capacity

C.8.1 Input Capacity

The loading or input time shall start at the feeding of the input material from the intake hopper or pit and ends when there is no more material in the hopper or pit. Input time

(T_i) and weight of input (W_i) shall be recorded. Input capacity shall be calculated using the formulas in Annex E.

C.8.2 Output Capacity

The output time shall start from the first discharge of the output at the product outlet and shall end after the last discharge. Output time (T_o) and weight of output (W_o) shall be recorded. Output capacity shall be calculated using the formulas in Annex E.

C.9 Determination of Product Recovery

Weight of input (W_i) and of output (W_o) collected at the product outlet shall be recorded. Product recovery shall be calculated using the formula in Annex E.

C.10 Determination of Operator's Pulse Rate

Pulse rate of the operator shall be determined for all manually-operated machines. The pulse rate of the operator before and after operation shall be measured and recorded.

C.11 Measurement of Speed of Components

The shaft speed of the major rotating components of the machine, with and without load, shall be taken using a tachometer. Requirements for each data to be taken shall conform to C.5.2.

C.12 Measurement of Air Velocity

The air velocity generated by the fan shall be measured using an air velocity meter in m/s. Requirements for each data to be taken shall conform to C.4.2.

Annex D
(normative)

Laboratory Analysis

D.1 Determination of Bulk Density

D.1.1 Randomly obtain samples from the representative samples of the grain and granule samples. The bulk density of each sample shall be measured using a bulk density tester/meter.

D.1.2 Fill the bulk density meter's measuring cup with samples at a standard height. Level the heap above the cup using a blunt ruler. Weigh the samples inside the cup and record the resulting weight (M_s). Replicate these steps five (5) times.

D.1.3 Calculate the moisture content using the formula in Annex E.

D.2 Determination of Grain Content

D.2.1 Take three (3) representative samples of approximately 500 g each of cut plants from the test materials.

D.2.2 For each sample, manually thresh the grains from the panicle or plant.

D.2.3 Determine the weight of the grain (M_g) and the straw or plant separately. Record and calculate the grain-straw or grain-plant ratio using the formula in Annex E.

D.3 Determination of Grain Losses

D.3.1 Blower Loss

Collect and weigh the clean grains from the blower outlet sample. Record the total weight of the clean grains (M_b) and the total time of collection (T_c) for the computation of blower loss using the formula in Annex E.

D.3.2 Scattering Loss

D.3.2.1 Collect grains scattered beyond 1.0 m from the base of the machine after each trial.

D.3.2.2 Clean and weigh the sample. Record the total weight of the clean grains (Sc_l) for the computation of scattering loss using the formula in Annex E.

D.3.3 Separation Loss

Collect and weigh the clean grains from the by-product (e.g., straw, chaff, cob) outlet sample. Record the total weight of the clean grains (M_s) and the total time of collection (T_c) for the computation of separation loss using the formula in Annex E.

E.3.4 Unthreshed Loss

Manually thresh and weigh the unthreshed grains collected at the by-product outlet or from the plants after threshing operation. Record the total weight of the clean grains (M_u) and the total time of collection (T_c) for the computation of unthreshed loss using the formula in Annex E.

D.4 Moisture Content Determination by Air Oven Method

D.4.1 Randomly obtain three (3) 100 g of representative samples and place them in moisture cans. 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 (M_0).

D.4.2 Dry the samples in the oven with the recommended temperature (e.g., 105 °C) and duration (e.g., 72 hours) or until constant weight is attained.

D.4.3 After removing the samples from the oven, place the moisture can with samples in a desiccator and allow them to cool in the ambient temperature.

D.4.4 Weigh the moisture can with the dried sample. Record the final weight (M_1). Calculate the moisture content using the formulas in Annex E.

D.5 Moisture Content Determination by Moisture Meter

D.5.1 Randomly obtain at least five (5) representative samples. Ensure that no moisture is lost or gained by the sample between the time it was collected until its moisture content is determined.

D.5.2 Measure the moisture content of the samples using a calibrated moisture meter.

D.6 Determination of Net Percent Cracked Kernels

D.6.1 Obtain three (3) samples from each output of both manual and machine operation. Each sample shall consist of 100 grains.

D.6.2 Inspect each sample for kernels with fissures. Count these kernels.

D.6.3 The net percent cracked kernels shall be taken as the difference between the number of kernels obtained from manual (C_{ma}) and machine operation (C_{me}) as presented in the formula in Annex E.

D.7 Determination of Percent Broken/Damaged Grains

D.7.1 Obtain three (3) samples from each output of both manual and machine operation. Each sample shall consist of 100 g.

D.7.2 For each sample, separate and weigh grains that were broken, crushed, or dehulled (partially or fully).

D.7.3 Compute for the percentage of broken/damaged grains using the formula in Annex E.

D.8 Determination of Purity

D.8.1 Randomly take three (3) 500 g samples from the representative samples of the material.

D.8.2 Clean each sample to remove the impurities. Weigh the clean sample and record the resulting weight (M_c). Calculate the purity using the formula in Annex E.

D.9 Procedures for Sieve Analysis

D.9.1 For each test trial, take three (3) 100 g samples from product outlet.

D.9.2 Place the 100 g samples in a laboratory sieve shaker with a series of sieves screen.

D.9.3 Shake the samples for the required duration (e.g., 5 to 10 minutes).

D.9.4 After shaking, remove the samples from each sieve screen. Weigh each sample and record data. Repeat this for the rest of the samples.

D.9.5 Calculate the percent of materials retained on each sieve screen, particle size diameter, coefficient of variation of size, and fineness modulus using the formulas in Annex E.

D.10 Measurement of Average Grain Size or Dimension

D.10.1 Randomly take at least ten (10) pieces of samples from the representative samples of the material.

D.10.2 For each sample, measure the largest dimensions (e.g., diameter, length, width, thickness) using a caliper. Record the measurement to the nearest 0.01 mm.

