UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

CSAM

ANTAM STANDARD CODE FOR TESTING OF PADDY TRANSPLANTERS

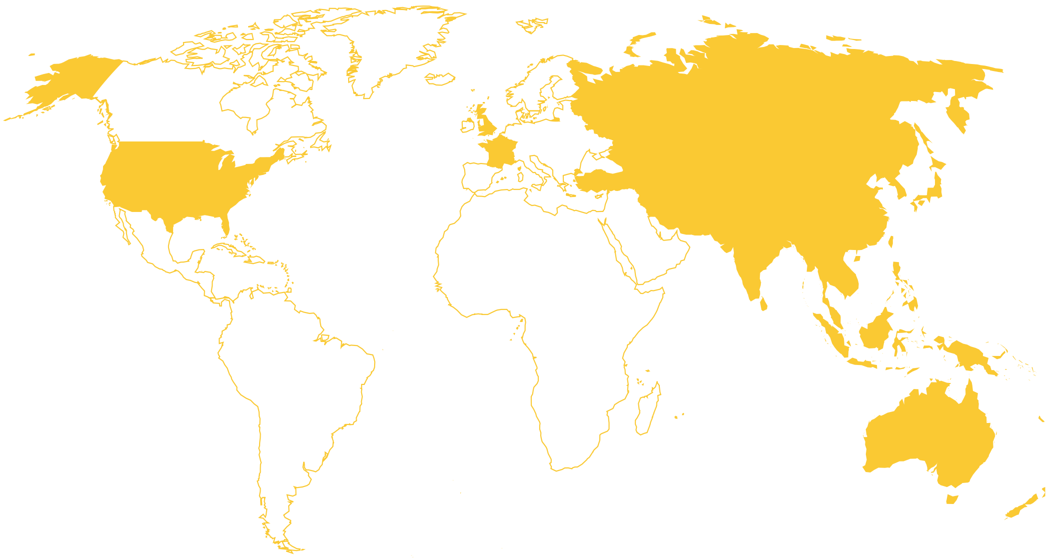
003-2017

ANTAM
Asian and Pacific Network for Testing of Agricultural Machinery

The Centre for Sustainable Agricultural Mechanization (CSAM), is a regional institution of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), based in Beijing, China. CSAM started operations in 2004, building on the achievements of the Regional Network for Agricultural Machinery (RNAM) and the United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery (UNAPCAEM). CSAM serves the 62 members and associate members of UNESCAP.

The vision of CSAM is to achieve production gains, improved rural livelihood and poverty alleviation through sustainable agricultural mechanization for a more resilient, inclusive and sustainable Asia and the Pacific.

The Secretariat of the Asian and Pacific Network for Testing of Agricultural Machinery (ANTAM) is based at CSAM. CSAM is the executing agency of ANTAM. The ANTAM Secretariat assists and coordinates the operation of the network, and provides necessary logistical and administrative support.



The shaded areas of the map indicate ESCAP members and associate members

ANTAM STANDARD CODE
FOR TESTING OF PADDY TRANSPLANTERS

Centre for Sustainable Agricultural Mechanization
United Nations Economic and Social Commission for Asia and the Pacific

003-2017

August 2017*

*The current Code is subject to revision and adoption by the 4th Annual Meeting of ANTAM to be held in Manila, the Philippines, on November 22-24, 2017.

Acknowledgments

The Asian and Pacific Network for Testing of Agricultural Machinery (ANTAM) Standard Code for Testing of Power Tillers was prepared under the supervision of the Centre for Sustainable Agricultural Mechanization of the United Nations Economic and Social Commission for Asia and the Pacific (CSAM-ESCAP). The current version of the Code is based on the first edition published in August 2015, initially drafted by Dr. Chan Chee Wan and modified based on technical negotiations conducted with designated national counterparts in 2015, 2016 and 2017.

The consultation process in 2017 started in March and was concluded at the 3rd Meeting of ANTAM Technical Working Groups held on May 24-27, 2017 in Dhaka, Bangladesh. The Code has been developed with contribution from: Md. Anwar Hossen; Zhang Xiaochen; Allimuthu Surendrakumar; Joko Pitoyo; Takashi Fujimori; Mohd Shahril Shah bin Mohamad Ghazali; Romulo Esteban Eusebio; Anuradha Wijethunga; Isara Chaorakam and Ngo Van Phuong. Moreover, the Code benefitted from revisions suggested by Hideyuki Ichiki, technical expert from the Institute of Agricultural Machinery, Japan.

The ANTAM Testing Code for Paddy Transplants was formulated by referring to ANTAM Standards 001-2016 and 002-2016, standards developed by the International Standard Organization (ISO), the Regional Network for Agricultural Machinery (RNAM) and by merging with relevant national standards from China, India, and Japan to reflect unique regional conditions.

