

# **CHAPTER 13**

## ***Farm Machinery, Implements and Maintenance***

### **OBJECTIVES**

**At the end of this chapter, students should be able to:**

- â identify and mention the different types of farm machines.
- â list and explain the functions of the different types of farm machines.
- â name the major parts of tractor-coupled implements and their functions.
- â state reasons why farm machines should be maintained.
- â practise maintenance work on the farm machines.

### **13.1 Introduction**

The introduction of science and technology and its application in agriculture has made possible the introduction of farm machinery. Farm machinery has made agricultural production easy, reducing cost of labour and time expended in the course of production of agricultural produce and products with greater efficiency and precision.

### **13.2 Meaning of Farm Machinery**

Farm machinery is complex machines and implements used for carrying out farming operations. These machines save cost and labour. They can be used at various levels of production including land preparation, fertilizer application, pesticides application, harvesting and processing of agricultural produce and products.

Examples of farm machines are as follows:

- (i) Tractors (vii) Harvesters**
- (ii) Bulldozer (viii) Shellers**
- (iii) Ploughs (ix) Dryers**
- (iv) Harrows (x) Sprayers**
- (v) Ridgers (xi) Incubators**
- (vi) Planters (xii) Milking machines**

Tractors are very important as they play central role in the operation of several other implements as the key source of power.

#### **13.2.1 Advantages of using farm machinery in agriculture**

- â Farm machinery can cultivate large areas of land.
- â It increases productivity and enhances high income for farmers.
- â It saves time and energy.
- â It reduces drudgery and tediousness of farm work.
- â It makes farming more attractive to the youth.

#### **13.2.2 Disadvantages of using farm machinery in agriculture**

- â Machines are very expensive and most farmers cannot afford it.
- â The use of machines may lead to unemployment.
- â Use of heavy machines may lead to soil compaction and destruction of soil structure.
- â Most of the machines imported are not suitable for the soil condition in

West Africa.

â Inadequate personnel to handle and maintain the machines.

â High cost of maintenance of the machines.

### 13.3 Types of Farm Machinery

The type of farm machine the farmer will buy or use depends on the type of farming and the operations to be accomplished, the area of land to be covered and the economic status of the farmer. Farm machinery can be classified into three groups, based on the source and generation of power.

**1. Primary Machines:** These are the machines that can supply power to other machines and implements for their farming operations. An example of primary machine is the tractor.

**2. Secondary Machines:** These are tractors coupled or mounted machinery or implements on the farm. The tractors supply the needed power used for different farm operations. Examples are ploughs, harrows, ridgers, planters, harvesters and sprayers.

**3. Intermediate machines:** These are powered by a tractor, electricity or an electric generating set. Most of these machines are barn or stationary machines used in processing activities such as threshing, winnowing and drying. These also include grinding machines, incubators and other related machines.

### 13.4 Examples of Farm Machinery

#### 13.4.1 Tractors

The tractor is the most useful farm machine, capable of using its power to perform numerous farm tasks (Fig. 13.1). The most power absorbing of these tasks is usually the basic cultivation of land. The tractor is also able



FIGURE 13.1 A tractor

to perform other farming activities such as drilling seed, top dressing, spraying and haulage. There are different types of tractors such as the general-purpose tractor, track laying tractor, heavy-wheeled tractor and two-wheeled tractor.

#### Types of Tractors

The type of tractor to be used depends on the type of operation to be done.

**1. Track-Laying Tractors:** This type of tractor is sometimes referred to as crawler. Such tractors have high horsepower and are capable of doing very

heavy farm operation. They can be used to pull a five or six furrow plough for heavy cultivation. There are, however, relatively smaller track-laying tractors of not more than 6 horsepower. These are used for work on small-scale to medium-scale farms.

**2. Heavy-Wheeled Tractors:** Heavy wheeled tractors are used for the heavy work on farms. These are large tractors with engine capacity of up to 500 horse power (h.p.), equipped with twin wheels all round, which runs on top in the same way as a crawler tractor. They also carry out very heavy cultivations.

