

Identification of Common Tools and Equipments used for the Cultivation of Vegetable Crops

Exercise 20.1: Identification of common tools used in manual preparation of land and intercultural operations for the cultivation of vegetable crops.

Exercise 20.2: Identification of large implements used for land preparation and sowing of vegetable crops.

Exercise 20.3: Identification of plant protection equipments used for controlling vegetable pests.

Exercise 20.4: Identification of implements used in harvesting of vegetable crops.

Objective: Acquaintance with different tools and equipments along with their use in vegetable production.

Delivery schedule: 01 period

Student's expectations/learning objective:

- Importance of different implements in vegetable production.
- Functions and handling of different tools and equipments.

Handouts/material required/equipment's & tools: Paper sheet and pen to note down the instructions, different tools and equipments.

Pre-learning required: Different methods of field preparation and intercultural operations in vegetable crop production.

Introduction:

From the beginning of agriculture, the man has invented and used numerous kinds of implements/machinery for various field operations. The consistent efforts are being made to improve the working efficiency of the first introduced tools. Presently, wide variation exists in the use of implements. On the one hand, the advanced countries have adopted all the mechanized automatic machines for conducting various field operations thereby, reducing the dependence on manpower. On the other hand, in under developed and developing countries, most of the agricultural operations are done manually with small hand tools and implements which

need more manual labour. The implements according to the power used for their application can be grouped into three categories:

1. **Hand-operated:** The implements which are used by hand. These are less efficient as compared to animal drawn or power drawn implements. However, hand-operated tool/implements are very important in small land holdings especially in areas with undulating topography where human labour is readily available and is relatively cheaper *e.g.* hand plough, spade, sickle, *etc.*
2. **Animal drawn:** The heavy implements requiring more power to draw cannot be operated by human-beings. Hence, animals such as bullocks, buffaloes, yak, camel, horses *etc.* are used to draw them, these implements are called as animal drawn implements *e.g.* plough, cultivator, harrow, seed drill *etc.*
3. **Power drawn:** The implements and machinery requiring more power for their operation are called power drawn implements/machines. They can be operated with tractors, engines or any such power *e.g.* tractor drawn ploughs, harrow, cultivators, threshers, combines *etc.*

Advantages of improved implements and machines: The improved implements and machines increase the working efficiency of various farm operations by achieving:

- (i) In time field operations.
- (ii) Quality bed/land preparation.
- (iii) Desired plant population can be maintained.
- (iv) Economy and effective use of seed, fertilizers, chemicals and other inputs.
- (v) Reduction in drudgery in crop cultivation.

Different operations which are required for the systematic cultivation of vegetable crops can be grouped into:

- (i) Seed bed/land preparation
- (ii) Fertilizer application and sowing
- (iii) Inter-cultivation
- (iv) Irrigation and drainage
- (v) Plant protection
- (vi) Threshing and cleaning

Exercise 20.1: Identification of common tools used in manual preparation of land and intercultural operations for the cultivation of vegetable crops

Tillage implements (*Seed bed preparation and other inter-cultural operations*): Tillage is the first field operation for cultivation of any crop. Successful cultivation of crops needs tillage practices for seed bed/land preparation. A good seed bed/land free from weeds provides favourable conditions for raising a good vegetable crop. A number of tillage implements are used to make the soil friable and suitable for sowing/planting and good enough to sustain the plant life.

1. **Spade:** A hand tool consists of flat iron blade and iron joint to fix the wooden handle and has a sharp front. It is available in different sizes and is used for:

- Lifting and turning the soil.
- Digging the pits, preparing channels for irrigation and drainage.
- Construction of field bunds.
- Preparation of seed beds and hoeing of crops sown at wide row spacing and earthing up.
- Uprooting of bushes and stubbles.
- Harvesting of potato, sweet potato *etc.* by digging.



2. **Small garden spade:** Blade is smaller in size than the spade. It is most commonly used for making field bunds, seed bed preparation and hoeing (breaking and loosening of soil along with weeding) of crops.

3. **Khurpa:** It is widely used in hard soils for breaking and loosening the soil in addition to weeding, earthing up and digging small pits for transplanting vegetable seedlings. Potato and other vegetables can be harvested with it.



4. **Digging-cum-weeding hoe:** The iron blade which is slightly bigger than that of *khurpa* is fitted to a straight handle with its cutting ends downwards. It is used for giving deep hoeing about 2-5 cm deep so as to loosen the soil and remove the weeds.

5. **Hand hoes:** Mostly used for inter-cultural operations including removal of weeds, collection of stubbles and breaking of crusts to facilitate seed emergence.