Special thanks go to the ANTAM Focal Points in Sri Lanka, Bangladesh and China, namely Chintaka Balasooriya, Sheikh Md. Nazimuddin and Han Xue, for the important support provided during the organization of ANTAM meetings in their respective countries.

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At CSAM, the process of development of the Code was coordinated by Camilla Stelitano under the supervision of Anshuman Varma, Programme Officer and the overall guidance of Li Yutong, Head of CSAM. Chan Chee Wan provided final reviews and editing of the Code and Wei Zhen contributed to the layout and design of the publication.

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I. Foreword

The Asian and Pacific Network for Testing of Agricultural Machinery (ANTAM) is an initiative led by the Centre for Sustainable Agricultural Mechanization (CSAM) of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). The network develops regional standards to promote the use of safe, efficient and environmentally sound agricultural machinery in the Asia-Pacific region. In support of the 2030 Agenda for Sustainable Development, the ANTAM project aims to tackle cross-sectoral issues to impact economic, social and environmental aspects that affect the agricultural output of ESCAP member countries.

Over the past few decades the Asia-Pacific region has been an important engine for growth and poverty reduction. Between 2010 and 2013 the poverty rate fell to 10.3 percent of the total population in the region and the total number of people who are poor fell to 400 million[1]. In this context, the increase in productivity of the agricultural work force has played a crucial role and it has been estimated that greater labour productivity in agriculture has the potential to lift an additional 110 million people from poverty between 2016 and 2030[2].

In the coming years, modernization of production systems that can empower the agricultural workforce is expected to play a central role in enabling the required increases in productivity in the agricultural sector. However, substantive progress in the modernization of agricultural production in the Asia-Pacific region, of which sustainable agricultural mechanization is undoubtedly an important component, continues to be restrained by uneven manufacturing capacity and the lack of regional integration mechanisms. The adoption of mutually recognized testing Codes for agricultural machinery can significantly reduce the need to conduct national testing when importing foreign machinery, and set minimum regional standards on the requirements pertinent to safety and efficiency. The integration of the agricultural machinery market through mutually recognized testing Codes can also unleash the full potential of the agricultural mechanization sub-sector by facilitating technology and knowledge exchange while at the same time helping protect end users from the use of unsafe and inefficient inputs.

Furthermore, a shared commitment to combat climate change and support the sustainable intensification of agricultural production calls for simultaneously addressing production gains and environmental protection. In this context, it is crucial to support the adoption of mechanization technologies and products that can increase yields, reduce the excessive use of chemical fertilizers and pesticides, and minimize the related environmental footprint. The regional standards being developed through ANTAM can guide manufacturers and end users towards this objective.

The ANTAM Codes for testing of agricultural machinery are developed by appointed members of the Technical Working Groups (Appendix 2) and are based on national standards of ESCAP member countries and major international requirements for agricultural machinery testing. The first version of the ANTAM Code for Testing of Paddy Transplanters aims to provide a guideline to facilitate the provision of efficient, durable and safe equipment for end users to support the cultivation of one of the key crops in the Asia-Pacific region.

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[1] United Nations, Asian Development Bank, United Nations Development Programme (March 2017) Asia-Pacific Sustainable Development Goals Outlook. Bangkok, Thailand. Available at: http://www.unescap.org/publications/asia-pacific-sustainable-development-goals-outlook

[2] United Nations (2016) Economic and Social Survey of Asia and The Pacific 2016- Nurturing productivity for inclusive growth and sustainable development. Bangkok, Thailand. Available at:http://www.unescap.org/sites/default/files/publications/Economic%20and%20Social%20Survey%20of%20Asia%20and%20the%20Pacific%202016_0.pdf

II. Method of Operation[3]

The Annual Meeting shall adopt the Test Codes by consensus amongst ANTAM participating countries.

The Technical Working Groups (TWGs) of ANTAM develop, review and revise ANTAM Codes based on the decisions adopted at the Annual Meeting of ANTAM.

The ANTAM Test Codes are updated by the TWGs through technical negotiations led by CSAM. The content of the Codes is finalized and agreed upon by consensus amongst all TWGs members at the annual meetings of the TWGs.

The ANTAM Test Code on Paddy Transplanters was formulated by referring to ANTAM Standards 001-2016 and 002-2016, standards developed by the International Standard Organization (ISO), Regional Network for Agricultural Machinery (RNAM) and by merging relevant national standards from China, India, and Japan to reflect unique regional conditions. As specified in the Terms of Reference of the TWGs, members are responsible for selecting and providing relevant references to national and international standards. All selected standards are subject to revision and considered the most updated edition as per documents provided by TWGs members. All documents provided by national standards agencies are copyrighted.