Annex E
(normative)

Formulas Used During Calculations and Testing

E.1 Average Grain Size or Dimension

$$\bar{x} = \frac{\sum x_j}{n}$$

where:

- x_j is the dimension (length, width, thickness, diameter) of individual sample (mm)
- n is the total number of samples
- $\bar{x}$ is the average size or dimension (mm)

E.2 Bulk Density

$$\rho_b = \frac{M_s}{V_s}$$

where:

- ρ_b is the bulk density (kg/m^3)
- M_s is the weight of cleaned sample (kg)
- V_s is the volume of cleaned sample (m^3)

E.3 Post-production Processing Capacity

E.3.1 Input

$$C_i = \frac{W_i}{T_i}$$

where:

- C_i is the Input capacity (kg/h)
- W_i is the total weight of input (kg)
- T_i is the input time (h)

E.3.2 Output

$$C_o = \frac{W_o}{T_o}$$

where:

C_o is the output capacity (kg/h)
W_o is the total weight of output (kg)
T_o is the output time (h)

E.4 Electric Power Requirement

E.4.1 For Single-Phase

$$P_r = \frac{V\ x\ I\ x\ PF}{1000}$$

where:

P_r is the electric power requirement (kW)
V is the voltage (V)
I is the current (A)
PF is the power factor

E.4.2 For Three-Phase

$$P_r = \frac{V\ x\ I\ x\ \sqrt{3}\ x\ PF}{1000}$$

where:

P_r is the electric power requirement (kW)
V is the voltage (V)
I is the current (A)

E.5 Field Capacity

E.5.1 Actual Field Capacity

$$FC_a = \frac{0.006A_t}{T}$$

where:

FC_a is the actual field capacity (ha/h)
A_t is the area covered during test (m^2)
T is the total operating time (min)

E.5.2 Effective Field Capacity and Percent Overlap/Untilled

$$S = \frac{W}{2N}$$

$$D = \frac{A_t}{S}$$

$$A_e = wD$$

$$FC_e = \frac{0.006A_e}{T}$$

$$\%\, A_o = \frac{A_e - A_t}{A_t} \times 100$$

$$\%\, A_u = \frac{A_t - A_e}{A_t} \times 100$$

where:

S	is the actual width of swath (m)
W	is the width of plot (m)
N	is the number of rounds
D	is the total distance traveled (m)
A_t	is the area covered during test (m^2)
A_e	is the effective area accomplished (m^2)
w	is the operating width of implement (m)
T	is the total operating time (min)
FC_e	is the effective field capacity (ha/h)
% A_o	is the percent overlap (%)
% A_u	is the percent untilled (%)

E.5.3 Theoretical Field Capacity

$$FC_t = \frac{wS_o}{10}$$

where:

FC_t	is the theoretical field capacity (ha/h)
w	is the operating width of implement (m)
S_o	is the operating or traveling speed (kph)

E.6 Fuel Consumption

E.6.1 For Engine-Powered and Tractor-Attached Machine

E.6.1.1 Based on Operating Time

$$F_{ct} = \frac{F_v}{T_e}$$

where:

F_{ct} is the fuel consumption per unit time (L/h)
F_v is the volume of fuel consumed (L)
T_e is the total fuel consuming time of engine (h)

E.6.1.2 Based on Area Covered

$$F_{ca} = \frac{F_v}{A_t}$$

where:

F_{ca} is the fuel consumption per area covered (L/ha)
F_v is the volume of fuel consumed (L)
A_t is the area covered during test (ha)

E.6.1.3 For Liquid Fuel-Fed Burner

$$F_{cb} = \frac{F_v}{T_{fb}}$$

where:

F_{cb} is the fuel consumption per unit time (L/h)
F_v is the volume of fuel consumed (L)
T_{fb} is the total fuel consuming time of burner (h)

E.6.1.4 For LPG-Fed Burner

$$F_{cb} = \frac{F_{0w} - F_{1w}}{T_{fb}}$$

where:

F_{cb} is the fuel consumption per unit time (kg/h)
F_{0w} is the initial weight of LPG tank (kg)
F_{1w} is the final weight of LPG tank (kg)
T_{fb} is the total fuel consuming time of burner (h)

E.6.1.4 For Biomass-Fed Burner

$$F_{cb} = \frac{F_w}{T_{fb}}$$

where:

F_{cb} is the fuel consumption per unit time (kg/h)
F_w is the weight of biomass fuel consumed (kg)
T_{fb} is the total fuel consuming time of burner (h)

E.7 Grain Losses

E.7.1 Blower Loss

E.7.1.1 Amount

$$B_l = \frac{M_b T}{T_c}$$

where:

B_l is the blower loss (kg)
M_b is the weight of blown, clean grains (kg)
T_c is the duration of collection (h)
T is the duration of operation (h)

E.7.1.2 Percentage

$$\%\ B_l = \frac{B_l}{I} \times 100$$

where:

$\%\ B_l$ is the blower loss (%)
B_l is the blower loss (kg)
I is the weight of input grains (kg)

E.7.2 Scattering Loss

$$\% \, Sc_l = \frac{Sc_l}{I} \times 100$$

where:

$\% \, Sc_l$ is the scattering loss (%)
Sc_l is the scattering loss (kg)
I is the weight of input grains (kg)

E.7.3 Separation Loss

E.7.3.1 Amount

$$S_l = \frac{M_s T}{T_c}$$

where:

S_l is the separation loss (kg)
M_s is the weight of separated, clean grains (kg)
T_c is the duration of collection (h)
T is the duration of operation (h)

E.7.3.2 Percentage

$$\% \, S_l = \frac{S_l}{I} \times 100$$

where:

$\% \, S_l$ is the separation loss (%)
Sc_l is the separation loss (kg)
I is the weight of input grains (kg)

E.8 Grain-Straw or Grain-Plant Ratio

$$R = \frac{M_g}{M_s}$$

where:

R is the grain-straw or grain-plant ratio
M_g is the weight of grain (g)
M_s is the weight of sample (g)

E.9 Moisture Content

E.9.1 Dry-Basis

$$MC, \%_{db} = \frac{M_o - M_1}{M_1}\ x\ 100$$

where:

MC, $\%_{db}$	is the dry-basis moisture content of sample (%)
M_o	is the initial weight of the sample (g)
M_1	is the weight of the dried sample (g)

E.9.2 Wet-Basis

$$MC, \%_{wb} = \frac{M_0 - M_1}{M_0}\ x\ 100$$

where:

MC, $\%_{wb}$	is the wet-basis moisture content of sample (%)
M_0	is the initial weight of the sample (g)
M_1	is the weight of the dried sample (g)

E.10 Net Percent Cracked Kernels

$$NC_k = \frac{C_{me} - C_{ma}}{100\ kernel\ sample}\ x\ 100$$

where:

NC_k	is the is the net percent cracked kernels (%)
C_{me}	is the number of cracked kernels due to mechanical operation
C_{ma}	is the number of cracked kernels due to manual operation

E.11 Operating/Traveling Speed

$$S_o = \frac{3.6D_t}{T_t}$$

where:

S_o	is the operating or traveling speed (kph)
D_t	is the traveling distance (m)
T_t	is the traveling time (s)

E.12 Percent Broken/Damaged Grains

$$B_k = \frac{M_{bk}}{100\ g\ sample}\ x\ 100$$

where:

B_k is the percent broken/damaged grains (%)
M_{bk} is the weight of broken kernels (g)

E.13 Percent Wheel Slip

$$WS = \frac{D_a - D_b}{D_a}$$

where:

WS is the percent wheel slip (%)
D_a is the distance traveled by the machine under no load after a given number of wheel revolution (m)
D_b distance traveled by the machine with load after a given number of wheel revolution (m)

E.14 Product Recovery

$$R_P\ = \frac{W_o}{W_i} \times 100$$

where:

W_i is the total weight of input (kg)
W_o is the total weight of output (kg)

E.15 Purity

$$P = \frac{M_c}{M_u}\ x\ 100$$

where:

P is the purity (%)
M_c is the weight of cleaned sample (g)
M_u is the weight of uncleaned sample (g)

E.16 Sieve Analysis

E.16.1 Fineness Modulus

$$FM = \frac{\sum N}{100}$$

$$N = Percent\ material\ retained\ on\ each\ sieve \times Multiplier\ (depends\ on\ the\ mesh\ no.)$$

where:

FM is the fineness modulus
N is weight fractions retained above each sieve

E.16.2 Average Particle Size Diameter

$$d_i = (d_u\ x\ d_o)^{0.5}$$

$$d_{gw} = log^{-1}\left[\frac{\sum(W_i \log d_i)}{\sum W_i}\right]$$

$$S_{gw} = log^{-1}\left[\frac{\sum W_i\ (\log d_i - \log d_{gw})^2}{\sum W_i}\right]^{0.5}$$

$$CV_{gw} = \frac{S_{gw}}{d_{gw}}$$

where:

d_i is the diameter of i^{th} sieve in the stack
d_u is the diameter opening through which particles will pass (sieve proceeding i^{th})
d_o is the diameter opening through which particles will not pass (i^{th} sieve)
d_{gw} is the average particle size (weight basis)
S_{gw} is the standard deviation of particle size
CV_{gw} is the coefficient of variation of particle size

Annex F
(normative**)**

Additional Guide in Testing

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.1	Automatic Fry Counter		**F.1.1** Mortality rate after two (2) hours under favorable condition **F.1.2** Water quality and temperature before and after passing the system **F.1.3** Number of fry per minute **F.1.4** Percent error of number of fry per minute, % **F.1.5** Coefficient of variation of number of fry per minute, % **F.1.6** Power consumption, kW (if applicable)
F.2	Baling Machine		**F.4.1** Conditions of test material (moisture content, dimensions and source) **F.4.2** Average weight of one bale, kg **F.4.3** Bulk density of bale, kg/m^3 **F.4.4** Output capacity, No. of bale/h or kg of bale/h **F.4.5** Dimensions of bale (L, W, t), mm **F.4.6** Operating pressure, psi **F.4.7** Speed of components (with and without load), rpm **F.4.8** Noise level (with and without load), dB(A) **F.4.9** Fuel consumption, L/h (if applicable) **F.4.10** Power, kW (if applicable) **F.4.11** Voltage, V (if applicable) **F.4.12** Current, A (if applicable)
F.3	Banca		**F.6.1** Weight capacity, kg **F.6.2** Speed in knots (with and without load) **F.6.3** Total load, kg **F.6.4** Fuel consumption, L/h **F.6.5** Noise level, dB(A) **F.6.6** Engine's throttle control lever setting **F.6.7** Engine/Propeller speed, rpm **F.6.8** Average boat speed, kph

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	F.7.1 Essential Tests and Parameters to Be Measured
F.4	Bed Former		**F.7.2** Field conditions **F.7.3** Machine conditions/settings **F.7.4** Tractor's gear shift setting **F.7.5** Traveling speed, kph **F.7.6** Fuel consumption, L/h and L/ha **F.7.7** Height of bed, mm **F.7.8** Width of bed, mm **F.7.9** Average width of tillage, mm **F.7.10** Coefficient of variation of height of bed, % **F.7.11** Coefficient of variation of width of bed, % **F.7.12** Actual field capacity, ha/h **F.7.13** Theoretical field capacity, ha/h **F.7.14** Field efficiency, % **F.7.15** Noise level, dB(A) **F.7.16** Wheel slip, %
F.5	Bottle Crusher	PNS/BAFS PAES 248:2018 Multicrop Pulverizer – Methods of Test	**F.8.1** Conditions of test material **F.8.2** Input capacity, kg/h **F.8.3** Pulverizing capacity, kg/h **F.8.4** Output capacity, kg/h **F.8.5** Product recovery, % **F.8.6** Speed of components (with and without load), rpm **F.8.7** Noise level (with and without load), dB(A) **F.8.8** Fuel consumption, L/h (if applicable) **F.8.9** Power, kW (if applicable) **F.8.10** Voltage, V (if applicable) **F.8.11** Current, A (if applicable) **F.8.12** Sieve analysis (Fineness modulus, Average particle size)
F.6	Brush Cutter	PAES 142:2004 Weeder – Methods of Test	**F.10.1** Field conditions **F.10.2** Area of test plot, m^2 (at least 120-150 m^2) **F.10.3** Actual field capacity, ha/h **F.10.4** Theoretical field capacity, ha/h **F.10.5** Field efficiency, % **F.10.6** Average height of cut, mm

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.7	Brush Cutter (cont'n)		**F.10.7** Average width of cut, mm **F.10.8** Average engine speed during operation, rpm **F.10.9** Fuel consumption, L/h and L/ha **F.10.10** Operator's pulse rate (before and after) **F.10.11** Traveling speed, kph **F.10.12** Noise level, dB(A) **F.10.13** Operator's pulse rate, bpm
F.8	Cacao Dryer	PAES/PNS 249:2010 Fruit Dryer – Methods of Test	**F.11.1** Drying efficiency, % **F.11.2** Actual holding capacity, kg/batch **F.11.3** Final moisture content, $\%_{wb}$ **F.11.4** Drying capacity, kg/h **F.11.5** Moisture reduction rate, %/h **F.11.6** Average air temperature inside the drying chamber, °C **F.11.7** Ambient air temperature, °C **F.11.8** Ambient air relative humidity, % **F.11.9** Dryer exhaust air temperature, °C **F.11.10** Exhaust air relative humidity, % **F.11.11** Fan air velocity, m/s **F.11.12** Air flow rate, m^3/min **F.11.13** Plenum static pressure, mmH_2O **F.11.14** Fuel consumption, kg/h **F.11.15** Power, kW (if applicable) **F.11.16** Voltage, V (if applicable) **F.11.17** Current, A (if applicable) **F.11.18** Heating system efficiency, %
F.9	Cacao Kneader/Mixer	PNS/PAES 259:2011 Feed Mixer – Methods of Test	**F.12.1** Fuel consumption, L/h (if applicable) **F.12.2** Power, kW (if applicable) **F.12.3** Voltage, V (if applicable) **F.12.4** Current, A (if applicable) **F.12.5** Speed of components (with and without load), rpm **F.12.6** Noise level (with and without load), dB(A) **F.12.7** Fineness of final mixture, microns **F.12.8** Total weight of mixture, kg **F.12.9** Mixing capacity, kg/h

