भारतीय मानक **IS 18718 : 2024**

Indian Standard

धान रोपाई यंत्र — परीक्षण संहिता और चुनिंदा कार्यकारिता मापदंड के लिए अनुशंसाएँ

Paddy Transplanter — Test Code and Recommendations on Selected Performance Characteristics

ICS 65.060.30

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Agricultural Machinery and Equipment Sectional Committee, FAD 11

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Agricultural Machinery and Equipment Sectional Committee had been approved by the Food and Agriculture Division Council.

Paddy/rice is one of the most important staple crops grown globally. Traditionally, the process of paddy planting involved manual labour, where farmers plant each paddy seedling individually by hand into the puddled field. However, with the introduction of the paddy transplanter also called as rice transplanter, the process got mechanized, which significantly reduced the need for manual labour and increases the planting speed. Paddy transplanter is a specialized agricultural machine used for transplanting paddy seedlings into the puddled field. It helps streamline the labour-intensive process of transplanting seedlings, making it more efficient and time-saving.

Considering the above, a need was felt to develop a standard for testing the performance of different types of paddy transplanters such as engine driven, walk-behind and riding type paddy transplanters.

In developing this standard, considerable assistance has been derived from the technical information provided in ANTAM 003-2017 “Antam standard code for testing of paddy transplanters” developed by “Asian and pacific network for testing of agricultural machinery (ANTAM)” .

The composition of the Committee responsible for the formulation of this standard is given in Annex F.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PADDY TRANSPLANTER — TEST CODE AND RECOMMENDATIONS ON SELECTED PERFORMANCE CHARACTERISTICS

1 SCOPE

This standard covers the terminologies, requirements, and tests to be conducted on paddy transplanters which may be engine driven, walk-behind type and riding type with mat/tray type or root-washed type paddy seedlings.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard the following definitions shall apply.

3.1 Paddy Transplanting — Technique of placing paddy seedlings from one location to another. The first location may be a specially prepared nursery in favorable conditions.

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 Confidential Test — The test conducted for providing confidential information on the performance of paddy transplanter whether ready for commercial production or not, or to provide any special data that may be required by the manufacturer/applicant.

3.6 Commercial Test — The tests conducted for establishing performance characteristics of paddy transplanter that are ready for commercial production or already in production.

3.6.1 *Initial Commercial Test* — The tests conducted on indigenous or imported prototype of paddy transplanter ready for commercial production.

3.6.2 *Batch Test* (*Conformity of Production*) — The tests conducted on paddy transplanter which have already undergone initial commercial test and are being manufactured/sold commercially in the country as per ministry of agriculture order.

NOTE — The timelines for first batch test (conformity of production) after release of initial commercial test report and subsequent batch tests after the previous batch test shall be carried out as per the issued guidelines by Department of Agriculture and Farmer Welfare.

3.6.3 *Repeat Test* — The tests conducted on paddy transplanter, to ascertain the re-occurrence of breakdown/ defects observed in earlier tests, for the same parameter and on the same sample under the test after rectifying the defects or after replacing the defective part/sub-assembly by new part/sub-assembly of the same specifications.

3.7 Evaluative Requirements — Requirements under this category are the ones which are mandatory for acceptance of the paddy transplanter for the purpose of subsidies/financing.

3.8 Non-Evaluative Requirements — Requirements under this category are the ones which are not mandatory for acceptance of the paddy transplanter for the purpose of subsidies/ financing. However, the authorized testing institute shall observe the performance for these requirements and record in the test report.

3.9 CMVR — *The Central Motor Vehicles Rules* under the *Motor Vehicles Act*, 1988.

3.10 Seedlings

3.10.1 *Mat Type Seedlings* — The paddy seedlings that are raised on thin layer of soil either being prepared in the paddy field on polythene or in the nursery box/tray as mat.

3.10.2 *Root-Washed Seedlings* — Paddy seedlings that are pulled up from the traditional nursery field. After pulling up, the soil attached to the root is washed away, then seedlings are separated from

each other and roots are cut to the length of 2 cm to 3 cm, so that higher accuracy of planting operation can be achieved.

3.10.3 *Soil-Bearing Seedlings* **—** These seedlings are mostly raised in seedling boxes or trays and sometimes in special nursery fields. In many cases, seedlings boxes contain soil to a depth of 1.5 cm to 2.5 cm. Seedlings grown in boxes develop their roots in entangled form forming a root-mat (*see* 3.10.1).

3.10.4 *Growing Density of Seedlings* **—** The population of grown seedlings per unit soil per hill.

NOTE — In the case of soil bearing seedlings, the population of grown seedlings per unit of soil will influence the accuracy of the planting operation and determine the numbers of seedling per hill.

3.10.5 *Rupture Strength of Seedling Mat* — In case of mat (soil bearing) seedling, it is the force to separate seedlings from seedling mat.

3.11 Seedlings Density — The number of seedlings per unit area on the mat.

3.12 Leaf Stage of Seedlings — Leaf stage indicates the number of leaves or height of the seedling.

NOTE — Seedlings, which has more than 3 leaves and less than 6 leaves are suitable for machine transplanting.

3.13 Total Missing Hills — Non-existence of seedlings in any planting point due to floating, buried and inability of the finger to pick the seedlings. It is the number of transplanting hills which are not actually planted by the machine in 1 m^2 planted area.

3.14 Floating Hills — Seedlings that remain afloat on the water after transplanting.

3.15 Buried Hill — Seedlings that remain in the soil layer after transplanting.

3.16 Damaged Seedling — Seedlings which have had some damages during picking, planting and other machine operations.

3.17 Soil Hardness — The soil hardness at transplanting operation is expressed with the depth of penetration of a drop type cone penetrometer (*see* Fig. 1) 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).

NOTE — Soil hardness refers to the topsoil surface layer.

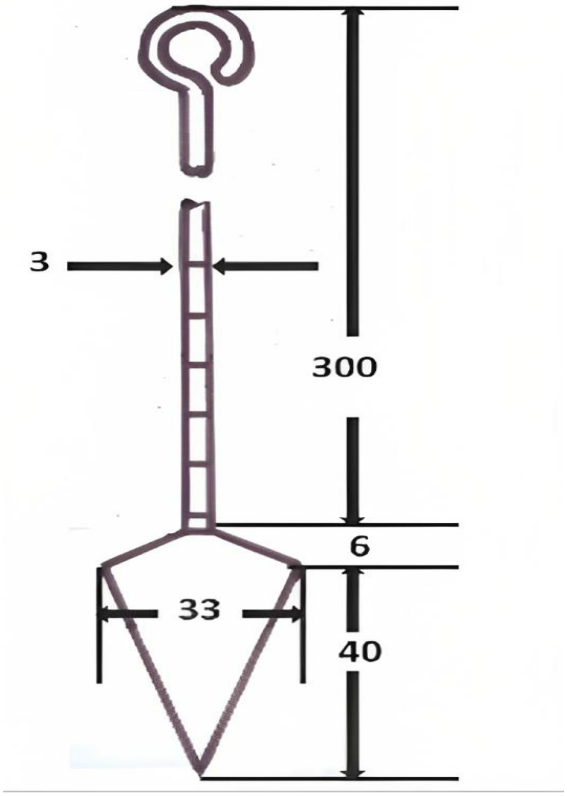


FIG. 1 DROP TYPE CONE PENETROMETER

3.18 Theoretical Field Capacity (TFC) — It is the rate of field coverage that would be obtained if the machine were performing its function 100 percent of the time at the rated speed and always covering 100 percent of its rated width. This is calculated by multiplying theoretical working width of the machine and the average operational speed of the machine. Results are obtained as area per unit time. It is given by the formula

$$Theoretical\ field\ capacity\ (ha/h) = \frac{S \times W}{10}$$

where

S = speed of travel, kmph; and

W = rated working width of machine, m (number of finger × spacing between two adjacent fingers).

3.19 Actual Field Capacity or Rate of Work — It is the area transplanted by the machine during total operating time. Results are obtained area per unit time.

3.20 Effective Field Capacity — It is the actual average rate of coverage by the machine. Effective field capacity (*ha/h*) is measured by area covered per unit time.

3.21 Field Efficiency — It the ratio of effective field capacity to the theoretical field capacity and is expressed in percent.

NOTE — During the practical field operation, time will be lost in turning at the headland and corners and other operations. These affect the efficiency, decreasing the rate theoretical field capacity of work. Field efficiency will vary according to the size and shape of the field, the type and size of machine, the skill of operator, and other similar factors.

3.22 Travel Reduction (Wheel Skid) — It is a situation in which wheels of machine lose traction of wet muddy field, causing the paddy transplanter to slide or get stuck, hindering the transplanting operation. Travel reduction can be determined by the following formula:

$$TR = \frac{100\ (D_1 - D_2)}{D_1}$$

where

D_1 = distance travelled in m, at no load for 10 or 20 revolutions of wheel; and

D_2 = distance travelled in m, at load in 10 or 20 revolutions of wheel.

3.23 Transplanting Speed — The forward speed of the transplanter during seedlings transplanting.

3.24 Transplanting Depth — The suspended (vertical) distance from the surface of settled soil up to seedlings root end.

3.25 Total Transplanting Faults — The total number of hills missed, buried, floated, and damaged with respect to rated number of hills in one square meter area. It is expressed in percentage.

3.26 Variation in Seedling Trays Consumption — It is the variation of number of seedling trays required for transplanting one-hectare area in different test trials with respect to average seedling trays consumption. It is expressed in percentage.

3.27 Variation in Number of Hills Per Meter Row Length — It is the variation of average number of hills recorded in one-meter row length in different test trials with respect to average number of hills in one-meter row length. It is expressed in percentage.

3.28 Variation in Number of Seedlings Per Hill — It is the variation in average number of seedlings counted in one hill in different test trials with respect to average number of seedlings per hill. It is expressed in percentage.

3.29 Variation in Planting Depth — It is the variation in average planting depth recorded in different test trials with respect to average depth of planting. It is expressed in percentage.

4 SAMPLING AND GENERAL GUIDELINES

4.1 Selection of Sample

The paddy transplanter shall either be selected at random (*see* IS 4905) from the production lot by the testing institute for commercial tests or shall be submitted by the manufacturer/applicant to the testing authority for confidential/initial commercial tests or as the case may be. The paddy transplanter selected or submitted for test shall be complete with its usual accessories and in a condition generally offered for sale. The paddy transplanter shall be new and shall not be given any special treatment or preparation for test (*see* Annex B for sample selection).

4.2 Specification Sheet

The manufacturer/applicant shall supply the specifications of the paddy transplanter consisting of the items listed in the specimen report given

in Annex C as well as any additional data required to carry out the tests. The manufacturer/applicant shall also supply literature consisting of operational and maintenance manual, service manual and parts catalogue with the transplanter. The literature should be in Hindi/English.

