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NO-TILL TECHNOLOGIES – ENVIRONMENTALLY SAFE, ENERGY – AND RESOURCE-SAVING OF AGRO-FOOD TECHNOLOGIES

Kobyrenko Y. O., PhD
e-mail: kobirenko.j@gmail.com
Lviv National Environmental University,
Research PhD, *Institute for Sustainable Agriculture* (CSIC)

Abstract. The instability of the agricultural management system, which was noted during the 20th century, devastation after wars and pseudo-scientific transformations, the almost complete lack of care for many areas, untimely harvesting of herbs and their overgrowth with shrubs, overwetting, overdrying and many other factors led to the degradation of grassland [1]. The correct system of basic tillage is one of the effective measures for the formation of high yields of agricultural crops. In combination with optimal doses of organic and mineral fertilizers in crop rotations, it ensures an increase in soil fertility and their rational use [2].

Keywords: no-till, degraded lands, cultivation, agriculture, soil, Ukraine.

For a long time, the main and most common method of cultivation is shelf plowing with the rotation of the blade. Compared to other measures of the main tillage, plowing is an energy-intensive and expensive technological operation. In addition, turning over the topsoil is not always beneficial. Under arid conditions in the spring and summer, the soil dries quickly due to the movement of a wetter layer to the surface. In areas subject to wind erosion, when the post-harvest remains are completely wrapped, not only moisture is lost due to blowing, but also the upper, most fertile, layer of the soil [3,4].

In Ukraine, taking into account the specifics of modern farming conditions, the latest soil cultivation technologies are increasingly finding their place in agriculture. It is about tillage, surface, minimal and zero (so-called No-till technologies) tillage [5].

The system of zero tillage, also known as No-till, is a modern farming system that involves the refusal of plowing the land, planting stubble, the use of cover crops and the competent use of crop rotation. All the work is done by a special seeder that cuts the harvest residues, distributes them on the soil, makes a furrow of the required depth in it, carefully plants the seeds there and closes. No-till technology allows to rapidly increase labor productivity by 3-5 times, reduce labor costs by 1.6 times, equipment costs by 1.5 times, and fuel costs by 2.2 times. Thanks to this technology, water erosion, which carried both toxic chemicals and substances that caused the rapid development of algae, was significantly reduced. Since the harvest residues remain on the field, a gradual increase in the content of organic matter and humus in the soil is achieved. In conditions of sufficient moisture, the use of nutrients, primarily phosphorus, increases. Harvest residues preserve soil moisture from evaporation. Soils are enriched with micro- and mesofauna, including earthworms, which play an important role in increasing soil fertility [6].

Technological methods of surface improvement were studied at a long-term hospital with degenerate meadow grass during 2012-2014, which is located on lowland

meadows near the village of Obroshino of Pustomytiv district, Lviv region. Direct sowing of perennial leguminous grasses in undisturbed sod of leveled lowland meadows was carried out in March 2011 with a Grait Plains 1006NT stubble seeder.

The main parameters that show the ratio between the volume and the mass of the constituent elements of the soil and determine the quantitative values of the general properties are the density of the structure and the general porosity.

In the course of the research, we determined the density of the soil structure and the general pore space of the fodder land with the sowing of leguminous crops in early spring before the growth of grasses (Tab.).

Table. Changes in general agrophysical parameters in the 0-20 cm layer dark gray podzolized soil of an improved meadow depending on the types of sown grasses and fertilizer

