## Foreword

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) and with support from the Department of Agriculture.

This standard has been technically prepared in accordance with PNS 01-4: 1998 (ISO/IEC Directives Part 3:1997) - Rules for Structure and Drafting of International Standards.

The word “shall” is used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that certain course of action is preferred but not necessarily required.

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

PAES 206:2000 Agricultural Machinery - Rice Mill – Specifications

PAES 207:2000 Agricultural Machinery – Rice Mill – Methods of Test

Part 18 of the Regional Network for Agricultural Machinery Test Codes and Procedures for Rice Mill.

Primer on Philippine Grains Standardization Program of National Food Authority.

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# Agricultural Machinery – Micromill – Methods of Test

## 1 Scope

This standard specifies the methods of test for micromill. Specifically, this shall be used to:

**1.1** verify the mechanism, main dimensions, weight, material accessories of the micromill 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;

**1.4** determine the effect of milling on grain quality through laboratory analysis; and

**1.5** report the result of tests

## 2 Reference

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

PAES 103:2000 Agricultural Machinery – Methods of Sampling

PAES 226:2005 Agricultural Machinery - Micromill - Specifications

## 3 Definitions

For the purpose of this standard the definitions given in PAES 226:2005 and the following shall apply:

**3.1**
**bran streaks**
**l**ongitudinal bran layers remaining in the dorsal grooves after milling

**3.2**
**brewer's rice**
"binlid"
small pieces or particles of grains that pass through a sieve with round perforations of 1.4 mm in diameter

**3.3**
**head rice**
grain or fraction of grain with its length equal to or greater than eight-tenth (8/10) of the average length of the whole grain

**3.4**
**milling degree**
extent or degree by which the bran layer and germ have been removed

**3.5**
**output capacity**
weight of milled rice per unit of milling time, kg/h

**3.6**
**overall height**
distance between the horizontal supporting surface and horizontal plane touching the uppermost part of the micromill

**NOTE:** All parts of the micromill projecting upwards are contained between these two planes.

**3.7**
**overall length**
distance between the vertical planes at right angles to the median plane of the micromill and touching its front and rear extremities

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

**3.8**
**overall width**
distance between the vertical planes parallel to the median plane of the micromill, each plane touching the outermost point of the micromill on its respective side

**NOTE:** All parts of the micromill projecting laterally are contained between two planes.

**3.9**
**overmilled rice**
rice grain from which the hull, the germ, and the bran layers have been completely removed

**3.10**
**regular milled rice**
rice grain from which the hull, the germ, the outer bran layers and the greater part of the inner bran layers have been removed but part of the lengthwise streaks of the bran layers may still be present on 15% to 40% of the sample grains

**3.11**
**running-in period**
preliminary operation of the machine to make various adjustments prior to the conduct of the test until the operation is stable

**3.12**
**undermilled rice**
rice grain from which the hull, the germ, the outer bran layer, and the greater part of the inner bran layer have been removed, but part of the lengthwise streaks of the bran layer may still be present on more than 40 % of the sample grains

**3.13**
**well-milled rice**
rice grain from which the hull, the germ, the outer bran layers, and the greater part of the inner bran layer have been removed, but part of the lengthwise streaks of the bran layers may still be present on less than 15% of the sample grains

## 4 General Conditions for Test and Inspection

### 4.1 Selection of micromill to be tested

Micromill submitted for test shall be sampled in accordance with PAES 103.

### 4.2 Role of manufacturer/dealer

The manufacturer/dealer shall submit to the official testing agency the specifications and other relevant information on the micromill. He/She shall abide with the terms and conditions set forth by the authorized testing agency.

### 4.3 Role of the representative of the manufacturer/dealer

An officially designated representative of the manufacturer/dealer shall operate, adjust, repair and decide on matters related to the operation of the machine.

### 4.4 Test site conditions

The micromill shall be tested as installed for normal operation. The site should have ample provisions for grain handling, temporary storage and work space.