4.3 Running-in

The manufacturer/applicant shall run-in the machine before test under his/her responsibility and in accordance with his/her usual instructions. The running-in shall be carried out in collaboration with the testing authority or the procedure agreed to with the manufacturer/applicant.

NOTE — The place and duration of running-in shall be reported.

4.4 Servicing and Preliminary Setting after Running

After completion of running-in, servicing and preliminary settings should be done according to the printed literature supplied by the manufacturer/applicant. The following may be carried out, wherever applicable:

a) Change of the engine oil;

b) Change of air cleaner oil (if provided with an oil bath type air cleaner);

c) Change of transmission oil;

d) Change of oil and fuel filters (if required);

e) Greasing/oiling of all the lubricating points;

f) Adjustment of valve clearance and injection pressure (if required);

g) Tightening the nuts and bolts;

h) Checking and adjusting the tension of belts and chains;

j) Checking and adjustment of safety devices, if any; and

k) Any other checking or adjustment recommended by the manufacturer after the ruining-in period and included in the printed literature of the paddy transplanter.

4.5 The manufacturer/applicant may make adjustments in fuel injection pump/carburetor, governor, fuel injector/spark plugs and any other adjustments during the period the paddy transplanter is prepared for tests. These adjustments should conform to the values specified by the manufacturer for agricultural use in the printed literature/specification sheet. No adjustment shall be made unless it is recommended in the literature. All the parts replaced shall be reported in the test report.

NOTE — Adjustment of fuel injection pumps/ carburetors except for low/high idling speed shall not be permitted under commercial test.

4.6 Repairs and Adjustments During Tests

All the repairs and adjustments made during the tests shall be reported together with remarks/any practical defects/short comings.

5 MEASURING TOLERANCES

The measuring apparatus shall be such that the following items shall have the tolerances within the limits shown against each:

a)	Rotational speeds, rev/min	± 0.5 percent
b)	Time	± 0.2 second
c)	Distance, m or mm	± 0.5 percent
d)	Force, N and torque, N-m	± 1.0 percent
e)	Mass, kg	± 0.5 percent
f)	Atmospheric pressure, kPa	± 0.2 percent
g)	Tyre pressure, kPa	± 5 percent
h)	Temperature of fuel, etc, °C	± 2 percent
j)	Wet and dry bulb temperatures, °C	± 0.5 percent
k)	Fuel consumption during engine test, kg	± 1 percent (overall for the apparatus used)

6 TESTS

Various tests to be conducted on paddy transplanter are given in Table 1. The implementing authority shall decide about the tests and their frequency to be carried out during initial commercial and batch testing.

Table 1 Tests to be Conducted on Paddy Transplanter

(*Clause* 6)

Sl No.	Tests	Reference to	Remarks
(1)	(2)	(3)	(4)
i)	Checking of specification	*see* 4.2	
ii)	Engine performance test	*see* 8	
iii)	Mechanical vibration measurement	*see* 12	
iv)	Turning ability	*see* 9	
v)	Air cleaner oil pull over	*see* 11	In case of oil bath type air cleaner
vi)	Smoke measurement	IS 12062	
vii)	Noise measurement:		
	a) At operator ear level; and	IS 12180 (Part 1)	
	b) At by standard position	IS 12180 (Part 2)	
viii)	Brake performance test	*see* 10	
ix)	Field test	*see* 14	
x)	Components/assembly inspection	*see* 15	
xi)	Special characteristics	–	If any

7 CHECKING OF SPECIFICATIONS

7.1 The information given by the manufacturer/ applicant in the specification sheet (*see* 4.2) shall be verified by the testing authority and reported. Details of the components and assemblies which do not conform to the relevant Indian Standards shall also be reported. The adequacy or otherwise of the literature shall be indicated.

7.2 While checking the dimensions of the paddy transplanter, the conditions laid down in 4.2 shall be followed.

8 ENGINE PERFORMANCE (*SEE* ANNEX D FOR DATA RECORDING)

8.1 Power Tests for Diesel Engine

8.1.1 *Natural Ambient Test*

The following tests on the engine as per IS 12036 shall be conducted under natural ambient conditions only.

8.1.1.1 *Maximum power test* — *see* **6.1.2** of IS 12036.

8.1.1.2 *Varying speed test at full load* — *see* **6.1.3** of IS 12036.

8.1.1.3 *Varying loads test* — *see* **6.1.4** of IS 12036.

8.1.1.4 *Five-hour engine rating test* — The engine shall be run at 90 percent of load corresponding to maximum power continuously for 4 h. During the fifth hour, the engine shall be run at a load corresponding to maximum power. During the test, all the parameters specified in **6.1.7** of IS 12036 shall be recorded after every half-an-hour during the first 4 h and after every 15 min during the fifth hour.

NOTE — If the engine speed recommended for field tests is different from rated engine speed, then 5 h test at the recommended speed setting shall only be conducted.

8.1.2 *High Ambient Test*

The following tests on the engine under high ambient temperature (43 ± 2) °C shall be conducted.

8.1.2.1 *Varying speed test*

This test shall be carried out in accordance with **6.1.3** of IS 12036.

8.1.2.2 *Maximum power test* (*see* **6.1.2** of IS 12036)

The coolant and lubricating oil consumption shall

be recorded as under:

a) Coolant-percent of total coolant capacity; and

b) Lubricating oil, g/kWh.

8.1.3 The data shall be recorded in D-2.

8.2 Power Tests for Gasoline Engine

The following tests on the engine as per IS 7347 shall be conducted under natural ambient conditions only.

8.2.1 *Rating Test — see* **9.2** of IS 7347.

8.2.2 *Governing Test — see* **9.3** of IS 7347.

8.2.3 *No Load and Low Speed Test — see* **9.4** of IS 7347.

8.2.4 *Starting Test — see* **9.5** of IS 7347.

8.2.5 *Endurance Test — see* **9.6** of IS 7347.

8.2.6 *Rating Test after Endurance Test — see* **9.7** of IS 7347.

8.2.7 *Strip Examination — see* **9.8** of IS 7347.

8.2.8 *Reassembly — see* **9.9** of IS 7347.

9 TURNING ABILITY

9.1 General

9.1.1 The test area shall be a horizontal compacted or paved surface having good tyre adhesion and capable of displaying legible marking.

9.1.2 The machine shall be tested with all liquid reservoirs filled to the specified level and any other specified components.

9.1.3 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.

9.1.4 The tyres shall be new and inflation pressure (if applicable) shall be maintained as recommended for the road work by the manufacturer.

9.2 Procedure

The test shall be carried out on the paddy transplanter 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. During the test the following shall be recorded:

a) Diameter of the minimum turning circle; and

b) Diameter of the minimum turning space required.

9.3 The data shall be recorded in D-3.

10 PARKING BRAKE TEST

10.1 The paddy transplanter shall be placed 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 in the test report.

NOTE — For walk behind types Parking brake shall be tested wherever provided. If parking brake is not provided in walk behind type paddy transplanter, then this test shall be exempted.

10.2 The data shall be recorded in D-4.

11 AIR-CLEANER OIL PULL-OVER TEST

The paddy transplanter shall be parked on a level ground. The air-cleaner shall be cleaned and filled up to a level of 5 percent (on mass basis) over the specified level with an oil of viscosity recommended by the manufacturer The engine shall then be operated at full governed speed for 15 minutes. This shall be followed by sudden accelerations and decelerations made after every 30 seconds for a period of 15 minutes. The air-cleaner assembly shall be weighed before and after the test. The loss of mass of oil, both in grams and in percentage of mass, shall be reported.

NOTES

1 Before starting the test, the engine shall be run for one hour.

2 This test is applicable to paddy transplanter equipped with wet type air cleaner.

11.1 The air-cleaner oil pull over test shall be carried out in the following positions:

a) In horizontal position;

b) Tilted 15° to either side; and

c) 15° forward and backward in relation to the direction of travel of the paddy transplanter.

11.2 The data shall be recorded in accordance with D-5.

12 VIBRATION MEASUREMENT

12.1 The amplitude of mechanical vibration of components/assemblies of the paddy transplanter shall be measured with the help of suitable vibration measuring device on the components listed in D-6.

12.2 The paddy transplanter shall be parked on a levelled grass field/levelled earthen track touching the float in operational condition (if possible) and tyres inflated (if applicable) according to off field pressure recommended for road work. The paddy transplanter shall be operated at rated engine speed at no-load. The maximum horizontal displacement (HD) and vertical displacement (VD) in microns shall be measured by mounting the measuring device in related positions.

12.3 The data shall be recorded in accordance with D-6.

13 NOISE MEASUREMENT

13.1 General

The measuring equipment, meteorological conditions, ambient noise and test site for measuring the noise of paddy transplanter shall be in accordance with IS 12180 (Part l) and (Part 2).

13.2 Noise Level at By-Standards Position

The measurement of the noise of paddy transplanter at by standard position shall be conducted in accordance with IS 12180 (Part 2). The measurement shall be made with the paddy transplanter moving in all the forward gears on earthen track/field.

13.2.1 *Operational Condition*

The surface area of radius not less than 50 m shall be free from acoustically absorptive materials. A microphone shall be located on 7.5 m from the center line and 1.2 m above the ground level.

13.2.2 *Measurements*

Immediately before the test, the engine shall be brought to its normal operating temperature. The machine with its center line over the center line of the track, shall approach a steady speed corresponding to the three quarters of the maximum travel speed.

When the front of the machine reaches the marking on 10m line the throttle shall be fully opened as rapidly as practicable and held in that position until the rear of the tractor crosses that line. The A-weighted sound pressure level and optionally octave band pressure level shall be measured and reported in accordance with D-7.

13.3 Noise level at Operator's Ear Level

13.3.1 This test shall be conducted as per IS 12180 (Part 1) during the field performance test of the machine and all the general conditions as specified in 13.1 shall remain the same.

13.3.2 The test shall be conducted in recommended transplanting speed gear(s) and the maximum value shall be reported.

13.3.3 During the measurement, the microphone shall be horizontal and facing forward. It shall be 5 cm to the side of the operator's forehead and in line with his/her eyebrows. It shall be mounted on an open frame helmet.

13.3.4 During the test, the governor control lever shall be in fully open position.

13.3.5 The data shall be recorded in accordance with D-8.

NOTE — For walk behind type paddy transplanters, noise measurement test shall be carried out as per the recommendation of manufacturer.