**3. General-Purpose Tractors:** These are wheeled tractors of about 100 horse power. There may be lighter types of about 40 horsepower (h.p.). Either one or both are those tractors which are used for all farming activities.

**4. Two-Wheeled Tractors:** This type is powerful enough to do light cultivations and is steered by a walking operator. Most tractors are powered by internal combustion engines which may slightly differ depending on the manufacturer.

They operate on the same basic principles.

### **The Internal Combustion Engine**

The internal combustion engine is a form of heat engine and it is called heat engine because heat energy, produced by the burning of fuel within the engine, is changed into mechanical energy. Different types of fuel are used in different types of tractor engines but this does not alter the basic operation. The fuel used is petrol for sparking ignition and diesel fuel is used in compressing ignition engines.

### **Factors Necessary for Choosing a Tractor for Farm Operation**

The following factors may be considered before choosing a tractor for farm operation:

- (i) The tractor must have enough power for the job it is intended to do.
- (ii) If it is to be the only tractor on the farm, it must be of a general-purpose type and it must be powerful enough to carry out the most difficult operations on the farm.
- (iii) The tractor should have a hydraulic kit and a live power take-off system.
- (iv) The tractor should have sufficient ground clearance.
- (v) There must be a guaranteed after sales service.

### **Uses of a Tractor**

- 1. A tractor is used to pull farm implements like ploughs, harrows and ridgers.
- 2. It is used for transporting farm inputs and outputs by coupling a trailer to it.
- 3. Workers can also be transported within the farm by means of the tractor.
- 4. It can be used to apply herbicides, pesticides, plant crops and cultivate land.
- 5. It can also be used to operate a grinder, thresher or pump or connect to an electric motor to generate electricity.

### **Maintenance of a Tractor**

#### **(a) Daily Maintenance Operations**

- (i) Check the oil level and top it when necessary.
- (ii) Check the water level in the radiator and top it when necessary.
- (iii) Check the tyre pressure before taking the tractor out for work.

- (iv)** Check wheel nuts for tightness.
- (v)** Check hydraulic oil level in the pot and top-up if necessary.
- (vi)** Grease the nipples and oil the moving parts.
- (vii)** Check battery, water hoses, fan belt and fuel tank, daily, before any operation.
- (viii)** Tighten all loose bolts and nuts.

### **(b) Routine or Periodic Maintenance Operations**

- (i)** Change engine oil and oil filter at regular intervals or as and when necessary.
- (ii)** Change fuel filter and hydraulic filter regularly.
- (iii)** Check and adjust the brakes and clutch if necessary.
- (iv)** Inspect bearings and grease front wheel bearings regularly.
- (v)** Check cylinder head, bolts, torques and adjust engine valve clearance.
- (vi)** Change the spark plugs where applicable.
- (vii)** Lubricate all moving parts and change worn out parts as and when necessary.
- (viii)** Park tractor on level ground when not in operation, preferably under shade.
- (ix)** Adhere strictly to manufacturer's instructions on the use and maintenance of a tractor.

### **Useful Precautions When Operating a Tractor**

- (i)** Do not use trinkets, wrist watches; they can cause electrical short circuit.
- (ii)** Ensure that a proper sitting position is maintained while operating a tractor.
- (iii)** Do not drive with gear on neutral.
- (iv)** Ensure that proper pins are used to secure implements attached to the tractor.
- (v)** Do not allow people to sit on the mudguard.  
People should sit on the floor of the trailer.
- (vi)** Do not operate the tractor in a closed-up garage. Carbon monoxide from the exhaust is poisonous.
- (vii)** Wear an overall and boots when operating a tractor. Do not wear loose clothing.
- (viii)** Fit the power-take-off(PTO) shaft properly before setting out for work.

### **13.4.2 Bulldozer**

The bulldozer is a very useful and powerful machine for bush clearing. It has an internal combustion engine powered by diesel oil. It consists of a rectangular concave steel blade ranging from 1 to about 1.75 metres in depth with a reinforced lower cutting edge.