### 4.5 Test instruments

The instruments to be used shall have been calibrated and checked by the testing agency prior to the measurements. The suggested list of minimum field and laboratory test equipment and materials needed to carry out the micromill test is shown in Annex A.

### 4.6 Test materials

**4.6.1** Test materials to be used shall have the following characteristics:

**4.6.1.1** Variety: locally grown (as much as possible single variety)

**4.6.1.2** Grain Moisture Content: dried to a uniform moisture content of 14% ± 1%

**4.6.1.3** Purity: 98%, minimum

**4.6.1.4** Type: Long and slender grains

**NOTE:** long grains – palay whose average length of the full brown rice grain is above 6.5 mm.
slender grains – palay with whole milled rice grain having length/width ratio over 3.0

### 4.6.2 Quantity to be supplied

The amount of test material to be supplied shall be sufficient for 1.5 hours of continuous milling operation. At least two test trials shall be conducted with minimum duration of 30 minutes per trial. The excess amount shall be used for running-in prior to the actual conduct of test trials.

### 4.6.3 Sample preparation

Prepare the sample in such a way that test sample to be used for the running-in and in each test trial shall have identical characteristics in terms of moisture content and variety.

### 4.7 Running-in and preliminary adjustments

Before the start of the test, the micromill should have undergone running-in period where various adjustments of the micromill shall be made according to the recommendation of the manufacturer. (No other adjustments shall be permitted while the test is on-going).

### 4.8 Termination of test

If during the test run, the machine stops due to major component breakdown or malfunctions, the test shall be terminated by the test engineer.

## 5 Test and Inspection

### 5.1 Verification of the manufacturer's technical data and information

**5.1.1** This inspection is carried out to verify the mechanism, dimensions, materials and accessories of the micromill in comparison with the list of manufacturer's technical data and information.

**5.1.2** A plain and level surface shall be used as reference plane for verification of micromill dimensional specification.

**5.1.3** The items to be inspected and verified shall be recorded in Annex B.

### 5.2 Performance test

**5.2.1** This is carried out to obtain actual data on machine performance, operating accuracy, work quality and adaptability.

**5.2.2** Initial data shall be collected before the test such as crop conditions.

### 5.2.3 Operation of the micromill

The micromill shall be operated at the manufacturer's recommended setting of its components. The recommended feeding rate shall be maintained during the test run with duration of at least 30 minutes.

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

### 5.2.4 Sampling and handling procedure for the test materials

#### 5.2.4.1 Sampling for paddy input

The conditions of the paddy input such as bulk density, moisture content, purity and percentage cracked grains to be used in each test shall be taken using three (3) "representative samples" each weighing 1.5 kg which represent the different conditions of paddy input in the bulk. This can be done by taking samples each at the top, middle and bottom portions of the bulk. Samples representing the materials for each test trial shall be placed in appropriate containers for laboratory analysis.

#### 5.2.4.2 Sampling of output

During each test trial three samples shall be randomly collected from different outlets of the component of the micromill to be analyzed in the laboratory. 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.

#### 5.2.4.3 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 must be kept in dry and airtight containers.

### 5.2.5 Measurement of performance parameters

#### 5.2.5.1 Input time/Loading time

The duration of the input time shall start with the feeding of the paddy into the intake hopper and ends after the last paddy in the hopper enters the milling unit.

#### 5.2.5.2 Milling time/Operating time

The milling time in each test trial shall start with the feeding of the paddy into the intake hopper and ends after the last drop of milled rice comes out from the discharge chute.

#### 5.2.5.3 Noise level measurement

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

#### 5.2.5.4 Speed of components

The speed of the rotating shafts of the micromill major components shall be taken using a tachometer.

**NOTE:** Measurements shall be taken with and without load for sub-clause 5.2.5.3 and 5.2.5.4 as specified in Annex C.

#### 5.2.5.5 Fuel/electric energy consumption

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

##### 5.2.5.5.1 Using engine as primemover

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

##### 5.2.5.5.2 Using electric motor as primemover

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

### 5.2.6 Data recording and observations

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

## 6 Laboratory Analysis

This is carried out to analyze the grain samples taken during the performance test.