Implementation of ANTAM Test Codes is voluntary. Member countries can use ANTAM Test Codes in their entirety or refer to parts of the Code to integrate them with procedures applied in national testing stations. ANTAM Test Codes apply only to the equipment described in the Codes. Thus, any testing station from an ANTAM member country is welcome to use the test Codes assuming it has adapted testing equipment, facilities and skilled personnel.

Participating national testing stations are responsible for using the Codes to carry out the tests and complete the test report. Each testing station shall certify that ANTAM Codes are followed and that the test report complies with ANTAM Test Codes and procedures. ANTAM strongly encourages the implementation of round robin tests[4] among testing stations in order to ensure that test reports are supported by a quality assurance process.

The test report shall be verified by the ANTAM Secretariat prior to its release. The ANTAM Secretariat shall work with the Technical Reference Unit (TRU), an independent third party elected by member countries at the Annual Meeting, to check the technical contents of the report to ensure strict compliance with ANTAM testing methodologies.

Upon approval and validation of the test report by the ANTAM Secretariat, the ANTAM logo may be used on the tested machinery. The ANTAM Secretariat will then release the test report on its website.

The ANTAM Test Codes are designed to guide member countries in the application of standards for testing of agricultural machinery. The Codes provide information only and do not constitute formal legal advice. The ANTAM Secretariat assumes no liability for actions undertaken in reliance on the information contained in the Codes.

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[3] In reference to the Terms of Reference of ANTAM and the Terms of Reference of ANTAM Technical Working Groups adopted by the Annual Meeting on December 9, 2016.

[4] Measurement system analysis technique, where independent technicians perform the tests in different stations. Such interlaboratory activity is encouraged to compare discrepancies in results, if any, and determine the reproducibility of test methods.

*The current Code is subject to revision and adoption by the 4th Annual Meeting of ANTAM to be held in Manila, the Philippines, on November 22-24, 2017

III. General Text

1.0 SCOPE

This Test Code covers the terminology, general guidelines and tests to be conducted on paddy transplanters applicable for engine driven, walk behind and riding type paddy transplanters with mat type seedlings. It also covers methodology for verification of machine specifications, performance, evaluation, safety measures, data collection and test report format.

Paddy transplanters that are already for commercial production or already in production should be tested with reference to this Code.

2.0 REFERENCES

The complete list of references to existing international standards that have been incorporated to this text is provided in **Annex A**. The list includes international standards developed by the International Standard Organization (ISO), the Regional Network for Agricultural Machinery (RNAM), ANTAM and national standards practiced by China, India and Japan. The selection of publications, the editions indicated were provided by the various national representatives. All selected standards are considered recent as per documents provided. All documents provided from the various national standards agency are copyrighted.

3.0 TERMINOLOGY

3.1 Paddy transplanting

Technique of placing paddy seedlings from one location to another. The first location may be specially prepared nursery in controlled or uncontrolled conditions or normal paddy field.

3.2 Paddy transplanter

Machine, which is used to perform paddy seedlings transplanting.

3.3 Walk behind type transplanter

Machine, where the operator has to walk from behind to operate it.

3.4 Riding type transplanter

Machine, where the operator can sit comfortably on the machine to operate it.

3.5 Mat type seedlings

The paddy seedlings that are raised on thin layer of soil either being prepared in the paddy field or in the nursery box as mat

3.6 Seedlings density

It indicates the number of seedlings per unit area on the mat.

3.7 Leaf stage of seedlings

Leaf stage indicates the number of leave or height of the seedling. (Seedlings, which has more than 3 leaves and less than 6 leaves suitable for machine transplanting).

3.8 Total missing hills

Nonexistence of seedlings in any planting point due to floating, buried and inability of the finger to pick the seedlings.

3.9 Floating hills

Seedlings that remain afloat on the water after transplanting.

3.10 Buried hill

Seedlings that remain in the soil layer after transplanting.

3.11 Damaged seedling

Seedlings which have had some damages during picking, planting and other machine operations.

3.12 Soil hardness[5]

The soil hardness at transplanting operation is expressed with the depth of penetration of a drop type cone penetrometer and called "cone depth". The apex angle of the cone should be 45 degrees and weight is about 135 grams. Cone penetrometer should drop from a height of 1 meter from the soil surface, without standing water to the tip of the cone. After penetrating, the depth should measure from the tip of the cone to the soil surface in centimeters (RNAM 1983).

3.13 Theoretical field capacity

This is calculated by multiplying the theoretical working width of the machine and the average operational speed of the machine. Results should come as area per unit time.

3.14 Actual field capacity or rate of work

Area transplanted by the machine during total operating time. Results should come as area per unit time

[5] Soil hardness refers to the top soil surface layer.

3.15 Field efficiency

Ratio between actual field capacity and theoretical field capacity, expressed as a percentage.

3.16 Transplanting speed

The forward speed of the transplanter during seedlings transplanting.

