Farm Machinery and Equipment-I (Practical Manual)

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Farm Machinery & Equipment-I

A Practical Manual

Jagvir Dixit

DIVISION OF AGRICULTURAL ENGINEERING
SHER-E-KASHMIR UNIVERSITY OF AGRICULTURAL SCIENCES & TECHNOLOGY OF KASHMIR (SKUAST-K)
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Foreword

Farm mechanization plays a vital role in increasing production, productivity and profitability in agriculture by achieving timeliness in farm operations, bringing precision in metering and placement of inputs, reducing available input losses, increasing utilization efficiency of costly inputs (seed, chemical, fertilizer, irrigation, water etc.) and reducing unit cost of produce. It is one of the important inputs to usher in all round development in the rural India.

This manual on ***"Farm Machinery and Equipment -1"*** aims at imparting practical knowledge and training to the students of B.Tech. (Agricultural Engineering) and B.Sc (Agriculture). The students will get first hand practical information on the subject and would become conversant with the fine techniques of conceptual and execution of the controls.

I wish to put on record my sincere appreciation to the author Dr. Jagvir Dixit, Associate Professor & Head, Division of Agricultural Engineering, SKUAST-K, Srinagar for sincere and untiring efforts in compiling this manual. I hope the readers will find this manual useful in imparting technical knowledge to the field of farm machinery and equipment.

(Nazeer Ahmed)

Date. 18.10.2016

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PREFACE

Application of farm machines and equipment has been a matter of great concern to enhance agricultural production in Indian Agriculture. Mechanical power has become the major power source for precisely and timely completion of different farm operations viz. seed bed preparation, sowing & planting operation, intercultural & spraying operation, harvesting & threshing operations etc.

A great need for the preparation of practical manual on "***Farm Machinery & Equipment***" was felt, so that the subject matter could be familiarized to the undergraduate students of Agricultural Engineering, Agriculture and Horticulture.

This manual contains 13practical covering different farm machineries and equipment viz. primary & secondary tillage equipment, sowing and transplanting machines, earth moving machineries, weeding and plant protection machines. For better understanding sufficient nos. of schematic diagrams and line sketches have been added in the manual.

The author expresses deep gratitude and is indebted to the individuals and the faculty of Division of Agricultural Engineering, SKUAST-K, Srinagar for providing the necessary support during the preparation and publication of this manual. The suggestions, if any for the improvements of the manual are welcome and will be gratefully acknowledged.

(Jagvir Dixit)

October, 2016
Srinagar

Contents

Practical No. 1. Introduction to various farm machines and equipment used on the farm

Objectives: (i) To make familiar about various farm machines used on farm

Introduction: Crop production requires a number of operations like seed bed preparation, seeding, fertilizing, spraying, dusting, irrigation, harvesting and threshing. The various farm equipment/machines have been used on the farm to perform these operations in order to enhance their output capacity, efficiency, timeliness of operation and to reduce drudgery involved.

1. Seed bed preparation

Seed bed preparation is the first operation in production of crop which is very labour intensive operation. The main objective of seed bed preparation is to provide favourable condition for proper crop growth through mechanical manipulation of soil. Soil tillage consists of breaking the compact surface of earth to a certain depth and to loosen the soil mass so as to enable the roots of the crops to penetrate and spread into the soil.

Tillage operations for seed bed preparations are classified as: i) Primary tillage ii) Secondary tillage.

2. Seeding

Seeding or sowing is an art of placing seeds in the soil to have good germination in the field. A perfect seeding gives

- Correct amount of seed per unit area.
- Correct depth at which seed is placed in the soil.
- Correct spacing between row-to-row and plant-to-plant.

The various Sowing methods are as below:

(i) Broadcasting (ii) Dibbling (iii) Drilling (iv) Seed dropping behind the plough (v) Transplanting (vi) Hill dropping (vii) Check row planting

3. **Intercultural operation**

Weeds can compete with productive crops or pasture, or convert productive land into unusable scrub. Weeds are also often poisonous, distasteful, produce burrs, thorns or other damaging body parts or otherwise interfere with the use and management of desirable plants by contaminating harvests or excluding livestock. They provide competition for space, nutrients, water and light.

The weeder can be classified as (i) Dry land weeder (ii) Wet land weeder (cono weeder), Sweep, Engine Operated weeder etc.

4. Plant Protection

There is increase in plant pests and diseases as more fields remain covered under crops for longer duration of time due to multiple cropping, intensive farming and better irrigation facilities. So it has become necessary now to use pesticides and fungicides for controlling the pests and diseases. The chemicals are applied on plants in the form of spray and dust. Many types of sprayers and dusters are available in different sizes for plant protection work.

Sprayer

Sprayer is a machine to apply fluids in the form of droplets. Sprayer is used for the following purpose.

- Application of herbicides to remove weeds.
- Application of fungicides to minimize fungus diseases.
- Application of insecticides to control insect pests.
- Application of micro nutrients on the plants.

The main functions of sprayer are

- To break the liquid droplets of effective size.
- To distribute them uniformly over the plants.
- To regulate the amount of liquid to avoid excessive application.

Duster

It is a machine to apply chemical in dust form. Duster make use of air streams to carry pesticides in finely ivided dry form on the plants.

Exercise 1.1 Enlist the name of equipment/machines used for different field operations.

S. No.	Name of field operation	Name of implement/machine used
1.	Seed bed preparation a. Primary tillage b. Secondary tillage	 1. _____ 2. _____ 3. _____ 1. _____ 2. _____ 3. _____
2.	Sowing/Planting/Transplanting	1. _____ 2. _____ 3. _____ 4. _____
3.	Intercultural operation	1. _____ 2. _____ 3. _____

4.	Plant protection	1. _____ 2. _____ 3. _____

Practical. 2. To Measure Field capacity and field efficiency of Farm implements

Objectives:

i. To measure field capacity of farm implements used on farm

ii. To measure field efficiency of farm implements used on farm

Equipment Required:

1. Tractor
2. Disk harrow
3. Cultivator
4. Measuring Tape
5. Stop Watch

Methodology:

Select an area of approximately 10 x 10 m for determination of field capacity and field efficiency of the implement. For theoretical capacity, take a test run of 10 m. Operate the farm machinery at optimum speed and at suitable gear in the field. Note down the average time taken by the implement to cover 10 m run. Also record average width coverage by implement in one pass. Find the theoretical field capacity to be covered by the implement based on width of the implement and speed of the implement using the formula, find the theoretical field capacity of the implement.

For effective field capacity, operate the farm machinery to cover 10 x 10 m area taking into consideration of various time losses turning, refueling, adjustment, if any or any other time loss in the field. Operate the farm machinery in the selected field and note down the total time taken by the implement to cover 100 m^2 area.