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.10	Cacao Refiner/Colloid Mill	PNS/PAES 259:2011 Feed Mixer – Methods of Test	**F.13.1** Conditions of crop **F.13.2** Input capacity, kg/h **F.13.3** Output capacity, kg/h **F.13.4** Milling/Refining recovery, % **F.13.5** Milling loss, % **F.13.6** Fuel consumption, L/h (if applicable) **F.13.7** Power, kW (if applicable) **F.13.8** Voltage, V (if applicable) **F.13.9** Current, A (if applicable) **F.13.10** Speed of components (with and without load), rpm **F.13.11** Noise level (with and without load), dB(A) **F.13.12** Quality of output
F.11	Cage Roller	PNS/PAES 148:2010 Field cultivator – Methods of Test	**F.14.1** Field conditions **F.14.2** Machine conditions/settings **F.14.3** Tractor's gear shift setting **F.14.4** Actual field capacity, ha/h **F.14.5** Theoretical field capacity, ha/h **F.14.6** Field efficiency, % **F.14.7** Traveling speed, kph **F.14.8** Fuel consumption, L/h and L/ha **F.14.9** Average width of tillage, mm **F.14.10** Average depth of tillage, mm **F.14.11** Noise level, dB(A)
F.12	Cashew Decorticator	PNS/BAFS PAES 254:2018 Cacao Huller – Methods of Test	**F.15.1** Conditions of crop **F.15.2** Fuel consumption, L/h (if applicable) **F.15.3** Power, kW (if applicable) **F.15.4** Voltage, V (if applicable) **F.15.5** Current, A (if applicable) **F.15.6** Speed of components (with and without load), rpm **F.15.7** Noise level (with and without load), dB(A) **F.15.8** Decorticating capacity, kg/h **F.15.9** Undecorticated, kg **F.15.10** Quality of output

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.13	Cashew Nut Cracker		**F.16.1** Conditions of crop **F.16.2** Fuel consumption, L/h (if applicable) **F.16.3** Power, kW (if applicable) **F.16.4** Voltage, V (if applicable) **F.16.5** Current, A (if applicable) **F.16.6** Speed of components (with and without load), rpm **F.16.7** Noise level (with and without load), dB(A) **F.16.8** Capacity, kg/h **F.16.9** Uncracked, kg **F.16.10** Quality of output
F.14	Conveyor (Belt, Screw, Chain, Bucket)		**F.19.1** Maximum load, kg (per bucket for bucket elevator) **F.19.2** Linear speed, m/min **F.19.3** Fuel consumption, L/h (if applicable) **F.19.4** Power, kW (if applicable) **F.19.5** Voltage, V (if applicable) **F.19.6** Current, A (if applicable) **F.19.7** Speed of components, rpm **F.19.8** Noise Level, dB(A)
F.15	Dozer	PAES 132:2004 Disc/Moldboard –Methods of Test	**F.21.1** Average depth of cut, mm **F.21.2** Distance covered to fill the bucket at depth of cut, m **F.21.3** Turnability of the dozer at maximum load (to the right and to the left) **F.21.4** Fuel consumption, L/h **F.21.5** Noise level, dB(A)
F.16	Drone Sprayer	PAES 113:2000 Lever-Operated Knapsack Sprayer – Methods of Test	**F.22.1** Field conditions **F.22.2** Ambient air temperature, °C **F.22.3** Wind velocity, m/s **F.22.4** Weather (sunny, cloudy, rainy, hot, cold, etc.) **F.22.5** Nozzle discharge rate, L/min **F.22.6** Total discharge, L/min **F.22.7** Application rate, L/h and L/ha **F.22.8** Distance traveled, m **F.22.9** Sprayed area, m^2 **F.22.10** Average swath, m

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.17	Drone Sprayer (cont'n)		**F.22.11** Liquid sprayed, mL **F.22.12** Liquid left after operation, mL **F.22.13** Battery operating voltage, DCV **F.22.14** Forward traveling speed, kph **F.22.15** Actual field capacity, ha/h
F.18	Dump Trike	PAES 137:2004 Agricultural Trailer – Methods of Test	
F.19	Evaporator	PAES 237:2008 Crystallizer – Methods of Test	**F.24.1** Holding capacity, kg/h **F.24.2** Cooking recovery, % **F.24.3** Average particle size diameter of final product, mm **F.24.4** Power, kW (if applicable) **F.24.5** Voltage, V (if applicable) **F.24.6** Current, A (if applicable) **F.24.7** Noise level (with and without load), dB(A) **F.24.8** Stirring speed (with and without load), rpm **F.24.9** Speed of components (with and without load), rpm **F.24.10** Burner fuel consumption, kg/h **F.24.11** Prime mover fuel consumption, kg/h
F.20	Feed Mill	PAES 217:2004 Hammer Mill – Methods of Test, PNS/PAES 259:2011 Feed Mixer – Methods of Test, and PNS/BAFS PAES 275:2019 Feed Pellet Mill – Methods of Test (if with pelleting or briquetting)	
F.21	Fertilizer Spreader/Broadcaster	PAES 146:2005 Granular Fertilizer Applicator – Methods of Test	Tested for 3-in-1 Mist blower **F.26.1** Discharge rate, kg/h **F.26.2** Fuel consumption, L/h

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.22	Fertilizer Spreader/Broadcaster (cont'n)		**F.26.3** Blower range, m **F.26.4** Width of spray, m **F.26.5** Blower shaft speed, rpm **F.26.6** Noise level, dB(A) **F.26.7** Air velocity, m/s
F.23	Fogging Machine		**F.28.1** Ambient temperature, °C **F.28.2** Ambient relative humidity, % **F.28.3** Temperature at fogger outlet, °C **F.28.4** Discharge rate, L/h **F.28.5** Fuel consumption, L/h **F.28.6** Noise level, dB(A) **F.28.7** Power at combustion chamber, kW **F.28.8** Percent residue, %
F.24	Forage Harvester	PAES 219:2004 Forage Chopper – Methods of Test PNS/PAES 225:2015 Rice combine harvester – Methods of Test	Tested as forage chopper (chopping) and combine harvester (harvesting) **F.29.1** Field conditions **F.29.2** Conditions of crop **F.29.3** Machine conditions/settings **F.29.4** Actual field capacity, ha/h **F.29.5** Theoretical field capacity, ha/h **F.29.6** Field efficiency, % **F.29.1** Height of standing crop, mm **F.29.2** Row and hill spacing, **F.29.3** Plant population **F.29.4** Moisture content of input forage, % **F.29.5** Traveling speed, kph **F.29.6** Height of cut, mm **F.29.7** Width of cut, mm **F.29.8** Fuel consumption, L/h and L/ha **F.29.9** Uncut plant, % **F.29.10** Noise level, dB(A) **F.29.11** Output Capacity, kg/h **F.29.12** Chopping efficiency, % **F.29.13** Average length of chopped material, mm **F.29.14** Coefficient of variation of cut, %