14 FIELD PERFORMANCE TEST

14.1 Selection of Land and Preparation of Paddy Transplanter for Tests

14.1.1 *Selection of Land*

The land selected for tests shall preferably be agricultural land on which a crop was harvested within the last one year. The transplanting operation should not be carried out in a plot less than 0.1 ha and a rectangle with a side in the ratio 2 : 1. The trial plots should be puddle, well settled, levelled fields and as recommended in the printing literature of the test sample.

The condition of the plot shall be checked and reported in accordance with D-9.

14.1.2 *Preparation of Paddy Transplanter for Tests*

14.1.2.1 The paddy transplanter should be fitted with accessories in accordance with the manufacturer's/applicant's recommendations. The servicing and maintenance shall be carried out in accordance with the schedule prescribed by the manufacturer/applicant in the printed literature.

14.1.2.2 The gear selection/speed selection shall be one in which satisfactory and safe operation is attained. The gear selected for the operations shall be; maintained during the test except at head land. The throttle setting operation shall be full or in accordance with the manufacturer's/applicant's recommendation. The initial throttle setting shall not be disturbed throughout the operation. However, the setting may be reduced at head-land.

14.1.2.3 For transplanting operation, the field should have average 2 cm to 3 cm water over puddled land.

14.1.2.4 During and after the operation, the data/observations shall be recorded.

14.1.2.5 Lubricating oil and coolant (water) consumption shall be measured after the completion of each test trial and shall be reported.

14.1.2.6 The stoppage, breakdown/defects, ease of operation and difficulties occurred during the operation shall be reported.

14.1.2.7 After completion of field performance test the ingress of water and or mud in critical components and assemblies/sub-assemblies of the paddy transplanter shall be reported with **D-10**.

14.2 Field Operation

Transplanting operation shall be carried out for duration of at least 25 hours comprising of minimum five test trials.

14.2.1 *General*

The objective or purpose of this test is to determine the actual field performance of the machine. It includes depth of planting, uniformity in plant to plant spacing, percent of seeding floating, number of seedlings per hill, number plants per square meter of area, field efficiency, transplanting accuracy, and uniformity of transplanting.

14.2.2 *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 1 000 m^2. The plot should preferably be of a rectangular shape.

14.2.3 Test instruments/equipment. The test instruments shall be calibrated.

14.3 Initial Data to be Gathered

a) The date and actual location of test shall be recorded;

b) Seedlings Conditions shall be obtained as follows:

1) Age of seedlings;

2) Variety — plant density[1] (No. of plants per cm^2);

3) Leaf stage (No. of leaves);

4) Height of seedlings (mm);

5) Thickness of seedling mat (mm); and

6) Type of seedling used (tray type/mat type).

14.4 The actual field condition shall be obtained as follows:

a) Area (L × W), m^2;

b) Soil type[2] — soil hardness (cone depth, mm), (drop cone test);

c) Depth of hard pan (mm);

d) Depth of standing water[3] (mm) should be at least 25 mm; and

e) Qualitative assessment (leveling, stubble).

NOTES

1 Please randomly sample 3 seedling mats and take 5 measurements of seedling number per cm^2 for each seedling mat. Report the average number of seedlings per cm^2 in Annex D.

2 Please provide specific soil physical properties including bulk density, clay percentage in addition to the soil type in Annex D.

3 To be collected after cone depth data measurement is completed.

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

a) Distance between hills (mm) — 100 to 250 (adjustable);

b) Depth of planting (mm); and

c) Number of seedlings per hill.

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

a) Time of transplanting;
b) Total operation time;
c) Number of row;
d) Average operating speed (kmph);
e) Effective working width (mm);
f) Wheel slippage (without and with load);
g) Noise level at operator's ear level [db (A)]; and
h) Fuel consumed (kg).

14.5.2 *Transplanting Pattern*

A transplanting pattern shall be followed as in Fig. 2.

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

14.5.4 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.

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

14.5.6 *Average Operating Speed*

The transplanter shall be operated at the manufacturer's recommended field setting but not less than 75 percent 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 m to 5 m from poles A and C to stabilize speed before measuring and recording data. Ten measurements are to be made to obtain the average speed.

14.5.7 *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 maintained.

14.5.8 *Uniformity of Transplanting*

Five sampling areas shall be randomly selected in the field (Fig. 3A). Each sampling area shall be of one meter length in succession and covers the rows of transplanter.

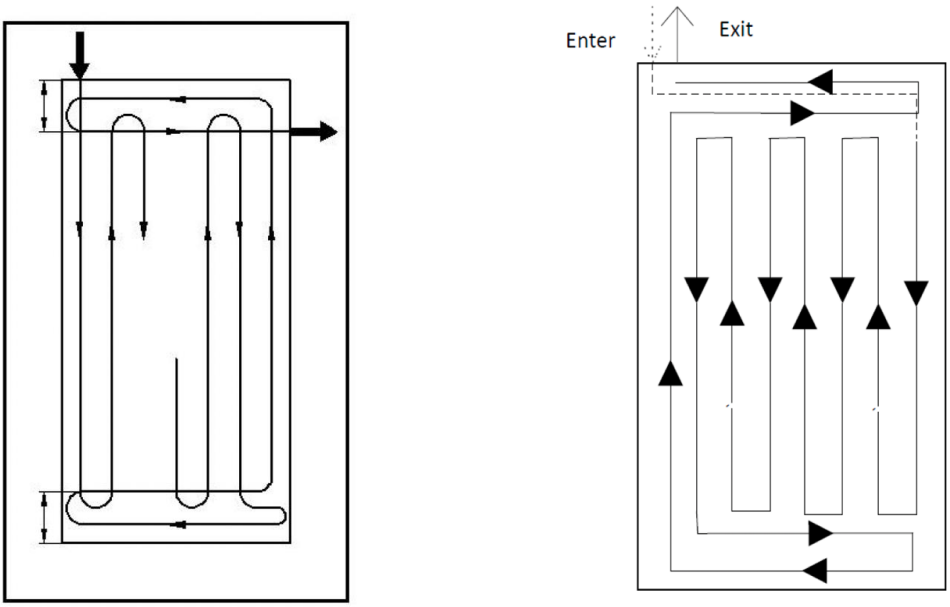
14.5.9 From the sampling areas, the following shall be determined:

a) Total number of hills required for the sample area.
b) Distance between hills (mm);
c) Number of seedlings per hill;
d) Standing angle of plants;
e) Depth of planting (mm);
f) Missing hills;
g) Continuous missing hills;
h) Buried seedlings;
j) Floating seedlings; and
k) Damaged seedlings.

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

14.5.11 *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.



PATTERN A PATTERN B

FIG. 2 TRANSPLANTING PATTERN

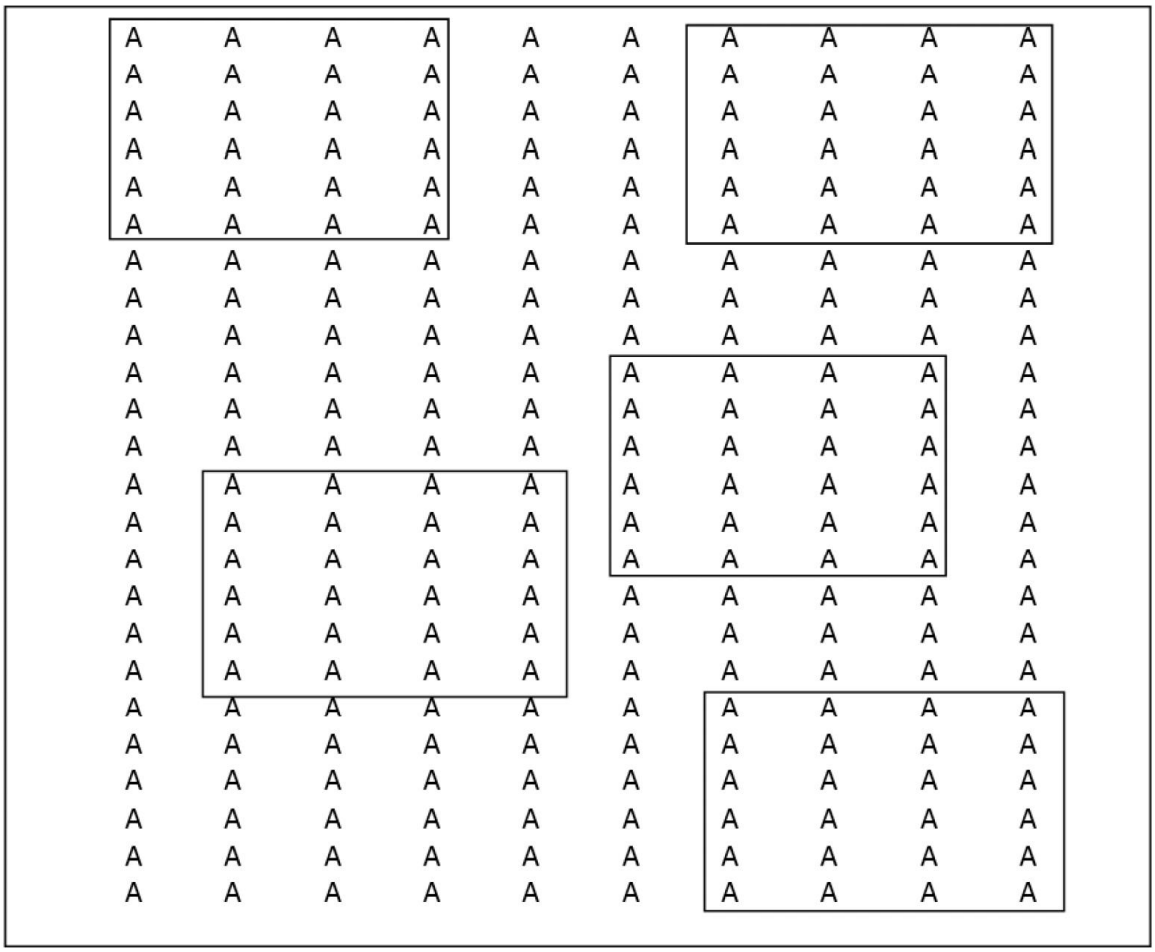


FIG. 3A SAMPLING AREA FOR FOUR ROW PADDY TRANSPLANTER

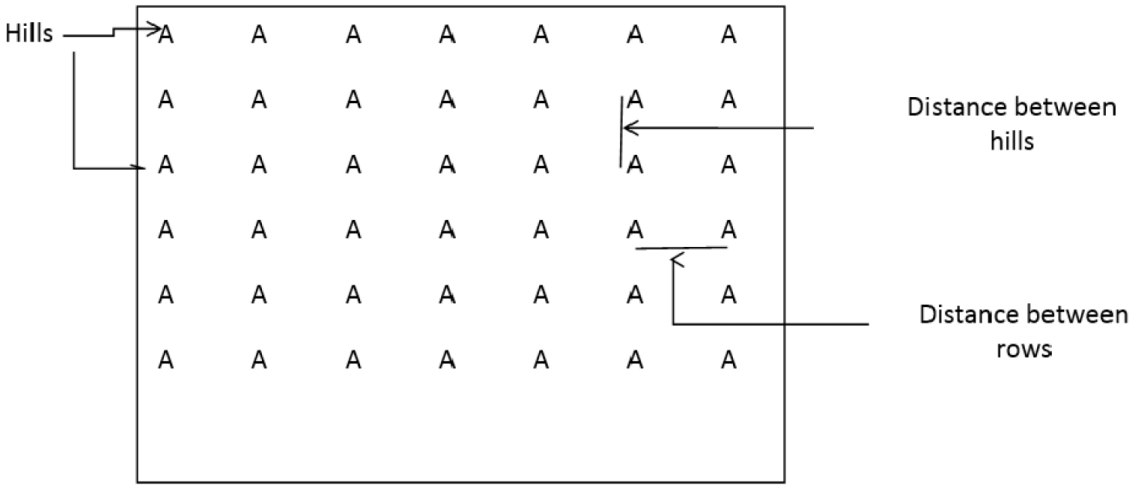


FIG. 3B ONE SAMPLING AREA

14.6 Trials of Field Performance Test

At least three trials (observations) shall be conducted.