Perennial legumes (factor A)	Fertilization (factor B)	Compaction density, g/cm3				Total spariness, %			
		years			average	years			average
		2012	2013	2014		2012	2013	2014	
1	$P_{60}K_{90}$	1,1	1,2	1,3	1,2	55,2	54,0	49,0	52,7
	$N_{60}P_{60}K_{90}$	1,0	1,2	1,3	1,2	56,5	54,8	51,2	54,2
	$N_{60}P_{60}K_{90}$+Vuksal Combi B	1,2	1,3	1,4	1,3	52,3	51,2	50,5	51,3
2	$P_{60}K_{90}$	0,8	1,1	1,2	1,0	59,0	58,0	54,4	57,1
	$N_{60}P_{60}K_{90}$	0,9	1,0	1,2	1,0	58,4	57,0	53,0	56,1
	$N_{60}P_{60}K_{90}$+Vuksal Combi B	1,1	1,2	1,3	1,2	55,2	55,0	54,7	54,9
3	$P_{60}K_{90}$	1,1	1,3	1,4	1,3	55,0	50,8	50,1	51,9
	$N_{60}P_{60}K_{90}$	1,2	1,1	1,3	1,2	57,0	56,2	56,1	56,4
	$N_{60}P_{60}K_{90}$+Vuksal Combi B	1,2	1,3	1,4	1,3	56,0	56,0	55,9	55,9
4	$P_{60}K_{90}$	1,2	1,2	1,3	1,2	54,1	54,0	53,0	53,7
	$N_{60}P_{60}K_{90}$	1,2	1,2	1,3	1,2	54,6	54,0	52,7	53,8
	$N_{60}P_{60}K_{90}$+Vuksal Combi B	1,4	1,4	1,5	1,4	51,0	50,4	50,6	50,7
5	$P_{60}K_{90}$	1,2	1,3	1,3	1,3	52,0	50,9	48,5	50,5
	$N_{60}P_{60}K_{90}$	1,1	1,3	1,4	1,3	54,4	51,0	50,8	52,1
	$N_{60}P_{60}K_{90}$+Vuksal Combi B	1,3	1,4	1,5	1,4	49,8	49,6	49,6	49,7
6	$P_{60}K_{90}$	1,3	1,3	1,4	1,3	50,8	50,2	49,6	50,2
	$N_{60}P_{60}K_{90}$	1,3	1,3	1,4	1,3	50,6	50,0	49,8	50,1
	$N_{60}P_{60}K_{90}$+Vuksal Combi B	1,4	1,4	1,5	1,4	50,2	50,0	49,2	49,8
7	$P_{60}K_{90}$	1,3	1,3	1,4	1,3	50,6	50,0	49,6	50,1
	$N_{60}P_{60}K_{90}$	1,4	1,4	1,5	1,4	49,6	49,2	49,1	49,3
	$N_{60}P_{60}K_{90}$+Vuksal Combi B	1,4	1,5	1,6	1,5	49,6	48,8	48,5	48,9
HIP_{05}	Factor A	0,4	0,8	0,4	0,2	1,4	1,6	1,4	1,6
	Factor B	0,2	1,0	0,2	0,4	1,5	1,4	1,6	1,8

Note. 1 – meadow clover; 2 – hybrid clover; 3 – lotus corniculatus ; 4 – galega orientalis; 5 – meadow clover + hybrid clover; 6 – meadow clover + hybrid clover + lotus corniculatus; 7 – meadow clover + hybrid clover + lotus corniculatus + galega orientalis.

Over the years, compaction of the soil was observed, which led to a decrease in sparability. Soil porosity is not only agronomically valuable, but at the same time it is a kind of «biosphere» of the soil. It is in the cracks that the gaseous and liquid phases, as well as the «living» phase of the soil, are located. Both the quantitative ratio of phases and the conditions for movement of soil solutions, air, heat, living organisms and plant roots depend on the total number of cracks, their size and shape.

So, according to our research, the agrophysical parameters of the soil restored under the system of zero tillage, such as soil density, pore density, were characterized as sufficient for the normal growth and development of sown leguminous perennial grasses. No-till is a modern agricultural system that meets the economic requirements of today's agricultural producers, takes into account the needs of consumers, promotes self-renewal and soil conservation, and reduces the harmful impact on the environment.

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Анотація. Нестабільність системи ведення сільського господарства, яка відзначалася протягом XX ст., розруха після воєн і псевдонаукових перетворень, майже повна відсутність догляду за багатьма ділянками, несвоєчасне збирання трав і їх заростання чагарниками, перезволоження, пересушування та ін. інші фактори призвели до деградації пасовищ [1]. Правильна система основного обробітку ґрунту є одним із ефективних заходів формування високих урожаїв сільськогосподарських культур. У поєднанні з оптимальними дозами органічних і мінеральних добрив у сівозмінах це забезпечує підвищення родючості ґрунтів та їх раціональне використання [2].

Ключові слова: no-till, деградовані землі, обробіток, землеробство, ґрунт, Україна.