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THE BIOPHYSICAL INSURANCE OF A REGIONAL MODEL OF CONSERVATION AGRICULTURE

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Abstract

Alternative soil tillage technologies within short crops rotation do not provide process of liquidation of the soil profile stratification and of optimization of physical characteristics and regimes of arable layer. At the same time the intermediare crops also do not provide these effects. Therefore, even after 7 years of practicing agricultural technologies works, biological processes is highly concentrated in the top 15-25 inches from the surface. From this point of view, it is proposed that alternative technologies to be implemented within the framework of a biologization and fiziatization program of chernozems in 3 stages using rotation works.

Key words*: conservative technologies, landscape adaptation, biologization, greening minimization.*

INTRODUCTION

Accelerated degradation of soil resources associated with a number of new challenges of millennium (instability - climate change, rapid reduction in non-renewable energy resources and increasing prices for them, constantly increasing the energy inputs in agriculture and income reduction, reductions in water and their quality, desertification and so on. a.) shows that the concept of green revolution failed, which involved working in agriculture paradigm shift in which emphasis is placed on increasing yields paradigm focused on reproduction enlarged production base. Last materialize the concept of sustainable agriculture, part of a broader concept - sustainable economy.

The concept of sustainable agriculture requires identification of the non-conformities within agricultural system practiced in its efficiency by reducing energy inputs, greening and biologization part of a vaster concept - sustainable economy.

Reducing energy inputs implies, firstly, minimizing works based on scientific arguments regarding the genesis and evolution of soils and their characteristics.

Minimizing the purposes of conservative technology is seen as a measure of the degree of enhancement technologies. As the degree of intensity is greater than the deeper is minimization, including by direct sowing.

Greening and biologization assume reducing chemical inputs in favor of biological crop protection and soil management fertility. In this regard, drawing out that the concept of conservation agriculture is incompatible with the principles of intensive chemicalization of agroecosystems. This implies the need to move from the paradigm intensification of agriculture by chemical treatment to one paradigm based on the principles of bioagriculture new evolutionary-genetic and environmental - genetic interaction living matter (various plants, animals, microorganisms) and abiotic materials (parent rocks) which lead to the formation and development of various soils and fertility (Jigău, 2009). Failure to follow these principles in their practice of conventional and without significant broadening genetic diversity agrocenosi has reduced the role of biological factor and factor geomorphological increase in anthropogenic pedogenesis. Therefore, under the given climate instability increased strength of the various processes of soil degradation and their bioproductivity. At the same time, the new paradigm involves developing a conceptual framework - a methodological approach based on the fair value of the soil-plant relationships in the development and evolution of ecosystems.

MATERIALS AND METHODS

To these research elaboration, started from point that in all agricultural reforms have faced economical and environmental aspects, giving preference always economical ones.

Acumalated experience in Moldova, in this chapter shows that such approach persists in the conservative farming system practiced in the region.

According to recent generalizations practice technologies provide more conservative economic advantages:

- reducing costs per unit of production by 30-45%.
- reduce energy consumption, particularly fuel and lubricant, thus reducing significantly impact the efficiency econmic these prices;
- reducing the technical park and farm units aggregates, respectively, of expenses connected to maintenance;
- reducing the consumption of mineral fertilizers, synthetic, as captivating the dependence of foreign markets where they are imported.

Despite the fact that many farmers insist that the crop is reduced dependence on climatic conditions, in reality there is great variability in yields from year to year, depending on climatic peculiarities of years. Something else, that even in dry years provides not only the size of harvests and income expenses connected refund.

Environmental issues, in particular the development of soil functions within agroecosystems, in most cases, are considered lesser extent.

At the same time, our research shows that during 2007-2014 years soil development involves many questions.

In this respect mention first, mainly in the substitution of the type of organic waste storage site by the type ex site. This leads to the concentration of biochemical processes mainly in the surface layer.

The soil moisture regime also suffer noticeable changes.

RESULTS AND DISCUSSIONS

Systematic inspection of the pilot lands arranged under production conditions indicate a significant increase water reserves at the beginning of the variation in vegetation deep loosening. Values plowing, no-till and loosening surface is characterized by relatively identical reservations. During vegetation, however, water consumption is the most rational variant No-Till. The variants loosening superficial and deep moisture consumption is almost identical (Figures 1-4).