The blade is supported by steel arms mounted on the front of a track-laying wheel. The blade is raised to the depth of cut required. The bulldozer can sweep out shallow rooted plants while the blade is set much lower; the action is to dig and push tree



**FIGURE 13.2** A bulldozer

stumps. A dig on one side and a sharp push on the opposite side followed by a repeat action will get the stump out.

### **Uses of Bulldozer**

1. It is used in land clearing.
2. Used in removing trees and root stumps.
3. It can be used on the farm to construct fish pond.
4. It is used for levelling and moving of the earth on the farm.
5. Bulldozer can be used in road construction, irrigation and drainage channels.

### **Side effects of using Bulldozer on the farm**

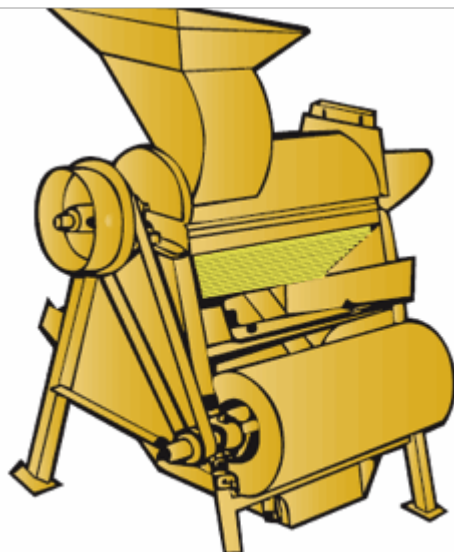
1. It leads to the destruction of soil structure as well as soil compaction.
2. It exposes the land to wind and water erosion as well as excessive soil water evaporation.
3. It can cause pollution such as soil pollution, air pollution and noise pollution.

### **Maintenance of Bulldozer**

The same as in daily and periodic maintenance of a tractor.

### **13.4.3 Shellers**

Shellers are equipments fabricated for removing grains from their cobs or pods at a fast rate such as maize sheller. It can be operated mechanically, manually or electrically. This equipment reduces the cost of human labour in shelling grains.



**FIGURE 13.3** A maize sheller

Care should be taken when loading the shellers so that you do not put your hand in the shelling unit of the machine.

### **Maintenance of a Sheller**

1. Clean the machine after use, especially the shelling cylinder.
2. Tighten all loose bolts and nuts.
3. Lubricate all the rotating parts of the machine.
4. Keep the sheller in a cool dry place.

### **13.4.4 Dryers**

Agricultural materials such as cereals, grains, legumes, vegetables and root crops are harvested with high moisture contents. This makes them unsuitable for storage. High levels of moisture in the farm produce accelerated growth of microorganisms which cause decay and mouldiness. Drying reduces the moisture content of farm produce to a level which preserves quality for a long time. For some produce, drying facilitates processing of the produce such as milling of grains.



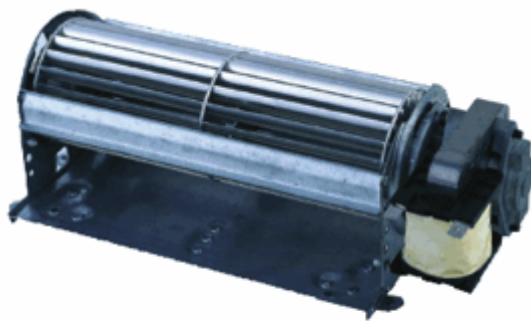
### **Basic Principles of Crop Drying**

Drying is the use of heat to remove water from the material. Heated air is passed through the material. The air accelerates the evaporation of water both by supplying heat of vaporization and by carrying away the water vapour. The air may be heated by burning hydrocarbon fuels such as coal gas, electric heaters or solar energy.

### **Types of Drying Equipments**

**(a) Batch systems:** The grain is dried and then moved to a separate storage. Grain can be dried on perforated metal floor or in layers.

