

BHUTAN STANDARD
Paddy Transplanter – Test Code (Part 2)



ICS 03.080.30

© Copyright 2025

BHUTAN STANDARDS BUREAU
The National Standards Body of Bhutan
Thimphu 11001

April 2025

Price group A

BHUTAN STANDARD

Paddy Transplanter – Test Code (Part 2)

PDF disclaimer

This PDF may contain embedded typefaces. In accordance with Adobe's Licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The Bhutan Standards Bureau accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

COPYRIGHT PROTECTED DOCUMENT

© BSB 2025

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from BSB at the address below in the country of the requester.

Director General
Bhutan Standards Bureau
Rijug Lam
Thimphu-11001
Tel: 00975-2-325104/325401
Fax: 00975-2-323712/328298
Web: www.bsb.gov.bt

Published in Thimphu, Bhutan

Table of Contents

<i>NATIONAL FOREWORD</i>	<i>v</i>
<i>1 Scope.....</i>	<i>1</i>
<i>2 Normative References.....</i>	<i>1</i>
<i>3 Terms and Definition</i>	<i>1</i>
3.1 Paddy transplanter	1
3.1 Walk behind type transplanter.....	1
3.2 Mat Type Seedlings	1
3.3 Seedlings density	1
3.4 Leaf stage of seedlings	1
3.5 Total missing hills	1
3.6 Continuous missing hills	2
3.7 Floating hills.....	2
3.8 Buried hill Seedlings.....	2
3.9 Damaged seedling	2
3.10 Soil hardness	2
3.11 Theoretical field capacity	2
3.12 Actual field capacity.....	2
3.13 Field efficiency.....	2
3.14 Transplanting speed.....	2
<i>4 General condition of test.....</i>	<i>2</i>
<i>5 Test Items and Methods</i>	<i>3</i>
5.1 Verification of Structure.....	3
5.2 Safety verification.....	3
5.3 Noise test	3
5.4 Vibration test	3
5.5 Performance test	4
5.6 Turning ability test	5
5.7 Parking brake test.....	5
5.8 Water proof test.....	6

DBTS XXX: 2025

5.9 Inspection after disassembling.....	6
<i>Bibliography</i>	7
<i>Annexure A</i>	8
<i>Annexure B</i>	10
<i>Annexure C</i>	12
<i>Annexure D</i>	12
Annexure E	1

NATIONAL FOREWORD

Bhutan Standards Bureau (BSB) is a National Standards Body (NSB) of Bhutan. This standard for Paddy Transplanter-Basic Requirement (Part 1) was developed by Agriculture Machinery Certification Program, Agriculture Machinery Centre under Department of Agriculture, MoAL after the draft finalization by the Mechanical Engineering Technical Committee, TC 08 and approved by the Bhutan Standards Bureau Governing Body on date Month year.

This standard specifies requirements for paddy transplanter. This standard is drafted in accordance with the BSB Rule for Structure and Drafting of Bhutan Standards, 2018. Some of the elements of this standard may be the subject of copyrights.

This standard is subject to systematic review after five years to keep pace with the market trends, industrial and technological developments. Amendments are issued to standards as the need arises on the basis of comments.

BHUTAN STANDARD

Paddy Transplanter – Basic Requirements

1 Scope

This Test Code covers the terminology, general guidelines and tests to be conducted on wet land paddy transplanters applicable for engine driven with mat type seedlings. It also covers methodology for verification of machine specifications, performance evaluation and safety measures.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANTAM 003-2017 –ANTAM Standard Code for Testing of Paddy Transplanter

ICS 65.060.30 – Draft Indian standard (paddy transplanter- test code)

PNS/PAES 151:2010 – Agriculture machinery- Mechanical Rice Transplanter – Specifications.

3 Terms and Definition

For the purpose of this document, the following terms and definitions shall apply:

3.1 Paddy transplanter

Machine, which is used to perform paddy seedlings transplanting in wet land.

