



UNIT II NOTES

## 2.7 Field preparation

Ploughing also uproots weeds and previous crop residues. The depth of ploughing should be kept 20–25 cm as superficial ploughing will not favour plant development, whereas, ploughing too deep will bury nutrients and make it beyond the reach of the root zone.

### 2.7.1 Tillage

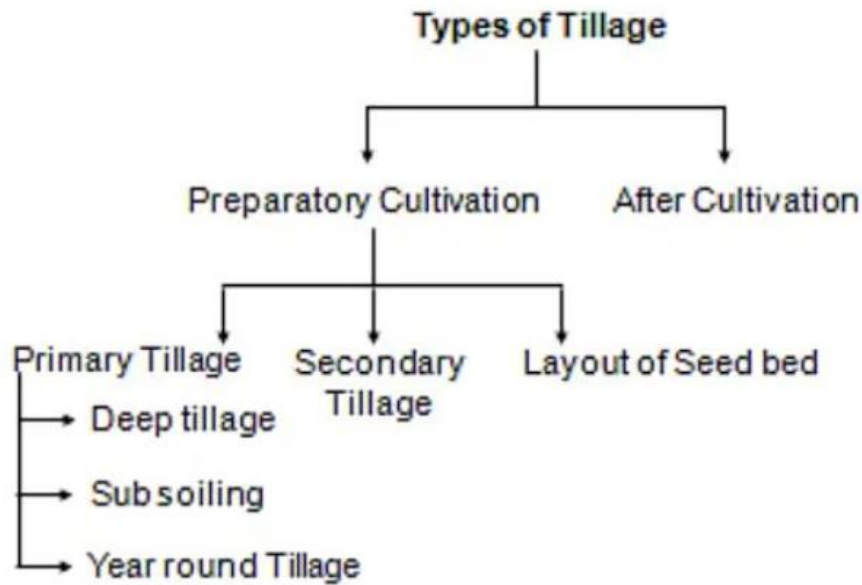
- **Tillage** is man's oldest and most fundamental agricultural activity, preparing virgin or fallow land for crop cultivation.
- **Tillage** is the mechanical manipulation of soil with tools and implements in order to create ideal conditions for seed germination, seedling establishment, and crop growth.
- Tillage is the agricultural preparation of soil by various types of mechanical agitation, such as **digging, stirring, and overturning**.
- Shovelling, picking, mattock work, hoeing, and raking are examples of **hand-powered tilling methods**.
- Ploughing, rototilling, rolling with cultipackers or other rollers, harrowing, and cultivating with cultivator shanks are all examples of **draft-animal-powered or mechanised work**.
- **Tilth** is the physical state of soil that results from tillage (or is the result of tillage). A coarse tilth, fine tilth, or moderate tilth is possible, based on the crop requirements and the soil where we are cultivating.

- **Primary tillage** is deeper and more thorough, whereas secondary tillage is shallower and sometimes more selective in location.
- **Primary tillage**, such as ploughing, produces a rough surface finish, whereas **secondary tillage**, such as that required to make a good seedbed for many crops, produces a smoother surface finish.

### 2.7.2 Types of Tillage

Tillage operations are mainly classified as:

- **On-season Tillage:** It refers to tillage operations performed for crop production during the same season or at the start of the crop season.
- **Off-season Tillage:** It refers to tillage operations performed to prepare the soil for the upcoming main season crop. Off-season tillage may include:
  - Post harvest tillage
  - Summer Tillage
  - Winter Tillage
  - Fallow Tillage



## Preparatory Tillage

This refers to tillage operations performed to prepare the field for crop production. When the soil is in a workable condition, it consists of deep opening and loosening of the soil to achieve a desirable tilth as well as incorporating or uprooting weeds and crop stubble.

### 1. Primary Tillage

- Primary tillage is the tillage operation performed after crop harvest to prepare the land for cultivation.
- It is normally done when the soil is moist enough to facilitate ploughing but not so wet that it does not give appropriate traction.
- Primary tillage is often performed after the last harvest, when the soil is moist enough to allow ploughing but dry enough to provide sufficient traction.