14.7 Formula to be Used

14.7.1 *Actual Field Capacity* (*ha/h*), *AFC*

$$AFC = A_t / T_t$$

where

A_t = transplanted area in ha; and
T_t = transplanting time in h.

14.7.2 *Theoretical Field Capacity* (*ha/h*), *TFC*

$$TFC = W_{at} \times S/10$$

where

W_{at} = actual transplanting width (m); and
S = average operating speed (kmph).

14.7.3 *Field Efficiency* (*%*), E_f

$$E_f = AFC / TFC \times 100$$

14.7.4 *Effective Working width* (*m*), *We*

$$We = \frac{Width\ of\ field}{Number\ of\ passes}$$

$$Coefficient\ Variation = {}^{SD}/_{Mean} \times 100$$

Standard Deviation (SD) is expressed as

$$Standard\ Deviation = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \overline{x})^2}{n-1}}$$

where

x_i = value of the i^{th} point in the data set;
x_i = the mean value of the data set; and
n = the number of data points in the data.

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

The data shall be recorded in Annex D.

15 COMPONENT/ASSEMBLY INSPECTION

15.1 The engine, transmission, parking brakes, axle, and generator shall be dismantled after conducting all the tests.

The following measurement/observations shall be made and reported.

15.1.1 *Cylinder Bore*

The cylinder bore shall be measured on the thrust

side and perpendicular to it at the top, middle and at the bottom position of the liner.

15.1.2 *Piston Diameter*

The piston diameter shall be measured on the thrust side and perpendicular to it at the top above the gudgeon pin and at the skirt. The clearance between the piston and cylinder at the skirt shall be worked out from the measurements made on piston and cylinder liner. Clearance between the piston and cylinder at skirt shall be worked out from the measurements made on piston and cylinder liner.

15.1.3 *Ring End Gap*

The ring end gap for all compression and oil rings shall be measured at the top, middle and bottom position.

15.1.4 *Ring Groove Clearance*

The ring groove clearance shall be measured for all the compression and oil rings.

15.1.5 *Clearances of Main and Big End Bearing*

The radial and axial clearance of main and big end bearings shall be measured. The radial clearance shall be measured after tightening the crankshaft bolts with the torque specified by the manufacturer.

15.1.6 *Valves, Guides, Valve Springs and Timing Gear/Chain*

The valve shall be inspected for overheating signs and pitting of the seats. Stiffness of spring and clearance between valve guide and valve stem shall be measured. The timing gear cover shall be opened, and the gears/sprockets inspected for damage/wear.

15.1.7 *Clutch*

The clutch shall be opened and inspected for condition of the clutch-release bearing, springs, and release levers. Clutch friction plate wear should be determined by measuring the thickness. The clutch housing shall be inspected for the entry of dust, mud, water, and oil.

15.1.8 *Gear Box*

The top cover of the gearbox shall be opened and inspected for visual damage to the gear teeth.

15.1.9 *Brakes*

The brake housing shall be opened and inspected for the entry of dust, mud, water and oil. The wear of brake the liner shall be determined by measuring the thickness.

15.1.10 *Chain Case* (*if Applicable*)

The chain case shall be opened and inspected for the entry of dust, mud, water and oil. The condition of chains and sprockets shall also be examined.

15.1.11 *Planting Mechanism*

The sub-assemblies of planting mechanism such as planting gearbox, planting arms, planting fingers, seedling platform, cross feed mechanism, float, components of hydraulic system, etc shall be inspected visually and their condition shall be reported.

15.1.12 *Starter, Motor and Generator*

These shall be dismantled and inspected for entry of dust, mud, water, and oil. The condition of the bearings shall also be examined.

NOTE — The observation covered under 15.1.7 to 15.1.11 shall be made after cleaning, washing, and greasing as recommended by the manufacturer in printed literature.

15.2 The data shall be recorded in **D-10**.

16 ACCEPTANCE CRITERIA FOR PERFORMANCE CHARACTERISTICS

The product may be accepted for the purpose of subsidy/financing after confirming compliance to all evaluative requirements. Performance characteristics of paddy transplanter along with the tolerances with respect to the declared values and in certain cases minimum/maximum values are given in Table 2.

NOTE — In case of a parameter not meeting evaluative requirements of this standard, the ‘repeat test’ as defined in 3.6.3 may be conducted. In case the parameter is not meeting the evaluative requirement during the repeat test, ‘supplementary test’ as defined in 18 may be conducted.

17 ACCEPTANCE CRITERIA IN CASE OF BREAKDOWNS/DEFECTS

17.1 The product may be accepted subject to the following conditions:

a) There is no 'critical breakdown' during its validation after all tests including repeat/ supplementary tests;

b) There is not more than one 'major breakdown'; and

c) There are not more than three 'minor defects' during the test and the frequency of each is not more than two.

In no case, the total number of breakdowns should exceed four, that is (1 major + 3 minor) or 4 minor breakdowns.

NOTE — In case of single critical breakdown/more than one major breakdown/more than four minor defects and their frequency being not more than two, the 'repeat test' as defined in 3.6.3 may be conducted.

17.2 In case reoccurrence of breakdowns/defects during the repeat test, supplementary test as defined in 18 may be conducted.

17.3 In case of multiple consequential failures resulting from a single defect/breakdown, the primary single defect/breakdown shall only be counted.

17.4 Categorizations of defects in terms of 'critical', 'major' and 'minor' for various sub-assemblies/ parts are provided in the Annex E.

18 GUIDELINES FOR SUPPLEMENTARY TEST

18.1 In case the fresh sample is required for carrying out supplementary test, the model will have to be ascertained as being the same model as tested earlier (under initial commercial test), by the following checks:

a) Specification in full;

b) Two-hour maximum engine power test under normal ambient condition; and

c) Nominal speed.

18.2 In case of request received for supplementary test for certain parameters of the sample, the testing authority may carry out other relevant test(s) also in consultation with the manufacturer/ applicant.

If a sample is accepted for supplementary test and during test period or subsequently (before release of test report), it is found not being of the same model as tested earlier under initial commercial testing (ICT), further tests on the sample will be stopped and manufacturer/applicant will be asked to withdraw the sample from test. However, incomplete test report, on tests, already carried out, shall be released under commercial test.

19 SAFETY REQUIREMENTS

a) The exposed transmission and rotating parts should have protective cover (IS 16814);

b) The position and the direction of the exhaust port should be such that it minimizes the driver's exposure to exhaust gases;

c) The operator work floor should be flat and non-slippery for ride on type paddy transplanter;

d) The row marker should have locking mechanism to keep it in stationery position during field operation;

e) The operation symbols should be pasted near the key controls. There should be a minimum gap of at least 25 mm between the control levers [IS 6283 (Part 1)];

f) The positive terminal of the battery should have the protective cover (insulation) to prevent the short circuit;

g) Riding type transplanters should be equipped with footsteps on both sides for boarding. Minimum height of the steps while standing on level ground shall be according to IS 12239 (Part 1);

h) All exposed sharp edges and corners shall have smooth finishing; and

j) Safety signs shall be appropriately displayed when necessary to alert the operator and others of the risk of personal injury during normal operation and servicing should be presented in the operator's manual. Safety signs shall conform to the requirements of ISO 11684.

20 MARKING AND LABELLING

Labelling plate shall be mandatory for paddy transplanter. The manufacturer's plate, typically shown on Sl No. (xi) of Table 2 shall be firmly attached by welding/riveting in a place, where it is easily visible, conspicuous and readily accessible position on a part which is normally not likely to be replaced during use. The size of letter shall not be less than 5 mm. Use of the letters 'I' 'O' and 'Q' and dashes, asterisks and other special signs shall not be permitted.

Table 2 Parameters Applicable for Qualifying Minimum Performance Criteria

(*Clauses* 16 *and* 20)

Sl No.	Characteristic	Category (Evaluative/ Non-Evaluative)	Requirement	Tolerance	Remark
(1)	(2)	(3)	(4)	(5)	(6)
i)	Engine performance (diesel/gasoline):				
	a) Maximum power under 2 h test, kW for diesel engine and equivalent test for gasoline engine;	Evaluative	To be declared by the manufacturer	Declared value to be achieved with a tolerance of ± 10 percent	
	b) Power at rated engine speed, kW;	Non evaluative	-do-	-do-	
	c) Specific fuel consumption corresponding to maximum power, g/kWh;	Evaluative	-do-	+ 5 percent	
	d) Maximum equivalent crankshaft Torque, Nm;	Non -evaluative	To be declared by the manufacturer	- 5 percent	
	e) Back up torque, percent;	Non-evaluative	5 %, minimum	Nil	The test is not applicable to gasoline engines
	f) Maximum operating temperature, °C:				
	1) Engine oil; and	Evaluative	To be declared by the manufacturer	Nil	The declared value should not exceed maximum value specified by the oil company. Manufacturer/applicant shall supply the recommendation of oil company along with the application form.
	2) Coolant/cylinder liner in case of air cooled engine.	Evaluative	To be declared by the manufacturer	Nil	Observed value should not exceed the declared value

Table 2 (*Continued*)

