METHODS OF PRESERVING SOIL FERTILITY IN AN ECOLOGICAL SYSTEM

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Abstract. *Ecological agriculture has an important role in preserving soil fertility due to the use of organic fertilizers instead of chemical ones. Organic fertilizers contribute to increasing soil fertility by increasing the content of nutrients; correction of the aerohydric regime in the soil, the intensification of microbiological activity as well as the improvement of the soil structure. The leguminous plants have the ability to ensure their nitrogen requirements through this symbiosis, and after their harvest, an appreciable amount of nitrogen remains in the soil. Within the cultural technologies, soil works represent an important link. In order to correct the aerohydric regime, a scarification was performed and the preparation of the germinal bed was carried out by a passage with a heavy disc. Before sowing, a pass is made with the combinator with the arrow blade (goose paw) with an important role in combating weeds. Vegetable remains are chopped and incorporated into the soil, leading to an increase in the content of organic matter, having an important role in the synthesis of the organic compounds that make up the humus. The degree of weeding is a problem in wheat cultivation in the ecological system, it can lead to high harvest losses of up to 60%. Optimum density, crop rotation, blind seeding, are the main factors to consider in reducing the degree of weeding*

Keywords*:ecological agriculture, fertilization, culture technologies*

INTRODUCTION

Soil is home to over 25% of all biodiversity on the planet and is at the base of the food chains that feed humanity and, above all, biodiversity. This fragile layer is expected to provide food and filter drinking water suitable for consumption for a world population of nearly 10 billion people by 2050.

Among the objectives of the European Union regarding the achievement of good soil health, in the medium term until 2030, we mention the reduction of nutrient losses by at least 50%, the general level of use and risk of chemical pesticides by 50% and the use of 50% more dangerous pesticides by 2030 (FAO 2020)

The use of ecological methods to restore soil fertility leads over time to an improvement of the physical-chemical characteristics of the soil (humus content, pH, aerohydric regime, etc.).

The main purpose of agroecological systems is to increase and/or preserve soil fertility; An important source of increasing soil fertility is organic matter from the decomposition of plant residues,

Disease control is done by applying certain methods which, depending on the time and method of application, can be preventive and curative (Toncea and Stoianov, 2002).

Within the culture technologies, soil works represent an important link and therefore it is necessary to be carried out in the best conditions. In this sense, the farmer must know some particularities of the land, the type of soil, the presence of problem weeds, some characteristics of the cultivated species, in order to set up the work methods, the necessary equipment and the indices for the execution of the works.

In order to prevent the degradation processes of cultivated land, it is mandatory to preserve a good structure by avoiding a large number of crossings and using appropriate systems of machines and equipment to perform several technological operations at a crossing.

MATERIALS AND METHODS

The agricultural operation under study has as its main activity agricultural production in an ecological system

Agrochemical mapping works were carried out on the perimeter of the holding in order to evaluate the pedo-agrochemical conditions

The data collected from the field and the interpretation of the laboratory analyzes were used to delimit the agrochemically homogeneous plots

Following the agrochemical study, measures were applied to prevent soil loosening and increase their fertility, work was carried out on the morphological, physical and chemical characterization, determining the productive potential of the soil cover.

In the 2020-2021 agricultural year, wheat, sunflower and soybeans were sown in an ecological system

Wheat was sown in the first week of October at a density of 120 kg/ha with the Capo variety, proven to have a strong twinning capacity in the spring, with high protein and gluten content.

In order to correct the aerohydric regime, a scarification was performed and the preparation of the germinal bed was carried out by a passage with a heavy disc. Before sowing, a pass is made with the combinator with the arrow blade (goose paw) with an important role in combating weeds

The degree of weeding is a problem in wheat cultivation in the ecological system, it can lead to high harvest losses of up to 60%. Optimum density, crop rotation, blind seeding, are the main factors to consider in reducing the degree of weeding

In sunflower, weed control is done by mechanical harrows, the first harrowing being carried out at sunrise with a disc with goose paw organs, the machine being provided with a guide camera. In the case of soybean cultivation, a harrow is attached after the sows, with the role of leveling the soil.

RESULTS AND DISCUSSIONS

The reaction of the soil is weakly acidic and the analytical data regarding the indices of the soil reaction (low degree of saturation in bases and sch aluminum greater than 0.3me/100 g of soil) require works to correct the reaction of the soil. On the soils on the perimeter of the farm analyzed, the reaction is slightly acidic.

Morphological characterization of the soil profile

Ap horizon (0-15 cm), dusty sandy loam, with shades of 2.5 Y 3/3 when wet and 2.5 Y 5/4 when dry, alluvial, friable, fine roots frequent, poorly structured, easily compacted at surface due to grazing, without carbonates, with a diffuse transition to the lower horizon;

Ao horizon (15-36 cm), medium sandy loam, with shades of 2.5 Y 4/3 wet and 2.5 Y 6/4 dry, reavan, unstructured, friable when wet, fine roots frequent in upper half of the horizon, does not make effervescence;

C1 horizon (36-62 cm), fine sand, with shades of 2.5 Y 4/4 wet and 2.5 Y 6/6 dry, wet, unstructured, rare fine roots, occurrence of coarse fragments

C2 horizon (62-90 cm), medium sand, with shades of 2.5 YR 5/3 wet and 2.5 Y 6/6 dry, unstructured, wet, abrupt transition to skeletal horizon;

Cn horizon (> 90 cm), coarse sand associated with coarse alluvium, gravel, boulders, etc.