**(b) Deep-layer systems:** This consists of silo bins or stores fitted with ducts or doors through which air is distributed



**FIGURE 13.5** Cross-flow dryer

and blown through the procedure to be dried. Drying in deep-layer should be completed in 7-30 days. Examples are the cocoa drier, tobacco curing and rubber drying process.

**(c) Continuous-flow or shallow-layer driers:** In this type, both the material and the air are in motion at regulated speeds. As the grain travels along the drier, it loses water to attain the correct storage moisture content.

### 13.4.5 Incubators

This is an equipment used by farmers in hatching eggs. Successful incubation and hatching depend to a considerable extent on the fertility of the eggs and the skill of the incubators'™ attendant. The incubation period is the time during which the embryo of the eggs develop gradually until they hatch into chicks. Incubation is, therefore, the process leading to the hatching out of young chicks from eggs. There are various types and sizes of incubators:

**(a) Hot air incubator:** In this device, hot air is used to maintain the temperature of the egg chamber. The heat may be generated from oil lamp, stove or gas. These



**FIGURE 13.6** An incubator

are the commonest incubators used by small-scale poultry keepers. The capacity may vary from 50 to 1000 eggs.

**(b) Hot water incubator:** The temperature of the egg chamber is maintained by a heated water tank usually situated above the egg chamber.

**(c) Electric incubator:** In this incubator the heat is provided by electricity, and most of the internal operations are electrically controlled. This type of incubator is used at the government farms and commercial hatcheries. The internal temperature regulation is very critical in all types of incubators. The

temperature is usually maintained between  $37.5^{\circ}\text{C}$  and  $39.5^{\circ}\text{C}$ . The relative humidity of the small incubators should be about 60%. A level water pan covering the floor of the incubator during the incubation period will generally supply sufficient moisture to give good hatching results. In larger incubators, the temperature, air speed and humidity are closely related and the manufacturer's instructions should be strictly followed. Ventilation is more important in larger incubators and it is particularly important at hatching time. Turning of the egg is very important, to prevent the adhesion of the embryo to the shell membrane. The greatest benefit from turning eggs is gained in the first week of incubation. Large incubators have automatic turning devices while in smaller incubators, eggs can be manually turned at least four times a day. Chicken eggs will hatch in 21 days; turkey, ducks and guinea fowls eggs in 28 days and goose eggs in 30 days.

#### 13.4.6 Milking Machines

The need for efficient handling of milk on a large scale has led to considerable developments in milking machines, particularly in terms of bulk handling. Although the basic milk-extraction process has remained unchanged for many years the necessity to do away with the handling of churns and



bucket unit has given rise to the fitting of pipeline milking system in dairy farms.

The layout of a milking machine is shown in Fig. 13.7.

#### 13.4.7 Sprayers

These are the machines used in spraying agro-chemicals such as pesticides, fungicides as well as liquid fertilizers on the farm.

##### Types of Crop Sprayers

Spraying machines may be classified into two groups on the basis of:

- (a) System of liquid delivery (i.e., hydraulic or pneumatic).
- (b) Volumetric capacity (high volume, medium volume, low pressure).

Classification of sprayers based on system of liquid delivery.

**(i) Hydraulic sprayers:** (Fig. 13.8) shows the main components of the sprayers and indicates the flow of the liquid. Thus the hydraulic principle of liquid movement by the action of the pump can be seen.

**(ii) Pneumatic (pressurised tank):** The liquid delivery from this type of machine is achieved by pressurising the partially filled tank (Fig. 13.8(a), (b)).



The air designed to force the liquid from the tank to the boom.



FIGURE 13.8 (a) Hydraulic field crop sprayer (b) Knapsack sprayer



FIGURE 13.9 Pneumatic (pressurised tank) type sprayer

The principal factors which influence the capacity of a sprayer are the size of its tank, the size and type of pump employed, and the size, number and type of nozzles used.

### **Maintenance of Crop Sprayer**

Lubrication of joints or greasing points with the use of grease or oil.

â During a working day a sprayer operator may remove the nozzles and filters for cleaning.

â The operator should avoid getting his hands contaminated with the spray liquid.