### 6.1 Laboratory analysis of input paddy

The steps in sampling input paddy for processing in the laboratory huller and laboratory whitener as well as in determining the grain parameters are shown in Figure 1.

### 6.1.1 Purity

Each of the three 0.5-kg test paddy sample is cleaned using the laboratory aspirator to separate the paddy from the impurities. The samples are then weighed.

### 6.1.2 Moisture content

This shall be taken using a calibrated moisture meter or by oven method. Five samples shall be taken for moisture content determination using a calibrated moisture meter. Using the oven method, three 100-gram samples are drawn from the bulk paddy sample. Each 100-gram paddy sample is placed in an open aluminum can for oven drying at a temperature of 100ºC for 24 hours. The mean moisture content from samples shall be taken as the moisture content of the test paddy.

### 6.1.3. Cracked grains

Three 100-whole head grain samples are drawn for hand hulling to determine the percentage cracked brown rice.

Each grain shall be hulled carefully by hand, taking care not to use undue rubbing force or high pressure to minimize mechanical stress on the grain. Each hulled grain or brown rice grain shall be examined for cracks under a magnifying lens against a backlight through a translucent plate or light diffuser. Grains which show cracks or which have been broken in the process of hand hulling shall be counted as cracked grains. The mean value determined from the three 100-grain samples shall be taken as percentage cracked hand-hulled brown rice.

### 6.1.4 Weight per 1000-grains full grain test paddy

Three 1000-grain samples are drawn and weighed as soon as possible.

### 6.1.5 Analysis of samples from laboratory huller

**6.1.5.1** Weigh 200 grams paddy and hull using the laboratory huller. Separate the brown rice from the unhulled rice.

**6.1.5.2** Weigh 20 grams from the brown rice sample and separate as to immature kernels, chalky, yellow/fermented and red rice and then weigh.

**6.1.5.3** Take three 1000-whole head grain samples from the brown rice sample and weigh.

### 6.1.6 Analysis of samples from laboratory whitener

Whiten the brown rice sample from the initial 200-gram paddy sample using the laboratory whitener.

#### 6.1.6.1 Milled rice grain parameters

The milled rice sample from the laboratory whitener shall be weighed and separated into components of head rice, broken rice, and brewer's rice. Each component shall be weighed individually to determine the percentage on weight basis.

#### 6.1.6.2 Weight of 1000-grain whole head milled rice

Three 1000-grain samples of whole head milled rice shall be drawn from the head rice component and then weighed.

#### 6.1.6.3 Damaged grain

Three 100-grain head milled rice samples shall also be drawn from the head milled rice component and examined under a magnifying lens for grain damage. The percentage grain damage is taken as the mean value from three 100-grain samples.

### 6.2 Laboratory analysis of samples from test micromill

### 6.2.1 Analysis of samples from milled rice outlet

#### 6.2.1.1 Grain parameters

Take three 100-gram samples from the milled rice outlet.

In each 100-gram sample, separate head rice, broken rice, brewer's rice, impurities and unhulled grains. Weigh and calculate the percentage of each.

#### 6.2.1.2 Milling degree

This parameter shall be determined by chemical test using the alcohol-alkali staining method.

##### 6.2.1.2.1 Preparation of rice samples

**6.2.1.2.1.1** A 500-gram sample shall be gathered from the source to be tested.

**6.2.1.2.1.2** Head rice shall be separated from the broken rice using the indented tray. Head rice shall be mixed thoroughly and three sets 100-grain head rice are separated manually.

##### 6.2.1.2.2 Preparation of alcohol-alkali staining solution

**6.2.1.2.2.1** For 2% potassium hydroxide (KOH) solution, weigh 20 g potassium hydroxide (KOH) and dissolve ion 1.0 L of distilled water.

**6.2.1.2.2.2** Mix the 2% KOH with ethyl alcohol (EtOH) in the volume ratio1:3. Shake well.

##### 6.2.1.2.3 Staining procedure

**6.2.1.2.3.1** Each of the 100-grain samples shall be placed in a Petri dish and 20 mL of 2% KOH-EtOH solvent shall be poured in each dish.