3.1 Walk behind type transplanter

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

3.2 Riding Type transplanter

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

3.3 Mat Type Seedlings

The paddy seedlings that are raised in the nursery box/tray as mat.

3.4 Seedlings density

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

3.5 Leaf stage of seedlings

The leaf stage indicates the number of leaves or height of the seedlings.

Note 1-For optimal efficiency in machine transplanting, seedlings should meet either of the following conditions:

- Have between 3 to 6 leaves.
- Be 10 to 15 cm in height.

DBTS XXX: 2025

3.6 Total (missing hills)

Total number of floating, buried and missing hills per 1 m² area.

3.7 Missing hills

nonexistence of seedlings in any transplanting points/hills.

3.8 Floating hills

Seedlings that remain afloat on the water due to inability of planting finger to place the seedlings in the soil-

3.9 Buried hill

Seedlings that remain completely buried in the soil/mud layer after transplanting.

3.10 Damaged seedling

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

3.11 Soil hardness

The soil hardness at transplanting operation is expressed with the depth of penetration of a drop type cone penetrometer and called "cone depth".

3.12 Theoretical field capacity

This is calculated by multiplying the theoretical working width of the machine and the average operational speed of the machine.

3.13 Actual field capacity

Area transplanted by the machine during total operating time.

Note: Total operating time includes turning, travelling, stoppage, minor breakdown and adjustment.

3.14 Field efficiency

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

3.15 Transplanting speed

The forward speed of the transplanter during seedlings transplanting.

3.16 Total Transplanting faults

The sum total of missing hills, floating seedlings, buried seedlings and damaged seedlings in 1m².

4 General condition of test

4.1 The transplanter for the test shall be new.

4.2 The transplanter manufacturer or supplier shall provide specification of transplanter consisting of items listed in Annexure A, as well as any further data required.

4.3 The transplanter shall not be operated in a way that it is not in accordance with the manufacturers published instruction unless specifically required by test criteria.

4.4 The fuel and lubricants shall be used in accordance with the manufacturer's recommendation or else can select the applicable range of product available.

- 4.5 The transplanter subjected to the test shall be adjusted as per the manufacturer's indication.
- 4.6 The measuring instruments shall be inspected and calibrated prior to measurement and shall have the minimum scale and accuracy.
- 4.7 The oil sump, hydraulic and other reservoir shall be filled as per manufacturer's specification.

5 Test Items and Methods

5.1 Verification of Structure

The objective of this test is to confirm the specifications of transplanter given by the manufacturer. The items shall be verified as per the Annex "A".

5.2 Safety verification

The objective of this test is to ascertain the safety features of the transplanter. It shall be performed by verifying following:

- a) Verify safety devices
- b) Check the caution labels
- c) Check the instruction manual.
- d) Others

5.3 Noise test

The objective of this test is to determine that the noise of the transplanter is under safe limit or not at varying engine revolution. It shall be performed by,

- a) At operator's position
 - i) Controlling the throttle position (Idle, middle and full throttle state).
 - ii) Shall be measured at a position of 50 mm away from operator's ear. The operator should be positioned properly.
- b) Affecting zone
 - i) Controlling the throttle position (Idle, middle and full throttle state).
 - ii) The microphone shall be placed 1.2 m above ground and at a distance of 7.5 m from the axis of forward movement of the tractor.

The following conditions shall be maintained to perform this test

- a) The measurement shall be made without load in a sufficiently silent and open zone.
- b) Ambient noise shall not exceed 10 decibels.

5.4 Vibration test

The objective of this test is to ascertain the intensity of the vibration while operating at varying acceleration. It shall be performed by: -

- a) Controlling the throttle position (Idle, middle and full throttle state).
- b) Magnitude of vibration shall be measured from hand held grip.

The following conditions shall be maintained to perform this test

- a) The measurement shall be without load.
- b) The transducer (accelerometer) shall be mounted rigidly on grip.