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.25	Front Loader		**F.35.1** Loading capacity, kg/load, kg/h **F.35.2** Maximum lift height, mm **F.35.3** Lift height, m Fuel consumption, L/h
F.26	Grain Collector	AMTEC Methods of Test 002:2023 Grain Collector	
F.27	Hydraulic Ram Pump		**F.32.1** Actual output discharge, L/s **F.32.2** Total head, m **F.32.3** Total actual flow, L/s **F.32.4** Vertical fall, m **F.32.5** Volumetric efficiency, % **F.32.6** Hydraulic efficiency, % **F.32.7** Duration of opening and closing of the wastewater valve, s
F.28	Levee Maker		**F.33.1** Field conditions **F.33.2** Machine conditions/settings **F.33.3** Tractor's gear shift setting **F.33.4** Levee production rate, m/min **F.33.5** Height of levee, mm **F.33.6** Width of levee base, mm **F.33.7** Width of levee top, mm **F.33.8** Fuel consumption, L/h **F.33.9** Traveling speed, kph **F.33.10** Noise level, dB(A)
F.29	Leveler	PNS/PAES 164:2011 Spring-Tooth Harrow – Methods of Test	**F.34.1** Field conditions **F.34.2** Machine conditions/settings **F.34.3** Tractor's gear shift setting **F.34.4** Actual field capacity, ha/h **F.34.5** Theoretical field capacity, ha/h **F.34.6** Field efficiency, % **F.34.7** Traveling speed, kph **F.34.8** Fuel consumption, L/h and L/ha **F.34.9** Effective width and depth of tillage, mm **F.34.10** Coefficient of variation of depth of tillage, % **F.34.11** Noise level, dB(A)

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.30	Mango Pulper	PNS/PAES 253:2011 Coffee Pulper – Methods of Test	**F.36.1** Conditions of crop **F.36.2** Pulping recovery of pulp and waste, % **F.36.3** Pulping capacity, kg/h **F.36.4** Pulping efficiency, % **F.36.5** Fuel consumption, L/h (if applicable) **F.36.6** Power, kW (if applicable) **F.36.7** Voltage, V (if applicable) **F.36.8** Current, A (if applicable) **F.36.9** Speed of components (with and without load), rpm **F.36.10** Noise level (with and without load), dB(A)
F.31	Milking Machine		**F.38.1** Milking capacity, L/h **F.38.2** Suction pressure, kPa **F.38.3** Suction capacity, L/min **F.38.4** Power, kW (if applicable) **F.38.5** Voltage, V (if applicable) **F.38.6** Current, A (if applicable) **F.38.7** Speed of components (with and without load), rpm
F.32	Moisture Meter		**F.39.1** Moisture content readings using moisture meter **F.39.2** Moisture content using oven dry method **F.39.3** Standard deviation of moisture content reading using moisture meter **F.39.4** Percent error of moisture content (between moisture meter and oven method)

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.33	Mulcher		**F.40.1** Traveling speed, kph **F.40.2** Depth of cut, mm **F.40.3** Effective width of coverage, mm **F.40.4** Actual field capacity, ha/h **F.40.5** Theoretical field capacity, ha/h **F.40.6** Field efficiency, % **F.40.7** Fuel consumption, L/h and L/ha **F.40.8** Noise level, dB(A)
F.34	Multi-Commodity Solar Tunnel Dryer	PAES/PNS 249:2010 Fruit Dryer – Methods of Test	**F.41.1** Drying efficiency, % **F.41.2** Actual holding capacity, kg/batch **F.41.3** Final moisture content, $\%_{wb}$ **F.41.4** Drying capacity, kg/h **F.41.5** Moisture reduction rate, %/h **F.41.6** Average air temperature inside the drying chamber, °C **F.41.7** Ambient air temperature, °C **F.41.8** Ambient air relative humidity, % **F.41.9** Dryer exhaust air temperature, °C **F.41.10** Exhaust air relative humidity, % **F.41.11** Fan air velocity, m/s **F.41.12** Air flow rate, m^3/min **F.41.13** Plenum static pressure, mmH_2O **F.41.14** Fuel consumption, kg/h **F.41.15** Power, kW (if applicable) **F.41.16** Voltage, V (if applicable) **F.41.17** Current, A (if applicable) **F.41.18** Heating system efficiency, %

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.35	Muscovado Milling Machine	PNS/BAFS PAES 248:2018 Multicrop Pulverizer – Methods of test	**F.43.1** Crop conditions **F.43.2** Milling capacity, kg/h **F.43.3** Milling recovery, % **F.43.4** Milling efficiency (Other Commodities), % **F.43.5** Fuel consumption, L/h (if applicable) **F.43.6** Power, kW (if applicable) **F.43.7** Voltage, V (if applicable) **F.43.8** Current, A (if applicable) **F.43.9** Speed of components (with and without load), rpm **F.43.10** Noise level (with and without load), dB(A) **F.43.11** Laboratory analysis
F.36	Oil Press	PAES 235: 2008 Multicrop Juice Extractor – Methods of Test PAES 231:2005 Coconut Oil Expeller – Methods of Test	**F.44.1** Conditions of test material **F.44.2** Capacity, kg/h **F.44.3** Recovery, % **F.44.4** Oil temperature, °C **F.44.5** Fuel consumption, L/h (if applicable) **F.44.6** Power, kW (if applicable) **F.44.7** Voltage, V (if applicable) **F.44.8** Current, A (if applicable) **F.44.9** Noise level, dB(A)
F.37	Peanut Roaster	PNS/BAFS PAES 215:2017 Coffee Roaster – Methods of Test	
F.38	Pili Nut Cracker		**F.47.1** Conditions of crop **F.47.2** Fuel consumption, L/h (if applicable) **F.47.3** Power, kW (if applicable) **F.47.4** Voltage, V (if applicable) **F.47.5** Current, A (if applicable) **F.47.6** Speed of components (with and without load), rpm **F.47.7** Noise level (with and without load), dB(A) **F.47.8** Cracking capacity, kg/h **F.47.9** Uncracked, kg **F.47.10** Quality of output