**6.2.1.2.3.2** Each dish shall be covered and allowed to stand for 15 to 30 minutes. After 15 to 30 minutes, staining solution shall be poured off and discarded.

**6.2.1.2.3.3** The stained head rice in each sample shall be transferred to a piece of white bond paper and air-dry for 5 minutes.

#### 6.2.1.2.4 Determination of milling degree

**6.2.1.2.4.1** Using either a grain picker or your finger, separate the stained kernels with residual bran streaks whose length is at least 1/6 of the total length of the grain which is averaging in size at 6 millimeters. Residual bran streaks are highlighted distinctly brown against a background of light yellow endosperm.

**6.2.1.2.4.2** Count the separated kernels with bran streaks. The count corresponds to the percentage of kernels with bran streaks (BS) in a working sample.

Number of Kernels = % Kernels with BS

**6.2.1.2.4.3** The standard specifications for milling degree are found in Table 1.

**Table 1- Standard Specifications for Milled Rice**

| Degree of Milling | % Kernels with Bran Streaks |
|---|---|
| Undermilled | 41% and above |
| Regular milled | 15% to 40% |
| Well – milled | 1% to 14% |
| Overmilled | 0% |

### 6.2.2 Analysis of samples from bran outlet

Take three 100-gram samples from the bran outlet. Separate the bran, broken grains and brewer's rice and hull, then weigh.

