Reference: - eagri.org

TILLAGE

Physical Manipulation of soil with tools and implements for obtaining conditions ideal for better seed germination, seedling establishment and growth of plants is called tillage.

Types of tillage:
1. On season tillage
2. Off-season tillage

1. On-season tillage:

Tillage operations that are done for raising crops in the same season or at the onset of the crop season are known as on-season tillage.

A. Preparatory tillage: This refers to tillage operations that are done to prepare the field for raising crops. It consists of deep opening and loosening of the soil to bring about a desirable tilth as well as to incorporate or uproot weeds and crop stubble when the soil is in a workable condition.

Types of preparatory tillage
1. Primary tillage
2. Secondary tillage

1. Primary tillage: The tillage operation that is done after the harvest of crop to bring the land under cultivation is known as primary tillage or ploughing. Ploughing is the opening of compact soil with the help of different ploughs.

2. Secondary tillage: The tillage operations that are performed on the soil after primary tillage to bring a good soil tilth are known as secondary tillage. Secondary tillage consists of lighter or finer operation which is done to clean the soil, break the clods and incorporate the manure and fertilizers.

2. Off-season tillage:

Tillage operations done for conditioning the soil suitably for the forthcoming main season crop are called off-season tillage.

Special purpose tillage: Tillage operations intended to serve special purposes are said to be special purpose tillage.

They are:

A. Sub-soiling: To break the hard pan beneath the plough layer, special tillage operation (chiseling) is performed to reduce compaction.

B. Clean tillage: It refers to working of the soil of the entire field in such a way no living plant is left undisturbed. It is practiced to control weeds, soil borne pathogen and pests.

C. Blind tillage: It refers to tillage done after seeding or planting the crop (in a sterile soil) either at the pre-emergence stage of the crop plants or while they are in the early stages of growth so that crop plants (sugarcane, potato etc.) do not get damaged, but, extra plants and broad-leaved weeds are uprooted.

D. Dry tillage: Dry tillage is practiced for crops that are sown or planted in dry land condition having sufficient moisture for germination of seeds. This is suitable for crops like broadcasted rice, jute, wheat, oilseed crops, pulses, potato and vegetable crops. Dry tillage is done in a soil having sufficient moisture (21-23%).

E. Wet tillage or puddling: The tillage operation that is done in a land with standing water is called wet tillage or puddling. Puddling operation consists of ploughing repeatedly in standing water until the soil becomes soft and muddy.

Depth of ploughing:

- The desirable depth of ploughing is 12 to 20 cm for field crops.
- The ploughing depth varies with effective root zone of the crop.
- The depth of ploughing is 10-20 cm for shallow rooted crops and 15-30 cm for deep rooted crops.

Number of ploughing: Number of ploughing depends on soil conditions, time available for cultivation between two crops and type of cropping systems.

TILLAGE SYSTEMS

1. **Conservation tillage (30 percent or more crop residue left after planting)**

- Any tillage and planting system that covers 30 percent or more of the soil surface with crop residue, after planting, to reduce soil erosion by water or any system that maintains at least 1,120 kilogram per hectare of flat, small grain residue equivalent on the surface throughout the critical wind erosion period is called conservation tillage system Conversion tillage systems are further classified

A. No- till

No-till is defined as a system in which the soil is left undisturbed from harvest to planting except for nutrient injection

B. Ridge-till

In ridge-till, the soil is also left undisturbed from harvest to planting except for nutrient injection. Planting is completed in a seedbed prepared on ridges with sweeps, disk openers, coulters, or row cleaners

C. **Mulch-**

The soil is disturbed before planting. Mulch-till is a category that includes all conservation tillage practices other than no-till and ridge-till. Two tillage practices that fall into this category are zone-till and strip-till

2. **Other tillage systems (less than 30 percent crop residue left after planting)**

I. Reduced-till

Reduced-till systems leave 15-30 percent residue cover after planting or 560 to 1,120 kilograms per hectare of small grain residue equivalent throughout the critical wind erosion period.