DBTS XXX: 2025

5.5 Performance test

5.5.1 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.

5.5.2 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 100 m² (20x5).

5.5.3 Initial data to be gathered before operation:

5.5.3.1 Seedling conditions shall be obtained as per Annexure "B"

5.5.3.2 Actual field condition shall be obtained as per Annexure "B"

5.5.4 The actual performance shall start by operating the transplanter in the field. The following shall be gathered to calculate actual fled capacity, field efficiency, and percentage of slippage and fuel consumption as per Annexure "B".

5.5.4.1 Transplanting Pattern. A transplanting pattern shall be followed as in Figure A:

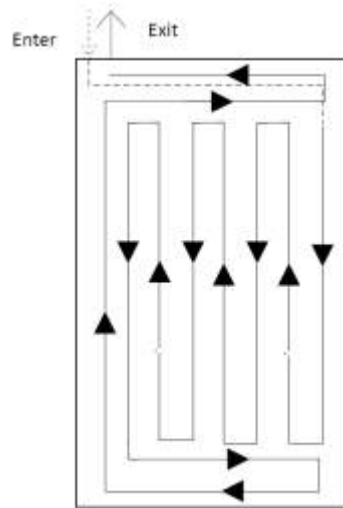


Figure: A

5.5.4.2 Uniformity of transplanting

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

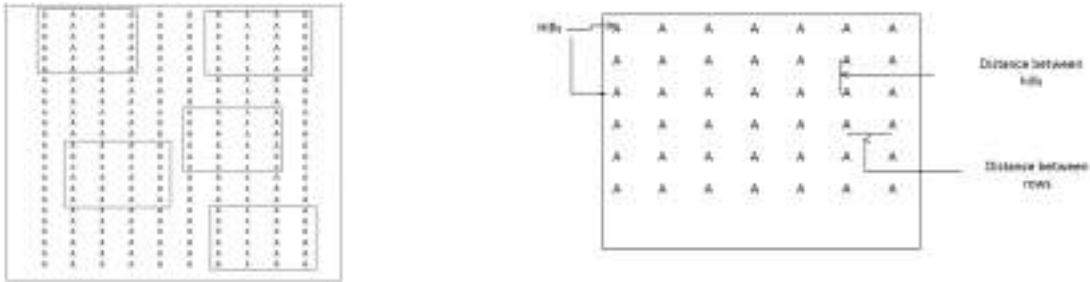


Figure: B

5.5.4.3 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
- Buried seedlings
- Floating seedlings
- Damaged seedlings

5.6 Turning ability test

The objective of this test is to recommend the minimum size of field for field operation. It shall be performed by turning it to the right and the left side by the use of steering clutch/steering control wheel till a 360° turn is completed. The observed data shall be recorded using Annexure C. During test the following shall be recorded:

- a) Diameter of the minimum turning circle, and
- b) Diameter of the minimum turning space required.

5.5.5 Test site condition

- 5.5.5.1 The test area shall be a horizontal compacted or paved surface having good tyre adhesion and capable of displaying legible marking.
- 5.5.5.2 The test shall be conducted with the machine moving at the minimum attainable speed, measured at a point located on the midpoint between the steering wheels.
- 5.5.5.3 The tyres shall be new and inflation pressure (if applicable) shall be maintained as recommended for the road work by the manufacturer.

5.7 Parking brake test

The objective of this test is to test the performance of braking and it shall be applicable to riding type transplanter only. It shall be performed by:

DBTS XXX: 2025

- a) Placing the machine out of gear on a slope of 18 percent with the parking brakes applied. The paddy transplanter shall be placed first facing up and then down the slope and the rotation of the wheels shall be observed. The force, necessary to apply at the control of the parking braking device to hold the machine, stationary when facing up and down, shall be measured. The observation along with the factors allowing the rotation of the wheels shall be stated using Annexure D.