Theoretical Field capacity:

It is the rate of field coverage of the implement, based on 100 percent of the time at the rated speed and covering 100 percent of its rated width.

$$\textbf{Theoretical Field capacity (ha/h)} = \frac{\text{width of implement(m) x speed of implement (m/h) x}}{1000}$$

Effective field capacity:

It is actual area covered by the implement based on its total time consumed and its width. Effective field capacity is calculated as

$$\text{Effective field capacity} = \frac{\text{width of coverage(m) x speed of implement (m/h) x } \eta}{1000}$$

Where η = field efficiency

Field efficiency (η) :

It is the ratio of effective field capacity anf theoretical field capacity expressed in per cent.

$$\text{Field efficiency} = \frac{Effective\ field\ capacity}{Theoretical\ field\ capacity} \text{ x } 100$$

Numerical 2.1. A three bottom 40 cm Disc plough has a working depth of 20 cm, field efficiency is 80 % and working speed is 4 km/h. Find the actual field capacity of the plough.

Sol.

Exercise 2.1: Measure the field capacity and field efficiency of Tractor drawn disk harrow.

Observations to be recorded:

Particulars	**1**	**2**	**3**	**4**	**5**	**Average**
Time taken to cover 10 m length (min)						
Width of coverage (m)						

Exercise 2.2: Measure the field capacity and field efficiency of Tractor drawn cultivator.

Observations to be recorded:

Particulars	**1**	**2**	**3**	**4**	**5**	**Average**
Time taken to cover 10 m length (min)						
Width of coverage (m)						

.

Practical 3. Draft & fuel consumption measurement for different implements under different soil conditions.

Objective:

1. To measure the draft of different tillage implements under different soil conditions.
2. To measure fuel consumption of different tillage implements under different soil condition.

Equipment required:

1. Tractor
2. Tillage implement (plough, Harrow, cultivator etc)
3. Load cell/ spring dynamometer (1000 kgf)
4. Fuel flow meter
5. Measuring tape, scale

Methodology

Draft (D): It is the horizontal component of the pull, parallel to the line of motion.

$D = P \cos \theta$

Where,

D = draft (kgf)

P = pull (kgf)

θ = angle between line of pull and horizontal

Pull (P) : It is the total force required to pull an implement.

Metric hp = $\frac{\boldsymbol{Draft\ (kgf) x\ Speed\ (m/s)}}{\mathbf{75}}$

Side Draft: It is the horizontal component of the pull perpendicular to the direction of motion. Side draft is developed if the centre of resistance is not directly behind the centre of pull.

Unit draft: It is the draft per unit cross sectional area of the furrow.

Fuel Consumption

The fuel consumed by an engine can be measured by determining the volume of flow of fuel in a given time interval and multiplying it by the specific gravity of the fuel.

Continuous flow meters like Flotron are also used to measure fuel consumption which give instantaneous readings.

Experiment: Determine the fuel consumption of different engines under different load conditions

S.No	**Name of engine/machine**	**Operation**	**Fuel consumed (lit/h)**			
			1	**2**	**3**	**4**
1.	Power Tiller	Rotalling				
		Transportation				
2.	Tractor	ploughing				
		Intercultural operation				
		Harrowing				

Practical 4. Study of construction details, adjustments and working of M.B. plough

Objectives:

i) To study the various components of M.B. plough and their function

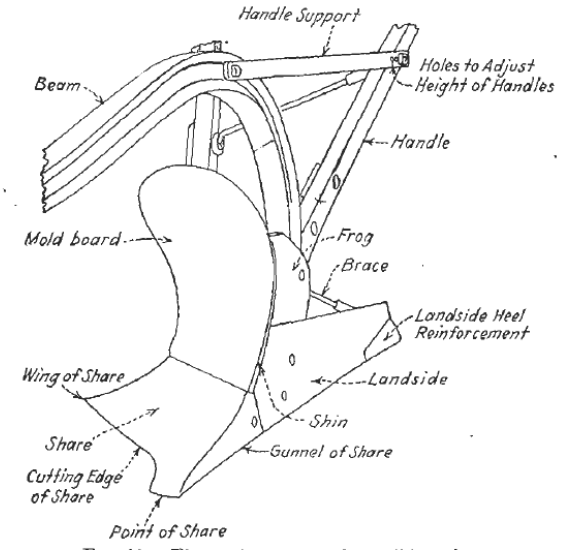
ii) To study the various adjustments of M. B. Plough

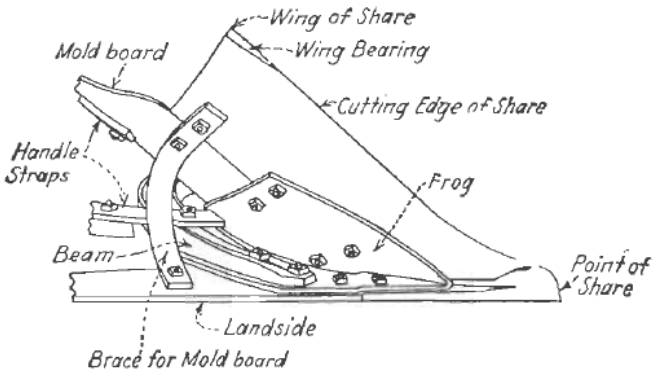
Introduction: Mould board plough cuts, loosen, invert the furrow slice and provide a deep seed bed of good structure for seed bed preparations. The main functions of M.B. plough are:

Main Function: (i) cutting the furrow slice (ii) lifting the soil (iii) Turning the furrow slice and (iv) pulverising the soil.

Components

M.B. plough consists of Share, Mould board, Land side, Frog and Tail piece.





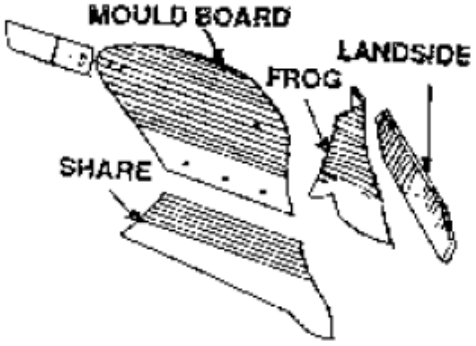


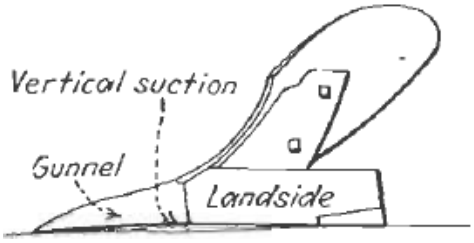
Fig. 4.1 Components of M. B. Plough

Various Adjustment of M.B. Plough

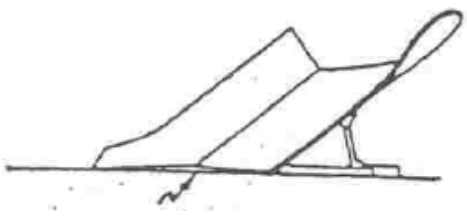
1. **Vertical clearance or suction:** It is the maximum clearance under the land side and the horizontal surface when the plough is resting on a horizontal surface in the working position. It is the vertical distance from the ground, measured at the joining point of share and land side. It helps the plough to penetrate into the soil to a proper depth. This clearance varies according to the size of the plough.