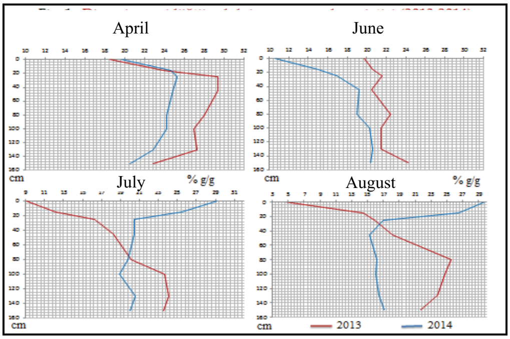


Figure 1. Dynamics of soil moisture under plowing during the vegetation (2013-2014)

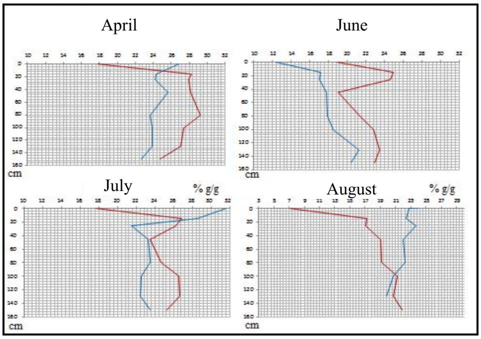


Figure 2. Dynamics of soil moisture under no-till during the vegetation (2013-2014)

Synchronized with moisture dynamics is dynamic apparent density (Figures 5-8).

Monitoring the dynamics of these two parameters show that after 7 years of work practice alternative systems of land within soil profiles clearly emerges arable layers and under arable layer with values close to the critical and even surpassing them. Under these conditions the soil pore space discontinuous gate which cause crop root system remains concentrated in the first 15 to 25 cm from the surface. At the same time, monitoring the dynamics and distribution of humus profile, nitrate nitrogen, phosphorus and potassium exchangeable mobile shows that the processes that determine these parameters are also concentrated in the surface layer (Figures 9-15).

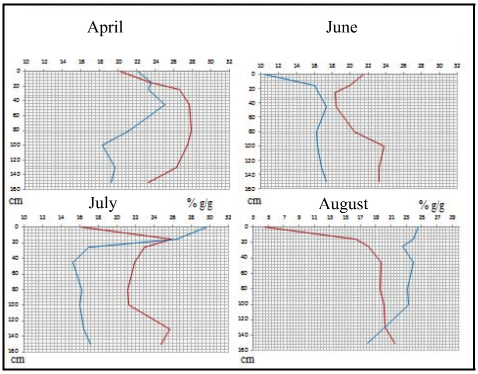


Figure 3. Dynamics of soil moisture under mini-till during the vegetation (2013-2014)

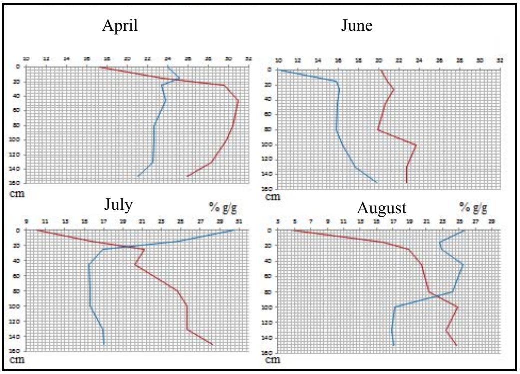


Figure 4. Dynamics of soil moisture under deep refining during the vegetation (2013-2014)

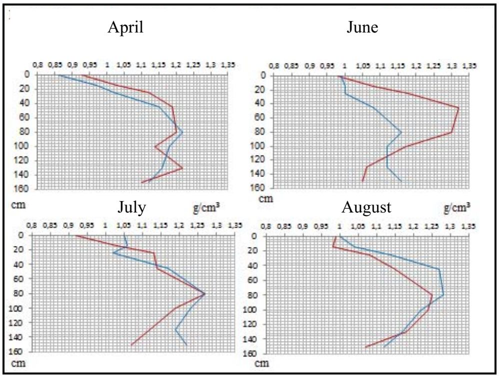


Figure 5. Dynamics of soil apparent density under plowing during the vegetation (2013-2014)

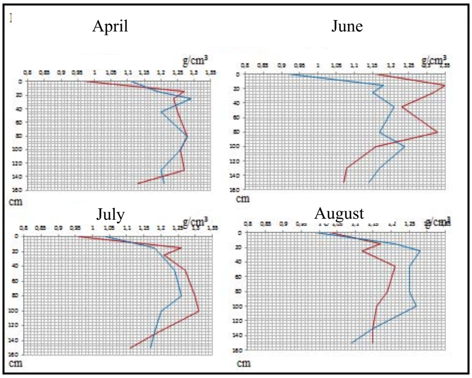


Figure 6. Dynamics of soil apparent density under no-till during the vegetation (2013-2014)