Physico-chemical characterization

The physico-chemical properties of this type of soil are consistent with the physico-geographical conditions of their formation. Analytical data for typical alluvium are presented in the following table.

Table 1

Physical and chemical analyses

Horizont	Ap	C_1	C_2	Cn
Depth (cm)	0-35	35-60	60-90	> 90
Sand gr. (2-0.2mm)	8.3	16.8	49.6	-
Fine sand (0.2-0.02 mm)	46.8	51.1	21.3	-
Dust (0.02-0.002mm)	25.5	27.8	24.5	-
Clay (< 0.002 mm)	19.4	4.3	4.6	-
Texture	SS	Sm	NF	NG
pH	5.55	6.52	6.69	-
Humus (%)	2.16	1.45	1.01	-
Bulk density (g/cm3)	1.23	1.26	1.27	-
Total Porosity (%)	54.5	50.7	47.2	-
GT settlement degree (%)	weak	Ñetas	moderate	-
Degree of saturation with bases (V%)	48.9	77.8	78.3	
Nitrogen Index (IN)	1.10	1.57	1.56	
Mobile P (ppm)	22	18	10	-
Mobile K (ppm)	34	28	27	-
Coefficient of hygroscopicity (%)	4.9	2.3	2.2	0
Wilting coefficient %	7.35	3.45	3.3	-
Field Capacity %	13.4	6.27	6.0	-
Useful water capacity %	6.1	2.8	2.7	-
Total capacity (%)	44	40	37	-
Humus reserve (t/ha)	95	47	44	-

The nitrogen supply status of the soil was calculated based on its positive correlation with the humus content and the degree of base saturation in the plowed soil layer. The soils analyzed in this paper are moderately supplied with nitrogen (2.01 - IN - 4.00)

The state of phosphorus provision of the soil is considered to be very poor (less than 8.00 mg/kg), the content of easily soluble phosphates is the main factor that differentiates the dose of phosphate fertilizer.

The potassium supply of the soils is good. In the case of high levels of products, it is necessary to correct it to balance the NPK ratio. Regarding the state of soil supply with potassium, we mean a good reserve (132.01 mg/kg < Kmobil > 200.00 mg/kg

The content of organic matter (humus) in the soil falls within the limits of an average state of insurance (2.01 - 4.00 %)

This type of soil is located in the Crisul Alb river meadow area, used as arable land. The texture is loamy-sandy in the upper horizon and becomes sandy-loamy on the rest of the soil profile, and at its base, coarse deposits of gravel, stones, etc., of quartz nature

A major importance is the controlled application of nutrients, in such a way as to ensure the optimal use by the crop plants of the nutrients existing in the soil and of those applied annually in accordance with the needs and requirements imposed for the protection of water and soil quality. The main objective of the current work is the evaluation of the ecopedological conditions and the establishment of ecological methods of soil fertility conservation

Crop rotation is the basis of natural fertilizers, as well as the construction of a healthy soil. It is important to modify the specific plots depending on the condition of the soil.In the future, it is proposed to sow with a vegetative layer of cereal soil protection in clover. Thus,

already in the second year, a harvest can be obtained with the same positive effect as a rotation, an alternation of cereal crops with grass.

Soil fertility is also done by introducing a leguminous crop in rotation. In the first year after the legumes, the wheat crop is established because it has high requirements for nutritional resources

Soy, as the preceding plant, has an important role in preserving soil fertility because it leaves up to 120 kg/ha in the soil, leading to a significant decrease in energy costs for the next crop

Vegetable remains are chopped and incorporated into the soil, leading to an increase in the content of organic matter, having an important role in the synthesis of the organic compounds that make up the humus

Approximately 30% of the total nitrogen that the plant accumulates throughout its life cycle remains in the soil, through plant residues. That nitrogen is in organic form and will enter the mineralization process to be accessible to the next crop

The degree of weeding is a problem in wheat cultivation in the ecological system, it can lead to high harvest losses of up to 60%. Optimum density, crop rotation, blind seeding, are the main factors to consider in reducing the degree of weeding

CONCLUSIONS

The production capacity of an agricultural holding depends decisively on a correctly planned and consistently executed rotation.

Agrochemical mapping works were carried out on the perimeter of the holding in order to evaluate the pedo-agrochemical conditions. The data collected from the field and the interpretation of the laboratory analyzes were used to delimit the agrochemically homogeneous plots

The content of organic matter (humus) in the soil falls within the limits of an average insurance state (2.01 - 4.00 %) The soils analyzed in this work are medium supplied with nitrogen (2.01 - IN - 4.00). The reaction of the soil is slightly acidic

The activity of macro and microfauna in the soil has an important role in maintaining and increasing soil fertility.

The symbiotic activity of bacteria significantly influences soil fertility.

In the evaluation of the nitrogen reserve in the soil, it is taken into account, in addition to the nitrogen from the introduction of leguminous soils (soy), and the nitrogen from atmospheric precipitation, the incorporation of plant residues.

By using ecological methods to restore soil fertility, the plants contain a smaller amount of nitrates, compared to those where chemical fertilizers with nitrogen were used, which gives a superior biological quality.

For wheat, the average production in the ecological system is 3500 kg/ha with a protein content of 11-13% and hectoliter mass up to 85 ha.

An average production of 2,500 kg/ha was obtained for soybeans and an average production of 1,800 kg/ha for sunflowers.

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