5.8 Water proof test

The objective of this test is to confirm waterproof performance of the transplanter. The items shall be investigated using Annexure E

- a) Test method.
 - 1) The test shall be conducted in normal paddy field ready for transplantation.
 - 2) The transplanter wheel speed shall be set to normal transplanting speed recommended by manufacturer in forward travelling speed.
 - 3) The test shall be continued for 2 hours.
- b) The items to be measured or investigated.
 - 1) Water splashing condition.
 - 2) Water infiltration to wheel axle bearings and engine.
 - 3) Waterproof system.
 - 4) Other items (If it is necessary.)

5.9 Inspection after disassembling

If any abnormalities are observed during any of the above tests, causes may be investigated by disassembling the specific parts.

Bibliography

- [1] *ANTAM 003-2017 –Antam Standard Code for Testing of Paddy Transplanter*
- [2] Paddy transplanter — test code, and recommendations on selected performance characteristics, ics 65.060.30.
- [3] Agricultural machinery – mechanical rice transplanter – specifications, pns/paes 151:2010 (paes published 2010) ics 65.060.01.

Annexure A

Specification Sheet for Walk behind paddy transplanter

No	Description	Manufacturers specification	Verification by the testing agency
1.0	General		
1.1	Type		
1.2	Make/brand		
1.3	Model		
1.4	No. of rows		
1.5	Serial number		
1.6	Year of manufacture		
1.7	Country of origin		
2.0	Engine		
2.1	Type		
2.2	Make/brand		
2.3	Model		
2.4	Serial number		
2.5	Rated speed (rpm)		
2.6	Power at rated speed (kW)		
2.7	Fuel tank capacity (liter)		
2.8	Type of cooling system and coolant capacity		
2.9	Type of air cleaner		
2.10	Type of starting system		
3.0	Seeding rack		
3.1	Material		
3.2	Width (mm)		
3.3	Height (mm)		
3.4	Nursery feeding type		
4.0	Planting arm & Fork		
4.1	Type of planting arm (rotary or cranking)		
4.2	No. of arms		
4.3	Length of fork (mm)		
4.4	Width of fork (mm)		
5.0	Floater		
5.1	Center floater(LxWxT(mm))		
5.2	Outer floater (LxWxT(mm))		
5.3	No of floaters		
6.0	Wheel		
6.1	Width (mm)		
6.2	Diameter (mm)		
7.0	Handle		
7.1	Diameter (mm)		
7.2	Types of grip for prevention of slipping		

8.0	Power transmission		
8.1	Type		
9.0	Overall Dimension		
9.1	Length (mm)		
9.2	Height (mm)		
9.3	Width (mm)		
9.4	Ground clearance (mm)		
9.5	Weight (kg)		
11.0	Publications		
11.1	Operator's manual		
11.2	Service Manual		
11.3	Parts catalogue		

Annexure B
Performance Data Sheet for Walk behind paddy transplanter
Location:

Date of Test:

Seedlings condition	R-I	R-II	R-III
Age of seedlings			
Variety			
Average seedling density (No. of plants/cm ²)			
Sample 1			
Sample 2			
Sample 3			
Leaf stage (No. of leaves)			
Height of seedlings (mm)			
Thickness of seedling mat (mm)			
Soil type of seedling mat			
Root length (mm)			
Test field condition			
A.1 Dimensions (m)			
Length			
Width			
Area (m ²)			
A.2 Soil hardness (cone depth)			
A.3 Depth of water (mm)			
A.4 Qualitative assessment (soil type, levelness & Stubble)			
B Machine setting			
B.1 Distance between hills (mm)			
B.2 Depth of planting (mm)			
B.3 number of seedlings per hill			
B.4 Other settings			
C Field performance			
C.1 Transplanting time (h)			
C.2 Total operation time (h)			
C.3 Non-productive time (min)			
C.4 The distance covers for 10 revolution of driving wheel			
- W/o load			
- With load			
C.5 Fuel consumption (ml)			
C.6 Distance between hills (mm)			
C.7 Number of seedlings per hill			