2. **Horizontal Clearance or suction**: It is the maximum clearance between the land side and a horizontal plane touching point of share at its gunnel side and heal of land side. This suction helps the plough to cut the proper width of furrow slice. This clearance varies according to the size of the plough. It is also known as side clearance.

3. **Throat clearance**: It is the perpendicular distance between point of share and lower position of the beam of the plough.



Vertical Suction



Horizontal Suction

Fig. 4.2. Vertical and Horizontal clearance in M.B. Plough

Plough size : The size of the mouldboard plough is expressed by width of cut of the soil.

Exercise 4.1 Measure the following parameters of a M.B. Plough

S. No.	Parameters	Value (mm)			Mean (mm)
		R_1	R_2	R_3	
1	Plough size				
2.	Vertical clearance				
3.	Horizontal clearance				
4.	Throat clearance				
5.	Depth of cut				

Exercise 4.2 Write down the functions of following components of M. B. Plough

Components	Function
1. Share:	_____
2. Mouldboard:	_____
3. Landside:	_____
4. Frog:	_____
5. Tail Piece:	_____
6. Jointer	_____
7. Coulter:	_____
8. Gauge wheel:	_____
9. Land wheel	_____
10. Furrow wheel:	_____

Practical 5. Study of construction details, adjustments and working of Disc plough

Objectives:

i) To study the various components of disc plough and their function

ii) To study the various adjustments of disc Plough

Introduction: It is a plough, which cuts, turns and in some cases breaks furrow slices by means of separately mounted large steel discs. A disc plough is designed with a view of reduce friction by making a rolling plough bottom instead of sliding plough bottom. A disc plough works well in the conditions where mould board plough does not work satisfactorily. It consists of steel disc of 60 to 90 cm diameter, set at a certain angle to the direction of travel. Each disc revolves on a stub axle in a thrust bearing, carried at the lower end of a strong stand which is bolted to the plough beam. The angle of the disc to the vertical and to the furrow wall is adjustable. In action, the disc cuts the soil, breaks it and pushes it sideways. There is little inversion of furrow slice as well as little burying of weeds and trashes. The disc plough may be mounted type or trailed type. In mounted disc plough, the side thrust is taken by the wheels of the tractor. Disc is made of heat treated steel of 5 mm to 10 mm thickness. The amount of concavity varies with the diameter of the disc. The approximate values being 8 cm for 60 cm diameter disc and 16 cm for 95 cm diameter.

Various Adjustments in a Disc Plough

1. **Penetration**: Penetration can be improved by (a) increasing the disc angle (b) decreasing the tilt angle (c) by adding additional weight on the plough

2. **Width of cut**: It can be adjusted by adjusting the angle between the land wheel axle and the frame.

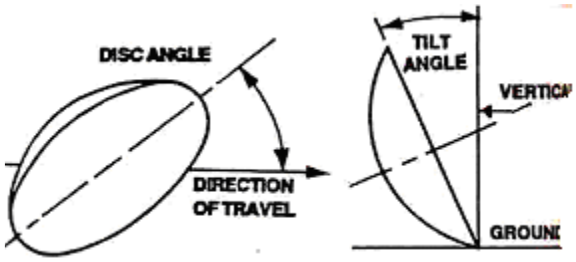


Fig.5.2 Angles of disc plough

Exercise 5.1 Label the various components of following disc plough

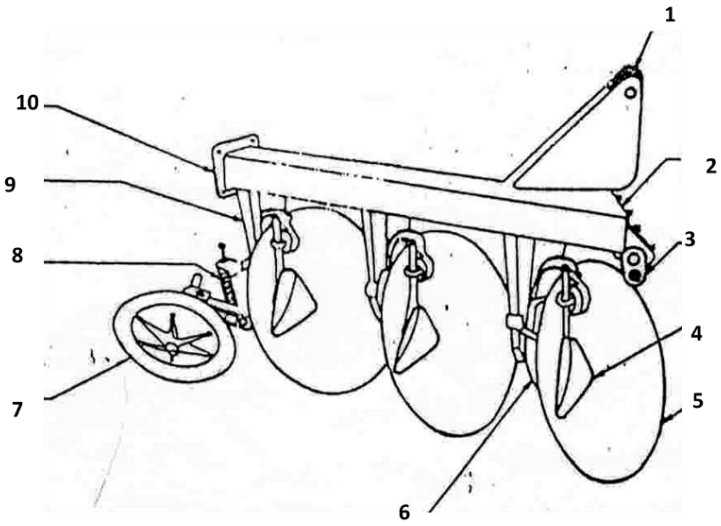


Fig. 5.1 Standard disc plough

Number	Name of component	Number	Name of component
1.	_____	6.	_____
2.	_____	7.	_____

3. _____ 8. _____

4. _____ 9. _____

5. _____ 10. _____

Exercise 5.2 Write down the functions of following components of disc Plough

Components	Function
1. Disc:	_____
2. Main Frame:	_____
3. Standard:	_____
4. Rockshaft:	_____
5. Scraper:	_____
6. Concavity:	_____
7. Furrow wheel:	_____

Practical 6. Study of construction details, adjustments and working of Disc Harrow

Objectives:

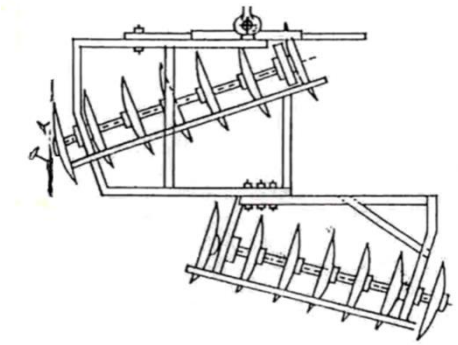
i) To study the various components of disc harrow and their function

ii) To study the various adjustments of disc harrow

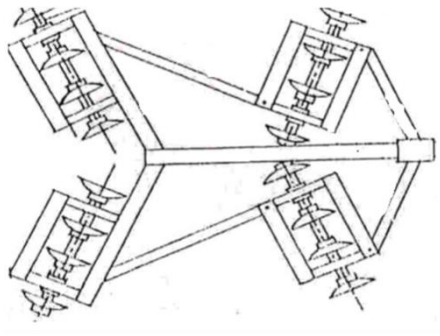
Introduction: It is a harrow, which performs the harrowing operation by means of a set, or a number of sets of rotating slat discs, each set being mounted on a common shaft. Disc harrow is found very suitable for hard ground, full of stalks and grasses. It cuts the lumps of soil, clods and roots. Disc are mounted on one, two or more axles which may be set at a variable angle to the line of motion. As the harrow is pulled ahead, the discs rotate on the ground. Depending upon the disc arrangements, disc harrows are divided into two classes a) Single action and b) Double action.