Sl No.	Characteristic	Category (Evaluative/ Non-Evaluative)	Requirement	Tolerance	Remark
(1)	(2)	(3)	(4)	(5)	(6)
	g) Lubricating oil consumption, g/kWh;	Evaluative	Not exceeding 1 % of SFC at maximum power under high ambient conditions	Nil	The value would be based on the test conducted under high ambient condition
	h) Maximum coolant (water); consumption (percent of total coolant capacity); and	Non -evaluative	Coolant consumption should not exceed 25 % of the total coolant capacity	Nil	
	j) Smoke level.	Evaluative	Maximum light absorption coefficient of 3.25/m or Equivalent BOSCH No. 5.2 or 75 hatridge value (as per CMVR)		Maximum smoke level shall be reported out of 6 readings tested as per IS 12062 for diesel engine and same procedure or any other equivalent procedure may be followed for gasoline engines. The observed value should be well within the required limits
ii)	Parking brakes	Evaluative	No rotation of drive wheels at a slope of 18 percent facing up and facing down	Yes / No	Based on the test conducted 'Yes/No' as applicable may be indicated.
iii)	Air cleaner oil pull over	Evaluative	0.25 %, *Max*		Maximum percentage of oil pull over (mass basis)
iv)	Noise level:				
	a) Maximum ambient noise emitted by the paddy transplanter, dB (A); and	Evaluative	85	Yes	The observed value should be within the permissible limit

Table 2 (*Continued*)

Sl No.	Characteristic	Category (Evaluative/ Non-Evaluative)	Requirement	Tolerance	Remark
(1)	(2)	(3)	(4)	(5)	(6)
	b) Maximum noise at operators' ear level dB(A).	Evaluative	96	Yes	The observed value should be within the permissible limit
v)	Amplitude of mechanical vibration at:				-
	a) Steering handle grips/steering control wheel;	Non -evaluative	100 µ *Max*	Nil	-
	b) Gear lever (s):	Non -evaluative	100 µ *Max*	Nil	-
	1) Transmission; and	Non -evaluative	100 µ *Max*	Nil	-
	2) Planting.	Non -evaluative	100 µ *Max*	Nil	-
	c) Clutch/brake lever(s)/pedal (s);	Non -evaluative	100 µ *Max*	Nil	-
	d) Accelerator lever/knob;	Non -evaluative	100 µ *Max*	Nil	-
	e) Operators seat; and	Non -evaluative	100 µ *Max*	Nil	-
	f) Foot rest.	Non -evaluative	100 µ *Max*	Nil	-
vi)	Field requirements				
	a) Variation in seedling trays consumption per hectare (%);	Non - evaluative	5 % *Max*	Nil	
	b) Variation in number of hills per meter of row length (%); and	Evaluative	5 % *Max*	Nil	
	c) Transplanting faults in 1 m^2, (%):				
	1) Missed hills;	Evaluative	5 % *Max*	Nil	
	2) Floating seedlings;	Evaluative	3 % *Max*	Nil	
	3) Buried seedlings;	Evaluative	2 % *Max*	Nil	
	4) Damaged seedlings; and	Evaluative	2 % *Max*	Nil	
	5) Total faults.	Evaluative	10 % *Max*	Nil	

Table 2 (*Continued*)

Sl No.	Characteristic	Category (Evaluative/ Non-Evaluative)	Requirement	Tolerance	Remark
(1)	(2)	(3)	(4)	(5)	(6)
	d) Variation in number of seedlings per hill; and	Non -evaluative	15 % *Max*	Nil	
	e) Variation in planting depth.	Non-evaluative	15 % *Max*	Nil	
vii)	Effectiveness of sealings:				
	a) Engine oil;	Evaluative	The entry of mud/ water should not take place in components /sub- assemblies	Yes/No	
	b) Hydraulic oil;	Evaluative		Yes/No	
	c) Transmission oil;	Evaluative		Yes/No	
	d) Clutch assembly;	Evaluative		Yes/No	
	e) Planting gear box oil; and	Evaluative		Yes/No	
	f) Planting arms.	Evaluative		Yes/No	
viii)	Discard limit, mm:				
	a) Cylinder bore;	Evaluative	diameter		
	b) Piston clearance;	Evaluative			
	c) Ring end gap;	Evaluative			Such component and values where discard limit specified by the manufacturer exceed should only be mentioned
	d) Diametrical clearance of big end bearing;	Evaluative			
	e) Axial clearance of big end Bearing;	Evaluative			
	f) Ring groove clearance;	Evaluative			
	g) Thickness of clutch lining;	-do-		Up to rivet head	
	h) Diametrical clearance of main bearings; and	-do-			
	j) Axial clearance of main bearings.	-do-			

Table 2 (*Concluded*)

Sl No.	Characteristic	Category (Evaluative/ Non-Evaluative)	Requirement	Tolerance	Remark
(1)	(2)	(3)	(4)	(5)	(6)
ix)	Safety Requirements:				
	a) Provision of guards on moving parts;	evaluative	Yes		
	b) Location and direction of exhaust emission to be away from the operator;	-do-	Yes		
	c) Covers on hot parts; and	-do-	Yes		
	d) Provision of headlights.	Non-evaluative	Yes		
x)	Literature (submission to test agency):				
	a) Operator manual;	Evaluative	Provided		
	b) Parts catalogue; and	Evaluative	Provided		
	c) Workshop/service manual.	Evaluative	Provided		
xi)	Labelling of machine (provision of labelling plate):				
	a) Name of manufacturer;	Evaluative	Metallic plate shall be welded/riveted permanently on the machine at place where it can be easily identified		
	b) Country of origin;	Evaluative			
	c) Make;	Evaluative			
	d) Model;	Evaluative			
	e) Year of manufacture;	Evaluative			
	f) Engine serial number;	Evaluative			
	g) Chassis serial number;	Evaluative			
	h) Size of machine;	Evaluative			
	j) Maximum engine power, kW; and	Evaluative			
	k) Specific fuel consumption, g/kWh.	Evaluative			

ANNEX A

(*Clause 2*)

LIST OF REFERRED STANDARDS

IS No./Other Standards	*Title*
IS 4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 6283 (Part 1) : 2023/ISO 3767-1 : 2016	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays: Part 1 Common symbols (*third revision*)
IS 7347 : 1974	Specification for performance of small size spark ignition engines for agricultural water pumps, sprayers, tillers, reapers and other similar applications
IS 9935 : 2002	Power tiller — Test code (*second revision*)
IS 16814 : 2021/ ISO 13857 : 2019	Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (*first revision*)
IS 12036 : 1995	Agricultural tractors — Test procedures — Power tests for power take off (*first revision*)
IS 12062 : 1987	Method for measurement of exhaust smoke emitted by agricultural tractors
IS 12180 (Part 1) : 2024/ISO 5131 : 2015	Tractors for agriculture and forestry — Noise measurement — Method of test: Part 1 Noise at the operator's position — survey method (*second revision*)
IS 12180 (Part 2) : 2024/ISO 7216 : 2015	Tractors for agriculture and forestry — Noise measurement — Method of test: Part 2 Noise emitted when in motion (*second revision*)
IS 12239 (Part 1) : 2018/ ISO 4254-1 : 2013	Guide for safety and comfort of operator of agricultural tractors and power tillers: Part 1 general requirements (*second revision*)
ISO 11684 : 2023	Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety labels — General principles

ANNEX B

(*Clause* 4.1)

RANDOM SELECTION OF PADDY TRANSPLANTER FOR COMMERCIAL TESTTNG

B-1 DATE OF SELECTION

B-2 PLACE

B-3 SELECTED BY

B-4 DESIGNATION

B-5 Planter selected out of_____No. of paddy transplanter

Planter bearing Sl No. _____

B-6 OBSERVATION ON PADDY TRANSPLANTER SELECTED

Sl No.	Component	Make	Model/Size	Serial No.
(1)	(2)	(3)	(4)	(5)
i)	Paddy transplanter			
ii)	Engine			
iii)	F.I. pump			
iv)	Governor			
v)	Gear box			
vi)	Hydraulic pump			
vii)	Self-starter			
viii)	Generator/alternator			
ix)	Front tyres			
	a) L.H.			
	b) R.H.			
x)	Rear tyres			
	a) L.H.			
	b) R.H			
xi)	Trailer tyres			
	a) L.H.			
	b) R.H			
xii)	Engine hour meter reading:_____h.			

B-7 PADDY TRANSPLANTER ASSEMBLY TO BE SEALED

1) Tappet cover Yes/No

2) Fuel injection pump coupling, mounting bolts Yes/No

3)	F.I. pump and governor screw	Yes/No
4)	Injectors	Yes/No
5)	Engine sump	Yes/No
6)	Engine bell housing	Yes/No
7)	Starter motor	Yes/No
8)	Dynamo	Yes/No
9)	Hydraulic pump — Nos. (one/two)	Yes/No
10)	Gear box front cover	Yes/No
11)	Final drive assembly, LHS and RHS	Yes/No
12)	Rear wheel axle	Yes/No
13)	Any other component/assembly (please specify)	Yes/No

ANNEX C

(*Clause* 4.2)

SPECIFICATION OF PADDY TRANSPLANTER

C-1 GENERAL

C-1.1 Name and Address of Manufacturer:

C-1.2 Name and Address of Applicant:

C-.1.3 Country of Origin:

C-1.4 If Imported, C.I.F. (Cost, Insurance and Freight) Value:

C-1.5 Selling Price in Country of Origin: ₹

C-1.6 Selling Price in India: ₹

C-1.7 Selected by:

C-1.8 Method of Selection:

C-1.9 List of Indigenous Components (In Case of Indigenous Products):

C-1.9.1 *Place of Running in*:

C-1.9.2 *Schedule and Duration of Running-in*, (h):

a) Engine:

b) Transmission:

C-2 TECHNICAL SPECIFICATION

C-2.1 Make:

C-2.2 Model:

C-2.3 Type:

C-2.4 Size:

C-2.5 Serial Number:

C-2.6 Serial Number of 1st Prototype:

C-2.7 Year of Manufacture:

C-2.8 Engine:

C-2.8.1 *Make*:

C-2.8.2 *Model*:

C-2.8.3 *Type*:

C-2.8.4 *Serial Number*:

C-2.8.5 *Engine Speed* (*Manufacturer's Recommended Setting*)

a) Maximum speed at no load (rpm): (High idle speed)

b) Low idle speed (rpm):

c) Speed at maximum torque (rpm):

d) Rated engine speed (rpm):

e) Rated engine speed for field: (if any)

C-2.8.6 *Cylinder and Cylinder Head*

a) Number:

b) Disposition:

c) Bore/stroke (mm):

d) Capacity as specified by the applicant (cm^3):

e) Compression ratio:

f) Type of cylinder head:

g) Type of cylinder liners:

h) Type of combustion chamber:

j) Arrangement of valves:

k) Valve clearance (cold/hot):

m) Inlet valve:

n) Exhaust valve:

C-2.8.7 *Fuel System*

a) Type of fuel system:

b) Type, make and model of feed pump:

c) Type, make and model of fuel filters:

C-2.8.7.1 *Injection pump*

a) Make, model and type:

b) Serial No.:

c) Method of drive:

C-2.8.7.2 *Fuel injectors*

a) Make, model and type:

b) Manufacturers production:

c) Pressure setting mPa (kg_f/cm^2):

d) Injection timing:

e) Firing order:

C-2.8.7.3 *Governor*

a) Make and model:

b) Type: Constant speed/variable speed

c) Class of governing:

d) Governed range of engine speed (rpm):

e) Rated engine speed (rpm):

C-2.8.7.4 *Gasoline engines* (*If fitted*)

a) Type, make and model of magnets:

b) Coil and distributor:

c) Type, make and model of carburetor:

d) Size of fuel jets:

e) Ignition timing:

f) Make, model and type of spark plugs:

g) Spark plug gap setting (mm):

C-2.8.8 *Air Intake System*

a) Make, model and type of pre-cleaner:

b) Make, model and type of air/cleaner: Oil capacity (oil bath type)

c) Range of suction pressure (mm of Hg):

d) Recommended grade of oil:

e) Recommended service schedule:

C-2.8.9 *Exhaust System*

a) Type of silencer:

b) Range of exhaust gas:

c) Pressure (mm of Hg):

d) Provision against entry of rain water:

C-2.8.10 *Lubricating System*

a) Type:

b) Make and number of filters:

c) Type of lubricating oil pump:

d) Capacity of lubricating oil pump at rated engine speed (l/min):

e) Relief valve setting:

f) Oil capacity (l) :

g) Recommended grade of lubricating oil:

h) Oil changing period:

j) Minimum and maximum permissible lubricating oil pressure:

k) Maximum permissible lubricating oil temperature (°C):

m) Details of cooling arrangement if any provided:

C-2.8.11 *Cooling System*

a) Type:

b) Details of pump and fan :

c) Coolant pump/blower size and capacity:

d) Coolant capacity (l):

e) Means of temperature control:

f) Type and pressure of radiator cap:

g) Maximum permissible coolant temperature (°C):

C-2.8.12 *Starting System*

a) Type:

b) Aid for cold starting:

c) Any other devise provided for easy starting:

d) Electrical system:

e) Make, type and capacity of battery:

f) Make, model and type of starter:

g) Serial number and output rating of generator:

h) Make, model and type of generator:

j) Light switch details:

k) Details about horn:

C-2.8.13 *Instrument Panel Details*

(i)
(ii)
(iii)
(iv)
(v)
(vi)
(vii)
(viii)

C-2.9 Transmission System

C-2.9.1 *Clutch*

a) Make, type and size of clutch:

b) Number of friction plate(s):

c) Make, type and method of operation of wheel clutch:

d) Make, type and method of operation of planting clutch:

C-2.9.2 *Gear Box*

a) Make, model and type of gear box:

b) Number of speeds:

1) Forward:
2) Reverse:

Movement	Gear No.	No. of Engine Revolutions for One Revolution of Drive Wheel	Nominal Speed at Rated Engine Speed, at Rolling Radius of ….mm (kmph)
Forward	1.		
	2.		
	3.		
	4.		
Reverse	1. 2. 3.		

c) Recommended grade of lubricant:

d) Oil capacity:

e) Oil changing period (h):

f) Normal speed:

C-2.9.3 *Details of Axle and Final Drive*

a) Type, make and reduction ratio:

b) Mode of power transmission from rreduction unit to ground level:

C-2.9.4 *Ground Wheel* (*Driving Wheel*)

a) Number and type:

1) Pipe diameter and wheel mounting:
2) Number and type:
3) Size of lugs:
4) Diameter of wheel (mm):

C-2.10 Steering

a) Make and type:

b) Method of operation:

C-2.11 Float

a) Number and type:

b) Size:

c) Method of suspension to chassis:

C-2.12 Markers

a) Number and type:

b) Method of mounting:

C-2.13 Planting Mechanism

a) Type and number of rows:

b) Spacing of rows (220 mm to 300 mm):

c) Method of changing row to row distance:

d) Range of hill-to-hill distance
(120 to 250 mm adjustable):

e) Method of changing hill to hill distance:

f) Range and number of seedlings per hill:

g) Method of changing number of seedlings per hill:

C-2.13.1 *Planting Arm*

a) Number and type:

b) Number of speeds and range for planting arm:

C-2.14 Seedling Platform Assembly

a) Type and size of seedling tray:

b) Type method of flow of seedlings:

C-2.15 Overall Dimensions

a) Length (mm):

b) Width (mm):

c) Height (mm):

d) Mass (operational) (kg):

e) Ground clearance (mm):

C-2.16 List of Other Accessories Supplied with Transplanter

1.
2.
3.

C-2.17 Procedure for Seedling Preparation

Place: Signature: _____

Date: Designation: _____

ANNEX D

(*Clauses* 8, 14.4 *and* 14.7.4)

PERFORMANCE CHARACTERISTICS AND DATASHEET FOR VAROIOUS TESTS ON A PADDY TRANSPLANTER

D-1 PERFORMANCE CHARACTERISTICS (TO BE DECLARED BY THE MANUFACTURER/ APPLICANT)

D-1.1 Engine Performance

a) Maximum power, kW:

b) Rated power, kW:

c) Specific fuel consumption corresponding to maximum power, kg/kWh:

d) Maximum equivalent crankshaft torque Nm:

e) Back-up torque (percent):

f) Maximum temperatures (°C):

1) Engine oil:
2) Coolant (water)/liner wall:

g) Lubricating oil consumption (g/kWh):

h) Coolant consumption (percent of total coolant capacity):

j) Smoke level (Bosch No.):

D-1.2 Parking Brake

a) No rotation of drive wheels at a slope of 18 percent facing up and facing down:

D-1.3 Air Cleaner-Oil Pullover

a) Maximum oil pullover (percent):

D-1.4 Noise Level

a) Maximum ambient noise level emitted by transplanter at bystander's position dB (A):

b) Maximum noise level at the operator's ear level dB (A):

D-1.5 Amplitude of Mechanical Vibration at, μ

a) Steering handle grips/steering control wheel:

b) Gear lever (s):

1) Transmission:

2) Planting:

c) Clutch/brake lever(s)/pedal (s):

d) Accelerator lever/knob:

e) Operators seat:

f) Foot rest:

D-1.6 Field Requirements

a) Variation in seedling trays consumption per/ha, (percent):

b) Variation in number of hills per meter of row length (percent):

c) Transplanting faults in 1 m^2, (percent):

1) Missed hills:
2) Floating seedlings:
3) Buried seedlings:
4) Damaged seedlings:
5) Total faults:

d) Number of seedlings per hill:

e) Average planting depth, (cm):

D-1.7 Effectiveness of Sealings

a) Engine oil:

b) Hydraulic oil:

c) Transmission oil:

d) Clutch assembly:

e) Planting gear box oil:

f) Planting arms:

D-1.8 Discard Limit, mm; Initial Settings, mm; Discard Limit, mm

a) Cylinder bore diameter:

b) Piston clearance:

c) Ring end gap:

d) Diametrical clearance of big end bearing:

e) Axial clearance of big end bearing:

f) Ring groove clearance:

g) Thickness of clutch lining:

h) Diametrical clearance of main bearings:

j) Axial clearance of main bearings:

D-1.9 Safety Requirements

a) Provision of guards on moving parts:

b) Location and direction of exhaust emission to be away from the operator:

c) Covers on hot parts:

d) Provision of headlights:

D-1.10 Literature (Submission to Test Agency)

a) Operator manual

b) Parts catalogue

c) Workshop/service manual

D-1.11 Any Other Specific Recommendations

Place: Signature: _____
Name: _____ Designation: _____
Date:

D-2 DATA SHEET — ENGINE PERFORMANCE TEST

Date of test		Type of test		Engine speed (No load), rpm	
Make and model transplanter				Rated engine speed, rpm	
Name of engineer and staff				Specific gravity of fuel at 15 °C	

Sl No.	**Hours of the Day**	**Crank Shaft Speed**	**Dynamometer Speed**	**Break Load**	**Horse Power**	**Equivalent Crank Shaft Torque**	**Fuel Consumption**				**Temperature (°C)**					**Pressure**			**Atmospheric Condition**			**Specific Energy kWh/l (hp h/l)**	**Smoke Density (Bosch No.)**
							g/ min	Hourly		Specific	Fuel	Eng. Oil	Coolant	Air Intake	Exhaust Gas	Intake Air (mm of Hg)	Exhaust (mm of Hg)	Lub. Oil (kgf sq. ca /kPa)	Dry/Wet Bulb Temp (°C).	R.H. (%)	Pressure (m/ kPa)		
			(rpm)	**(kgf/ kW)**	**(Ps/ kW)**	**(kgf- a/Na)**		kg	l	(kg/hph)													
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
i)																							
ii)																							
iii)																							
iv)																							
v)																							
vi)																							
vii)																							
viii)																							
ix)																							
x)																							
xi)																							
xii)																							
xiii)																							
xiv)																							
xv)																							
Av.																							
Min																							
Max																							

D-3 DATA SHEET OF TURNING ABILITY

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

D-4 DATA SHEET OF PARKING BRAKE TEST

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

D-5 DATA SHEET OF AIR CLEANER OIL PULL OVER TEST

Date of test:

Make and model:

Name of engineer:

Name of technician:

a) Dry and empty bowl/air cleaner weight (g):

b) Weight of bowl/air cleaner with oil (up to level):

c) Weight of oil in air cleaner (g):

d) 5 percent excess oil in (g):

e) Weight of air cleaner with 5 percent excess oil (g):

f) Total weight of air cleaner (g):

g) Loss of oil during one-hour engine run:

Position of Tractor	**Starting Time**	**Stopping Time**	**Mass of Oil Before Test**	**Mass of Oil After Test**	**Loss of Oil**		**Remark**
					g	%	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Machine parked on level ground							
Machine tilted to 15 degree laterally with RHS up							
Machine tilted to 15 degree laterally with LHS up							
Machine tilted to 15 degree longitudinally with front end up							
Machine tilted to 15 degree longitudinally with rear end up							

Remarks:

D-5.1 Atmospheric Conditions Range

a) Temperature (°C):

b) Relative humidity (%):

c) Pressure (kPa):

D-6 DATA SHEET OF VIBRATION MEASUREMENT

a) Date of test

b) Name and model:

c) Location of test:

d) Type of accelerometer:

e) Rated engine speed:

Sl No.	Measuring Points		Vibration, Micron	
			Vertical Displacement (VD)	Horizontal Displacement (HD)
1.	Steering handle grips/steering control wheel	Left		
		Right		
2.	Accelerator lever/pedal			
3.	Main gear shifting lever			
4.	Planting gear lever			
5.	Hill space change lever			
6.	Differential lock pedal/lever			
7.	Parking brake lever/pedal			
8.	Brake lever/pedal			
9.	Stop lever			
10.	Float control lever (hydraulic sensing)			
11.	Plants per hill adjusting lever			
12.	Float	LHS		
		Middle		
		RHS		
13.	Seed board assembly			
14.	Operator seat	Bottom		
		Back		
15.	Fuel tank top			
16.	Air cleaner top			
17.	Engine bonnet	Front		
		Middle		
		Rear		
18.	Head light	LHS		
		RHS		

Sl No.	Measuring Points		Vibration, Micron	
			Vertical Displacement (VD)	Horizontal Displacement (HD)
19.	Foot rest	LHS		
		RHS		
20.	Others (if any)			
21.				
22.				
23.				
24.				
25.				