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

## 7 Formula

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

## 8 Test Report

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

**8.1** Title

**8.2** Summary of Results

**8.3** Method and Scope of Test

**8.4** Place and Date of Test

**8.5** Description of the Machine

Table 1. Detailed Specifications of the Machine

**8.6** Results and Discussions

**8.7** Observations (include pictures)

Table 2. Laboratory Analysis of Paddy Samples

Table 3. Machine Performance Test Results

**8.8** Names and Signatures of Test Engineers

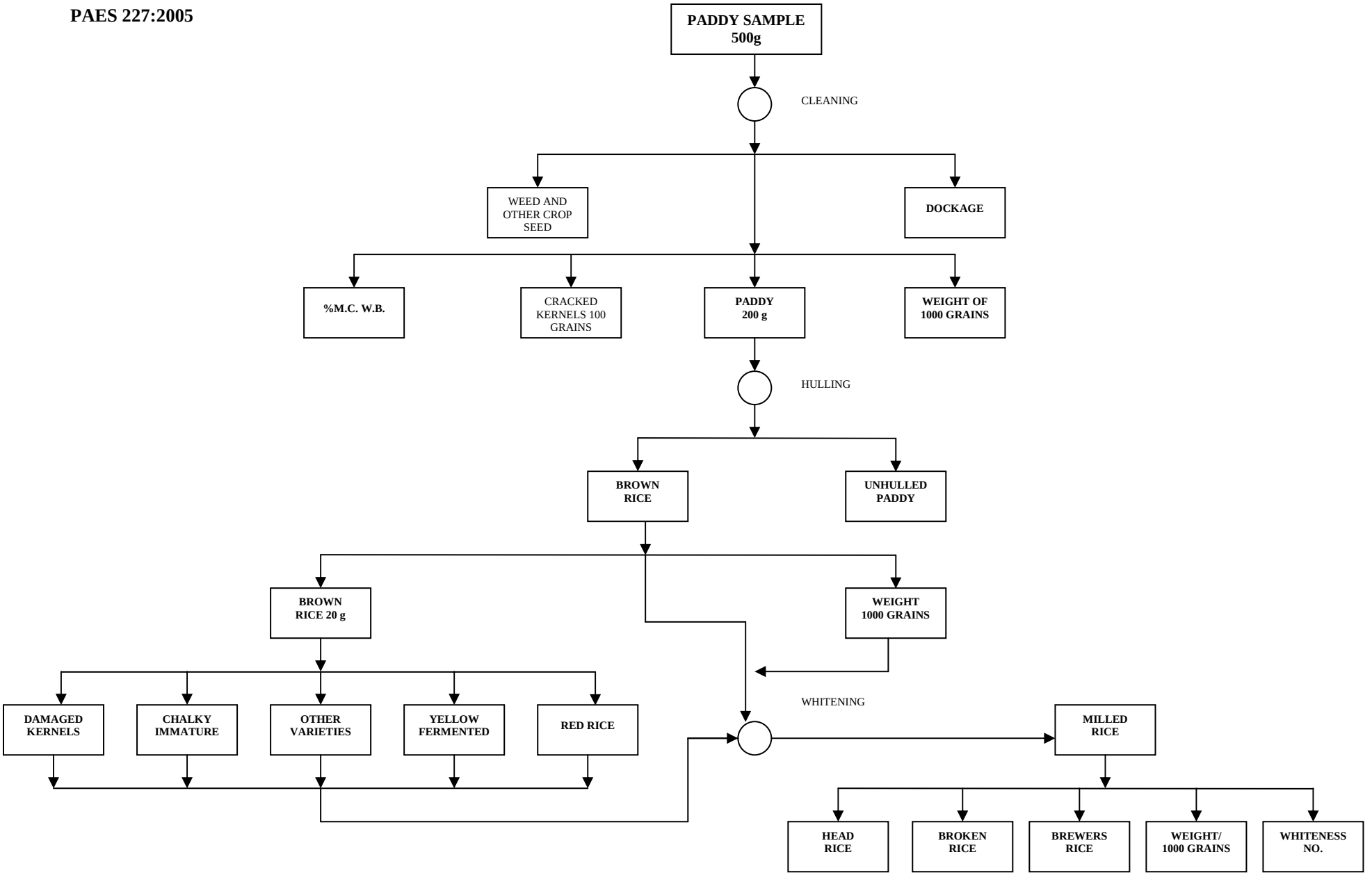


**Figure 1 - Standard laboratory method in assessing milling quality of paddy**

## Annex A
(informative)

## Minimum List of Field and Laboratory Test Equipment and Materials

| | | |
|---|---|---|
| **A.1** | **Equipment** | **Qty.** |
| **A.1.1** | **Performance test** | |
| **A.1.1.1** | Grain moisture meter (duly calibrated using the standard method)<br>Range: 12% to 24% (for paddy) | 1 |
| **A.1.1.2** | Tachometer, contact type, range: 0-5000 rpm; or<br>Photoelectric, range: 0-5000 rpm | 1 |
| **A.1.1.3** | Timers<br>Capacity: 60 minutes<br>Accuracy: 0.1 second | 2 |
| **A.1.1.4** | Measuring tape (capacity: 5m) | 1 |
| **A.1.1.5** | Noise level meter<br>Range: 30 to 130 dB(A) | 1 |
| **A.1.1.6** | Weighing scale<br>Capacity: 100 kg; scale divisions: 0.5 kg | 1 |
| **A.1.1.7** | Graduated cylinder (for engines) 500 ml capacity or watt-hour meter (for electric motors)<br>60 Hz, 220 V | 1 |
| **A.1.1.8** | Camera | 1 |
| **A.1.2** | **Laboratory test** | |
| **A.1.2.1** | Weighing scale (Sensitivity: 0.1 g)<br>Capacity: 3 kg | 1 |
| **A.1.2.2** | Magnifying lens (minimum of 10 magnifications) | 1 |
| **A.1.2.3** | Grain sample cleaner | 1 |
| **A.1.2.4** | Whiteness meter | 1 |
| **A.1.2.5** | Grain sampler/Divider | 1 |
| **A.1.2.6** | Petri dish | 3 |
| **A.1.2.7** | 2% potassium hydroxide-ethyl alcohol (KOH-EtOH) | 60 mL |
| **A.2** | **Materials** | |
| **A.2.1** | **Sample bags** | 50 |
| **A.2.2** | **Labeling tags which include:** | 50 |
| **A.2.2.1** | Date of test | |
| **A.2.2.2** | Machine on test | |
| **A.2.2.3** | Sample source | |
| **A.2.2.4** | Variety | |
| **A.2.2.5** | Trial number | |

