

Tilth and Tillage- Modern Concepts of Tillage

Modern Concepts of Tillage:

Tillage is time consuming, laborious & costly, owing to this new concepts like minimum tillage & zero tillage are introduced.

1. Minimum Tillage: It is aimed at reducing tillage operations to the minimum necessary for ensuring a good seedbed, rapid germination, a satisfactory stand & favorable growing conditions, Tillage can be reduced by:

- 1) Omitting operations which do not give much benefit when compared to the cost and
- 2) Combining agricultural operations like seeding & fertilizer application.

Advantages:

- 1) Improve soil condition due to decomposition of plant residues *in situ*,
- 2) Higher infiltration caused by decomposition of vegetation present on Soils & channels formed by decomposition of dead roots.
- 3) Less resistance to root growth due to improved structure.
- 4) Less soil compaction by reduced movement of heavy tillage vehicles.
- 5) Less soil erosion compared to conventional tillage.

Disadvantages:

- 1) Less seed germination,
- 2) More 'N' has to be added as rate of decomposition of organic matter is slow.
- 3) Nodulation may affect in some legumes.
- 4) Sowing operations are difficult with ordinary implements.

2. Zero tillage: It is an extreme form of minimum tillage. Primary tillage is completely avoided & secondary tillage is restricted to seedbed preparation in the row zone only.

It is followed where:

- 1) Soils are subjected to wind & water erosion,
- 2) Timing of tillage operations is too difficult &
- 3) Requirements of energy & labour for tillage are too high.

Advantages:

- 1) Soils are homogenous in structure with more no. of earth worms.
- 2) Organic matter content increased due to less mineralization.
- 3) Surface runoff is reduced due to presence of mulch. Several operations are performed by using only one implement. In these weeds are controlled by spraying of herbicides.

Disadvantages:

- 1) Higher 'N' is too applied due to slower mineralization of org. matter.
- 2) Large population of perennial weeds appears.
- 3) Build up of pests is more.

3. Stubble mulch tillage: The soil is protected at all times either by growing a crop or by crop residues left on the surface during fallow periods. It is year round system of managing plant residue with implements that undercut residue, loosen the soil and kill weeds. Soil is tilled as often as necessary to control weeds during the interval between two crops. However, it presents the practical problem as the residues left on the surface interfere with seedbed preparation & sowing operations. The traditional tillage & sowing equipment is not suitable under these conditions.

Modern methods of tillage are not practiced in Indian condition because:

- a) Left over residue is a valuable fodder & fuel.
- b) Limited use of heavy machinery & therefore problem of soil compaction is rare.

4. Peddling: Pudding is ploughing the land with standing water so as to create an impervious layer below the surface to reduce deep percolation losses of water and to provide soft seedbed for planting rice. This followed in rice as the growth and yield are higher when grown under submerged conditions. Maintaining standing water throughout the crop period is not possible without puddling. It aims at destroying soil structure and separates individual soil particles i.e. sand, silt & clay, during operation and settles later. The sand particles reach the bottom, over which silt particles settle & finally clay particles fill the pores thus making impervious layer over the compacted soil. It is done with several implements depending on the availability of equipment and the nature of land such as spade, wetland plough, worn out Dryland plough, mould board plough, wetland puddler, country plough, etc. It consists of ploughing repeatedly in standing water until the soil becomes soft & muddy. Initially, 5-10cm of water is applied depending upon the water status of the soil to bring saturation and above and the first ploughing is carried out after 2-3 days. By this operation, most of the clods are crushed and majority of the weeds are incorporated. Within 3-4 days, another 5cm of water is given & third ploughing is done in both the directions. Planking or leveling board is run to level the field.

5. Conservation tillage: It is disturbing the soil to the minimum extent & leaving crop residues on the soil. It includes minimum & zero tillage which can reduce soil loss up to 99% over conventional tillage. In most cases, it reduces soil loss by 50% over conventional tillage. Conventional tillage includes ploughing twice or thrice followed by harrowing & planking. It leaves no land unploughed & leaves no residues on the soil.