D-7 NOISE LEVEL TEST AT BY STANDARD'S POSITION

Date of test			:	
Name and model of machine			:	
Type of test surface			:	Loose soil track/field
Instrument used			:	
Standard calculated value dB (A)			:	
Calculated value set			:	
Height of microphone (cm)			:	120
Distance from the centre (m)			:	7.5
Background noise level dB (A)			:	
Inflation pressure (for road), kg/cm^2 (if applicable)		Front	:	
		Rear	:	
Engine RPM		Declare	:	
		Observed	:	
Atmospheric conditions				
Temperature (°C)			:	
Relative humidity (%)			:	
Atmospheric pressure (kPA)			:	
Wind velocity (m/s)			:	

Sl No.	Forward gears	75 % Speed of full throttle setting (kmph)	Silencer facing microphone, dB(A)	Silencer facing away from microphone, dB(A)
1				
2				
3				
4				
5				

D-8 DATA SHEET OF OPERATOR'S EAR NOISE LEVEL TEST

Date of test		:	
Machine under test		:	
Type of test surface		:	Test field
Instrument used		:	
Standard calculated value dB (A)		:	
Calculated value set		:	
Background noise level dB (A)		:	
Atmospheric conditions			
Temperature (°C)		:	
Humidity (%)		:	
Atmospheric pressure (kPa)		:	
Wind velocity (m/s)		:	
Sl No.	Field gears	Speed (kmph)	Measuring noise level In dB (A)
1			
2			
3			

D-9 DATA SHEET — FIELD PERFORMANCE TEST

Test No.		Make and model		Place of test	
Date		Gear selected for:		Type of soil	Light/medium/heavy
Starting time		Forward speed		No load engine speed (rpm)	
Finishing time		Planting speed		On load engine speed (rpm)	
Engineer & staff				Name of operator	

Sl No.	Time Taken for 10/20 Drive Wheel rev. (s)	Distance Covered in 10/20 Drive Wheel rev. (m)				Water Over Puddle (cm)	Puddle Depth (cm)	Wheel Sinkage (cm)	Trans-planting Depth (cm)	Hill to Hill Dist. (cm)	No. of Hills in 10/5 m	No. of Hills in 1 sq. m				
		On Load		No Load								Missed	Buried	Floating	Damage	Total
		RHS	LHS	RHS	LHS											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
i)																
ii)																
iii)																
iv)																
v)																
Total																
Avg.																

1	Total duration of test (h)		9	Time required (h/ha)		17	Transplanting faults in 1 sq. m (%)	
2	Total stoppage (h)		10	Field efficiency, (%)			Missed hills	
3	Net run hours (h)		11	Fuel consumption (l/h)			Floating	
4	Average forward speed (kmph)		12	Fuel consumption (l/ha)			Buried	
5	Travel reduction (%)		13	No. of seedling tray /ha			Damaged	
6	Average row to row spacing (cm)		14	Av. No. of plants per hill			Total	
7	Area covered (ha/h)		15	Standing angle of planted seedling, (°)				
8	Average width of 3/5 pass, (m)		16	Frequency of missed 2 or more successive hills in 3/5 pass				

I	**Condition of Seedlings**		b)	Topography of test plot	
a)	Variety of paddy		c)	Interval between last puddling and transplanting, (h)	
b)	Seed rate, (g/cm^2)		d)	Hardness of puddle soil/cone depth, cm	
c)	Seed germination rate, (%)		**III**	**Labour Requirement**	
d)	Type of nursery	Root wash/Mat type	a)	Seedling preparation (man-h/ha)	
e)	Soil components (soil/sand/FYM)			Treatment of seedling (man-h/ha)	
f)	Size of mat (L x W), cm		b)	Seedling arrangement (uprooting, transporting, etc) (man-h/ha)	
g)	Rupture strength of seedling mat (No. of seedlings 3/4/5), (g)		c)	Transplanting (man-h/ha)	
h)	Seedling density, (nos./100 cm^2)		d)	Gap filling (man-h/ha)	
j)	Date of sowing		e)	Transplanting at headlands (man-h/ha)	
k)	Date of transplanting		**IV**	**Performance of Transplanter**	
m)	Leaf stage		a)	Steering	
n)	Size of seedling (thickness at the base of shoot), (mm)		b)	Adjustability	
p)	Height of seedling, (cm)		c)	Difficulty in crossing bunds	
q)	Length of root, (cm)		d)	Was it difficult to operate continuously for 2 h?	
r)	Treatment of root (if any)		e)	Adequacy of engine power	
II	**Condition of Field**		f)	Sinkage of transplanter	
a)	Area and shape of field		g)	Any other difficulty:	

D-10 DATA SHEET OF CHECKING EFFECTIVENESS OF SEALINGS

Sl No.	Location	Whether Ingress of Mud and/or Water	Remarks
(1)	(2)	(3)	(4)
i)	Engine oil	Yes/No	None
ii)	Main transmission oil	Yes/No	
iii)	Hydraulic oil	Yes/No	
iv)	Planting transmission oil	Yes/No	
v)	Planting arms	Yes/No	
vi)	Axle hub (s)	Yes/No	
vii)	Starter motor	Yes/No	
viii)	Alternator	Yes/No	

D-11 DATA SHEET OF COMPONENTS/ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after---------- hours of paddy transplanter operation at the institute.

D-11.1 Engine

D-11.1.1 *Cylinder Bore*

Cylinder No.	Cylinder Bore Diameter, (mm)						Maximum Permissible Wear Limit, (mm)
	Top Position		Middle Position		Bottom Position		
	Thrust Side	Non-thrust Side	Thrust side	Non-thrust Side	Thrust side	Non-thrust Side	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.							
2.							
3.							
4.							

D-11.1.2 *Piston*

Piston No.	Piston Diameter, (mm)				Maximum Permissible Wear Limit of Piston Diameter, (mm)	Clearance between Piston and Cylinder Liner at the Skirt of the Piston, (mm)	
	Top (Above Top Compression Ring)		At Skirt				
	Thrust Side	Non- thrust Side	Thrust Side	Non- thrust Side		As Observed	Maximum Permissible Limit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.							
2.							
3.							
4.							

D-11.1.3 *Ring End Gap*

Rings	**Ring End Gap,** (mm)												**Maximum Permissible End Gap Limit,** (mm)
	Cylinder No.1			Cylinder No.2			Cylinder No.3			Cylinder No.4			
	T	M	B	T	M	B	T	M	B	T	M	B	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1st Compression ring													
2nd Compression ring													
Oil ring													
NOTE — T = Top, M = Middle and B = Bottom.													

D-11.1.4 *Ring Side Clearance*

Rings	**Ring Side Clearance,** (mm)				**Maximum Permissible Clearance Limit,** (mm)
	Piston-I	Piston-II	Piston-III	Piston-IV	
(1)	(2)	(3)	(4)	(5)	(6)
1st Compression ring					
2nd Compression ring					
Oil ring					

D-11.1.5 *Main Bearings*

Bearing No.	**Diametrical Clearance,** (mm)	**Crankshaft End Float,** (mm)	**Maximum Permissible Clearance Limit,** (mm)	
			Diametrical Clearance	Crankshaft End Float
(1)	(2)	(3)	(4)	(5)
1.				
2.				
3.				
4.				
5.				

D-11.1.6 *Big End Bearings*

Bearing No.	**Clearance,** (mm)		**Maximum Permissible Clearance Limit,** (mm)	
	Diametrical	Axial	Diametrical	Axial
(1)	(2)	(3)	(4)	(5)
1.				
2.				
3.				
4.				

D-11.1.7 *Valves, Guides and Timing Gears*

Observation

a) Any marked sign of overheating of valves : _____

b) Pitting of seat/faces of valves: _____

c) Any visual damage to the teeth of timing gears: _____

d) Spring rate, (N/mm)

i) Intake valve

Inner spring: _____

Outer spring: _____

ii) Exhaust valve

Inner spring: _____

Outer spring: _____

e) Clearance between valve guide and valve stem, (mm)

i) Intake valve: _____ to _____

ii) Exhaust valve: _____ to _____

D-11.1.8 *Clutch*

a) Any marked wear on clutch friction plates: _____

b) Condition of clutch release bearing: _____

c) Condition of release levers and springs: _____

d) Condition of pilot bearing: _____

e) Presence of oil in clutch housing: _____

f) Any marks on fly wheel/ pressure plate: _____

g) Overall thickness of clutch plate, (mm): **Discard limit**

i) Transmission clutch: _____ Up to over rivet head

ii) Planting clutch: _____ Up to over rivet head

h) Height of lining over rivet head, (mm):

i) Transmission clutch: _____ Up to over rivet head

ii) Planting clutch: _____ Up to over rivet head

j) Against the discard limit of inner and outer spring ____ & ____ N/mm
For inner and outer spring respectively

k) Against the discard limit of _____ mm

D-11.1.9 *Transmission Gears*

a) Any visual damage, pitting and chipping of _____ any transmission gear teeth.

b) Backlash between crown wheel and pinion, (mm) _____. Backlash is adjusted by_____ shim.

D-11.1.10 *Brakes*

Description	**Initial Specified Overall Thickness of Disc Brake,** (mm)	**Measured Thickness of Brake Disc After Test,** (mm)	**Measured Height of Lining Over Rivet Head,** (mm)	**Discard Limit,** (mm)
(1)	(2)	(3)	(4)	(5)
Left				Against discard limit up to rivet head.
Right				

D-11.1.11 *Planting Mechanism*

The following sub-assemblies including if any shall be dismantled after completion of all the tests to check their condition and damage, if any.

D-11.1.11.1 *Planting gearbox*

All the gears, bearing, shafts, etc shall be visually inspected and their wear or damage, if any shall be reported.