II. Conventional-till

Conventional-till systems leave less than 15 percent residue cover after planting, or less than 560 kilograms per hectare of small grain residue equivalent throughout the critical wind erosion period. These systems generally involve plowing or some other form of intensive tillage

ANOTHER CLASSIFICATION OF TILLAGE SYSTEM

There are two types of tillage namely

a. Conventional tillage or clean tillage and

b. Conservation tillage

1. Conventional tillage or clean tillage

Ploughing the entire field several times to prepare a seed bed is called conventional tillage

2. Conservation tillage

Ploughing the field with lesser number of passes over the entire land or ploughing only in the required space of .the land and then sowing is called conservation tillage.

Different types of conservation tillage are as fallows.

Minimum Tillage -Minimum soil manipulation necessary to meet tillage requirements
Mulch Tillage – Tillage operations in which nearly 30 % of crop residue or other mulching materials are left on or near the soil surface is called mulch tillage
Rotary Tillage for crop production is called minimum tillage. tilled.**-** Tillage operations employing rotary action of the tool to cut, break and mix the soil is called rotary tillage.
Strip Tillage In strip tillage system only isolated bands of soil are tilled.
Combined Tillage – Tillage operations utilizing simultaneously two or more different types of tillage tools or implements to simplify, control or reduce the number of operations over a field is called combined tillage.

- **Modern concepts in tillage**

1. **Minimum tillage:** It aims at reducing tillage operations to the minimum necessity for ensuring a good seed bed.

2. **Zero tillage (No tillage):** In this, new crop is planted in the residues of the previous crop without any prior soil tillage or seed bed preparation and it is possible when all the weeds are controlled by the use of herbicides.

3. Stubble mulch tillage or stubble mulch farming: Soil is protected at all times either by growing a crop or by leaving the crop residues on the surface during fallow periods.

4. **Conservation tillage:** The major objective is to conserve soil and soil moisture. It is a system of tillage in which organic residues are not inverted into the soil such that they remain on surface as protective cover against erosion and evaporation losses of soil moisture.

➢ PLOUGHING OF LAND

Ploughing of land separates the top layer of soil into furrow slices.

(i) Furrow

- It is a trench formed by an implement in the soil during the field operation

(ii) Furrow slice

- The mass of soil cut, lifted and thrown to one side is called furrow slice.

(iii) Furrow wall

- It is an undisturbed soil surface by the side of a furrow.

(i) Crown

- The top portion of the turned furrow slice is called crown.

(ii) Back furrow

- A raised ridge left at the centre of the strip of land when ploughing is started from centre to side is called back furrow.

(iii) Dead furrow

- An open trench left in between two adjacent strips of land after finishing ploughing is called dead furrow

(iv) Head land

- While ploughing a land with a tractor a strip of unplugged land is left at each end of the field for the tractor to turn.

- **Methods of Ploughing Land**

1. Gathering

- Whenever a plough works round a strip of ploughed land, it is said to be gathering.

2. Casting

- Whenever a plough works round a strip of un ploughed land, it is said to be casting.

➢ **For economical ploughing the following methods are used.**

1. Continuous ploughing method

In normal conditions, the continuous ploughing method is considered very convenient and economical.

1. Round and round ploughing

In this method, the plough moves round and round in a field. Three types

➢ **Starting at the centre**

A small plot of land is marked in the middle of the field and it is ploughed first. After that, the plough works round this small plot and the entire plot is completed. This is not a very economical method.

➢ **Starting at the outer end**

Tractor starts ploughing at one end of the field and then moves on all the sides of the field and comes gradually from the sides to the centre of the field. There are no back furrows in this method. Conventional ploughing is usually done by this method.

➢ **One way ploughing**

This system requires the use of a special type of plough known as reversible plough or one-way plough. In gently sloping fields, this method is suitable

It is a mouldboard whose surface is made of slats placed along the length of the mouldboard, so that there are gaps between the slats. This type of mouldboard is often used, **where the soil is sticky.**