6. **Garden rake:** It is used for collecting stump and other residues of plant in the nursery. It also used in breaking clods and levelling of land.

7. **Trowel:** It is used for lifting nursery plants and also for transplanting seedling.

8. **Hand leveller:** It is used in small beds or nursery beds for levelling land and covering the seed after sowing. It can also be used for even distribution of manure.

9. **Shovel:** It is used for placing/lifting dug-out soil from one place to another.

10. **Fork:** It is used for loosening the soil in addition to weeding, mixing of compost in the soil.

11. **Hoe-cum-rake:** It is used for digging, hoeing, earthing up, levelling and collecting weeds.

12. **Pronged hoe:** It is available with two, three or four arms. It is used for digging of hard soil and also for digging crops like potato, turnip *etc.* It can also be used for mixing manures.

13. **Hand cultivator/hand pronged hoe:** It is a small hand fork type cultivator which is useful for loosening and aerating the soil without damaging the roots. It can be used for small scale vegetable growing.

14. **Pick Axe/Mattocks:** Pick axe has two edges with provision of axial hole in the centre for attachment with handle. One edge of pick axe is pointed and another is broadened. It is used for digging hard, compact and stony soils.



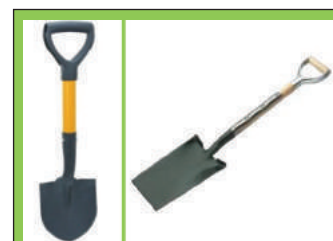
Garden rake



Trowel



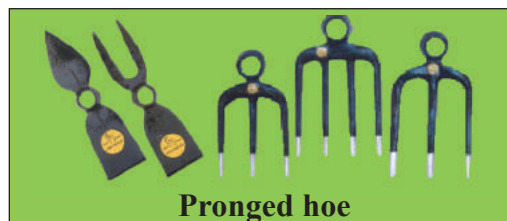
Hand leveller



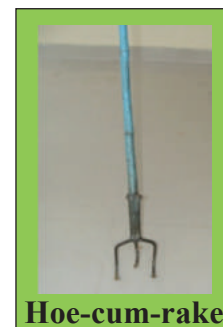
Shovel Spade shovel



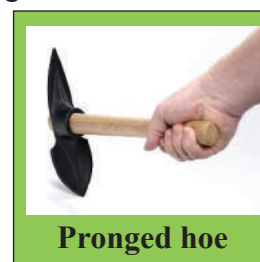
Garden fork



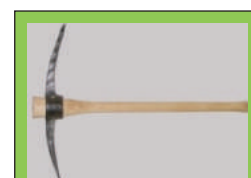
Pronged hoe



Hoe-cum-rake



Pronged hoe



Pick axe



Mattock

Exercise 20.2: Identification of large implements used for land preparation and seeding of vegetable crops.

Plough: Plough is the most important tillage implement. It is used to break, cut, turn and pulverize the soil to obtain a good tilth of the upper 15-20 cm soil surface. Thorough preparatory tillage of soil is an essential pre-condition for successful cultivation of a crop and it is mainly achieved by the use of plough. Ploughing buries weeds and grasses, stubbles of harvested crop and also green manure crops inside the soil and result in healthy soil management. The ploughing restores health, fertility and vigour of the soil. Ploughs are of different types:

- (a) Local/desi plough
- (b) Mould board plough
- (c) Disc plough

Desi / local plough:

Desi ploughs are animal drawn. They tear open the soil surface but do not turn the soil. They form 'V' shape furrows and may leave some unploughed area between two furrows.

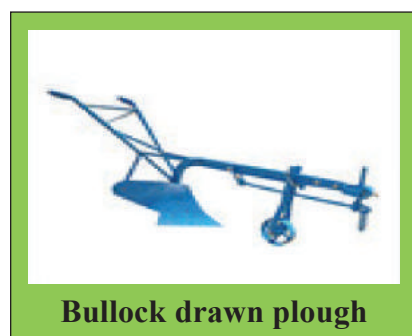
Mould board plough:

This is a soil turning plough. It requires more draft than *desi* plough. Along with tearing the soil, it turns the excavated soil. These ploughs are both animal drawn and tractor drawn.

Disc plough:

The disc ploughs are with 2-4 disc of 610 to 710 mm in diameter. The disc plough is normally suitable for hard soils and fields with heavy weed growth and trash.

Chisel plough: It is primary tillage deep plough which works up to 20 cm depth. It ensures proper root development of crop at proper depth and environment.



Harrows: Harrows are those tillage tools which are used to prepare the land by breaking clods, cutting weeds, pulverizing the soil, covering seeds and making the surface smooth. They are often used in seed bed preparation just before planting.