Exercise 6.1 Write the name of following types of disc harrow

1. _____ 2. _____ 3. _____



4._____

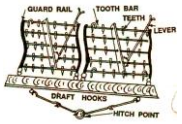
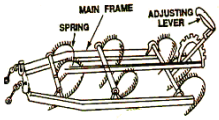
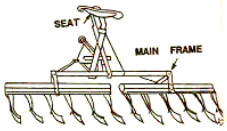
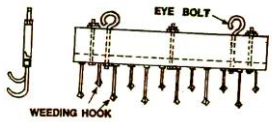
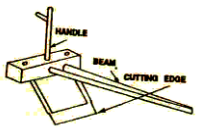
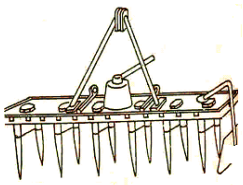


5._____

Exercise 6.2 write down the functions of different components of disc harrow

Components	Function
1. Disc:	_____
2. Gang:	_____
3. Arbor bolt:	_____
4. Gang axle:	_____
5. Gang control lever:	_____
6. Weight box:	_____
7. Spool/spacer:	_____
8. Transport wheel:	_____
9. Bearing:	_____
10. Scraper:	_____

Exercise 6.3. Write down the name of following types of harrow and their special use.

Picture	Name of harrow	Special use
		
		
		
		
		
		
		

Practical 7. Study of construction details, adjustments and working of Cultivator

Objectives:

i) To study the various components of a cultivator and their function

ii) To study the different types of shovel and sweep used in a cultivator

Introduction: It is an implement for inter cultivation with laterally adjustable tines or discs to work between crop rows. The cultivator stirs the soil, and breaks the clods. The tines fitted on the frame of the cultivator comb the soil deeply in the field. A cultivator performs functions intermediate between those of plough and the harrow. Destruction of weeds is the primary function of a cultivator.

Functions:

- Interculture the fields.
- Destroy the weeds in the field.
- Aerate the soil for proper growth of crops.
- Conserve moisture by preparing mulch on the surface.
- To sow seeds when it is provided with sowing attachments.
- To prevent surface evaporation and encourage rapid infiltration of rain water into the soil.

The cultivator can be 1) Disc cultivator, 2) Rotary cultivator, 3) Tine cultivator.

Exercise 7.1 Label the parts of following cultivator and write their function.

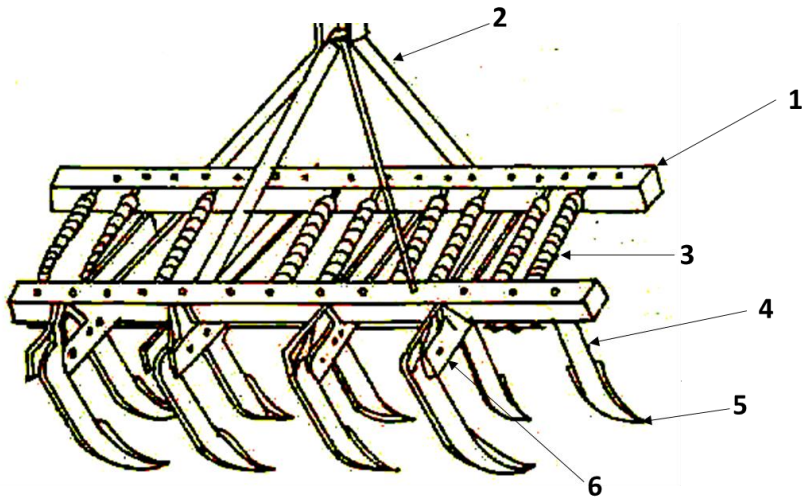
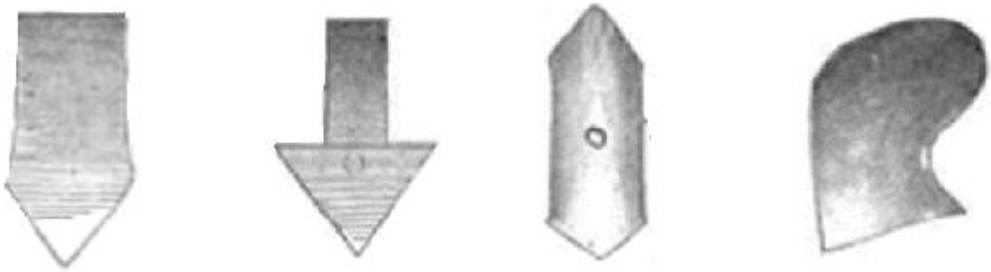


Fig. 7.1 Cultivator with spring loaded tynes

S. No.	Components	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____

Exercise 7.2 Write the name of following types of shovel /sweep alongwith their specific use.



1._____ 2._____ 3._____ 4._____

5._____ 6._____ 7._____

S. No. Name	Use
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____

Practical 8. To study the Construction details and working of earth moving machinery

Objectives:

i) To study the various components of a earth moving machinery and their function

ii) To study the working of earth moving machinery

Introduction: Earth moving equipments are generally used for digging and mowing the unwanted soil from one place to another. The major benefits of earth moving equipments are to reduce the workload of the human resource, save time as well as money.

1. **Excavator**

An excavator consists of an articulated arm (backhoe), bucket and cab mounted on a pivot (a rotating platform, like a Lazy Susan) a top and undercarriage with tracks or wheels. Excavators are intended for excavating rocks and soils. It digs, elevates, swings and dumps material by the action of its mechanism, which consists of boom, arm, bucket and hydraulic cylinders. Bucket is used for trenching, in the placement of pipe and other under-ground utilities, digging basements or water retention ponds, maintaining slopes and mass excavation.

2. **Backhoe Loaders**

Backhoe loaders share many similarities with tractors. The main difference is they contain a shovel at the front which can be adjusted and a bucket at the rear which is used to dig. Backhoe loaders are usually the best choice for smaller jobs which need to be completed in a more restrained space. Backhoe loaders shift dirt, shovel trenches and position pipes into place.

3. **Bulldozers**

Generally Bulldozers are believed to be the most heavy-duty machines in farm machineries. Bulldozers are used for shifting large amounts of dirt on sites where there are wide open spaces, rough grading, and grinding rock. Bulldozers are

easily identified by the huge blade at the front of the equipment that is controlled with the use of hydraulic pistons.