IV. Code

1.0 CHECKING OF SPECIFICATIONS

1.1 Specification Sheet

1.1.1 The "manufacturer/supplier" (here after "applicant") shall supply the specifications of the paddy transplanter as per the Annex A, and any other information required by the testing authority, to carry out the tests. The applicant should also supply the technical literature such as operational and maintenance manual, service manual and parts catalogue (4.1 IS 9935:2002).

1.1.2 The information given by the applicant in the specification sheet (Clause 1.1) shall be verified by the testing authority and reported. The details of the components and assemblies, which do not conform to the relevant ANTAM standards shall also be reported. The adequacy or otherwise of the literature shall be indicated (7.1 IS 9935:2002).

1.2 Manual

The applicant shall submit operation, maintenance and service manuals. The operational manual shall include schematic diagrams of levers, switches and other parts with functional description and instruction on all adjustments necessary for operation of the transplanter, assembly and disassembly for cleaning and routine inspection, replacements of parts, safety precautions to be taken during operation and handling and spare parts list with part no (number) in the manual. Manuals shall comply with ISO 3600:1998, GB/T 20864-2007 or IS 8132:1999 standards and contain information on main technical details of the engine with filters and other accessories, technical details on transplanting spacing, speeds, planting depths, plants per hill, cuts per tray and contact details of manufacturer and supplier.

1.3 Checking of Overall Dimension

The transplanter shall be kept in horizontal leveled position on a flat surface and the measurements shall be taken from outermost points.

1.4 Fabrication Material

The applicant has to clearly state the fabrication material of the main parts in the specification sheet as specified in Annex B.

1.5 Mechanisms

Power transmission, transplanting and floating mechanism should be specially examined or investigated during the beginning of the testing (GB/T 20864-2007, Japan 2015).

2.0 SAFETY REQUIREMENTS

2.1 The exposed transmission and rotating parts should have protective cover (GB 10395.9, Japan 2015).

2.2 The position and the direction of the exhaust port shall avoid the driver and other operators who are supposed to stand on the machine.

2.3 The operator work floor should be flat and non-slip (GB 10395.9, Japan 2015).

2.4 The row marker should have locking mechanism.

2.5 The operation symbols should be pasted near the key controls. There should be a minimum gap of at least 25mm between the control levers (GB 10395.9, Japan 2015).

2.6 The pedal should have non-slip surface and easy to clean.

2.7 The positive pole of the battery should have the protective cover to prevent the short circuit.

2.8 Riding type transplanters should be equipped with footsteps on both sides.

2.9 All exposed sharp edges and corners must have smooth finishing.

2.10 Transplanters should be equipped with a front side and a rear side light.

2.11 Dangerous moving parts must be indicated by safety signs and should be presented in the operating manual.

2.12 Riding type transplanters should be equipped with a reverse horn.

3.0 PARKING BRAKE TEST

3.1 Riding type transplanters shall be placed with parking brake applied, on a hard dry slope of 18% facing uphill and downhill slopes. Transplanter may be in unload condition and movements of the braked wheel should be observed for at least 5 minutes. (ANTAM 001-2016)

4.0 NOISE MEASUREMENT TEST (ANTAM 001-2016)

4.1 The noise level shall be measured at the operator's ear level during transplanting operation.

4.2 The noise shall be measured with instrument and expressed in decibels set on slow level.

4.3 The test area shall be a flat open space. There shall be no obstacle likely to reflect significant sound, such as building, solid fence, tree or other vehicle for a distance of at least 20 m from the tested machine (ANTAM 002-2016).

4.4 The air temperature shall be in the range from -5 °C to 35 °C and the wind velocity shall not exceed 5 m/s at the operator's position (GB/T 6229-2007).

4.5 The ear side noise of the operator shall be no more than 90 dB(A) in operating condition at maximum speed (GB/T 20864-2007).

5.0 PERFORMANCE TEST

5.1 General

5.1.1 The objective or purpose of this test is to determine the actual field performance of the machine. It includes field efficiency, transplanting accuracy, and uniformity of transplanting.

The applicant should supply the transplanter with standards accessories and in a condition as generally offered for sale. The transplanter shall be new and should not be given any special treatment or preparation for test (ANTAM 002-2016).

5.1.2 Operator of the machine during the test. The operator should be knowledgeable on the operation of the machine. It could be from the applicant or from the testing authority.

5.1.3 Test site conditions. The transplanter shall be tested in an actual field condition. The field shall be prepared for transplanting operation and shall have an area of at least 1000 m^2. It shall have a rectangular shape with ratio of 1:2 (RNAM 1983).

5.1.4 Test Instruments/Equipment. The test instruments shall be calibrated. The list of test instruments used to carry out transplanter test shall be presented in Annex C.

