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ECONOMIC AND ECOLOGICAL EFFICIENCY OF NO-TILL TECHNOLOGY IN SUSTAINABLE AGRICULTURE

У статті досліджено переваги впровадження системи нульового обробітку ґрунту (No-Till). Проаналізовано вплив технології на збереження вологи, запобігання ерозії та зниження собівартості агропродукції. Визначено роль пожнивних решток у формуванні органічного шару ґрунту.

Ключові слова: *агрономія, No-Till, нульовий обробіток, вологозбереження, прямий посів, ерозія.*

The paper examines the benefits of implementing the zero tillage system (No-Till). The impact of technology on moisture conservation, erosion prevention, and reduction of agricultural production costs is analyzed. The role of crop residues in the formation of the organic soil layer is determined.

Keywords: *agronomy, No-Till, zero tillage, moisture conservation, direct seeding, erosion.*

The No-Till system involves a complete rejection of mechanical soil cultivation (plowing, disking). Sowing is performed using specialized seed drills directly into the untreated soil, which allows for maximum preservation of its natural structure [1].

Crop residues on the surface create a protective shield that stops wind and water erosion by up to 90% [2]. The absence of plowing prevents rapid mineralization of organic matter, contributing to the restoration of soil fertility [3].

A layer of mulch (residues from the previous crop) reduces soil temperature by 2–5°C and significantly decreases moisture evaporation. This is critically important for the steppe zones of Ukraine under conditions of global warming [1, 3].

Diesel fuel consumption is reduced from 70–90 L/ha to 20–25 L/ha due to the reduction in the number of field operations [4]. The technology allows for a reduction in the number of field operations, which decreases the workload on personnel and the depreciation of the machinery fleet [4].

Successful application of No-Till requires strict adherence to crop rotation and the use of cover crops (green manure) for natural soil loosening by the root systems of plants [2].

There is a common belief that the hardest part of No- Till is just quitting the plow. But in reality, everything boils down to what you leave on top. How your combine spreads straw during crop can literally save or ruin your coming season. However, the ground warms up inversely in the spring, and you will end up with a" patchy" crop, If the straw is floundered in piles. principally, if you do not have high- end copters on your combine, you presumably should not indeed start this system [4].

Anyone switching to" zero- till" requirements to be ready for the nitrogen in the soil to putatively evaporate during the first couple of times. It’s not magic - microbes are just rushing to break down all that face mulch, and they" adopt" nitrogen from the shops to do it. The fix is simple either impinge up your toxin rates for a while or, more dashingly, factory cover crops like vetch to let them" energy" the soil with nitrogen naturally [3].

Critics love to point out the heavy use of dressings in No- Till. But that is only half the story. Once the system is" broken in," the right cover crops(like rye smoothed by a comber-crimper) produce a carpet so thick that weeds can not indeed find a place to grow. After 5-7 times, the weed seed bank in the top subcaste actually starts to dry up because you are not constantly furrowing new seeds back into the light [1,2].

A lot of people are spooked that without a plow, the ground will turn into a slipup. Actually, that is when biology takes over. Crops with aggressive roots (like oilseed

radish) act as living drills, punching through the hard layers of earth. Plus,the number of earthworms in these fields just explodes.

Their coverts produce a erected- in drainage and air system that's way better than any iron tool because it works 24/7 [3].

Let's be blunt a standard seed drill is useless then. A real No-Till carriage has to be heavy enough to slice through the straw and drop the seed exactly where it needs to go. Specialized discs (coulters) and heavy ending bus are the" chuck and adulation" of this setup.However, you are just throwing plutocrat at the wind, If you do not get good seed-to- soil contact [4].

Besides just carbon, No- Till gives you a cool perk the buildup of Glomalin. It's principally a" soil cement" made by fungi. It holds the soil structure together so it does not just wash down in the rain. Down south, like in the Mykolaiv or Odesa regions, this stuff keeps the soil from turning into dust when there has n't been a drop of rain formonths in August [1,3].

Plowing is a death judgment for fungal networks (mycorrhizae). In No-Till, they come back to life and literally" plug into" the factory roots. This symbiosis helps crops stink up phosphorus and water from bitsy cracks.

That roots could noway reach on their own. It's a real chance to save on toxin because nature is doing half the work for you [3].

Since Ukraine is moving toward the EU, No-Till is actually getting a fiscal strategy. We are not flipping the soil, so the carbon stays locked in there rather of floating into the sky. This is a direct path to" green" subventions and carbon credits. In the long run, this is going to be a veritably decent source of income for agribusiness [1,2].

In the environment of Ukraine's European integration, switching to "zero-till" is also getting a fiscal tool. Since the soil is not capsized, carbon is sequestered in the ground rather than being released into the air as. This pavesthe way for" green" subventions and impulses, offering the agrarian sector real profitable benefits from lo ng- term decarbonization programs [1,2].

No- Till technology is a strategic direction for the agrarian business in Ukraine. Despite the high conditions for the qualification of agriculturists and the cost of technical outfit, it ensures long- term profitability and the preservation of land resourcesx [1,2].

In the context of Ukraine's European integration, switching to "zero-till" is also becoming a financial tool. Since the soil isn't overturned, carbon is sequestered in the ground rather than being released into the air as CO_2. This paves the way for "green" subsidies and incentives, offering the agricultural sector real economic benefits from long-term decarbonization programs [1, 2].

No-Till technology is a strategic direction for the agricultural business in Ukraine. Despite the high requirements for the qualification of agronomists and the cost of specialized equipment, it ensures long-term profitability and the preservation of land resourcesx [1, 2].

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