â Care must therefore be taken when applying chemicals to make sure that the right type of crop is sprayed with the right chemical.

â The spraying machine should be thoroughly cleaned in order to remove all traces of the chemical that may be harmful.

### **13.4.8 Harvesters**

Harvesters are implements designed to facilitate the processes of harvesting various crops. Most harvesters are mounted on to the tractor and derive their power from the power-take-off shaft. Examples include the following:

**1. Hay-Harvesting Equipment:** These are machines required in the various stages of hay making. The principal machines are the mower, the hay rakes and the baler. The mower is designed to cut grass/legume crops for hay. The baler is



FIGURE 13.10 A combined harvester

the machine used for compressing hay or straw to facilitate handling.

**2. Grain-Harvesting Equipment:** These are used for harvesting and

threshing of cereals. Example is the combined harvester

### **Maintenance of combined harvester**

The combined harvester is another machine that requires careful and systematic lubrication attention. There are many greasing and boiling points, some of which require attention more than once daily, others daily and some weekly.

Each morning before work, the combined operator should do the following:

- (i)** Remove any straw or trash that may have been collected around drive pulleys.
- (ii)** Remove any straw or trash that may have been collected on parts within the combined harvester such as on sieves and straw walkers.
- (iii)** Ensure that the grain pan and sieves are clean.
- (iv)** Clean the concave.
- (v)** Clean the threshing drum bars.
- (vi)** Check the cutting mechanisms for adjustment at the knife head section.
- (vii)** Service the engine and transmission system.

At the end of a day's work the combined harvester should be covered with a tarpaulin



**FIGURE 13.11** A grinder

### **13.4.9 Grinding Machines**

Grinding machines are processing machines used in crushing or breaking grains into smaller particles. They are stationary or barn machines operated electrically. Some are designed to be operated mechanically. The commonest types of grinding machines are crushing mill, buhastone mill and hammer mill.

### **13.4.10 Tractor-Coupled Implement**

These include:

- (i)** Primary tillage equipment such as the mould board and disc plough.
  - (ii)** Secondary tillage equipment, such as the spike tooth harrow, planting equipment, manure and fertilizer spreaders, weeders, sprayers, harvesters and threshers.
- (a) Primary Tillage:** This involves the breaking and loosening of the soil to a depth of 15–90 cm. The mouldboard and disc ploughs are the two principal types of primary tillage equipments.
- (b) Secondary Tillage:** This includes all soil stirring operations at comparatively shallow depths. These are normally performed after the deeper

primary tillage operation. The major types of secondary tillage equipment are the spike-tooth harrow and the disc harrow.

### 13.4.11 Ploughs

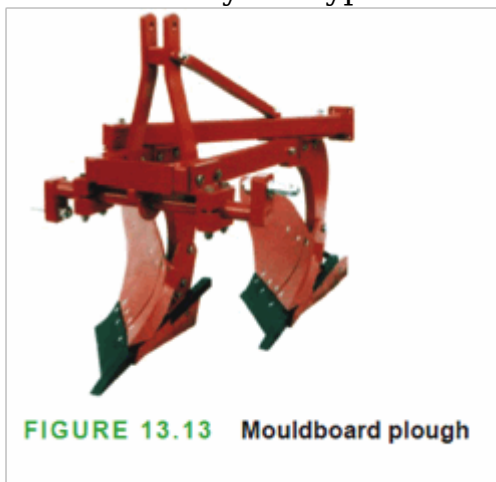
The plough is the primary tillage implement used for working the earth to loosen and pulverize it before the seeds are sown.



The main components of the plough are:

#### The Mouldboard Plough

The mouldboard plough (Fig. 13.13) is responsible for the shattering and inversion of the furrow slice. The degree of both of these factors being determined by the type fitted.



### TYPES OF MOULDBOARD PLOUGH

**(a) General-purpose:** This is associated with shallow ploughing of approximately 20 cm deep in grassland, clay soils or where there is little depth of soil. The body is long with a gentle curvature and a cross-sectional convex curve.