**Annex B**
(informative)

**Specification of Micromill**

Name of applicant (or Distributor) : _____

Address : _____

Tel. No. : _____

Name of manufacturer : _____

Address : _____

Telephone : _____

General information : _____

Serial No.: _____ Brand/Model: _____

Type: _____ Make: _____

Production date of rice mill to be tested _____

Testing agency :_____ Location of test :_____

Date of testing :_____ Test Engineer : _____

| Item | Manufacturer's specifications | Verification by the testing agency |
|---|---|---|
| **B.1** Main structure | | |
| **B.1.1** Overall dimensions (mm) | | |
| **B.1.1.1** Length | | |
| **B.1.1.2** Width | | |
| **B.1.1.3** Height | | |
| **B.1.2** Weight (kg), if applicable | | |
| | | |
| **B.2** Prime mover | | |
| **B.2.1** Electric motor | | |
| **B.2.1.1** Brand | | |
| **B.2.1.2** Type | | |
| **B.2.1.3** Make or manufacturer | | |
| **B.2.1.4** Serial number | | |
| **B.2.1.5** Rated power (kW) | | |
| **B.2.1.6** Rated speed (rpm) | | |
| **B.2.1.7** Phase | | |
| **B.2.1.8** Voltage (V) | | |
| **B.2.1.9** Current (A) | | |
| **B.2.1.10** Frequency (Hz) | | |

| Item | Manufacturer's specifications | Verification by the testing agency |
|---|---|---|
| **B.2.2** Engine | | |
| **B.2.2.1** Brand | | |
| **B.2.2.2** Model | | |
| **B.2.2.3** Make or manufacturer | | |
| **B.2.2.4** Type | | |
| **B.2.2.5** Serial number | | |
| **B.2.2.6** Rated power (kW) | | |
| **B.2.2.7** Rated speed (rpm) | | |
| **B.2.2.8** Displacement ($cm^3$) | | |
| **B.2.2.9** Cooling system | | |
| **B.2.2.10** Starting system | | |
| | | |
| **B.3** Intake hopper | | |
| **B.3.1** Type | | |
| **B.3.2** Holding capacity (kg) | | |
| **B.3.3** Materials of construction | | |
| **B.3.4** Features | | |
| | | |
| **B.4** Milling Unit | | |
| **B.4.1** Solid steel cylinder | | |
| **B.4.1.1** Overall length (mm) | | |
| **B.4.1.2** Overall diameter (mm) | | |
| **B.4.2** Cylinder housing for screwed portion | | |
| **B.4.2.1** Length (mm) | | |
| **B.4.2.2** Diameter (mm) | | |
| **B.4.2.3** Size of opening (from hopper), L x W, (mm) | | |
| **B.4.3** Screen | | |
| **B.4.3.1** Length (mm) | | |
| **B.4.3.2** Diameter (mm) | | |
| **B.4.3.3** Size of perforations | | |
| **B.4.4** Aspirating fan | | |
| **B.4.4.1** Size of blade L x W x T, (mm) | | |
| **B.4.4.2** Diameter of impeller | | |
| **B.4.4.3** Type of fan | | |
| **B.4.4.4** Number of blades | | |
| | | |
| **B.5** Power transmission system | | |
| **B.5.1** Size of pulley (mm) | | |
| **B.5.1.1** Prime mover | | |
| **B.5.1.2** Milling unit | | |
| **B.5.1.3** Aspirating fan | | |

| Item | Manufacturer's specifications | Verification by the testing agency |
|---|---|---|
| **B.5.2** Size of Belt | | |
| **B.5.2.1** Prime mover to milling unit | | |
| **B.5.2.2** Milling unit to aspirator fan | | |
| **B.5.3** Discharge device | | |
| | | |
| **B.6** Safety devices | | |
| **B.7** Special features | | |

