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## DRAFT ZANZIBAR NATIONAL STANDARD

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**Agricultural equipment – Walking type agricultural tractors –  
Specification**

DRAFT FOR STAKEHOLDERS COMMENT

**ZANZIBAR BUREAU OF STANDARDS**

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## Foreword

This draft Zanzibar national standard has been developed by Mechanical and Automotive Standard Technical committee. In accordance with ZBS general procedures, this draft standard is presented to the public in order to receive any technical and editorial comment concerns.

This draft Zanzibar national standard is modified adoption of Tanzania Bureau of Standards, TZS1417: 2011, Agricultural equipment – Walking type agricultural tractors – Specification.

This Zanzibar national standard was prepared by Mechanical and Automotive Standard Technical committee which consists of representatives from the following organizations:

Karume Institute of science and Technology (KIST)

Budda Auto Works

Zanzibar Utilities Regulatory Authority (ZURA)

Zanzibar Electricity Corporation (ZECO)

Ministry of Infrastructure, Communications and Transportation (MoICT)

Government Agency for Tractor and Farmer Machinery Service (GATFS)

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## **Introduction**

The walking type agricultural tractors commonly known as power tillers are the most popular type of agricultural machines commonly used in Tanzania especially in rural areas for agricultural purposes. Recently Tanzania has experienced introduction of different types of these walking type agricultural tractors. These tractors brought into the Tanzanian market, came from different countries. These tractors are still being available at different qualities, different sizes, models and capability.

In addressing the safety issues of these walking type agricultural tractors, this Tanzania Standard is being prepared in order to address the quality performance of these tractors.

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# Agricultural equipment – Walking type agricultural tractors – Specification

## 1 Scope

This Tanzania Standard specifies the requirements for the construction and operation of walking type agricultural powered machinery for land tilling, weeding, ploughing, grass cutting and transplanting.

This standard covers agricultural machines that are classified as walking type agricultural tractors, which are either pulled or pushed. These include tractors with chain and sprocket transmission system, gear transmission system and combination thereof.

## 2 Field of application

Application of the walking type tractors might be different according to the intended purposes; the manufacturer shall state the movement types and applicable fields that the walking type tractors can be able to perform.

### 2.1 Types of movements

The manufacturer shall state how different movement types of forward, reverse or turning movements can be achieved by the walking tractor.

### 2.2 Application fields

The manufacturer shall state different application that the walking tractor can perform in different fields. The manufacturer shall specify the performance of tractors in terms of tilling (dry land and wet land), weeding, plough, transplanting, ridging, bund forming and trailing application.

## 3 Reference

For the purpose of this Tanzania Standard the following reference shall apply:

TZS 4:2009, *Rounding off of numerical values*

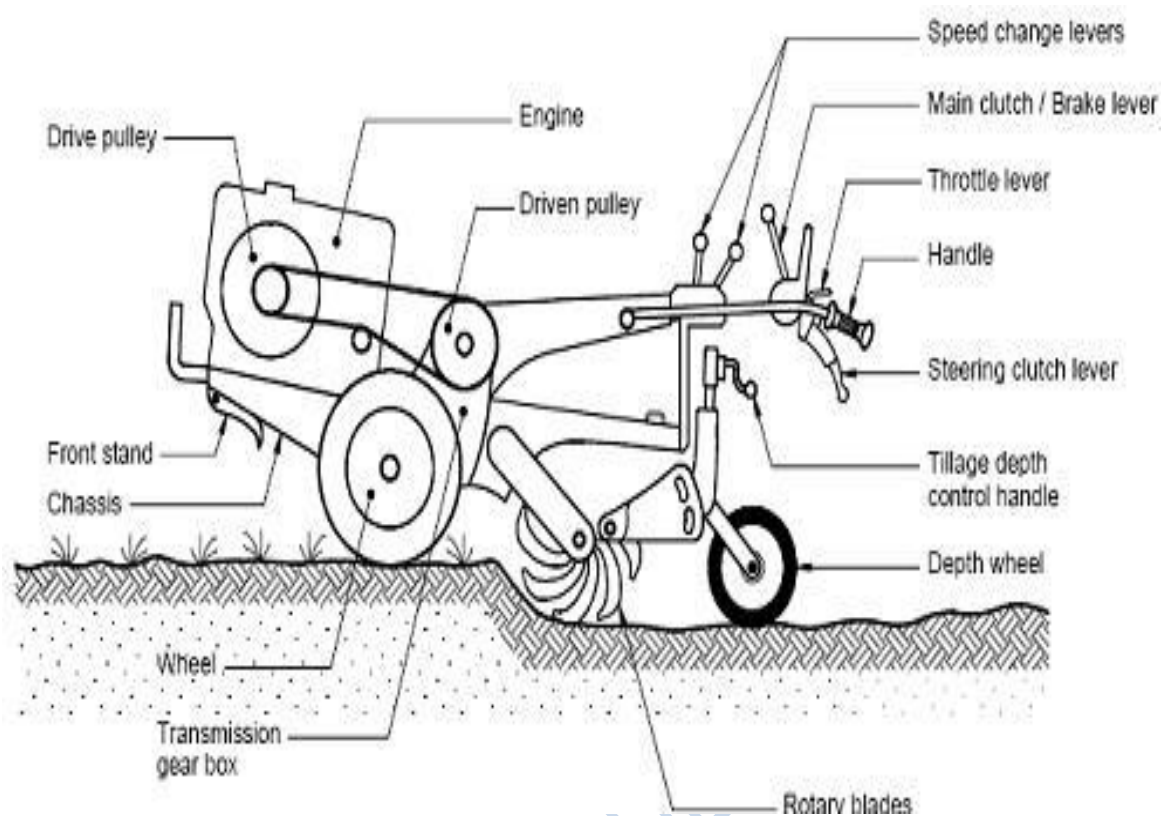
## 4 Definitions

For the purpose of this Tanzania Standard, the following definitions shall apply:

### 4.1

#### walking-type agricultural tractor

a self-propelled machine having a single axle designed primarily to pull and propel trailed or mounted agricultural implements and machinery. This machinery type is also known as hand tractor or pedestrian tractor (see figure1).



**Figure 1– Walking agricultural tractor – General features and details**

**4.2  
rotary tilling tractor (power tiller)**

a walking-type agricultural tractor equipped with rotary tilling attachment cuts, breaks up, and mixes the soil and/or plant residues. It is used to loosening the soil, pulverizing the soil,

**4.3  
rotorvator**

consists of a single or pair of radially mounted blades attached to a common hollow shaft or axle of rotary tilling tractor, supported and powered by the transmission (see figure 1).

**4.4  
pull application**

a traction type capable of pulling various kinds of implements.

**4.5  
handlebars**

any part of the bar or bars connected to the fork top by means of which the agricultural tractor is steered (see figure 2 b).

**4.6  
handgrip**

a part of the handlebars, farthest from the centre, by which the driver holds the handlebars (see figure 2 b).

**4.7  
lever**

device consisting of an arm turning on a fulcrum, by means of which some functional mechanism of the agriculture is operated (see figure 2 b).

**4.8  
throttle control**

the throttle control is a hand operated and located on the right side of the handlebar when rotated around its axis in a counter-clockwise direction. As viewed from the right end of the bar, the engine speed shall increase. Hand operated control may be self return type (see figure 2 b).

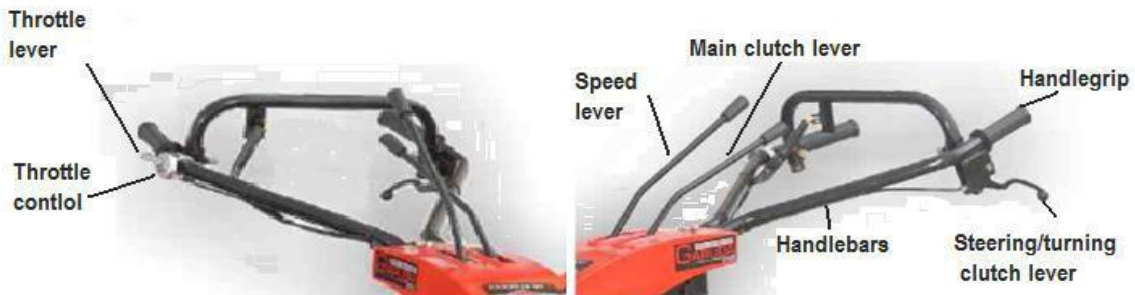
**4.9  
flotation application**

a component (float or hull) of a tractor which provides buoyancy (see figure 2 a).



**Typical flotation application**

**Figure 2 a – Typical details of floating application**  
adding and weeding (see figure 1).



**Figure 2 b – Typical details of control levers**

## 5 Classification

The powered machineries that are classified as walking type agricultural tractors shall be of the following types.

### 5.1 Walking agricultural tractor for light duties (up to 14 kW)

This is a walking type tractor designed purposely for light duties such as intercrop weeding, loosening of soil and ridging and bund forming; such tractor shall be recommended for light duties only.

### 5.2 Walking agricultural tractor for heavy duties (above 14 kW)

This is a walking type tractor designed purposely for heavy duties such as tilling (wet land and dry land), ploughing and trailing application. This type of tractors shall be able to perform intercrop weeding, loosening of soil and ridging and bund forming. The tractor shall be recommended for heavy duties purposes and light duties application.