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.39	Plastic Shredder	PNS/PAES 245:2010 Biomass Shredder – Methods of Test	**F.48.1** Input, kg **F.48.2** Input capacity, kg/h **F.48.3** Shredding efficiency, % **F.48.4** Unshredded, % **F.48.5** Fuel consumption, L/h (if applicable) **F.48.6** Power, kW (if applicable) **F.48.7** Voltage, V (if applicable) **F.48.8** Current, A (if applicable) **F.48.9** Speed of components (with and without load), rpm **F.48.10** Noise level (with and without load), dB(A)
F.40	Polisher	PNS/BAFS PABES 304:2020 Rice Mill – Methods of Test	**F.49.1** Conditions of crop **F.49.2** Input capacity, kg/h **F.49.3** Output capacity, kg/h **F.49.4** Product recovery, % **F.49.5** Speed of components (with and without load), rpm **F.49.6** Noise level (with and without load), dB(A) **F.49.7** Fuel consumption, L/h (if applicable) **F.49.8** Power, kW (if applicable) **F.49.9** Voltage, V (if applicable) **F.49.10** Current, A (if applicable)
F.41	Portable Hay Baler		**F.50.1** Conditions of test material (moisture content, dimensions and source) **F.50.2** Average weight of one bale, kg **F.50.3** Bulk density of bale, kg/m^3 **F.50.4** Output capacity, No. of bale/h or kg of bale/h **F.50.5** Dimensions of bale (L, W, t), mm **F.50.6** Operating pressure, psi **F.50.7** Speed of components (with and without load), rpm **F.50.8** Noise level (with and without load), dB(A) **F.50.9** Fuel consumption, L/h (if applicable) **F.50.10** Power, kW (if applicable) **F.50.11** Voltage, V (if applicable) **F.50.12** Current, A (if applicable)
F.42	Reduction Machine	PAES 237: 2008 Crystallizer – Methods of Test	

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.43	Rice Whitening Machine	PNS/BAFS PABES 304:2020 Rice Mill – Methods of Test	**F.52.1** Crop conditions **F.52.2** Speed of components (with and without load), rpm **F.52.3** Noise level (with and without load), dB(A) **F.52.4** Fuel consumption, L/h (if applicable) **F.52.5** Power, kW (if applicable) **F.52.6** Voltage, V (if applicable) **F.52.7** Current, A (if applicable) **F.52.8** Input capacity, kg/h **F.52.9** Output capacity, kg/h **F.52.10** Product recovery, % **F.52.11** Purity, % **F.52.12** Head rice recovery, % **F.52.13** Broken rice, % **F.52.14** Brewer's rice, % **F.52.15** Milling degree **F.52.16** Whiteness index **F.52.17** Analysis of bran output, % **F.52.18** Analysis of broken and brewer's rice output, %
F.44	Rotary Sifter		**F.53.1** Input capacity, kg/h **F.53.2** Main product recovery, % **F.53.3** Purity, % **F.53.4** Coefficient of variation of output's size (L, W, D, and/or t), mm **F.53.5** Fuel consumption, L/h (if applicable) **F.53.6** Power, kW (if applicable) **F.53.7** Voltage, V (if applicable) **F.53.8** Current, A (if applicable) **F.53.9** Speed of components (with and without load), rpm **F.53.10** Noise level (with and without load), dB(A) **F.53.11** Air velocity, m/s
F.45	Rotary Drum Composter	AMTEC Methods of Test 003:2023 Rotary Drum Composter	

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.46	Rubber Creper		**F.55.1** Conditions of test material **F.55.2** Operating capacity, kg/h **F.55.3** Thickness of input, mm **F.55.4** Average thickness of output, mm **F.55.5** Coefficient of variation of thickness of output, mm **F.55.6** Number of pass **F.55.7** Fuel consumption, L/h (if applicable) **F.55.8** Power, kW (if applicable) **F.55.9** Voltage, V (if applicable) **F.55.10** Current, A (if applicable) **F.55.11** Speed of components (with and without load), rpm **F.55.12** Noise level (with and without load), dB(A)
F.47	Paddy Sorter	AMTEC Methods of Test 004-2023 Paddy Sorter	
F.48	Self-Propelled Farm Carrier	PAES 137:2004 Agricultural Trailer – Methods of Test	
F.49	Soil Puddler		**F.59.1** Field conditions **F.59.2** Machine conditions/settings **F.59.3** Tractor's gear shift setting **F.59.4** Actual field capacity, ha/h **F.59.5** Theoretical field capacity, ha/h **F.59.6** Field efficiency, % **F.59.7** Traveling speed, kph **F.59.8** Fuel consumption, L/h and L/ha **F.59.9** Depth of tillage, mm **F.59.10** Width of tillage, mm **F.59.11** Puddling index, % **F.59.12** Noise level, dB(A)

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.50	Solar Panel		Tested for two settings: Latitude facing South and perpendicular with the sunlight Tested for one whole day with clear skies in which hourly data shall be taken **F.60.1** Solar irradiance, W/m^2 **F.60.2** Maximum power, W **F.60.3** Maximum power voltage, V **F.60.4** Maximum power current, A **F.60.5** Short-circuit current, A **F.60.6** Open-circuit voltage, V **F.60.7** Efficiency, %
F.51	Sorghum Grain Sorter		**F.61.1** Input capacity, kg/h **F.61.2** Main product recovery, % **F.61.3** Purity, % **F.61.4** Coefficient of variation of output's size (L, W, D, and/or t), mm **F.61.5** Fuel consumption, L/h (if applicable) **F.61.6** Power, kW (if applicable) **F.61.7** Voltage, V (if applicable) **F.61.8** Current, A (if applicable) **F.61.9** Speed of components (with and without load), rpm **F.61.10** Noise level (with and without load), dB(A) **F.61.11** Air velocity, m/s