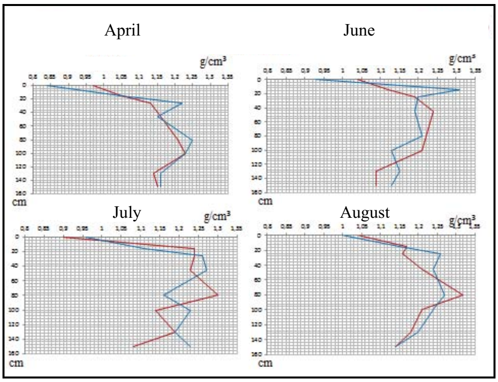


Figure 7. Dynamics of soil apparent density under mini-till during the vegetation (2013-2014)

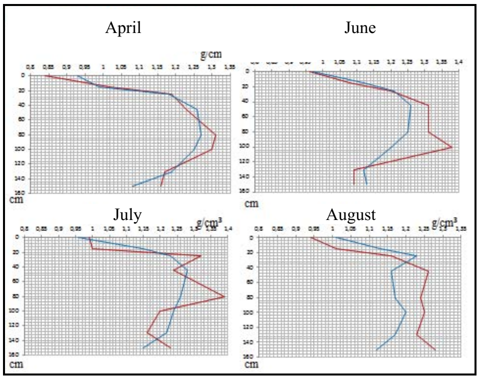


Figure 8. Dynamics of soil apparent density under deep refining during the vegetation (2013-2014)

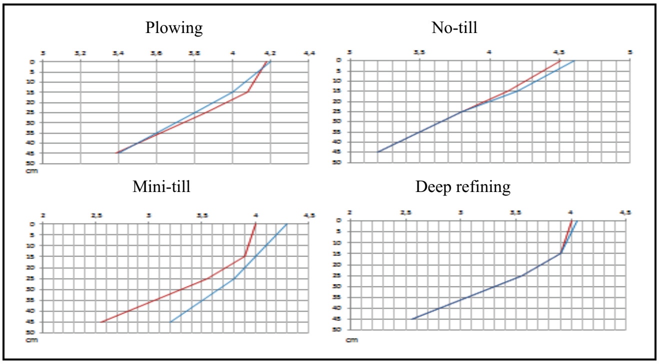


Figure 9. Profile of Humus in different tillage systems

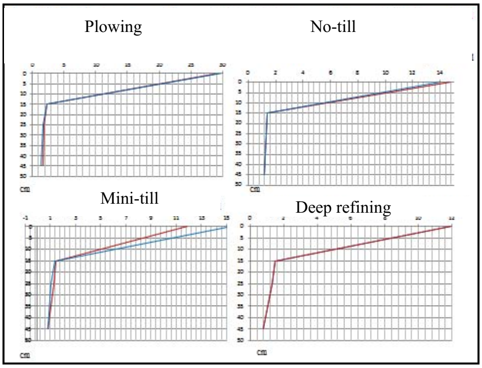


Figure 10. Distribution of nitrogen in the beginning of vegetation on profile in different tillage systems (2013-2014)

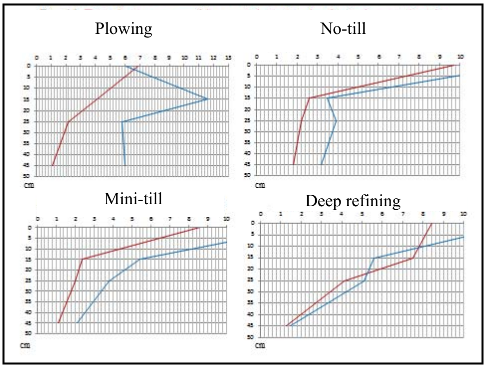


Figure 11. Distribution of nitrogen at the end of of vegetation on profile in different tillage systems (2013-2014)

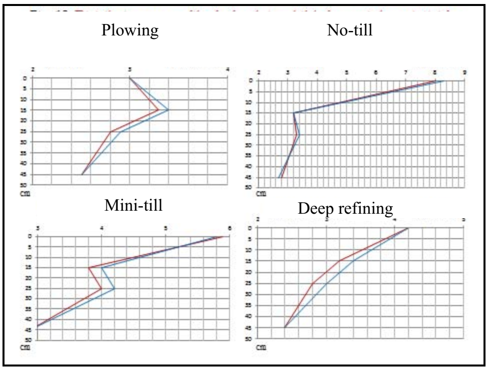


Figure 12. Distribution of mobile phosphorus in the beginning of vegetation on profile in different tillage systems (2013-2014)