Cultivators: Cultivator usually refer to the tool used for tillage operation to manipulate the soil after the seed is planted or the seedlings have emerged. The cultivator is used to achieve the following objectives

- To control weeds so that they do not compete with the main crop.
- To prevent/reduce surface evaporation.
- To maintain the seed bed in good tilth during the growth of the crop.
- To achieve rapid infiltration of rainfall and adequate aeration.

Bed roller and levellers: These implements are used immediately after ploughing or harrowing to level the land for seeding. The main purpose of operating these implements is to crush, pulverize and tear the unevenly ploughed soil to produce smooth, well packed seed bed. It also reduces evaporation losses from the land surface.



Bed roller
Source: www.landpride.com

The most common clod crusher is *Patela* (Planker) which is generally a rectangular section of long wooden log provided with two pegs for hitching and its length depend upon the power of the bullock.

In field preparation, levelling is an essential operation as levelled fields receive uniform penetration of irrigation water with high efficiency. Special tractor drawn land roller is also used to level the fields.

Seeding implements:

Seed drill: It opens furrows at a uniform depth, drops seeds uniformly, and covers the seeds and compact the soil around them. In addition, the seed drill equipped with fertilizer attachment distributes the fertilizer evenly by the side of row in which seeds are placed. Depending upon the seed metering device, seed drill may be classified as:



Seed drill

- (i) Manually metered drills
- (ii) Mechanical metered drills

They may also be classified as:

- (i) Plain seed drills
- (ii) Fertilizer drills or fertilizer-seed drills or combination drills.

According to power employed, they may be called animal drawn or tractor drawn seed drills.

Exercise 20.3: Identification of plant protection equipments used for controlling vegetable pests

Spraying and dusting machines: The chemicals for protecting the plants from various injurious organisms need to be applied on plant surfaces in the form of spray, dust, mist, *etc.* Different types of spraying and dusting machines are available to meet the requirements of agriculturists in controlling insects, pests, diseases and weeds. These are:

- (i) Hand operated machines suitable for small holding lands. They are operated at pressure ranging from 1-7 kg/sq. cm.
- (ii) Power operated machines suitable for treating large areas. They are operated at pressure in the range of 22-55 kg/sq. cm.

Sprayers: The following types of sprayers are used widely by the farmers:

Knapsack sprayer: The common type of knapsack sprayer is provided with a pump and a large air chamber permanently mounted in a 9-22.5 litre tank. The handle of the pump is extended over the shoulder or under the arm of the operator. Thus, the operator can create pressure in the pump with one hand and spray with other hand. One man can spray about 0.4 ha of land in a day.



Knapsack sprayer

Hand Sprayer/ hand atomizer: It is used for spraying pesticides in small beds of vegetable and flower nurseries.



Hand sprayer

Engine power sprayer: These machines are usually portable type. Since the sprayer is driven by an engine, there is no variation in output, pressure and performance of the sprayer.

Dusting machines: Dusting machines may be classified into following three types:

Plunger type hand duster: This machine consists of a chamber for the dust, dust outlet, a cylinder with piston, piston rod and a handle. Some times, the dust chamber is placed below the cylinder. By moving the piston back and fore in the cylinder, dust is forced through the outlet. This type of duster is suitable for dusting small area.

Rotary type hand and power duster: This type of duster is provided with an enclosed fan geared to a hand crank and a hopper holding the dust. It is equipped with an agitator to stir the dust and regulate the discharge at opening. The duster is fastened on operators back by means of shoulder straps. The right hand is used for cranking and the left hand to guide the discharge. The dust can be blown up to the height of 6 meters.

Exercise 20.4: Identification of implements used for harvesting of vegetable crops

Many of the tillage implements are used in harvesting of underground economic parts of many vegetables such as potato, onion, root vegetables, garlic *etc.* These implements include *khurpa*, different hoes, spade *etc.* The other implements used for harvesting are:

Sickle: The harvesting of vegetable crops in India is done mostly manually. The most commonly used manual implement for harvesting is sickle. There are two types of sickles namely,

- i) Plain edged sickles
- ii) Serrated edged sickles.



It is used for cutting leafy vegetable like fenugreek, spinach, coriander, cauliflower, cabbage *etc.*

Knife and secateurs: These are also used for harvesting and preparing produce to the market. Secateurs are also used in tomato, cucurbits, bell pepper for pruning of twigs and shoots.

Exercise

1. Visit a local vegetable garden and try to identify the agricultural implements and categorize them according to their use.
2. Identify the implements and record the observations on data sheet.



DATA SHEET

S. No.	Name of the Implement	Operation for which it is used	Driven by	Specific characters for identification
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				

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