C.8 Standing angle with respect to vertical (degree)			
C.9 Number of missing hill @ one sampling area			
C.10 Number of buried seedling @ one sampling area			
C.11 Number of floating seedling @ one sampling area			
C.12 Number of damage seedling @ one sampling area			
C.13 Travelling time for 20 m distance (sec)			
C.14 Items to be computed			
C.14.1 Actual field capacity (Acre/h)			
C.14.2 Theoretical field capacity (Acre/h)			
C.14.3 Field efficiency (%)			
C.14.4 Operating speed (km/h)			
C.14.5 Effective Working width (m)			
C.14.6 Percent Wheel slippage			
C.14.7 Fuel consumption (l/h)			

Formulae to be used.

- Actual Field Capacity (ha/h)

$$AFC = \frac{A1(Acre)}{T1(h)}$$

Where; A1 = transplanted area in Acre

T1 = Transplanting time in hour

- Theoretical Field Capacity (ha/h)

$$TFC = \frac{W \times S}{10}$$

Where; W = Actual transplanting width (m)

S = Average Operating Speed (km/h)

- Field Efficiency (%)

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

- Effective Working width (m)

$$W = \frac{AFC \text{ Width of the field}}{TFC \text{ No. of passes}}$$

Annexure C**DATA SHEET OF TURNING ABILITY**

Characteristics	Minimum turning diameter, (m)		Minimum clearance diameter, (m)	
	LHS	RHS	LHS	RHS
Brakes released				
Brake applied				

Annexure D**DATA SHEET OF PARKING BRAKE TEST**

Particulars	18 percent slope	
	Up	Down
Braking device control force, (N)		
Efficacy of parking brake		

Annexure E

Water proof test

Sl/No	MAKE:- <input type="text"/> MODEL:- <input type="text"/>	Date; Person in-charge;
1	Gear position for the test:- Traveling speed;	Remarks:-
2	Start time for running in the water;-	Remarks:-
3	End time for running in the water:-	Remarks:-
4	Water splashing condition by observation;-	Remarks:-
5	Water proof system Axle case: Engine:	Remarks:-
1	Inspection on transmission oil:- Inspection on engine oil:-	Remarks:-
2	Axle shaft housing:- (Describe the model of oil seal)	Remarks:-
4	Others.	Remarks:-

DBTS XXX: 2025

Mechanical Engineering Technical Committee (TC-08)

Organization

Representatives

Chairman

Agriculture Machinery & Technology Centre, MoAL

Mr. Sangay Lhendup

Members

Department of Agriculture, MoAL

Mr. Bal Badur Rai

Farm Machinery Corporation Limited

Ms. Tshering Choden

College of Natural Resource, RUB

Mr. Ongpo Lepcha

Private

Mr. Chetem Wangchen

Sonam Wangchuk Drophen Dealer.

Ms. Kuenlay Tshogyal Dorji

Bhutan Standards Bureau

Mr. Lobzang Dorji
Director
(Ex- Officio member)

Member Secretary

Kesang Phuntsho Namgay
Standardization Division
Bhutan Standards Bureau

Mechanical Engineering Sub - Technical Committee (TC-AMC)

Organization

Representatives

Chairman

Agriculture Machinery Centre,
Ministry of Agriculture and Forest

Mr. Sangay Lhendup

Members

Agriculture Machinery Centre,
Ministry of Agriculture and Forest

Mr. Ugyen Dorji

Agriculture Machinery Centre,
Ministry of Agriculture and Forest

Miss. Pema Wangmo

Agriculture Machinery Centre,
Ministry of Agriculture and Forest

Mr. Jigme

Bhutan Standards Bureau,

Mr. Chetem Wangchen
Farm Mechanization Specialist
(Ex-Officio member)

Member Secretary

Standardization Division
Bhutan Standards Bureau