5.2 Initial data to be gathered

5.2.1 The date and actual location of test shall be recorded.

5.2.2 Seedlings Conditions shall be obtained as follows:

- Age of seedlings
- Variety
- Plant density[6] (No. of plants per cm^2)
- Leaf stage (No. of leaves)
- Height of seedlings (mm)
- Thickness of seedling mat (mm)

5.2.3 The actual field condition shall be obtained as follows:

- Area (L x W), m^2
- Soil Type[7]
- Soil hardness (Cone depth, mm), (Drop cone test)
- Depth of hard pan (mm)
- Depth of water[8] (mm)

[6] Please randomly sample 3 seedling mats and take 5 measurements of seedling number per cm2 for each seedling mat. Report the average number of seedling per cm2 in ANNEX C.

[7] Please provide specific soil physical properties including bulk density, clay percentage in addition to the soil type ANNEX C.

- Qualitative assessment[9] (leveling, stubble)

5.3 Field performance Test

5.3.1 The following transplanter settings shall be recorded before the test:

- Distance between hills (mm)
- Depth of planting (mm)
- Number of seedlings per hill

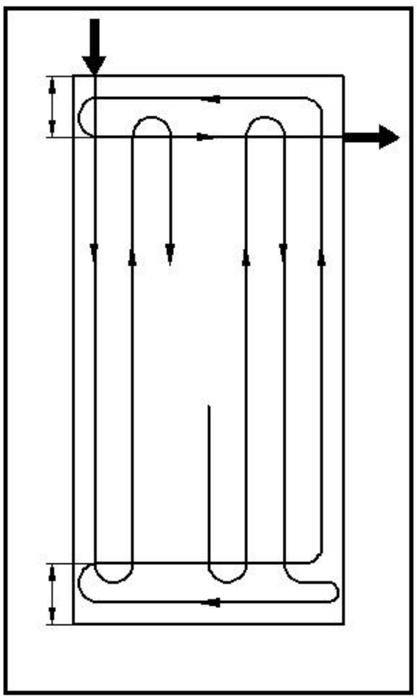
5.3.2 The actual performance shall start by operating the transplanter on the field. The following shall be gathered to calculate actual fled capacity, field efficiency, percentage of slippage and fuel consumption.

- Time of transplanting
- Total operation time
- Average operating Speed (kph)

- Effective working width (mm)
- Wheel slippage (without and with load)
- Noise level at operator's ear level (db(A))
- Fuel Consumed (kg)

5.3.3 Transplanting Pattern. A transplanting pattern shall be followed as in Figure (A and B).

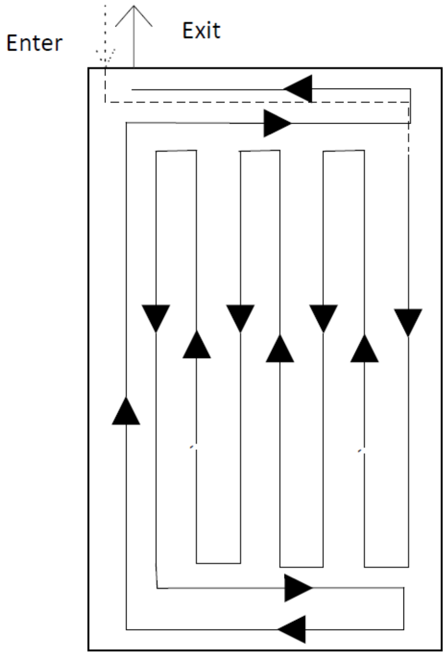
5.3.4 Testing authority should mention in the report the actual pattern used in test.



Pattern A

[8] To be collected after cone depth data measurement is completed.

[9] A brief description of the measurement method of field levelness and stubble shall be provided in the test report ANNEX C.



Pattern B

5.3.5 The transplanting time, including non-productive time, shall start as soon as the seedlings are transplanted on the field and end when the transplanter stopped planting.

5.3.6 The total time of operation shall start as soon as the engine started and ends as soon as the engine stopped.

5.3.7 Average operating speed

The transplanter shall be operated at the 80-85% of maximum transplanting speed. The operating speed shall be determined by putting two poles 20 m apart (A, B) on the length of the test field approximately in the middle of the test run. On the opposite side two poles are also placed in similar position, 20 m apart (C, D) so that all four poles form corners of a rectangle parallel to at least one long side of the test plot. The speed will be calculated from the time required for the transplanter to travel the distance (20 m) between the assumed line connecting two poles on opposite sides AC and BD. The easily visible point of the machine should be selected for measuring the time. The starting position shall be at least 2 to 5 m from poles A and C to stabilize speed before measuring and recording data (RNAM 1983). Ten measurements are to be made to obtained the average speed.