**(b) Semi-digger:** It does deep ploughing of approximately 25 cm (10 in.) for root crops or where the establishment of a seed bed soon after ploughing is desirable. The body is shorter than the general purpose type with a greater curvature and a concave cross-section.

**(c) Digger:** The digger is used for very deep ploughing, approximately 30 mm deep, for root crops or land reclamation work. The body is very concave in cross-section.

The work produced is very broken, with individual furrow slices being virtually indistinguishable. The mouldboard plough consists of three important sections: the mouldboard, the share and the landside. The mouldboard is the part of the plough that is at the back of the share. It receives the furrow slice from the share and turns it.

The share provides the cutting edge and makes the horizontal soil cut. They are made of cast iron and can be resharpened by grinding. The landside (Fig. 13.14) is part of the plough bottom that slides along the face of the furrow wall. It helps to counteract the



effect of the pressure exerted by the furrow slice on the mouldboard.

**Maintenance:** Lubrication requirements on a mouldboard plough are very small since there are few moving parts. After the day's work, all soil engaging areas should be cleaned and coated with oil to prevent rust.

#### **Precautions**

- (i)** Be very careful to couple and pin the plough properly to the tractor.
- (ii)** Do not go under a plough that is in the raised position.
- (iii)** Do not dismount from a tractor with the outfit still in motion.

#### **Disc Ploughs**

The disc plough is generally used where soil conditions are very hard and rough. It is more suited for tropical conditions where the climate is hot and the land bakes hard. It performs better where the mouldboard will not work such as:

- (a)** sticky soils.
- (b)** dry hard ground which the mouldboard cannot penetrate.
- (c)** where there is need to remove stumps, roots and rocks.



**FIGURE 13.15** Principal part of a mounted disk

## Harrows



**FIGURE 13.16** Tractor-mounted disk harrow



**FIGURE 13.17** Tractor-mounted spring tine harrow



**FIGURE 13.18** Spike-tooth and spring-tooth harrows

Harrows function mainly for secondary, tillage which involves the breaking down of the soil to form tilth. They are used for preparation of

seed beds. They can also be used for the following:

- (i) Pulverizing the soil after tillage or cultivation.
- (ii) Breaking up the soil, clods.
- (iii) Consolidating the soil.
- (iv) Eradicating weeds.
- (v) Mixing soil with fertilizers and manure.
- (vi) Aerating pastures.
- (vii) Covering of seeds.

The common types of secondary tillage implements used in Nigeria include the disc harrow, the spring-tooth harrow and the spike-tooth harrow.

**(i) Disc harrows:** Disc harrows consist of sets of concave discs with varying diameters.

They are usually arranged in two or more sets. The front pair throws the soil outwards while the rear pair throws the soil inwards. This double action pulverizes the soil.

**(ii)** The spring-tooth harrow is used as a seed harrow or for light cultivation to loosen previously ploughed soil.

**(iii)** The spike-tooth harrow is used to pulverize and level the soil after ploughing.

**(iv)** Ridgers are a secondary tillage implement used for making ridges after ploughing and harrowing have been completed. They are also used for splitting and remoulding ridges. There are two types of ridgers: (i) the disc ridger

and (ii) the mouldboard ridger. The disc ridger is more popular than the mouldboard ridger because of the



**FIGURE 13.19** A disc ridger

advantages of the disc implements. This includes the following:

### **ADVANTAGES OF RIDGERS**

1. Ridgers prevent weed growth and erosion.
2. It improves soil aeration.
3. It enhances root penetration.
4. Makes harvesting of root and tuber crops easy.
5. Water percolation is also made easy.