- Primary tillage's goal is to achieve an appropriate depth of soft soil, absorb crop leftovers, kill weeds, and aerate the soil.
- When adequate force is available, some soil types are ploughed dry.
- Ploughing is the process of breaking up compact soil with various ploughs.
- Primary tillage is accomplished with a country plough, mould board plough, borse plough, tractor, and power tiller.

**Different types of primary tillage are used depending on the purpose or necessity:**

***(i) Deep Tillage***

- Deep tillage refers to modifying the physical or chemical qualities of a soil by executing tillage operations below the standard ploughing depth.
- Deep tillage is achieved by shattering the compacted soil while leaving the topsoil, plants, and surface detritus alone.
- When deep ploughing is done in the summer, it produces large clods that are baked by the hot sun. These clods crumble as a result of alternate heating and cooling, as well as summer showers.
- This gradual clod disintegration process improves soil structure.
- Summer deep ploughing kills pests by exposing pupae to the hot sun.

- Deep tillage of 25-30 cm depth is required for deep-rooted crops such as pigeonpea, while maize requires moderate deep tillage of 15-20 cm depth.
- Deep tillage improves soil moisture content as well. However, the benefit of deep tillage in dry farming depends on the rainfall pattern and crop.
- Deep ploughing should be used only for long-term, deeply rooted crops.
- The depth of ploughing should be proportional to the amount of rainfall that can be absorbed.

***(ii) Subsoiling***

- Hard pans may be present in the soil, limiting crop root growth. Silt pans, iron or aluminium pans, clay pans, or man-made pans are examples.
- Tillage pans caused by repeated tillage at the same depth are known as man-made pans.
- Crop root growth is restricted to the top few centimetres of soil, where hard pans prevent deep root penetration.
- Special tillage operations (chiselling) are used to break the hard pan beneath the plough layer and reduce compaction.
- Subsoiling is required every four to five years where heavy machinery is used for field operations such as seeding, harvesting, transporting, and so on.
- Subsoiling is the process of breaking the hard pan without inversion and with minimal disturbance to the top soil.

- While a portion of the subsoiler shatters hard pans, a narrow cut is made in the top soil. Chisel ploughs are also used to break up hard pans that can be found at depths of 60-70 cm.
- Subsoiling has a short duration of effect. Vertical mulching is used to prevent the subsoil furrow from closing.

### ***(iii) Year Round Tillage***

- Year-round tillage refers to tillage operations that take place all year. Field preparation begins in dry farming regions with the help of summer showers.
- Tillage operations are repeated until the crop is planted.
- Even after the crop has been harvested, the field is repeatedly ploughed or harrowed to prevent weed growth in the off season.

## **2. Secondary Tillage**

- Secondary tillage refers to the tillage operations performed on the soil after primary tillage to improve soil tilth.
- Secondary tillage is a finer or lighter operation used to clean the soil, break up clods, and incorporate manure and fertilisers.
- Harrowing and planking are done to accomplish these goals.
- Secondary tillage is often shallower and more gentle than primary tillage.

- Secondary tillage prepares the seed bed by producing finer soil and occasionally shaping the rows.
- It also offers weed control throughout the growing season throughout crop plant development, unless weed control is done using low-till or no-till methods incorporating pesticides.

### **3. Layout of Seedbed and Sowing**

- Following seedbed preparation, the field is properly laid out for irrigation and sowing or planting seedlings. These are crop-specific operations.
- A levelled seedbed is prepared for most crops such as wheat, soybean, pearl millet, groundnut, castor, and so on.
- These crops are sown without any land treatments after secondary tillage.
- However, growing crops in deep black soils during the rainy season is difficult due to ill-drained conditions and the inability to tillage during the rainy season.
- **Broadbed and furrows (BBF)** are thus formed prior to the onset of monsoon, and dry sowing is used.
- Some crops, such as maize and vegetables, require the field to be divided into ridges and furrows. **Sugarcane is grown in furrows or trenches.**
- To facilitate two-way intercultivation, crops such as tobacco, tomato, and chillies are planted with equal inter and intra-row spacing.