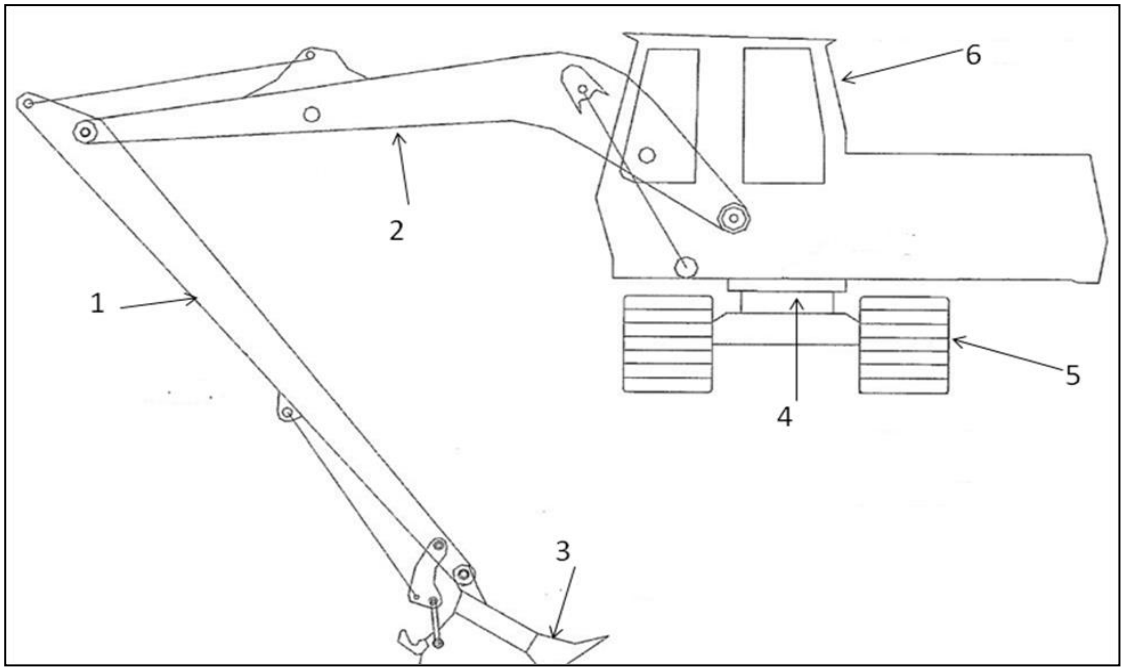
4. Trencher

Trenchers are mostly used to dig trenches before pipes are laid down. A range of different trencher machines are available including walk-behind modules, smaller-sized trenchers or heavier equipment used to trench firmer ground.

Exercise 8.1: Enlist the following types of earth moving machine

S.No.	Sketch of machine	Name of machine
1.		
2.		
3.		
4.		

Exercise 8.2. Label the components and write their function in the following Backhoe loader



S. No.	Name	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____

Practical 9. To study the Construction details and working of rotavator

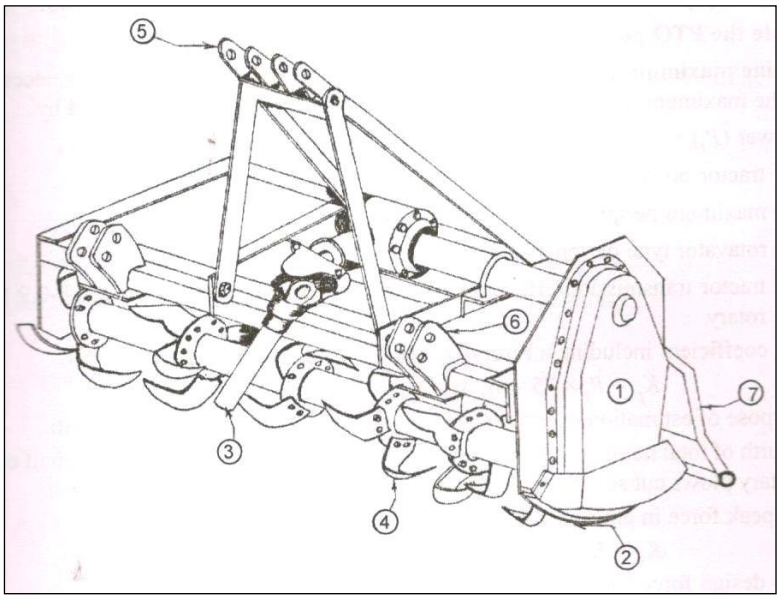
Objectives:

i) To study the various components of a rotavator and their function

ii) To study the working of a rotavator

Introduction: A rotavator is a secondary tillage implement especially designed for seed bed +preparation in a single pass. It gives excellent pulverization of soil and mixes the trash, crop residues, weeds etc. into the soil. It works on the principle of rotary motion. It takes its drive from tractor PTO shaft and transmits to the tynes through the reduction gear so that its tynes rotates at 250-350 rpm while in operation. It consists of steel frame, a rotary shaft on which blades are mounted, power transmission system and gear box. Rotary motion of the PTO is transmitted to the shaft carrying the blades through gear box and transmission system. The main components of tractor drawn rotavator are (i) Hitch point (ii) PTO shaft attachment (iii) Tyne (iv) Chain sprocket driver cover (v) Depth control plate (vi) Hydraulic linkage hitch (vii) Leveller

Exercise 9.1. Label the components and their functions in the following rotavator



S. No.	Components	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____

Practical 10. Study of seed cum fertilizer drill and its calibration

Objectives:

i) To study the various components of seed cum fertilizer drill

ii) To study the calibration method of seed cum fertilizer drill

Introduction: Seeding or sowing is an art of placing seeds in the soil to have good germination in the field. A perfect seeding gives (a) Correct amount of seed per unit area. (b) Correct depth at which seed is placed in the soil. (c) Correct spacing between row-to-row and plant-to-plant.

Seed cum fertilizer drill : Seed cum fertilizer drill consists of dropping seeds in furrow lines in a continous flow and covering them with soil.

Components of Seed Drill : A seed drill with mechanical seed metering device mainly consists of: (i) Frame (ii) Seed box (iii) Seed metering mechanism (iv) Furrow openers (iv) Covering device (vi) Transport wheels.

Seed Metering Mechanism: The mechanism of a seed drill or fertilizer distributor which delivers seeds or fertilizers from the hopper at selected rates is called *seed metering mechanism*. Seed metering mechanism may be of several types:

(a) Fluted feed type (b) Internal double run type (c) Cup feed type (d) Cell feed mechanism (e) Brush feed mechanism (f) Auger feed mechanism (g) Picker wheel mechanism (h) Star wheel mechanism.

Calibration of seed drill: The procedure of testing the seed drill for correct seed rate is called calibration of seed drill. It is necessary to calibrate the seed drill before putting it in actual use to find the desired seed rate. It is done to get the pre determined seed rate of the machine. The following steps are followed for calibration of seed drill.

