A UNIQUE FEATURE OF GROWING WINTER WHEAT ON THE BASIS OF NO-TILL TECHNOLOGY

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Abstract. Winter wheat cultivation using no-till technology is a method of planting wheat seeds directly into the soil without any prior mechanical tillage. This contrasts with conventional tillage practices that involve plowing or disking the soil to prepare a seedbed.

Key Words: No-till, Winter wheat, Conservation agriculture, Reduced soil disturbance, Improved soil health, Increased soil moisture retention, Potential for herbicide use

As a method of residue management, direct sowing of winter wheat is a way to conserve moisture and energy, and in the context of other concomitant technologies, such as irrigation or associated crops, there is potential for yield increases in comparison with such practice carried out when winter wheat is sown post-tillage (Tan et al., 2022). The application of no-till technology in the sowing process has been widely studied over the past 25 years, including with wheat cropping, and is well documented. Such tillage leaves residue on the surface that protects the soil, avoids the mixing of soil layers, ensures balanced intra- and inter- specific development of plants, and reduces CO2 emissions, thus having a very positive impact on the environment. Furthermore, the cultivation of winter wheat in no-till systems allows for lower water consumption and energy use for cultivation. Under no-till cultivation systems, the soil is more biologically active, and yields suff er from less water stress.

As a result of the environmental impact of conventional agronomic methods, alternative agricultural practices such as organic farming, cover cropping, and reduced tillage have been gaining ground (Khan et al., 2020). One system that has grown in popularity is no-till technology, which was developed in the 1960s. This technology maintains residue on the soil surface as a shield to protect the soil, water, and wind from soil degradation. No-till technology is particularly important in the cultivation of crops that are initiated by direct sowing, and wheat became a showcase for exactly this type of cultivation technology. A cover of plant material, including crop residues and green cover, subsequently remains on the soil so that the entire soil surface is covered—subjacent demersal, and winter crops have grown. Soil management with the technology involves one or two treatments throughout the crop-growing season: once before its initiation and again in the spring of its next growing season.

The no-till drilling system is characterized by the mechanism of direct sowing and the two main components of the subsystems, which are to provide enough soil resistance to correctly open the seed furrows on the ground soils without applying full tillage tools and to establish seed and fertilizer in desired depth successfully without inversion or complete tillage. Residues that remain to the surface lead to mulching when planting seeds in a large fraction of soil moisture in no-till sowing and form a mechanical barrier against the seeds of successive weeds. Total-yielding grown mature wheat plant preserves moisture, decreases soil erosion. Planted no-till sowing winter wheat remains on soil surface as a mechanical barrier after harvesting (direct seeding) also it is used to overlap soil surface on waterways directions against soil erosion. Due to the ability to recover from the distressing effects of full-tillage and the rapid production of organic material by the processes-bound organic residues, the winter wheat, in which no procedures were performed after wheat harvest in no-till sowing, catches up with the yields of Fresh-tillage wheat fields after long-term cultivation in full-tillage agricultural systems in a few seasons (Sapkota & Flores, 2022).

Conservation tillage in various agriculture production systems not only conserves soil and water resources but also reduces the threats of climate change (S. Li et al., 2018). When applied correctly, it leads to enhancement in soil health, soil carbon sequestration, saving of soil moisture and generation of a disease-suppressive environment. Traditional no-till (NT) is a widely accepted technique that helps maintain the ecosystem balance, soil structure and fertility. No-till sowing directly affects yield components, including plant population and wheat plant weight and contributes significantly to grain yield (Ingraffia et al., 2022). In addition to maintaining satisfactory yield levels, the no-till sowing system can also develop a sustainable agriculture production system of winter-wheat-dominated cropping sequences.

(Singh Khedwal et al., 2023) Tillage operation by conventional methods has been considered as a mandatory agricultural field practice since the start of the civilization. Conventional tillage practices from beginning of history aimed to grow healthy plants, maintaining the fertility of the soil and to produce maximum crop production. These practices have been intensified with the use of heavy implements and draft power in the near history. Continuous tillage gradually realized its negative effects on land and without any realization and earliest judgement in either developing or developed countries. Deranged the physical and micro-flora status of soil and root delevelopment of crop weakens and find hard to take available food from upper layers. No-till agriculture involves continuing of residue on soil surface, sowing the seed in that residue placed directly without any use of extra water for land preparation. (Sapkota & Flores, 2022) Over the past 30 years, the agronomic practice of no-till stacking cereal and grain crops has been introduced in Uzbekistan, ennobling results in increased and stabilization in average yield of winter wheat 10-12 c/ha, improvement and stabilization of the structure of the crop, as well as saving material resources, in particular electricity, from 97.8 to 1270 kW/ha, and seeds, from 30-50-40-45%. At the same time, saving the total energy steel and labor 60-65%, field tractors and implements of the required types to carry out activities - 1 tractor instead of 2-2.5 within 8 years, energy consumption from 545000 kW on 10 °bc and the active layer to 20-50% and to 1% after technical improvement until 8%. Water saving from 25-40 to 50-70%, picking up from 50 to 30 days of the harvesting season. CO2 emissions are reduced in the 2018 produced world, including 4.7 million cars, benefiting the creation of the green economy.

Winter wheat cultivation with no-till technology offers a unique approach to growing this important cereal crop. Unlike conventional methods that rely on plowing or disking the soil, no-till minimizes soil disturbance, creating a distinctive set of advantages for both agricultural productivity and environmental sustainability.

Reduced Soil Disruption: The core principle of no-till lies in leaving the soil largely untouched. Crop residues from the previous season are left on the surface, acting as a natural mulch. This mulch layer protects the soil from wind and water erosion, promotes moisture retention, and fosters beneficial microbial activity.

Enhanced Soil Health: With minimal disruption, no-till allows the soil's natural structure and biology to thrive. Earthworm populations increase, leading to improved soil aeration and drainage. Organic matter content gradually rises, fostering a healthy soil ecosystem that translates to better nutrient availability for the growing wheat.

Moisture Conservation: The mulch layer created by crop residue acts as a barrier, reducing soil evaporation and helping retain precious moisture. This is particularly beneficial in arid regions or during drier seasons, ensuring that winter wheat has access to the water it needs for proper growth.

Efficiency Boost: No-till offers significant efficiency gains for farmers. By eliminating the need for plowing or disking, it reduces fuel consumption, labor costs, and overall production time. This translates to lower operational expenses and potentially higher profit margins.

Environmental Benefits: Beyond the direct advantages for the crop, no-till practices contribute to a healthier environment. Reduced soil erosion minimizes the risk of sedimentation in waterways, protecting water quality. Additionally, no-till helps capture carbon dioxide from the atmosphere and store it in the soil, mitigating climate change impacts.

Challenges and Considerations: While no-till offers a compelling approach, some challenges exist. Weed control becomes more critical as seeds are planted directly into existing residue. Herbicides are often necessary, and farmers need to adopt appropriate weed management strategies. Additionally, successful no-till implementation may require specialized equipment for seeding directly into undisturbed soil.

In conclusion, no-till technology presents a unique and transformative approach to winter wheat cultivation. By minimizing soil disturbance, it fosters a healthier soil environment, improves water conservation, and enhances overall production efficiency. While challenges exist, the long-term benefits for both agricultural productivity and environmental well-being make no-till an increasingly attractive option for sustainable winter wheat production.

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