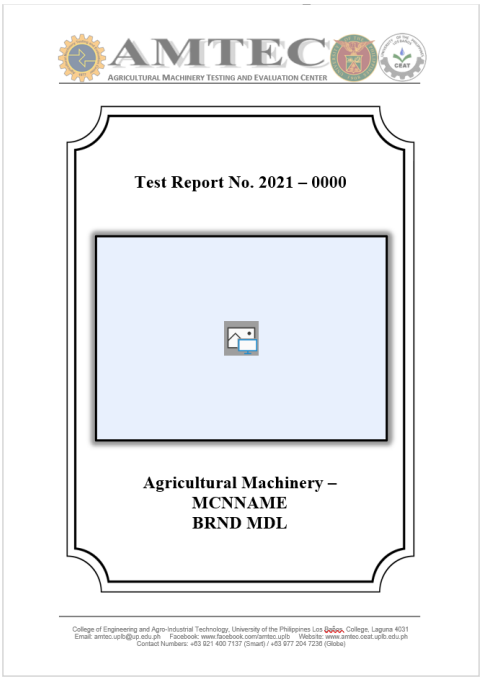
Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.52	Sorghum Thresher	PNS/PAES 263:2015 Multipurpose Thresher –Methods of Test	
F.53	Soybean Sorter	AMTEC Methods of Test 005:2023 Soybean Sorter	
F.54	Sugarcane Cutter		**F.64.1** Field conditions **F.64.2** Machine conditions/settings **F.64.3** Actual field capacity, ha/h **F.64.4** Theoretical field capacity, ha/h **F.64.5** Field efficiency, % **F.64.6** Height of standing crop, mm **F.64.7** Row and hill spacing, **F.64.8** Plant population **F.64.9** Traveling speed, kph **F.64.10** Height of cut, mm **F.64.11** Width of cut, mm **F.64.12** Dimension of sugarcane stalk at cutting height, mm **F.64.13** Fuel consumption, L/h and L/ha **F.64.14** Noise level, dB(A)
F.55	Sugarcane Grabber		**F.65.1** Weight of cut sugarcane stalk per grab, kg **F.65.2** Grabber capacity, kg/h **F.65.3** Fuel consumption, L/h **F.65.4** Noise level, dB(A)

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.56	Sugarcane Harvester		**F.66.1** Field conditions **F.66.2** Machine conditions/settings **F.66.3** Actual field capacity, ha/h **F.66.4** Theoretical field capacity, ha/h **F.66.5** Field efficiency, % **F.66.6** Height of standing crop, mm **F.66.7** Row and hill spacing, **F.66.8** Plant population **F.66.9** Traveling speed, kph **F.66.10** Uncut loss, % **F.66.11** Scattering loss, % **F.66.12** Dimension of sugarcane stalk at cutting height, mm **F.66.13** Height of cut, mm **F.66.14** Width of cut, mm **F.66.15** Length of stalk, mm (if with topper) **F.66.16** Fuel consumption, L/h and L/ha **F.66.17** Noise level, dB(A)
F.57	Vacuum Dryer	PNS/BAFS 344:2022 Agricultural and Fishery Commodity Dryer – Methods of Test	
F.58	Vermicast Sifter/Vermicompost Separator		**F.68.1** Conditions of test material (moisture content and source) **F.68.2** Input capacity, kg/h **F.68.3** Output capacity, kg/h **F.68.4** Separating recovery, % **F.68.5** Fuel consumption, L/h (if applicable) **F.68.6** Power, kW (if applicable) **F.68.7** Voltage, V (if applicable) **F.68.8** Current, A (if applicable) **F.68.9** Speed of components (with and without load), rpm **F.68.10** Noise level (with and without load), dB(A) **F.68.11** Number of passes of material in the sifter

Item No.	Machinery	Specific Standard and Reference Standard for the Methods of Test	Essential Tests and Parameters to Be Measured
F.59	Wind-Powered Water Pump		**F.69.1** Ambient air relative humidity, % **F.69.2** Ambient air temperature, °C **F.69.3** Average wind velocity, m/s **F.69.4** Total head, m **F.69.5** Average output discharge, L/min-stroke **F.69.6** Average stroke per minute **F.69.7** Discharge capacity, L/s **F.69.8** Actual discharge per stroke, L/stroke **F.69.9** Piston displacement, cm^3 **F.69.10** Volumetric efficiency, %

Annex G
(informative)

AMTEC Test Report Format


AMTEC
AGRICULTURAL MACHINERY TESTING AND EVALUATION CENTER

Test Report No. 2021 – 0000

Agricultural Machinery –
MCNNAME
BRND MDL

College of Engineering and Agro-Industrial Technology, University of the Philippines Los Baños, College, Laguna 4031
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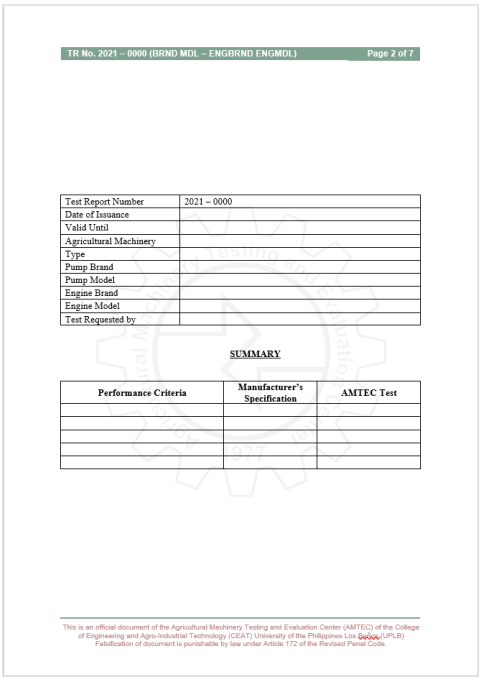
Contact Numbers: +63 921 400 7137 (Smart) / +63 977 204 7236 (Globe)

1 – Name of Testing Agency, Test Report Number, and Title

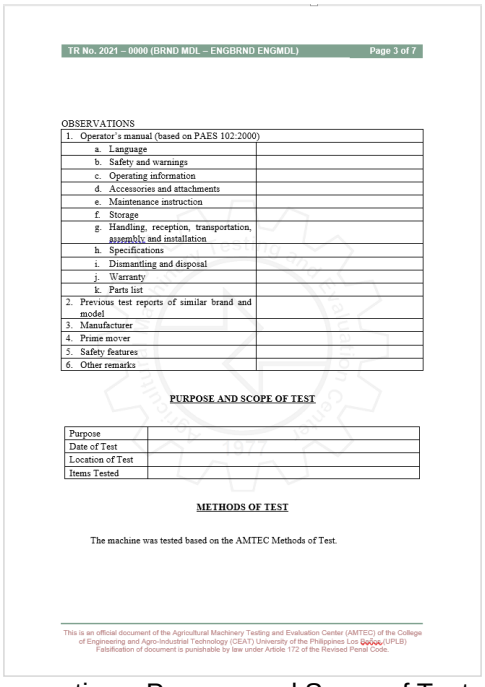


Test Report Number	2021 – 0000
Date of Issuance	
Valid Until	
Agricultural Machinery	
Type	
Pump Brand	
Pump Model	
Engine Brand	
Engine Model	
Test Requested by	