Procedure:

i. Determine the nominal width (W) of seed drill

W = M x S,

Where,

M = Number of furrow openers, and

S = Spacing between the openers, m

ii. Find the length of the strip (L) having nominal width (W) necessary to cover 1 ha (10000 m^2) area

L = 10000/W, meter

iii. Determine the number of revolutions (N) of the ground wheel of the seed drill required to cover the length of the strip (L)

L = π x D x N = 10000/W

N = 10000/ π x D x W revolutions per minute

iv. Jack the seed drill so that the ground wheels turn freely. Make a mark on the drive wheel and a corresponding mark at a convenient place on the body of the drill to help in counting the revolutions of the ground wheel

v. Fill the selected seed in the seed hopper. Place a container under each boot for collecting the seeds dropped from the hopper

vi. Set the seed rate control adjustment for maximum position and mark this position on the control for reference

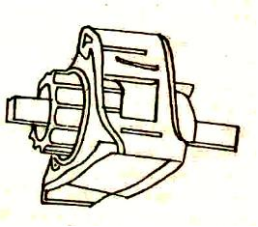
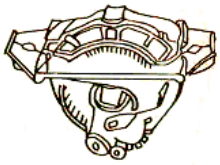
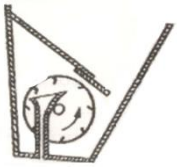
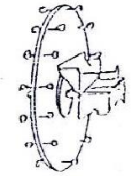
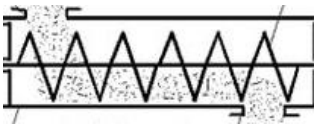
vii. Engage the clutch and rotate the ground wheel for N = 10000/ π x D x N, revolutions per minute

viii. Weigh the quantity of seed collected in the container and record the observation.

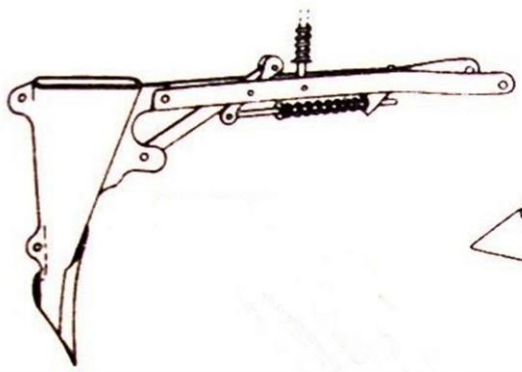
ix. Calculate the seed rate in kg/ha

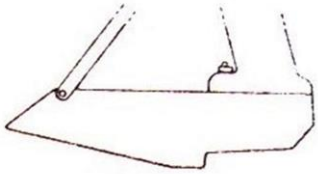
x. If the calculated seed rate is higher or lower than the desired rate of selected crop, repeat the process by adjusting the seed rate control adjustment till the desired seed rate is obtained.

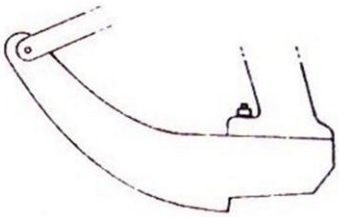
Exercise 10.1 Identify the following seed metering mechanism.

Sketch of metering mechanism	Name of metering mechanism
	_____
	_____
	_____
	_____
	_____
	_____

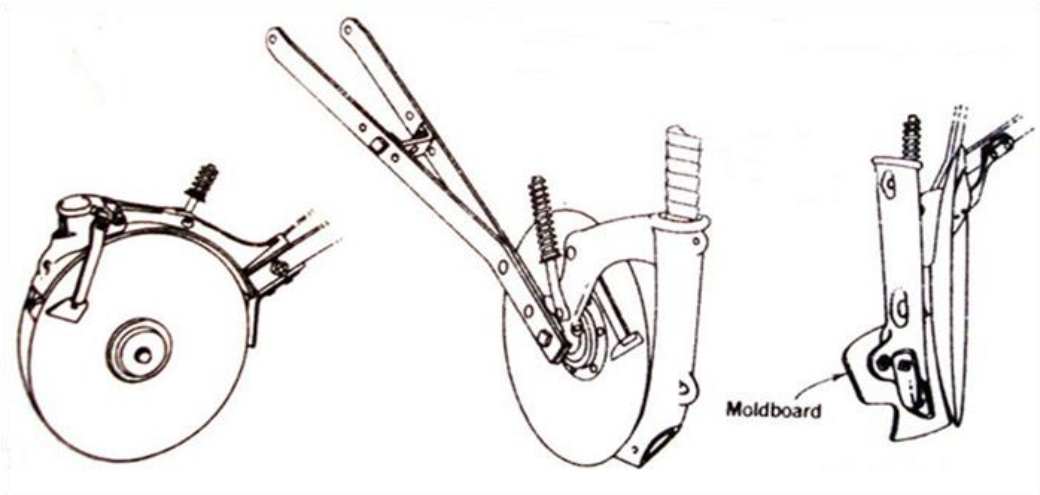
Exercise 10.2 Identify the type of furrow openers used in seed cum fertilizer drill as shown below.





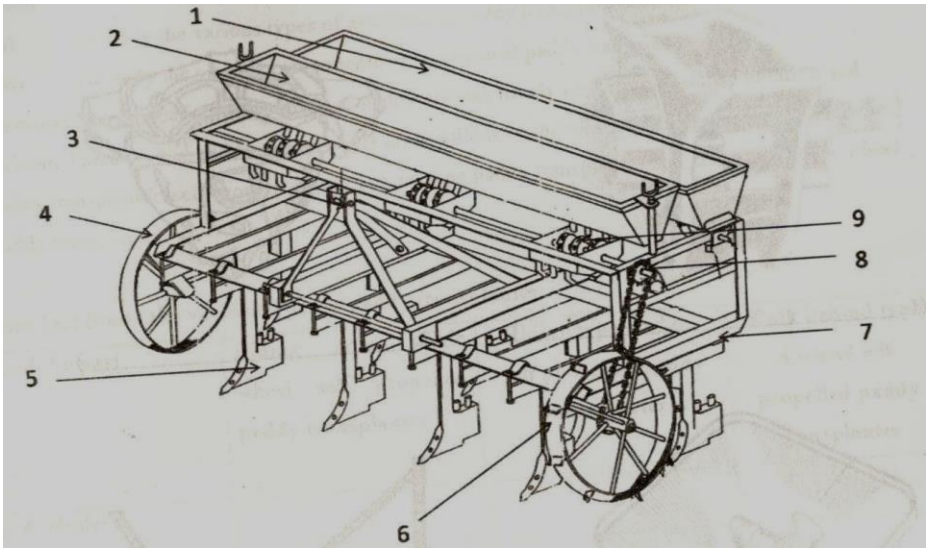


1._____ 2. _____ 3. _____



4._____ 5._____ 6._____

Exercise 10.3 Label the component of the seed cum fertilizer drill and write their main function



S. No.	Components	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____

9.	_____	_____

Practical. 11. Study of different type of mechanical paddy transplants

Objectives:

1) To study the various types of mechanical paddy transplanters

2) To study the various components of mechanical paddy transplanters

Introduction: Mechanical transplantation of paddy ensure timely operation of transplantation saves labour. Three type of paddy transplanters are available in the market - self-propelled single wheel type paddy transplanters, self-propelled walk behind paddy transplanter and self-propelled 4-wheel type paddy transplanter.