5.3.8 Wheel Slippage

The distance travelled shall be measured at 10 revolutions of the driving wheels at level field in dry condition. A visible mark shall be placed on the wheels for obtaining the number of revolutions. During Transplanting the distance for ten revolutions of the driving wheel shall also be obtained. In both conditions, same speed of the transplanter shall be maintain (RNAM 1983).

5.3.9 Uniformity of transplanting

Five sampling areas shall be randomly selected in the field (as shown in figure 1). It shall be of five, -one meter length in succession and covers the rows of transplanter.

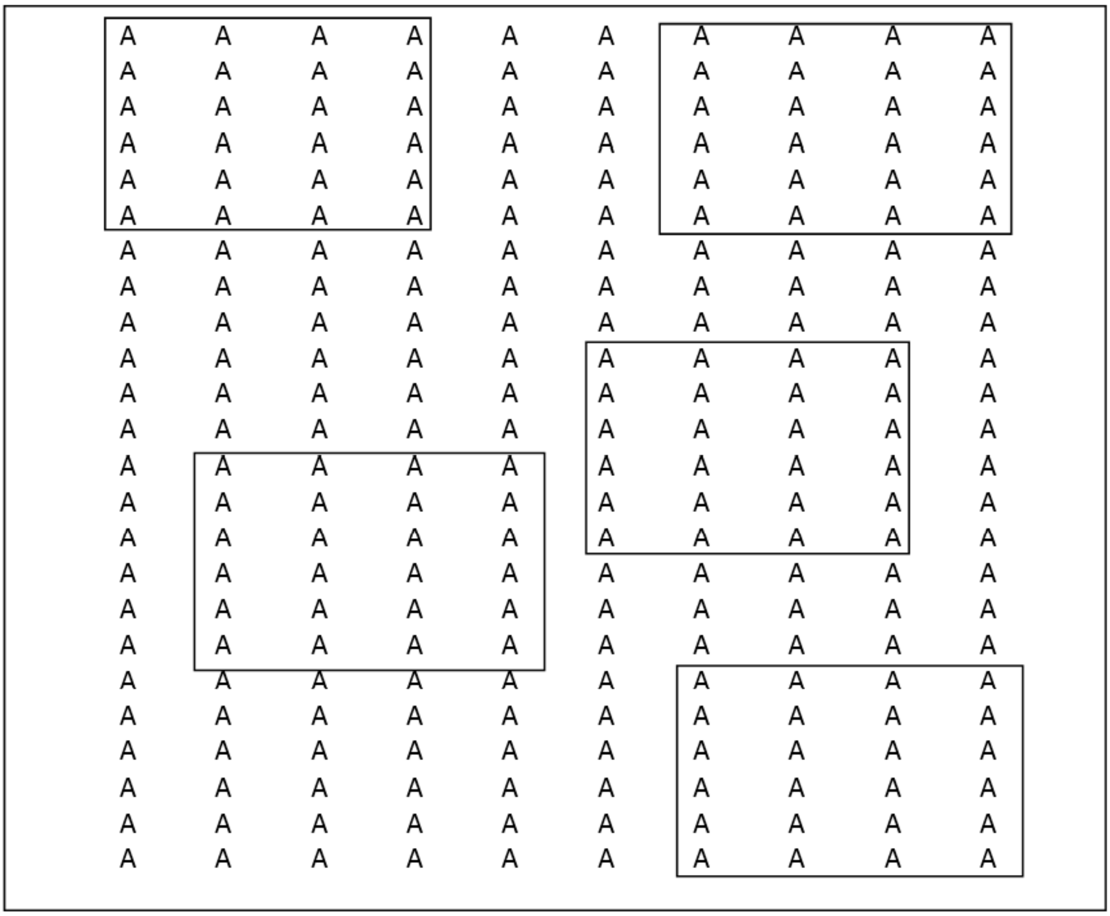


Figure 1: Sampling area for four rows transplanter

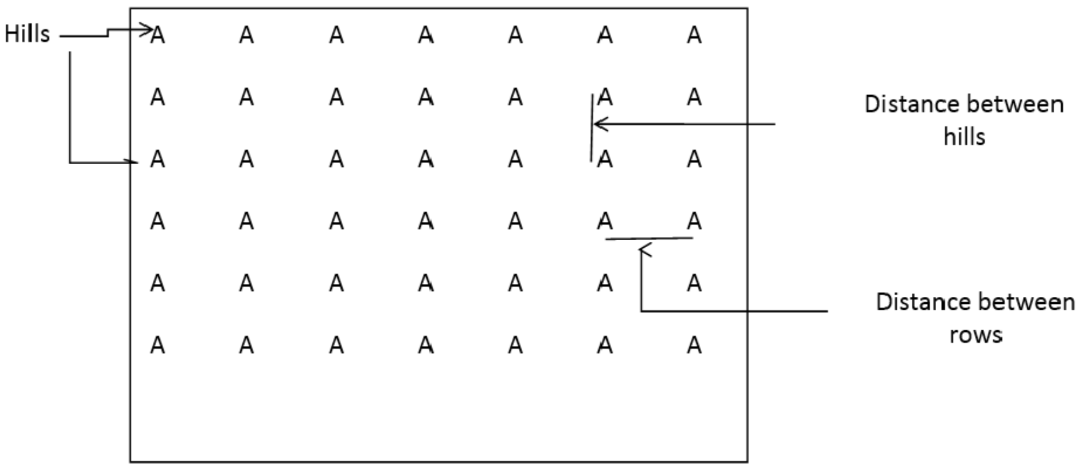


Figure 2: One sampling area

5.3.10 From the sampling areas, the following shall be determined:

- Total number of hills required for the sample area.
- Distance between hills (mm)
- Number of seedlings per hill
- Standing angle of plants
- Depth of planting (mm)
- Missing hills
- Continuous missing hills
- Buried seedlings
- Floating seedlings
- Damaged seedlings

5.3.11 The mean and coefficient of variation of the following shall be computed: depth of planting, distance between hills and number of seedlings per hill.

5.3.12 Fuel Consumption

The volume of fuel consumed shall be obtained by refill method. The tank of the engine shall be filled to full level and shall be refilled after the test. The amount of fuel refilled shall be the amount of fuel consumed.

5.3.13 Trials

At least three trials shall be conducted.

5.3.14 Termination of the test

If during the test, the transplanter encounter major breakdown that will prevent the transplanter to perform transplanting operation, the testing authority with the concurrence from the manufacturer shall terminate the test.

V. Annexes

ANNEX A

LIST OF CITED STANDARDS

Standards No.	**Title**
ANTAM 001-2016	Asian and Pacific Network for Testing of Agricultural Machinery Standard Code for Testing of Power Tillers
ANTAM 002-2016	Asian and Pacific Network for Testing of Agricultural Machinery Standard Code for Testing of Misters-Cum-Dusters