**Annex C**
(informative)

**Performance Test Data Sheet**

Test trial No.: _____ Date: _____

Test Engineers: _____ Location: _____

Assistants: _____ Machine: _____

Test requested by: _____ Manufacturer: _____

| Items | Trial 1 | Trial 2 | Trial 3 | Average |
|---|---|---|---|---|
| **C.1** Conditions of crop | | | | |
| **C.1.1** Crop | | | | |
| **C.1.2** Source | | | | |
| **C.1.3** Variety | | | | |
| **C.1.4** Moisture content (%) | | | | |
| | | | | |
| **C.2** Milling performance | | | | |
| **C.2.1** Total weight of input paddy (kg) | | | | |
| **C.2.2** Total weight of milled rice (kg) | | | | |
| **C.2.3** Total operating time (h) | | | | |
| **C.2.4.1** Input time (h) | | | | |
| **C.2.4.2** Output time (h) | | | | |
| **C.2.4** Milling capacity (kg/h) | | | | |
| **C.2.5** Input capacity (kg/h) | | | | |
| **C.2.6** Output capacity (kg/h) | | | | |
| **C.2.7** Total milling recovery (%) | | | | |
| | | | | |
| **C.3** Speed of components (average rpm) | | | | |
| **C.3.1** Prime mover | | | | |
| **C.3.1.1** Without load | | | | |
| **C.3.1.2** With load | | | | |
| **C.3.2** Huller/whitener | | | | |
| **C.3.2.1** Without load | | | | |
| **C.3.2.2** With load | | | | |
| **C.3.3** Aspirating fan | | | | |
| **C.3.3.1** Without load | | | | |
| **C.3.3.2** With load | | | | |
| | | | | |
| **C.4** Noise Level, db(A) | | | | |
| **C.4.1** Feeder | | | | |
| **C.4.1.1** Without load | | | | |
| **C.4.1.2** With load | | | | |

| Items | Trial 1 | Trial 2 | Trial 3 | Average |
|---|---|---|---|---|
| **C.4.2** Bagger | | | | |
| **C.4.2.1** Without load | | | | |
| **C.4.2.2** With load | | | | |
| | | | | |
| **C.5** Total power consumption | | | | |
| **C.5.1** Power (kW) | | | | |
| **C.5.1.1** Without load | | | | |
| **C.5.1.2** With load | | | | |
| **C.5.2** Load current (A) | | | | |
| **C.5.2.1** Without load | | | | |
| **C.5.2.2** With load | | | | |
| **C.5.3** Line voltage (V) | | | | |
| **C.5.3.1** Without load | | | | |
| **C.5.3.2** With load | | | | |
| | | | | |
| **C.6** Fuel consumption (L/h) | | | | |
| **C.6.1** Fuel consumed (L) | | | | |
| **C.6.2** Fuel time (h) | | | | |

**C.7 Rate the following observations:**

| Items | Rating* | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **C.7.1** Ease of loading | | | | | |
| **C.7.2** Ease of cleaning parts | | | | | |
| **C.7.3** Ease of adjusting and repair of parts | | | | | |
| **C.7.4** Ease of collecting output | | | | | |
| **C.7.5** Ease of transporting the machine | | | | | |
| **C.7.6** Safety | | | | | |
| **C.7.7** Vibration | | | | | |