SUMMARY

Performance Criteria	Manufacturer's Specification	AMTEC Test

2 – Summary of Results



OBSERVATIONS

1. Operator's manual (based on PAES 102:2000)	
a. Language	
b. Safety and warnings	
c. Operating information	
d. Accessories and attachments	
e. Maintenance instruction	
f. Storage	
g. Handling, reception, transportation, assembly and installation	
h. Specifications	
i. Dismantling and disposal	
j. Warranty	
k. Parts list	
2. Previous test reports of similar brand and model	
3. Manufacturer	
4. Prime mover	
5. Safety features	
6. Other remarks	

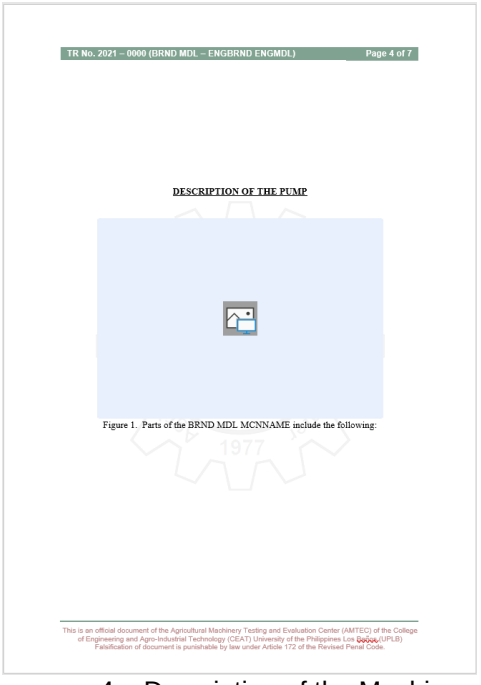
PURPOSE AND SCOPE OF TEST

Purpose	
Date of Test	
Location of Test	
Items Tested	

METHODS OF TEST

The machine was tested based on the AMTEC Methods of Test.

3 – Observations, Purpose and Scope of Test, and Methods of Test



DESCRIPTION OF THE PUMP

Figure 1. Parts of the BRND MDL MCNNAME include the following:

4 – Description of the Machine

SPECIFICATIONS

Item		Manufacturer's Specification	AMTEC Verification
1	Pumpset		
1.1	Overall dimensions, mm		
1.1.1	Length		
1.1.2	Width		
1.1.3	Height		
1.2	Weight, kg		
1.3	Power transmission system		
1.3.1	Engine pulley to pump pulley		
1.3.2	Engine		
1.3.3	Pump		
1.3.4	Belt size		
2	Pump		
2.1	Type		
2.2	Pipe size, mm		
2.3	Overall dimensions, mm		
2.3.1	Length		
2.3.2	Width		
2.3.3	Height		
2.4	Weight, kg		
2.5	Impeller		
2.5.1	Type		
2.5.2	Diameter, mm		
2.5.3	Width, mm		
2.5.4	Number of vanes		
2.5.5	Material		
2.6	Suction side		
2.6.1	Type		
2.6.2	Diameter, mm		
2.6.3	Material		
2.7	Discharge side		
2.7.1	Type		
2.7.2	Diameter, mm		
2.7.3	Material		

5 – Specifications

RESULTS

Performance Test

Table 1. Condition during the performance test of the BRND MDL Centrifugal Pump coupled to kW ENGBRND ENGMDL Diesel Engine.

Temperature, °C	
Relative Humidity, %	
Atmospheric Pressure, mb	
Pumping Water Temperature, °C	

Table 2. Performance test data of the BRND MDL Centrifugal Pump coupled to kW ENGBRND ENGMDL Diesel Engine.

Engine Shaft Speed, rpm	Pump Shaft Speed, rpm	Fuel Consumption Rate, L/h	Total Head, m	Discharge Capacity, L/s	Water Power, kW	Input Power, kW	System Efficiency, %

6 – Results

OBSERVATIONS

Figure 2.

7 – Other Observations with Pictures

Tested by:

_____
Test Engineer

Verified by:

_____
Test Engineer

Approved for Release:

_____ _____
AMTEC Director Date

REMINDER

This test report should not be used for advertisement or for promotion of the product but only for evaluation and verification purposes and should not be reproduced in whole or in part without the permission of AMTEC.

For inquiries regarding the test report, you can visit us at our office, contact us at +63 921 400 7137 or +63 977 204 7236, send us a message at amtec.uplb@up.edu.ph or visit our official website at www.amtec.ceat.uplb.edu.ph.

8 – Names, Signatures and Designation of Test Engineers and AMTEC Director

Bibliography

PAES 105:2000, *Agricultural Machinery – Symbols for Operator's Controls and Other Displays – Common Symbols*

PAES 106:2000, *Agricultural Machinery – Soil Tillage and Equipment – Terminology*

PAES 150:2010, *Agricultural Machinery – Subsoiler – Methods of Test*

PAES 203:2000, *Moisture Content Determination for Rice and Corn*

PAES 216: 2004, *Agricultural Machinery – Hammer Mill – Specifications*

PAES 258:2011, *Agricultural Machinery – Feed Mixer – Specifications*

PNS/BAFS/PAES 242:2018, *Agricultural Machinery – Corn Combine Harvester – Methods of Test*

PNS/BAFS/PAES 252:2018, *Agricultural Machinery – Corn Mill – Methods of Test*

PNS/PAES 164:2011, *Agricultural machinery – Spring-tooth Harrow – Methods of Test*

PNS/PAES 170:2015, *Agricultural machinery – Spike tooth harrow for walking type agricultural tractor – Methods of test*

PNS/PAES 204:2015, *Agricultural Machinery – Mechanical Rice Thresher – Specifications*

PNS/PAES 262:2015, *Agricultural Machinery – Multipurpose Thresher – Specifications*

REPUBLIC ACT NO. 10601, *An Act Promoting Agricultural and Fisheries Mechanization Development in the Country "Agricultural And Fisheries Mechanization (Afmech) Law"*

REPUBLIC ACT NO. 10915, *An Act Strengthening, Modernizing and Aligning the Practice of Agricultural Engineering in the Country into the Internationally Recognized Practice of Agricultural and Biosystems Engineering, and for Other Purposes*

University of the Philippines Los Baños (UPLB)
Agricultural Machinery Testing and Evaluation Center (AMTEC)

in partnership with:

Department of Agriculture (DA)
Bureau of Agricultural and Fisheries Engineering (BAFE)

Project Management Team for the Development of AMTEC Methods of Test (AM) on Agricultural and Fisheries Machinery

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