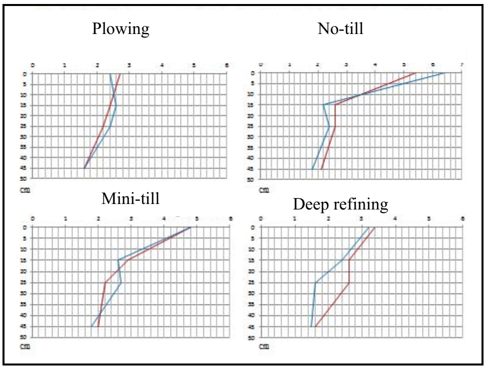


Figure 13. Distribution of mobile phosphorus at the end of vegetation on profile in different tillage systems (2013-2014)

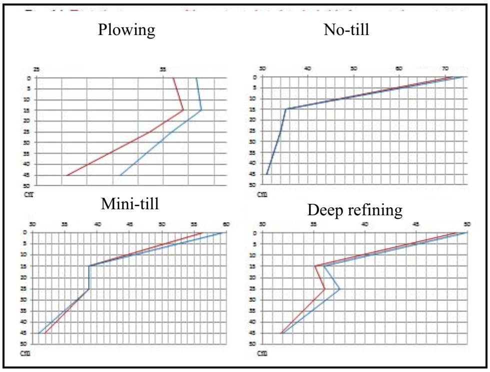


Figure 14. Distribution of potassium in the beginning of vegetation on profile in different tillage systems (2013-2014)

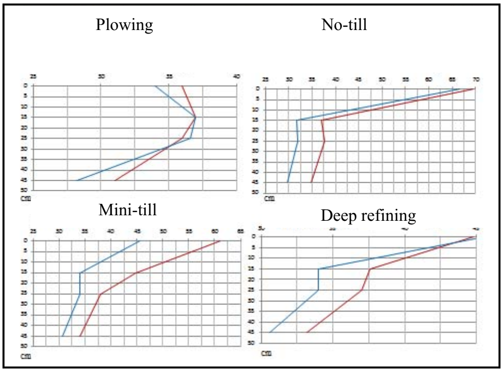


Figure 15. Distribution of potassium at the end of vegetation on profile in different tillage systems (2013-2014)

CONCEPT AND SOLUTIONS

The new paradigm of conservative agriculture is based on optimal combination of plants (crops) capability with adaptability of adaptive potential landscape and requires ecological and evolutionary processes modeled, which is nothing else than unidirectional interactions between different species and variety of living organisms and abiotic material (parent rock) in agrocenosis. By the theory of pedogenesis and soil evolution under only such approach can be ensured fertility increase in agricultural regime (Jigău, 2013). This constitutes the essence of biologization process of agrobiocenosis and creating agrobiogeocenosis. The principles of this process are drawn from nature remains to be done only theoretical interpretation and implementation in production, taking the principles of soil biophysics.

Last is the interface between physics, biology and soil science and study structural and functional organization regularities of soil as biorutinare dynamic systems and phenomena and physical processes taking place in soils involving biological substance.

The core idea of organizing this branch is biogenic soil, reflected in living organisms targeted action on abiotic components (solid, liquid, gas) of soil in order to organize their space and ambiance ambient opimizării initial intrinsic unfavorable for the development and reproduction of living organisms.

Substances, energy and information accumulated in these soils determines actions, in turn, the development of living organisms, achieving response relationships biorutinare systems - the main specific aspect of self-organized structures. Response relationship materializes ecological functions of soil, including the base - fertility. In this respect the development of the main factors of fertility (structure, pore space, water and air capacity reserves of nutrients) are determined by the self-organization of product-oriented optimization biogeocenoze original mother rock characteristics unfavorable for plant growth. Self-organization is achieved through regulatory processes flow rate (intake) and transformation of organic substances in biorutinare systems.

In Agrogen regime, an important factor in dealing with human factor is biorutinare systems that can perform both positive role and negative role degradative creative if his actions are contrary to the laws of natural organization of systems,

Through this prism of ideas biologization agroecosystems is a process of soil fertility management through parental modeling and optimization of substrate development and reproduction of plnatelor himself through crops. In this respect it is known that any work process is used to modeling an ambience ecopedological as optimal for the development and reproduction of plants.

In the role of modeling lies agrobiocenozer is come to plant itself. It is thus achieving a reduction in expenses connected to technological operations (work, fertilization, plant protection).