* 1- Very good
2 – Good
3 – Satisfactory
4 – Poor
5 – Very poor

**C.10 Other Observations:**

_____
_____
_____

# Annex D
(informative)

## D.1 Laboratory Analysis Data Sheet

| Item | Trial | | | | | | Mean | |
|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | | |
| | Control | Test | Control | Test | Control | Test | Control | Test |
| **D.1** Variety | | | | | | | | |
| **D.2** Source | | | | | | | | |
| **D.3** Paddy analysis | | | | | | | | |
| **D.3.1** Grain size, brown rice (mm) | | | | | | | | |
| **D.3.1.1** Length | | | | | | | | |
| **D.3.1.2** Width | | | | | | | | |
| **D.3.1.3** Thickness | | | | | | | | |
| **D.3.2** Grain type | | | | | | | | |
| **D.3.3** Paddy bulk density ($kg/m^3$) | | | | | | | | |
| **D.3.4** Moisture content (%) | | | | | | | | |
| **D.3.5** Purity (%) | | | | | | | | |
| **D.3.6** Cracked hand-hulled brown rice | | | | | | | | |
| **D.4** Laboratory hulling test | | | | | | | | |
| **D.4.1** Brown rice | | | | | | | | |
| **D.4.1.1** Chalky (%) | | | | | | | | |
| **D.4.1.2** Immature (%) | | | | | | | | |
| **D.4.1.3** Yellow & Fermented (%) | | | | | | | | |
| **D.4.1.4** Red Rice (%) | | | | | | | | |
| **D.4.1.5** Weight of 1000 whole head brown rice (g) | | | | | | | | |
| **D.5** Laboratory milling test | | | | | | | | |
| **D.5.1** Weight of 1000 whole milled rice (g) | | | | | | | | |
| **D.5.2** Head Rice (%) | | | | | | | | |
| **D.5.2.1** Based on milled rice | | | | | | | | |
| **D.5.2.2** Based on rough rice | | | | | | | | |
| **D.5.3** Broken rice (%) | | | | | | | | |
| **D.5.3.1** Based on milled rice | | | | | | | | |

| Item | Trial | | | | | | Mean | |
|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | | |
| | Control | Test | Control | Test | Control | Test | Control | Test |
| **D.5.3.2** Based on rough rice | | | | | | | | |
| **D.5.4** Brewer's rice (%) | | | | | | | | |
| **D.5.4.1** Based on milled rice | | | | | | | | |
| **D.5.4.2** Based on rough rice | | | | | | | | |
| **D.5.5** Total milling recovery (%) | | | | | | | | |
| **D.5.6** Whiteness index | | | | | | | | |
| **D.5.7** Milling degree | | | | | | | | |
| **D.6** Analysis of samples from micro mill test | | | | | | | | |
| **D.6.1** Head rice (%) | | | | | | | | |
| **D.6.1.1** Based on milled rice | | | | | | | | |
| **D.6.1.2** Based on rough rice | | | | | | | | |
| **D.6.2** Broken rice (%) | | | | | | | | |
| **D.6.2.1** Based on milled rice | | | | | | | | |
| **D.6.2.2** Based on rough rice | | | | | | | | |
| **D.6.3** Brewer's rice (%) | | | | | | | | |
| **D.6.4** Impurities (%) | | | | | | | | |
| **D.6.5** Unhulled grains (%) | | | | | | | | |
| **D.7** Analysis of samples from bran outlet | | | | | | | | |
| **D.7.1** Bran (%) | | | | | | | | |
| **D.7.2** Broken and brewer's rice (%) | | | | | | | | |
| **D.7.3** Hull (%) | | | | | | | | |

## D.2 Chemical Test (using alcohol-alkali staining solution) Data Sheet

| Sample No. | No. of Streak/Sample | Classification |
|---|---|---|
| **1** | | |
| **2** | | |
| **3** | | |
| **Average** | | |

## Annex E
(informative)

## Formula Used

1. Input capacity (kg/h) = $\frac{\text{Weight of input paddy (kg)}}{\text{Total loading time (h)}}$

2. Milling capacity (kg/h) = $\frac{\text{Weight of input paddy (kg)}}{\text{Total operating time (h)}}$

3. Milling recovery (%) = $\frac{\text{Weight of milled rice (kg)}}{\text{Weight of clean paddy (kg)}} \times 100$

4. Percent head rice (%) = $\frac{\text{Weight of head rice (g)}}{\text{Weight of milled rice (g)}} \times 100$

5. Broken rice (%) = $\frac{\text{Weight of broken rice (g)}}{\text{Weight of milled rice (g)}} \times 100$

6. Brewer's rice (%) = $\frac{\text{Weight of brewer's rice (g)}}{\text{Weight of milled rice (g)}} \times 100$

7. Milling degree = $\frac{\text{Weight of head brown rice - weight of head milled rice}}{\text{Weight of head brown rice}} \times 100$