### **Planters**



Planters are power-operated devices for placing seeds into the seedbeds. In precision planting, planters open the furrow and drop the seeds at regular intervals both between and within rows and thereafter cover up the seeds. Drilling planters (where seeds are dropped and covered in furrows to obtain definite rows) ensure that seeds are dropped at precise depth with adequate separation between rows and not within rows. Planters may be trailed or tractor mounted. It is possible to attach fertilizer-, pesticide- and herbicide-units to trailing- and rear-mounted planters. The planter consists of a main frame supporting a hopper, which has on its underside the seed metering device. The dispenser unit transfers the seeds from the hopper into the flexible coulters tubes. From these tubes the seed reaches the coulters which open up narrow grooves in the soil for seed placement. The seed-dispensing unit transfers the seed from the hopper to the coulters tubes at a rate that is fairly constant. The coulters are the furrow covers that cut a narrow groove in the soil to take the seed to the appropriate depth. Fig. 13.20(a) shows the basic elements of a maize planter. Fig. 13.20(b) shows the automatic cassava planter, recently designed and built at the Department of Agricultural Engineering, University of Nigeria, Nsukka).



(a)



(b)

**FIGURE 13.20** Planters (a) Maize planter  
(b) Automatic cassava planter



**FIGURE 13.21** Main components of a maize planter

## **Fertilizer Spreader**

A fertilizer spreader is used in applying or broadcasting fertilizers on the farm. It consists of a hopper for holding the fertilizer with agitator, just like seed planter. It also has a feed regulating disc or plate perforated to allow the spread of fertilizer. It rotates and distributes fertilizer by throwing it on the edge. It can also be used to spread manure (i.e., dried manure) on the farm. The following maintenance practices or operations can be carried out on farm machinery.

1. Regular servicing of machines.
2. Worn-out tyres, nuts, screws or shield and other parts of the machine should be replaced.
3. Ensure that nuts, bolts, screws or shield are checked and tightened at regular intervals.
4. Keep the machines clean by removing all trash or mud and excess grease/oil from machines at the start or at the end of operation.
5. Do not overload the tractor, i.e., operate at appropriate speed for field operations and avoid the use under conditions that are not favourable.
6. Check water and oil levels of machines regularly where applicable to ensure that



**FIGURE 13.22** A fertilizer spreader

they are at their normal levels to prevent any overheating or seizure of engine.

7. Check hydraulic system where applicable before operation.
8. Ensure complete coupling on all points of tractor-coupled implements before setting out for work.
9. Moving parts or joints of farm machines should be oiled or greased regularly.
10. Sharpen the blades and repair broken blades where applicable.
11. Employ a competent and experienced tractor operator and technicians to handle the machines.
12. Store machines and implements in a cool and dry place, usually under shade.
13. Adhere strictly to manual or manufacturer's instructions.
14. Always use the implement for the operation for which it was designed.

## **13.5 Reasons for Maintaining Farm Machines**

The following are the reasons why farm machines should be maintained.



1. To ensure maximum or efficient use of farm machines.
2. To keep the machines in a good working condition.
3. To increase their useful life or life span.
4. To prevent them from becoming obsolete or from deteriorating.
5. To detect or spot the potential machine failure and safety from hazards.
6. To prevent vibrations that can produce an irritating noise on the farm.
7. Checking of oil and water levels regularly prevents any overheating or seizure of the engine.
8. Maintenance of farm machines at times reduces the cost, i.e., the cost of purchasing new ones may be high.

**Activity 1:** Visit an agro-service centre or a mechanized farm. Identify the different farm machines and discuss their functions.

**Activity 2:** Draw and label fully the following farm machinery:

- (a) Disc plough
- (b) Disc harrow
- (c) Knapsack sprayer.

State two uses each of these machines. Discuss these farm machinery in your group discussion after school.

### Summary

- ◆ Field machines include tractors, self-propelled implements and trailed operations because they are designed to furnish the power to carry, propel, pull or drive implements.
- ◆ Tractors are at the centre of most field operations. They supply power for most farm operations such as cultivation, drilling seed, top dressing, spraying haulage.

◆ Different types of farm tractors are:

- (a) **Track-laying tractors:** These tractors are sometimes called 'crawlers' and are usually tractors with large horsepower and are capable of doing heavy work.
- (b) **Heavy-wheeled tractors:** These also are used for doing heavy work in the farm and for carrying out very heavy cultivations.
- (c) **General Purpose Tractor:** This is a common type of tractor used in the farm. It is a wheeled-tractor.
- (d) **Two-wheeled tractor:** It is hand-operated, found in most holdings and market gardens. It is powerful enough to do light cultivations and is steered by a walking operator.