## 6 Construction and operational requirements

### 6.1 General requirements

- a) The tractor shall be generally made of cast iron and steel material.
- b) Chain and sprocket and/or gears shall be used to transmit power from the transmission drive shaft to the axle.
- c) The handle bar shall be made of steel pipe with a minimum wall thickness of 3 mm and with a minimum outside diameter of 25 mm.

### 6.2 Materials

The tractor parts shall be made in accordance with the following requirements:

- a) Chain, sprockets, shafts and gears

Chain, sprockets and gears shall be used to transmit the power from gear box to drive axles/shafts; these parts shall be made of hardened steels of the hardness ranging from 35 HRC to 55 HRC.

- b) Tilling blades and cutting blades

This shall be used to cut, break up, and mix the soil and/or plant residues and shall be cast hardened spring steel of hardness between 37 HRC to 45 HRC at shank and  $56 \pm 3$  HRC at the cutting edge.

- c) Belts and pulleys

Belts and pulleys shall be used to transmit power from engine to gear box and shall be robust and capable of transmitting loads from engine to gearbox.

- d) Drive casings

All drive casings (gear boxes, rotary drive and clutch drive) shall be made only from cast iron materials.

- e) Sheet materials

Steel sheet shall be used to cover the parts and shall be protected by the painting and shall be of minimum thickness of 2 mm.

### 6.3 Engines requirement

All tractors shall be fixed with a four stroke cycle engine only.

### 6.4 Speeds

The speed ranges (rpm) in terms of maximum and minimum of the rotavators for specific walking type agricultural tractor shall be provided by manufacturer. The minimum allowed speed shall not be less than 200 rpm. The maximum travel speed of a tractor shall not be more than 18km/h.

### 6.5 Controls

The various controls of the walking type agricultural tractor shall be located and operated in accordance with the following requirements:

#### 6.5.1 Throttle lever (accelerator)

This shall be accessible to the operator's right-hand side of the handle bar.

#### 6.5.2 Types of throttle levers

##### a) Vertical type

For this type, the throttle lever is pushed forward/up to increase engine speed and pulled rearward/down to decrease engine speed.

##### b) Horizontal type

For this type, the throttle lever is pulled to the left to increase engine speed and to the right to decrease engine speed.

#### 6.5.3 Main clutch lever

a) This shall be accessible to the operator's left hand side of the handle bar;

b) In the case of a vertical lever, the lever shall be pushed forward to start the forward motion of the tractor and shall be pulled rearward to stop the tractor. An over-centre linkage shall lock the lever in the forward engaged position; and

c) In the case of a horizontal lever, the lever shall be pushed upward to start the forward motion of the tractor and shall be pulled downward to stop the tractor.

#### 6.5.4 Steering clutch

All tractors shall have a steering clutch and all heavy duty tractors shall be equipped with two steering clutches of the following requirements:

a) In the case of right-hand steering clutch lever, the lever shall be gripped toward the handle to disengage the right-hand clutch and stop the right-hand driving wheel, causing the tractor to turn to the right. Releasing the lever will re-engage the right-hand wheel; and

b) In the case of left-hand steering clutch lever, the lever shall be gripped toward the handle bar to disengage the left-hand clutch and stop the left-hand driving wheel, causing the tractor to turn toward the left. Releasing the lever will re-engage the left-hand wheel.

#### 6.5.5 Speed change lever

All tractors shall have speed change lever that can be engaged for various speed positions and neutral position.



## 7 Performance requirements

The tractor when tested in accordance with annexes A, B and C shall conform to the following requirements;

- a) The noise emitted by the tractor measured 50 mm away from the operator's ear level shall not be more than 90 db (A) (see annex B).
- b) The tractor shall have no breakdowns/malfunctions (i.e. failure of components, etc) during 50-hour endurance running test (see annex C).
- c) The emission levels shall be not more than 1 200 ppm of hydrocarbons and shall also not be more than 4.5% of carbon monoxide (see annex A). The excessive black smoke or fumes shall not be allowed.
- d) The details provided by manufacturer shall not differ with the observed details (see annex D).

## 8 Other requirement

- a) For operator's safety, the following shall be provided:
  - i) Belt guard or cover
  - ii) Mud guard
  - iii) Both ends of handlebar shall be fitted with rubber grips or end caps which withstand a removal force of 70 N.
- b) Mechanism for transmission belt adjustment shall be provided.
- c) Mechanism for handle bar height adjustment shall be provided.
- d) Mechanism for automatic disengagement of power transmission shall be provided.
- e) Mechanisms that minimize/reduce vibration shall be provided.

## 9 Workmanship and finish

- a) The tractor shall be free from manufacturing defects that may be detrimental to its operation.
- b) Any uncoated metallic surface shall be free from rust and shall be painted properly.
- c) The tractor shall be free from sharp edges and surfaces that may injure the operator.

