



## MODERN APPROACHES OF TILLAGE

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### Introduction:-

Conventional tillage involves primary tillage to break open and turn the soil followed by secondary tillage to obtain seed bed for sowing or planting. With the introduction of herbicides in intensive farming systems, the concept of tillage has been changed. Continuous use of heavy ploughs create hard pan in the subsoil, results in poor infiltration. It is more susceptible to run-off and erosion. It is capital intensive and increase soil degradation. To avoid these ill effects, modern concepts on tillage is in rule (Dumanski and Peiretti, 2013).

**1. Minimum tillage:** It aims at reducing tillage operations to the minimum necessity for ensuring a good seed bed. The advantages of minimum tillage over conventional tillage are,

- The cost and time for field preparation is reduced by reducing the number of field operations.
- Soil compaction is comparatively less.
- Soil structure is not destroyed.
- Water loss through runoff and erosion is minimum.
- Water storage in the plough layer is increased.

### Tillage can be reduced in 2 ways

1. By omitting operations which do not give much benefit when compared to the cost.
2. By combining agricultural operations like seeding and fertilizer application.

The minimum tillage systems can be grouped into the following categories,

#### I. Row zone tillage

Primary tillage is done with mould board plough in the entire area of the field; secondary tillage operations like discing and harrowing are reduced and done only in row zone.

#### II. Plough plant tillage

After the primary tillage, a special planter is used for sowing. In one run over the field, the row zone is pulverized and seeds are sown by the planter

#### III. Wheel track tillage

Primary ploughing is done as usual. Tractor is used for sowing; the wheels of the tractor pulverize the row zone in which planting is done.

In all these systems, primary tillage is as usual. However, secondary tillage is replaced by direct sowing in which sown seed is covered in the row zone with the equipment used for sowing.

**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. Zero tillage is applicable for soils with a coarse textured surface horizon, good internal drainage, and high biological activity of soil fauna, favourable

initial soil structure and an adequate quantity of crop residue as mulch. These conditions are generally found in *Alfisols*, *Oxisols* and *Ultisols* in the humid and sub-humid tropics.

**Till planting:** Till planting is one method of practicing zero tillage. A wide sweep and trash bar clears a strip over the previous crop row and planter opens a narrow strip into which seeds are planted and covered. Here, herbicide functions are extended. Before sowing, the vegetation present has to be destroyed for which broad spectrum non selective herbicides like glyphosate, paraquat and diquat are used.

Advantages

- Zero tilled soils are homogenous in structure with more number of earthworms.
- Organic matter content increases due to less mineralization.
- Surface run-off is reduced due to presence of mulch.

Disadvantages

- Higher amount of nitrogen has to be applied for mineralization of organic matter in zero tillage.
- Perennial weeds may be a problem.
- High number of volunteer plants and buildup of pests.

### **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. Sweeps or blades are generally used to cut the soil up to 12 to 15 cm depth in the first operation after harvest and depth of cut is reduced during subsequent operations.

When large amount of residues are present, a disc type implement is used for the first operation to incorporate some of the residues into the soil. This hastens the decomposition but still keeps enough residues on top soil.

Two methods for sowing crops in stubble mulch tillage are,

1. Similar to zero tillage, a wide sweep and trash bars are used to clear a strip and a narrow planter shoe opens a narrow furrow into which seeds are placed.
2. A narrow chisel of 5-10 cm width is worked through the soil at a depth of 15-30 cm leaving all plant residues on the surface. The chisel shatters the tillage pans and surface crusts.

Planting is done with special planters.

Disadvantages of stubble mulch farming

- The residues left on the surface interfere with seed bed preparation and sowing operations.
- The traditional tillage and sowing implements or equipment are not suitable under these conditions.

**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. If stubble forms the protective cover on the surface, it is usually referred to as stubble mulch tillage. The residues left on soil surface interfere with seed bed preparation and sowing operations. It is a year round system of managing plant residue with implements that undercut residues, losses the soil and kills the weeds.

**Advantages**

- Energy conservation through reduced tillage operations.
- Improve the soil physical properties.
- Reduce the water runoff from fields.

**References**

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