GB/T 6229-2007	Test Methods for Walking Tractors
IS 8132:1999	Tractors and Machinery for Agriculture and Forestry, Powered Lawn and Garden Equipment – Operator’s Manuals – Content and Presentation
IS 9935:2002	Power Tiller – Test Codes
ISO 3600:1998	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment-operators manuals-content and presentation
ISO 5353:1995	Earth-Moving Machinery and Tractors and Machinery for Agriculture and Forestry – Seat Index Point
RNAM 1983	RNAM Technical series no 12, April 1983
GB/T 6243-2003	Rice transplanter –Testing methods
GB/T 20864-2007	Rice transplanter –Specification
Japan 2015	National Test Code for Rice Transplanter (revised September 30, 2015

**ANTAM = Asian and Pacific Network for Testing of Agricultural Machinery*

GB/T = Chinese Standards

IS = Indian Standards

ISO = International Standard Organization

RNAM: Regional Network for Agricultural Machinery

ANNEX B

Specification sheet for Paddy Transplanter

No	Description	Manufactures specification	Verification by the testing agency
1.0	**General**		
1.1	Name and address of the manufacturer/s		
1.2	Name and address of the applicant		
1.3	Type		
1.4	Make/brand		
1.5	Model		
1.6	No of rows		
1.7	Serial number		
1.8	Year of manufacture		
1.9	Country of origin		
2.0	**Engine**		
2.1	**Certified test***(No test necessary if a certified test report is provided by the manufacturer according to either one of the following standard: IS 7374-1974, GB 20891-2014 or ISO 8178.4-2007)*		
2.2	Type		
2.3	Make/brand		
2.4	Model		
2.5	Country of Manufacture		
2.6	Serial number		
2.7	Rated speed (rpm)		
2.8	Power at rated speed (kW)		
2.9	Specific fuel consumption (g / kWh)		
2.10	Maximum torque (Nm)		
2.11	Fuel tank capacity (liter)		
2.12	Type of fuel filter		
2.13	Type of cooling system and coolant capacity		
2.14	Type of air cleaner		
2.15	Starting system Type Aids for cold starting Any other devices provided for easy starting		
2.16	Type of silencer		
2.17	Electrical system Voltage Output power of generator Details of head lights (number and watt)		
3.0	**Seedling rack**		
3.1	Material		
3.2	Width(mm)		
3.3	Height (mm)		