## 10 Warranty for construction and durability

**10.1** Warranty against defective materials and workmanship shall be provided for parts and services except for consumable maintenance parts (i.e. fan belts, oil filter, fuel filter, etc.) within twelve (24) months from the purchase of the tractor.

**10.2** The construction shall be rigid and durable without breakdown of its major components (i.e. transmission, cooling, lubrication systems, etc) within twelve (24) months from purchase by the first buyer.

## 11 Maintenance and operation

**11.1** Each tractor unit shall be provided with the following minimum quantity of basic hand tools: three (3) pieces open wrenches, one (1) piece each of star and flat screw driver, one (1) pair of mechanical pliers, one (1) piece adjustable wrench, one (1) piece grease gun, one (1) piece of tire wrench and one (1) piece of lifting jack.

**11.2** An instruction manual and/or operation manual shall be provided in English or Swahili language.

11.3 All components that require regular maintenance, servicing and adjustment shall be easily accessible.

## 12 Marking and labelling

Each walking type agricultural tractor shall be marked in English or Swahili language with the following information using a plate, stencil or by directly punching it at the most conspicuous place:

- a) Registered trademark of the manufacturer
- b) Brand
- c) Model
- d) Serial number
- e) Name and address of manufacturer
- f) Name and address of importer (optional)
- g) Country of manufacture
- h) Safety/precautionary markings

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**Annex A**  
(Normative)

**Exhaust emissions testing**

**A.1 Purpose**

The test is done to measure the volumetric concentrations of CO and HC emissions at idling and not at slightly higher speed and load.

**A.2 Apparatus**

The apparatus used should be an independent exhaust gas analyzer unit or part of engine analyzer.

**A.3 Procedures**

Procedures for calibrating and using exhaust gas analyzers vary with the make and model of testers so emphasis shall be put on careful reading of the instructions for the analyzer.

Make necessary connections (electrical supply etc), turn on the analyzer, warm the equipment and calibrate the HC and CO meters for zero reading.

Check the system to be sure it is leak free.

To measure the amount of CO, run the engine at fast idle (say 1 500 to 2 000 rpm for about 30 s), then run the engine at its specified idle speed and read CO on the CO meter.

To measure the HC, run the engine at fast idle (1500 – 2000 rpm for about 30 s), then run the engine at its specified idle speed and then read HC on the HC meter.

For diesel engine, vehicle measurement is done under no load and quickly accelerated and the percentage of smoke is read from the smoke meter or inspection done visually.

NOTE – The concentration of the exhaust gas from an automobile shall be measured when the engine is idling, and inserting the probe of a tester into the exhaust pipe to a depth of approximately 60 cm. (If this is not feasible, measures to prevent the ingress of air from outside shall be taken before inserting the probe).

## **Annex B** (Normative)

### **Sound level testing**

#### **B.1 Purpose**

This annex sets out assessment of the levels of noises produced by the vehicle. The gauge simulates human auditory perception. The audit level is indicated in dB (A) units.

#### **B.2 Apparatus**

Apparatus uses microphone that converts sound captioned in electrical current and its level is indicated on the indicator in dB (A).

#### **B.3 Procedures**

Calibrate the indicator before use; follow specific instructions as to the gauge settings and measurements taking. Note the specific settings for measuring of exhaust noises and sound level of the horn, careful noting placement of a gauge to avoid interference of background noises and reflected sounds. Make adjustments for such noises where such noises cannot be avoided.

**Annex C**  
(Normative)

**Endurance running test**

**C.1 Purpose**

This test is done to check the continuous performance of the machine while assessing the machine consistence and working ability.

**C.2 Apparatus**

The tractor has to be set under normal loading conditions such as in a mud water or dry soil.

**C.3 Procedures**

Start the machine and run it under its normal running condition for 50 working hours and thereafter check the fuel consumption in L/h, wear and tear of parts and report for any malfunction or abnormality.

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**Annex D**  
(Normative)

**Inspection requirements**

Inspection shall be done to verify the manufacturer's specifications and the manufacturer of the tractor shall supply the following information.

Item	Manufacturer's specification	Result of verification	Remarks
Type of fuel (petrol, diesel or gas)			
Starting system (rope recoil or hand crank)			
Dimensions and weight of tractor			
Overall length			
Overall width			
Overall height			
Ground clearance			
Ease of handling and stability of the tractor			
Ease of replacing and adjusting the parts			
Ease of manipulating of the operating levers			
Safety features			
Failure or abnormalities that may be observed on the tractor or its component parts			
Fuel consumption, L/h, g/kWhr (Dynamometer)			
Operation of the clutch			
Maximum travel speed and speed gear positions			
Rated speed and power ( rpm and KW)			
Easy of turning tractors			