Exercise 11.1 study the various types of paddy transplanter

Name of the part	**Manual paddy transplanter**	**Riding type single wheel self propelled paddy transplanter**	**Riding type 4 wheel self propelled paddy transplanter**
Make & Model			
Type of Engine			
Number of rows			
Total width			
Steering handle			
Seedling platform			
Seedling picking fingers			
Float			

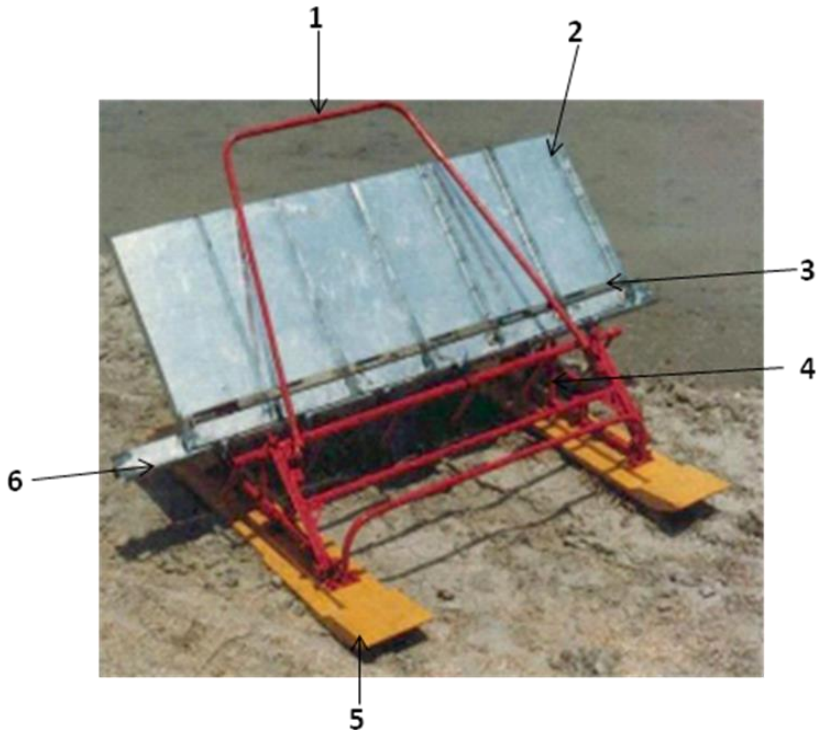
Covering device			
Towing bar			
Driving wheel			

Exercise 11.2 Label the major components of self-propelled riding type single wheel paddy transplanter and write their function.

S. No.	Components	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

5. _____	_____
6. _____	_____
7. _____	_____

Exercise 11.3 Label the components of Manual paddy transplanter alongwith their function



S. No.	Components	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____

4. _____	_____
5. _____	_____
6. _____	_____

Practical 12. Study of different weeding equipments and their use

Objective:

i. To study the various types of weeding/ intercultural equipments

Introduction:

Weeds can compete with productive crops or pasture, or convert productive land into unusable scrub. Weeds are also often poisonous, distasteful, produce burrs, thorns or other damaging body parts or otherwise interfere with the use and management of desirable plants by contaminating harvests or excluding livestock. They provide competition for space, nutrients, water and light.

Manually weeding is done by khurpi, sickle, kudali, tangaroo, wheel hand hoe, cono weeder etc. whereas mechanical weeding is done by self propelled power weeder and tractor operated rotary weeder.

The various types of weeders are

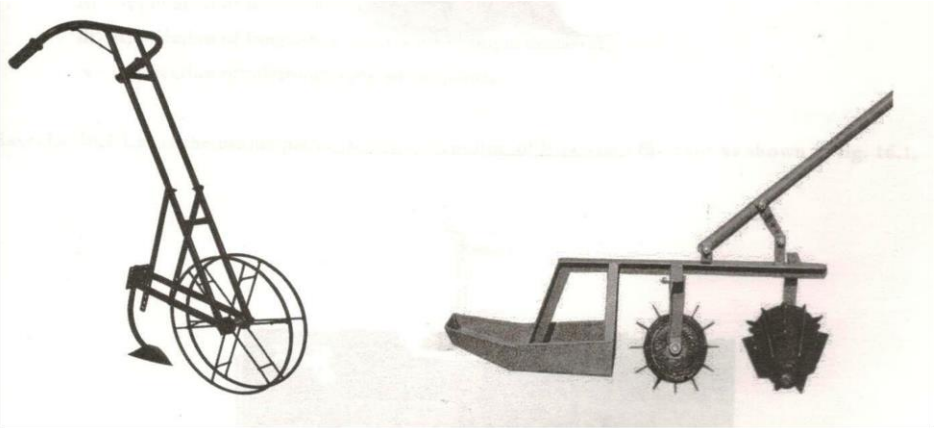
(i) Dry land weeder

(ii) Cono weeder for rice

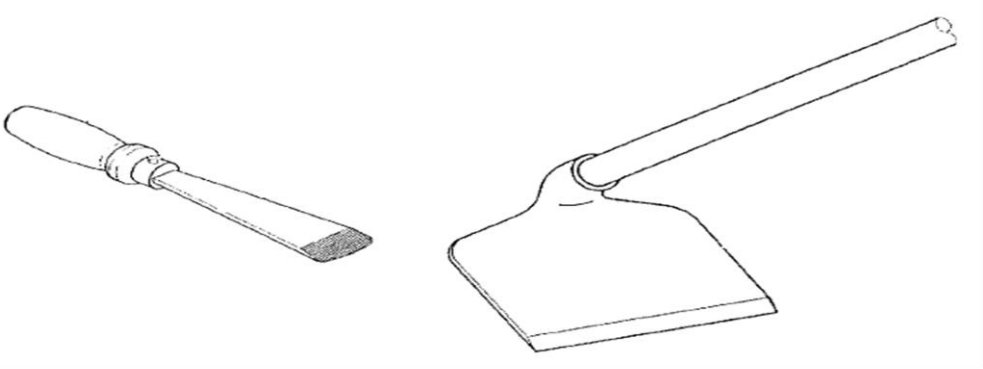
(iii) Selfpropelled weeder

(iv) Tractor operated rotary weeder

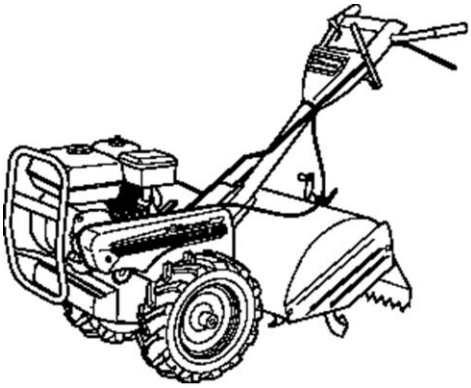
Exercise 12.1 Identify the types of weeding equipments