- Following field preparation, a marker is run in both directions. The seedlings are planted at the intersections.

## **Special Purpose Tillage**

### **Clean Tillage**

- Clean-tillage entails **inverting the soil** and burying the majority of the residue.
- A common clean-till procedure is **moldboard ploughing** followed by preplant disking.
- Because crop residue is mostly buried, the soil surface is exposed to wind and rain, which increases the risk of erosion and soil moisture loss.
- Clean-tillage poses the greatest risk of wind and water erosion of the tillage systems.
- Clean-tillage is **not a conservation tillage method**.
- Clean-tillage may be **best suited for bottomland or poorly drained soils** because **it accelerates soil heating and reduces soil water content**, and the risk of water erosion is low.
- Moldboard ploughing, on the other hand, can result in a plough pan that restricts plant root growth.

\*For detailed notes of this topic, check this link [Clean Tillage - Types of Tillage](#)

### **Blind Tillage**

- Blind tillage is tillage done after sowing the crop, either at the pre-emergence stage or during the early stages of crop growth, to damage crop plants in order to uproot weeds.
- Tractor cultivators perform blind tillage at a depth of 4-5 cm. Its purpose is to kill weeds, break up the soil crust, reduce evaporation, and allow air to reach the roots.
- It works especially well on wet clayey soils in areas with long, cold springs.
- Root crop yields are significantly reduced when blind tillage is performed too late.
- Harrowing the fields before and after sprouting is a common substitute for blind tillage.

\*For detailed notes of this topic, check this link [Blind Tillage - Types of Tillage](#)

### **Zero Tillage (No Tillage)**

- Zero tillage farming is an agricultural practice in which the topsoil of a field is not tilled after harvesting a specific crop and a new crop is sown within the remnants of the previous crop.
- The method is especially important in light of recent stubble burning incidents to clear crop remnants.

- Zero tilling farming, also known as **no-tillage or direct drilling**, is a farming technique that involves growing crops or pasture without disturbing the soil through tillage.
- The soil is left undisturbed except for the placement of the seeds in the desired position for germination.
- **Masanobu Fukuoka, a Japanese farmer**, is credited with pioneering zero-till farming.

\*For detailed notes of this topic, check this link [Zero Tillage \(No Tillage\) -](#)

Types of Tillage

### **Dry Tillage**

- Dry tillage is used for crops that are sown or planted in dry land conditions with enough moisture for seed germination.
- This is appropriate for crops such as broadcasted paddy, jute, wheat, oilseed crops, pulse crops, potato crops, and vegetable crops.

### **Wet or Puddling Tillage**

- Wet or puddling tillage refers to tillage performed on land that has standing water.
- The puddling operation entails repeatedly ploughing in standing water until the soil becomes soft and muddy.

- Puddling forms an impervious layer beneath the surface, reducing deep percolation losses of water and providing a soft seed bed for rice planting.

## 2.8 crop Stand Establishment

A good plant stand has 35 to 40 plants established per meter of drill row after permanent water is applied to the field. A benefit of drill seeding is that fertilizer can be applied at the same time as the seed. Manual weeding is much easier in machine-drilled crops than in broadcast crops.

The aim of establishing a good crop stand is to attain maximum and uniform germination and emergence, resulting in vigorous seedlings in the field. These vigorous seedlings may also perform well under stress conditions. Therefore, we need to know and understand the considerations and problems which affect crop stand establishment.

**Seed bed:** The seed bed preparation has the same importance as foundation for a house. Care at this stage will show positive effects throughout the crop season. The need is to create a good tilth and fine structure of the soil which should be well-pulverised, free of clods and plant residues. Firm and levelled soil will provide good seed contact which will result in better germination and emergence, enhanced root growth and good gaseous exchange. Unwanted and excessive disking will cause compaction of the soil and would restrict root growth.