

ZERO TILLAGE AGRICULTURAL TECHNOLOGY

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INTRODUCTION:

Tillage is an agriculture land preparation through mechanical agitation which includes digging, stirring and overturning. Zero tillage is the process where the crop seed will be sown through drillers without prior land preparation and disturbing the soil where previous crop stubbles are present. Zero tillage not only reduce the cost of cultivation it also reduces the soil erosion, crop duration and irrigation requirement and weed effect which is better than tillage. Zero Tillage (ZT) also called No Tillage or Nil Tillage. Conservation agriculture conserves natural resources, biodiversity and labour. It increases available soil water, reduces heat and drought stress, and builds up soil health in the longer term. Zero Tillage is an agricultural technique for growing crops or pasture without disturbing the soil through tillage. No-till farming decreases the amount of soil erosion tillage causes in certain soils, especially in sandy and dry soils on sloping terrain. Other possible benefits include an increase in the amount of water that infiltrates into the soil, soil retention of organic matter, and nutrient cycling. These

methods may increase the amount and variety of life in and on the soil. While conventional no-tillage systems use herbicides to control weeds, organic systems use a combination of strategies, such as planting cover crops as mulch to suppress weeds.

BASIC PRINCIPLES OF ZERO TILLAGE

Farmers are increasingly adopting conservation agriculture practices. This sustainable farming method is based on three principles: crop diversification, minimal soil movement and permanent soil cover.



CROP DIVERSIFICATION:

Conservation agriculture is based on the interrelated principles of minimal mechanical soil disturbance, permanent soil cover with living or dead plant material, and crop diversification through rotation or intercropping. It helps farmers to maintain and boost yields and increase profits, while reversing land degradation, protecting the environment and responding to growing challenges of climate change.



MINIMAL SOIL MOVEMENT:

Direct seeding involves growing crops without mechanical seedbed preparation and with minimal soil disturbance since the harvest of the previous crop. The term direct seeding is understood in CA systems as synonymous with no-till farming, zero tillage, no-tillage, direct drilling, etc. Planting refers to the precise placing of large seeds (maize and beans for example); whereas seeding usually refers to a continuous flow of seed as in the case of small cereals (wheat and barley for example). The equipment penetrates the soil cover, opens a seeding slot and places the seed into that slot. The size of the seed slot and the associated movement of soil are to be kept at the absolute minimum possible. Ideally the seed slot is completely covered by mulch again after seeding and no loose soil should be visible on the surface.

PERMANENT SOIL COVER:

Permanent soil cover is defined as having year-round cover either in the form of residue mulch, which is naturally decomposed by microbes in the soil, or cover crops, which are either inter seeded or planted late in the season.

ZERO TILLAGE IN INDIA

No Till approach started from 1960s by farmers in India. The zero-tillage system is being followed in the Indo-Gangetic plains where rice-wheat cropping is present. Wheat will be planted after rice harvest without any operation. Hundreds of farmers are following the same system and getting more yields and profits by reducing the cost of cultivation. In South, the southern districts like Guntur and some parts of West Godavari of Andhra Pradesh state follow the ZT system in rice-maize cropping system. The green revolution paved the way for the rice-wheat production system in the north-western parts of India. But in due course of time, the yields of rice and wheat become stagnant due to inappropriate soil and water management system and late planting of wheat, as in the hot season rice is being grown and in the winter wheat follows the rice. In 1990's the zero tillage came to mitigate the problem, by planting the wheat by drilling without any land preparation and tillage.

Also in Konkan region of Maharashtra zero tillage is practiced after harvesting of rice crop.



ADVANTAGES OF ZERO TILLAGE

1. Reduction in the crop duration and thereby early cropping can be obtained to get higher yields.
2. Reduction in the cost of inputs for land preparation and therefore a saving of around 80%.
3. Residual moisture can be effectively utilized and number of irrigations can be reduced.
4. Dry matter and organic matter get added to the soil.
5. Environmentally safe - Greenhouse effect will get reduced due to carbon sequestration.
6. No tillage reduces the compaction of the soil and reduces the water loss by runoff and prevent soil erosion.
7. As the soil is intact and no disturbance is done, No Till lands have more useful flora and fauna.
8. Less soil erosion from wind and water (because the mulch cover of previous crops covers the soil)
9. Less soil compaction
10. More fertile and resilient soils
11. Less moisture evaporation
12. Lower fuel and labour costs (because there are less passes across the field)
13. Less soil compaction
14. Less soil erosion
15. less evaporation
16. More fertile soils
17. lower costs
18. Good crop yield

WHY ADOPT ZERO TILLAGE?

Zero tillage (ZT) technology plays an important role in the sustainable intensification of rice-wheat cropping system and adoption of better management practices, such as timely crop establishment, in India. Nearly two decades ago, zero tillage was first introduced to help farmers reduce tillage costs and advance the planting time of wheat and other Rabi crops. In successive years, zero tillage marked the evolution of the concept of conservation agriculture in rice-wheat cropping systems. zero tillage now offers significant opportunities in cropping system optimization for greater system productivity, especially in the eastern Indo-Gangetic Plains of India. As the majority of farmers in rice-wheat cropping systems still burn the residues of the rice crop to enable their rapid disposal before wheat sowing, recent advances in zero tillage makes it possible to sow wheat successfully into heavy residues and facilitate the use of residues as mulches for weed suppression and moisture conservation. Zero tillage proves better for direct-seeded rice, maize, soybean, cotton, pigeonpea, mungbean, clusterbean, pearl millet during kharif season and wheat, barley, chickpea, mustard and lentil during rabi season. Wheat sowing after rice can be advanced by 10-12 days by adopting this technique compared to conventionally tilled wheat, and wheat yield reduction caused by late sowing can be avoided. ZT provides opportunity to escape wheat crop from terminal heat stress. Zero tillage reduces cost of cultivation.



FUTURE NEED OF RESEARCH:

The success of zero tillage in rainfed areas depends on two critical elements, viz., residue retention on surface and weed control. Since residues are generally used as fodder in drylands, there is a need to determine the minimum residue that can be retained without affecting the crop-livestock system. Initially, emphasis may be given for crops whose residues are not used as fodder. More research is needed on weed management under zero tillage in a cropping system perspective. Farm implements needed for seed and fertilizer placement simultaneously for ensuring optimum plant stand, early seedling vigour in rainfed crops under minimum tillage. Scarce crop residue leads to strong competition between soil and animals.

CONCLUSION:

The natural resources are precious and therefore demand an effective and sustainable use. Zero tillage is a potential technology in this scenario. Although the drawback of use of non-selective herbicide is more, it still causes less effect than the conventional method of farming. In zero tillage, more returns can be achieved and timely crop can be grown with higher yields. Due to zero tillage high returns can be obtained as compared to cost of cultivation in heavy rainfall area timely operations can be performed due to zero tillage technology.