1._____ 2._____

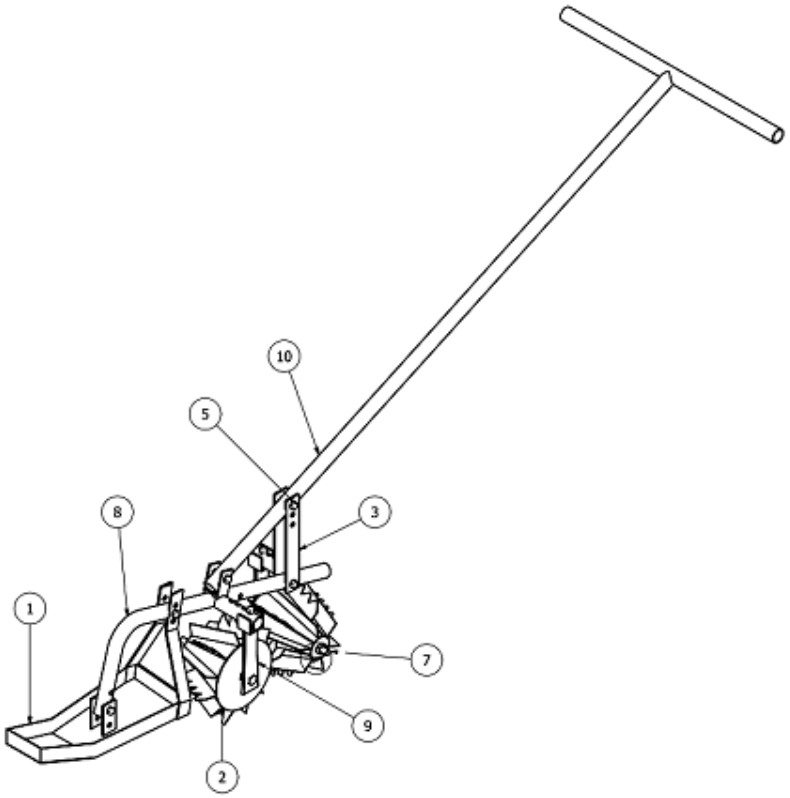


3._____ 4._____



5._____ 6._____

Exercise 12.2. Label the components of cono weeder along with their function.



S. No.	Components	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____

8. _____	_____
9. _____	_____
10. _____	_____

Practical 13. Study of sprayers & dusters and measurement of nozzle discharge

Objectives:

1. To study the major components and their functions
2. To study the various types of sprayer and their application
3. To study the various types of nozzles and their applications

Introduction: Sprayer is a machine to apply fluids in the form of droplets. Sprayer is used for the following purpose.

- Application of herbicides to remove weeds.
- Application of fungicides to minimize fungus diseases.
- Application of insecticides to control insect pests.
- Application of micro nutrients on the plants.

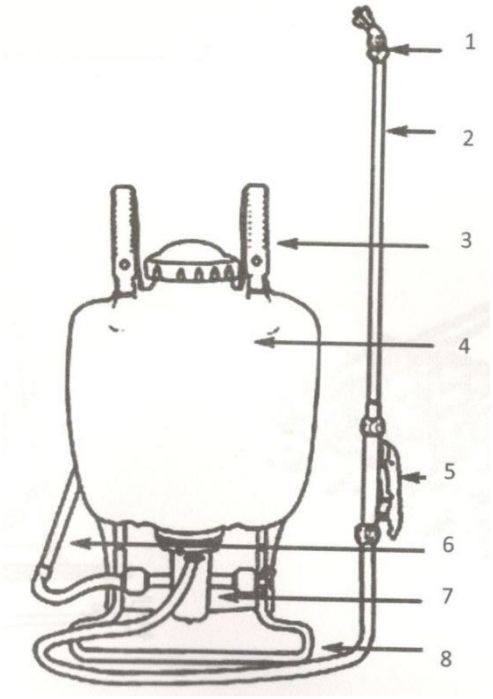
The main function of a sprayer are

(1) To break the liquid droplets of effective size. (2) To distribute them uniformly over the plants. (3) To regulate the amount of liquid to avoid excessive application.

Basic Components of Sprayer: Components of a sprayer are as follows

(1) Nozzle body (2) Swirl plate (3) Filter (4) Over-flow pipe (5) Relief valve (6) Pressure regulator (7) Cut-off valve (8) Spray boom (9) Drop legs (10) Nozzle boss (11) Nozzle disc (12) Nozzle cap (13) Nozzle tip (14) Spray lance (15) Spray gun.

Exercise 12.1 Label the major parts of knapsack sprayer shown below and write their function.

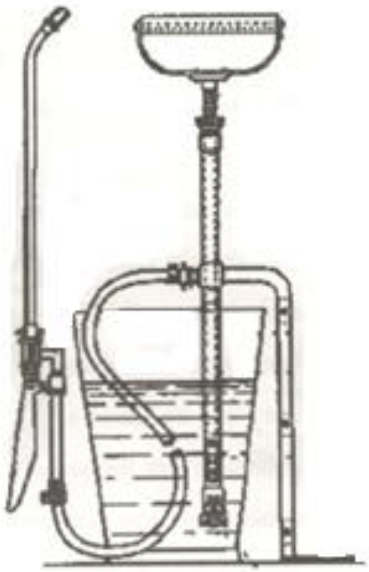


S. No.	Components	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____

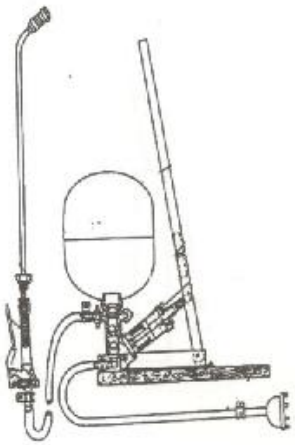
8. _____	_____

Exercise 13.2 Identify the following sprayers and write their specific use.

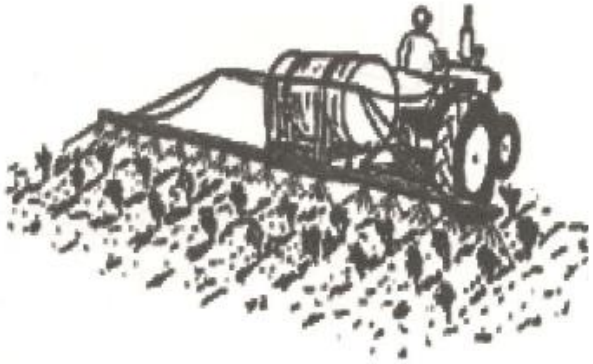
1._____



2._____



3. _____



4. _____

Exercise 13.3 Identify the following nozzle and their spray pattern being used in agriculture

1._____ 2._____ 3._____

Exercise 13.4 Measure the discharge of different types of nozzle used in sprayers

Nozzle Type	Discharge (*l*/min)			Average discharge (*l*/min)
1._____				
2._____				
3._____				