D-11.1.11.2 *Planting arms*

The planting arms shall be visually inspected and the condition of the arms, cams, bearing, springs, rods, etc shall be reported.

D-11.1.11.3 *Planting fingers*

The condition of planting fingers shall be visually inspected and their damage or bending, if any shall be reported.

D-11.1.11.4 *Seedling platform*

The seeding platform shall be visually inspected and its condition shall be reported.

D-11.1.11.5 *Cross feed mechanism*

The cross-feed mechanism shall be visually inspected and the condition of its components shall be reported.

D-11.1.11.6 *Float*

All the floats shall be visually inspected for cracks, punchers, etc and their condition shall be reported.

D-11.1.11.7 *Hydraulic systems*

All the components of hydraulic system shall be visually inspected, and their condition shall be reported.

D-11.1.12 *Steering System*

Visual condition of the components of complete steering assembly : _____

D-11.1.13 *Starter Motor and Alternator*

Presence of soil/oil in housing : _____

Condition of bearings and other components : _____

ANNEX E

(*Clause* 17.4)

CATEGORIES OF BREAKDOWN

E-1 CATEGORIES OF BREAKDOWNS/DEFECTS (PADDY TRANSPLANTER) (CRITICAL BREAKDOWN)

Code (1)	Aggregate (2)	Critical Defects (3)	Sub-assembly/Part (4)	Applicable Norms (5)
Cl	Engine	Engine seizure	Piston or liner or rings	As under col (3) and (4)
C2	do	do	Main or big end bearings	do
C3	do	Breakage/ crackage of	Piston	do
C4	do	do	Connecting rod	do
C5	do	do	Crankshaft	do
C6	do	do	Lubricating oil pump	do
C7	do	do	Fuel injection pump/ carburettor	do
C8	do	do	Governor	do
C9	do	do	Engine block	do
C10	do	do	Cylinder head	do
C11	do	do	Valve system	do
C12	Transmission	do	Clutch housing	do
C13	do	do	Gear box housing	do
C14	do	do	Axle	do
C15	Hydraulic	do	Piston/cylinder/housing	
C16	Brake system	do	Actuating linkage parts	do
C17	Wheel equipment	do	Wheel	do

E-2 CATEGORIES OF BREAKDOWNS/DEFECTS (PADDY TRANSPLATER) (MAJOR BREAKDOWN)

Code	Aggregate	Critical Defects	Sub-assembly/Part	Applicable Norms
(1)	(2)	(3)	(4)	(5)
Mj-1	Engine	Breakage/crackage of	Fan blade	As under col (3) and (4)
Mj-2	do	do	Oil sump	do
Mj-3	do	do	Engine head gasket	do
Mj-4	do	do	Fuel tank	do
Mj-5	do	do	Radiator	do

Code	Aggregate	Critical Defects	Sub-assembly/Part	Applicable Norms
(1)	(2)	(3)	(4)	(5)
Mj-6	do	Burst/cracked	High pressure pipe	do
Mj-7	Transmission	Breakage/crackage of	Clutch assembly	do
Mj-8	do	do	All gearing elements	do
Mj-9	do	do	All shaft elements	do
Mj-10	do	do	All bearings	do
Mj-11	do	do	Gear shifting forks	do
Mj-12	Steering	do	Steering system and its components	do
Mj-13	Hydraulic	do	Pipe lines	do
Mj-14	Planting mechanism	do	Planting arm	do
Mj-15	Float assembly	do	All floats	do
Mj-16	Wheel assembly	do	Wheel earings/bush	do

NOTES

1 Any breakage/crackage listed above which is repairable without change of component is treated as minor defects.

2 The decision whether concern part is to be repaired shall be taken on the basis of provisions available in the published literature submitted to the testing authority before the start of tests. In the case of non-availability of the provision in the literature, the matter shall be decided by the testing authority at its discretion.

E-3 CATEGORIES OF BREAKDOWNS/DEFECTS (PADDY TRANSPLANTER) (MINOR BREAKDOWN)

Code	Aggregate	Critical Defects	Sub-assembly/Part	Applicable Norms
(1)	(2)	(3)	(4)	(5)
Mn-1	Engine	Leakage from	Radiator	
Mn-2	do	do	Gasket (other than engine head gasket)	do
Mn-3	do	do	Seals	do
Mn-4	do	do	O-ring	do
Mn-5	do	Malfunctioning*	Fuel injector	do
Mn-6	Transmission	Leakage from	Gasket	do
Mn-7	do	do	Seal	do
Mn-8	Hydraulic	do	O-ring/seal/gasket/ hose/pipe	do
Mn-9	Planting mechanism	Breakage/bend	Planting finger	do
Mn-10	Sheet metal	Minor cracks		do
Mn-11	Electricals	do	Dynamo/alternator	do

NOTE — Malfunctioning marked as (*) above and requires replacement of complete assembly shall be treated as major defects.

ANNEX F

(*Foreword*)

COMMITTEE COMPOSITION

Agriculture Machinery and Equipment Sectional Committee, FAD 11

Organization	*Representative(s)*
ICAR - Central Institute of Agricultural Engineering, Bhopal	DR C. R. MEHTA **(*Chairperson*)**
Agriculture Machinery Manufacturers Association, Pune	DR SURENDRA SINGH SHRI MITUL PANCHAL (*Alternate*)
All India Farmers Alliance, New Delhi	DR RAJARAM TRIPATHI SHRIMATI APURVA TRIPATHI (*Alternate*)
Aspee Agro Equipment Pvt Ltd, Mumbai	SHRI JATIN S. PATEL SHRI GANGADHAR VARPE (*Alternate*)
Automotive Research Association of India, Pune	SHRI A. AKBAR BADUSHA SHRI GIRISH TANAWADE (*Alternate* I) SHRI GANGARAM AUTI (*Alternate* II)
Central Farm Machinery Training and Testing Institute, Budni	DR ANIL KUMAR UPADHYAY
CCS Haryana Agricultural University, Hisar	DR VIJAYA RANI
CLAAS India Pvt Ltd, Chandigarh	SHRI KRISHNA PRABHAKAR SINGH
CNH Industrial India Pvt Ltd, Pune	SHRI SANTHOSH RAO SHRI SUJIT HINGE (*Alternate*)
Consumer Guidance Society of India, Mumbai	SHRI SITARAM DIXIT
Dasmesh Mechanical Works Pvt Ltd, Malerkotla	SHRI SARBJEET SINGH PANESAR SHRI GURDEEP SINGH PANESAR (*Alternate*)
ICAR - All India Coordinated Research Project on Ergonomics and Safety in Agriculture, Bhopal	DR SUKHBIR SINGH DR RAHUL R. POTDAR (*Alternate* I) SHRIMATI SWEETI KUMARI (*Alternate* II)
ICAR - All India Coordinated Research Project on Farm Implements and Machinery, Bhopal	DR K. N. AGRAWAL
ICAR - All India Coordinated Research Project on Utilization of Animal Energy, Bhopal	DR S. P. SINGH
ICAR - Central Institute of Agricultural Engineering, Bhopal	DR V. P. CHAUDHARY DR U. R. BADEGAONKAR (*Alternate* I) DR DILIP JAT (*Alternate* II)
Indian Council of Agricultural Research, New Delhi	DR PANNA LAL SINGH
John Deere India Pvt Ltd, Pune	SHRI ANAND RAJ SHRI CHANDRASHEKHAR DESHMUKH (*Alternate* I) SHRI PRATIK DURAPHE (*Alternate* II)

Organization	*Representative(s)*
Kerala Agro Machinery Corporation Ltd (KAMCO), Athani	SHRI A. UNNIKRISHNAN SHRI P. C. SAJIMON (*Alternate*)
Kubota Agricultural Machinery India Pvt Ltd, Faridabad	SHRI ASHOK KUMAR SHRI ASHISH KUMAR MALLARH (*Alternate*)
Maharana Pratap University of Agricultural and Technology, Udaipur	DR SANWAL SINGH MEENA
Mahatma Phule Krishi Vidyapeeth, Rahuri	DR SACHIN MADHUKAR NALAWADE SHRI VIKRAM PARASHARAM KAD (*Alternate* I) DR AVDHUT ASHOK WALUN (*Alternate* II)
Mahindra and Mahindra Ltd, Mumbai	SHRI PRADEEP SHINDE
Ministry of Agriculture, Department of Agriculture, New Delhi	DR V. N. KALE SHRI ARVIND N. MESHRAM (*Alternate*)
National Institute of Plant Health Management, Hyderabad	DR VIDHU KAMPURATH P. SHRI MUTYALA UDAYA (*Alternate*)
North Eastern Region Farm Machinery Training and Testing Institute, Biswanath Charali	DR P. P. RAO SHRI S. G. PAWAR (*Alternate* I) SHRI KHAGENDRA BORA (*Alternate* II)
Northern Region Farm Machinery Training and Testing Institute, Hisar	DR MUKESH JAIN SHRI SANJAY KUMAR (*Alternate*)
Power Tillers Manufacturers Association, Kolkata	SHRI A. R. GANESH KUMAR
Punjab Agricultural University, Ludhiana	DR MAHESH KUMAR NARANG DR RAJESH GOYAL (*Alternate* I) SHRI APOORV PRAKASH (*Alternate* II)
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Tamil Nadu Agricultural University, Coimbatore	DR R. KAVITHA DR A. SURENDRA KUMAR (*Alternate* I) DR A. P. MOHANKUMAR (*Alternate* II)
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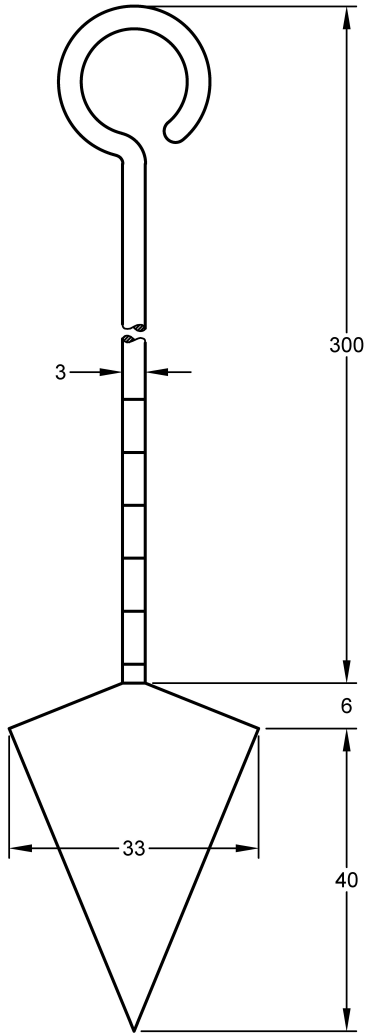

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