Most tractors are powered by internal combustion engines which, although they may vary slightly between one make and another as regards details of construction operate on the same basic principles.

- ◆ Incubators are insulated enclosures in which temperature and humidity are controlled to provide an ideal environment for the development of the chick's embryo.
- ◆ Milking machines are used for harvesting fresh milk from the cow.
- ◆ Field spraying has been very useful in the control of weeds, insects and diseases. The sprayer has simplified the control of weeds in growing cereals and consequently improved on the yield.
- ◆ Harvesters are equipment designed to facilitate the processes of harvesting various crops. Most harvesters are mounted onto the tractor and derive their power from the power-take-off shaft.
- ◆ The plough is the primary tillage implement used for working the earth to loosen and pulverise it before the seeds are sown. Ploughing provides an ideal soil environment for the germination of seeds.
- ◆ Harrows function mainly for secondary tillage which involves the breakdown of soil to form tilth.
- ◆ Ridgers are used for making ridges. They are tractor-mounted implements that act to mould ridge.
- ◆ Planters may be trailed- or tractor-mounted. They are used for placing seeds into the seedbeds.
- ◆ The reasons for maintenance practice are as follows:
  - ◆ To ensure efficient use of machines.
  - ◆ To increase the useful life of machine.
  - ◆ To prevent the machine from going obsolete.
  - ◆ To keep them in good working condition.

## **Revision Questions**

### **Essay Questions**

**1.** Discuss the importance of ploughs in farming. Describe the mouldboard plough or the disc plough stating the different functions of the pans described.

**2.** Write short notes on any three of the following.

- (a) Harrows
- (b) Ridgers
- (c) Planters
- (d) Harvesters

**3.** State five advantages of using tractor on the farm.

- (a) Enumerate five maintenance activities that can be carried out daily on the tractor.
- (b) State five maintenance activities that should be carried out periodically on the tractor.
- (c) (i) What type of fuel is needed to operate the tractor?  
(ii) Does the tractor require the use of spark plug?

**4.** (a) Explain the following terms.

- (i) Primary tillage implement.
- (ii) Secondary tillage implement.

(b) (i) State three reasons why disc ploughs are better suited for soils in West Africa than the mouldboard ploughs.

(ii) List six major parts of a disc plough.

- (c) Give three reasons why secondary tillage is necessary before sowing of seeds.
- (d) State three precautions a farmer should take when spraying chemicals. (WASSCE 2007)
5. Discuss eight maintenance practices including the precautions you would take to keep the tractor operating safely and ensure its durability. (WASSCE 1991)

### **Objective Questions**

1. The function of the scrapper on a disc plough is to
- (a) scrape the top soil.
  - (b) remove adhering soil from the disc.
  - (c) open the furrow.
  - (d) balance the plough.
2. Post-harvest equipment include
- (a) sheller and dryer.
  - (b) sprayer and planter.
  - (c) groundnut lifter and thresher.
  - (d) combine and forage harvesters.
3. The implement used for pulverising the soil is the
- (a) planter.
  - (b) ridger.
  - (c) harrow.
  - (d) plough.
4. An incubator is important in supplying
- (a) heat for day-old chicks.
  - (b) heat for embryo development.
  - (c) light for candling eggs.
  - (d) feed to chicks.
5. Which of the following implements will be used for the next farm operation after clearing a new farmland?
- (a) Harrow
  - (b) Ridger
  - (c) Planter
  - (d) Plough
- Answer**
6. Which of the following parts of a tractor need not be regularly checked before the tractor is put into use?
- (a) Engine oil and water level
  - (b) Tyres and tyre pressure
  - (c) Brake and gear
  - (d) Operators and adjustment

### **Answers to Objective Questions**

1. (b) 2. (a) 3. (c) 4. (b) 5. (d) 6. (b)