Achieving this goal is only possible by adapting crops landscape conditions. This implies the need to assess the potential of soils adapriv. In this situation the role of soils death have physical characteristics (size composition, denistatea apparent porosity, aggregate composition, degree of balancing the composition of aggregate and aggregate stability, degree of mobility and accessibility of water in the soil, the degree of aeration). Crop selection to be made taking into account the possibilities mandatory solitary landscapes and cultures. In case of non-simultaneousness capacity of crops adaptability and the potential of the landscape adaptiv, crop plants consume some of the energy necessary to ensure comfort, so they lose bioproductivity.

From those referred consider it necessary a model of conservation farming system corresponding with bioclimatic conditions in the region (Jigău, 2015).

The basic components of the regional model of conservation agriculture are:

- Systemic approach to conservation agriculture.
- Differentiation and adaptation of all components of Landscape agroecosystem (culture, work, fertilization, plant protection).
- Reduce to a minimum of mechanical pressure to modeling soil and increasing the role of biological factor in this process.
- Management of organic substances.
- Practice differentiated crop rotation based on landscape conditions.
- Implementation of a National Programme biologization and fiziatization of agroecosystems in Moldova
- Staggered implementation in stages of components of conservative farming system.

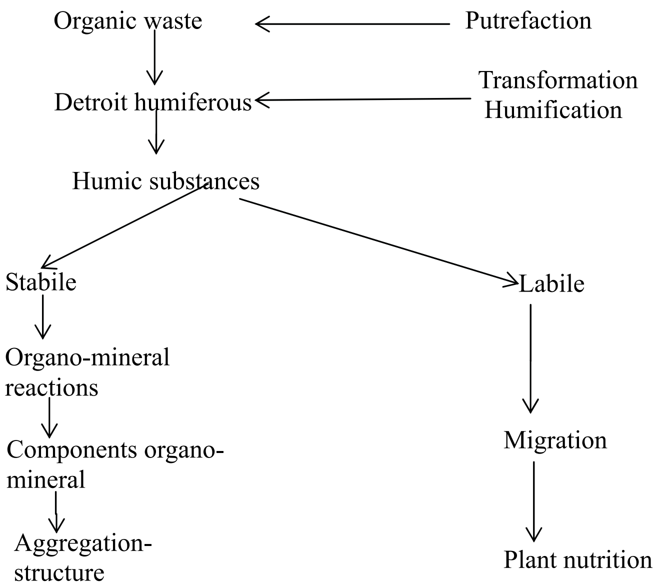
Basic components of the national program and fiziatization of biologization of agroecosystems in Moldova are:

1. The practice of differentiated crop rotation and increasing area occupied by perennial grasses.
2. Systematic practice of sidereal crop, intermediate and interspersed.
3. Incorporate all organic residues in the soil and ensuring biological nitrogen necessary for the decomposition and transformation, their humification.
4. The processing of organic waste in order facilitate the process of animal transportation and soil management.
5. Practicing effective biopreparates as to optimize nitrogen in the soil and transformation framework-humification of organic waste.
6. Minimize chemical inputs from outside and promote biodiversity by increasing biological energy resources.

Its implementation will lead to a number of pedofunctional and landscape effects within biological agroecosystems:

1. System restore of organic substances.
2. Favorisation of modeling biological processes of soil substance in accordance with plant needs:
   - Autorefining and ensuring optimal values of aparent density.
   - Aggregation substance and increasing soil aggregate stability.
   - Ensuring continuous and optimal pore space.
3. Optimizing relationships with water, air, heat, etc.
4. Restoration of soil biota, fewer pests and pathogens.
5. Returnation of the area pedogenetic processes and optimizing soil functions within the landscape.
6. Diminuation of erosion processes.
7. Reduction of energy consumtion.

Functional components of the system of organic substances can be drawn with the following scheme:



In complance with the concept stated above, implementation of regional model of conservation agriculture requires 3 stages as follows:

No.	Phase	Content
1	Transition	System works and arrangements adapted to the characteristics Agrogen layer. Increasing energy resources in the ground. Biologization and optimize physical properties of the layer Agrogen. Effective combination of processes (ie processes) agronomic and biological
2	Elementary pedogenetic processes and landscape restoration	Minimize work. Work systems adapted to the landscape. Differential rotation in accordance with necesitățille adaptive-improvement of the landscape. Practicing field with sidereal. Intermediate crops and intercropping practice tailored to the landscape. Promote biological processes in soil. Moderate fertilization corresponding recovery capacity of the soil.
3	The enlarged production of typogenic processes and working landscapes	Conservative system adapted to the landscape. Crop rotation adapted to the landscape. Structure of crops with high economic efficiency and pedofunctional. Inclusion of perennial grasses in rotation. Placing emphasis on biological resources of the landscape. Promoting biological methods of plant protection.

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