3.4	Nursery feeding type		
4.0	**Planting arm and fork**		
4.1	Type of planting arm (rotary or cranking)		
4.2	No of arms		
4.3	material of fork		
4.4	Length of fork (mm)		
	Width of fork (mm)		
5.0	**Floater**		
5.1	Material		
5.2	Center floater (L x W x T(mm))		
5.3	Outer floater (L x W x T(mm))		
5.4	Width (mm)		
5.5	No of floaters		
6.0	**Wheel**		
6.1	Material		
6.2	Width (mm)		
6.3	Diameter (mm)		
7.0	**Handle**		
7.1	Width / diameter (mm)		
7.2	Type of grip for prevention of slipping		
7.3	material of grip		
8.0	**Power transmission system**		
8.1	Type		
8.2	Material		
9.0	**Operator's seat for riding type**		
9.1	Type		
9.2	Adjustable (yes or no) (Up-down; forward – backward)		
10.0	**Overall dimension**		
10.1	Length (mm)		
10.2	Height (mm)		
10.3	Width (mm)		
10.4	ground clearance (mm)		
11.0	**Weight**		
11.1	**Total** Weight (kg)		
12.0	**Spare tray**		
12.1	No. of spare trays		
13.0	Publications		
13.1	Operator's manual		
13.2	Service Manual		
13.3	Parts catalogue		
13.4	Safety Precautions		

ANNEX C

Performance Data Sheet for Paddy Transplanters

Location					
Date and Time					
Ambient condition (Humidity, Temperature)					
Seedlings condition					
Age of seedlings					
Variety					
Average seedling density (No. of plant/cm2)					
Sample 1					
Sample 2					
Sample 3					
Leaf stage (No. of leave)					
Height of seedlings (mm)					
Thickness of seedling mat (mm)					
Soil type of seedling mat (mm)					
Root length (mm)					
A. Test Field Condition					
A.1 Dimensions (m)					
Length					
Width					
Area (m^2)					

A.2 Soil hardness (cone depth, mm) (Drop cone test)									

A.3 Depth of hard pan (mm)									

A.4 Depth of Water (mm)									

A.5 Qualitative Assessment (soil type, levelness and stubble)

B. Machine settings	
B.2 Distance between hills (mm)	
B.3 Depth of planting (mm)	
B.4 Number of seedlings per hill	
B.6 Other settings	
C. Field Performance	
C.1 Transplanting time (h)	
C.2 Total operation time (h)	

C.3 The distance covers for 10 revolutions of driving wheel										
W/o load	.									
With load										
C.4 Noise level[db(A)]										

Left									
Right									
C.4 Traveling time for ____20___m distance (sec)									
C.5 Non-productive time (m)									
C.6 Fuel consumed (g, ml)									
C.6 Number of passes									
C.8 Distance between hills (mm)									
Mean									
Coefficient of Variation									
C.9 Number of seedlings /hill									
Mean									
Coefficient of Variation									
C.10 Standing angle with respect to vertical (^{0})									
Mean									
Coefficient of Variation									
C.11 Number of missing hills @ one sampling area									
Mean									
Coefficient of Variation									
C.12 Number of buried seedlings @ one sampling area									
Mean									
Coefficient of Variation									
C.13 Number of floating seedlings @ one sampling area									
Mean									
Coefficient of Variation									
C.14 Number of damaged seedlings @ one sampling area									
Mean									
Coefficient of Variation									
C.15 Items to be computed									
C.15.1 Actual Field Capacity (ha/h)									
C.15.2 Theoretical Field Capacity (ha/h)									
C.15.3 Field Efficiency (%)									
C.15.4 Operating Speed (kph)									
C.15.5 Effective working width (m)									

C.15.6 Percent Wheel slippage	
C.15.7 Fuel Consumption (g/ha, ml/ha)	

FORMULA TO BE USED

1. Actual Field Capacity (ha/h)

$$AFC = \frac{A_t\ (ha)}{T_t\ (h)}$$

Where; A_t = transplanted area in ha
T_t = Transplanting time in hour

2. Theoretical Field Capacity (ha/h)

$$TFC = \frac{Wat x S}{10}$$

Where; W_{at} = Actual transplanting width (m)
S = Average Operating Speed (kph)

3. Field Efficiency (%)

$$E = \frac{AFC}{TFC} \times 100$$

4. Effective Working width (m)

$$Weff = \frac{\text{Width of the field}}{\text{No. of passes}}$$

Coefficient variation = (SD/Mean)*100

SD is Standard Deviation

$$S.D. = \sqrt{\frac{(x-\bar{x})^2}{n-1}}$$

$$\text{Fuel Consumption} = \frac{\text{Fuel consumed (g,ml)}}{\text{Transplanting Area (ha)}}$$

Appendix 1

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(As of August 2017)

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(As of August 2017)

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Dr. Shabbir Ahmed Kalwar	Pakistan
Mr. Darwin Aranguren	Philippines
Dr. Vadim Pronin	Russia
Mr. Pavel Ishkin	Russia
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Technical Working Group on Powered Knapsack Misters-Cum-Dusters

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Asian and Pacific Network for Testing of Agricultural Machinery

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