

THE COMPARATIVE ASSESSMENT OF INDICES OF SOIL IN DEPENDING OF AGROTECHNOLOGIES APPLIED TO GROWING MAIZE

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Summary. An important component in the agricultural technology tillage system with a view to creating favorable conditions for plant growth and development, leading to modification of the physical condition of the soil and taking direct action on chemical and biological soil characteristics, regardless of the cultivated plant. Maize is a crop less demanding of the previous plant. The best results are obtained by annual grain legumes and fodder followed autumn cereal grains, flax, hemp, potatoes, beets and sunflowers. Wheat maize rotation is required due to the weight of approx. 60% of the two cultures. In this rotation is favored maize is grown after a run-up early (www.agricultura-romania.ro). From research data is mentioned that both in cenosis maize monoculture (34 years) and maize in the crop rotation (after maize) following application of tillage - No-till soil moisture preserves layer is 40-50 cm, which and other researchers argue, regardless of the cultivated plant (Andriucă V., 2015). Conservation tillage system is best for rooting crops, including maize. CA is a precision agriculture with the purpose of preserving soil fertility.

Keywords: maize, soil properties, agrocenoses, soil tillage, crop rotation.

INTRODUCTION

Maize is a plant drought-resistant, heat-loving and light. It is an annual plant, which belongs to the grass family and originated in America. Maize was brought to Europe in the XVth century by Christopher Columbus and was adapted pretty quickly to new climatic conditions in Spain and Portugal so gradually spreading to all countries including the Republic of Moldova.

Maize occupies the third place between cultivated plants worldwide, totaling after the 2005 statistics, the surface of 147.0 mln. ha to 3587 kg/ha. The largest areas are in US maize 30.8 million. ha, followed by China (25.2 mln. ha), Brazil (11.4 mln. ha), Mexico (8.0 mln. ha), India (7.4 mln. ha). In the Moldova the maize is grown on large tracts of approx. 480 000 ha. High yields obtained in Italy (10063 kg/ha), USA (9315 kg/ha), France (8095 kg/ha).

Maize occupies third place in importance between cultivated plants worldwide. This position, in terms of agriculture, is motivated by a number of features, such as: has a large production capacity by about 50% higher than in other cereals; has great ecological plasticity, which allows a wide area of distribution, giving high yields and relatively constant, less influenced by climatic irregularities; is a plant hoes, good run for most crops; supports monoculture for several years; it has a high coefficient multiplier (150-400); having seeding later in the spring, enables better scheduling of agricultural operations; culture is mechanized 100%; harvesting is done without danger of shaking; well recovered organic and mineral fertilizers and irrigation water; their production possibilities are varied etc. (<http://www.agrimedia.ro>).

Tillage system influences many processes "chain" that directly or indirectly arise during the execution of the work. Soil works upon some organized structures through which you manifest effect on both the plant and the initial system. Organized system such as soil tillage and initially take their effect, amplify or shrink them action in relation to other systems (climate, plants and microorganisms).

Soil works through direct and indirect effects of soil layer influences both worked and Subari horizon. Changes are physical, chemical and then biological primarily variable characteristics (Pop A., 2008).

MATERIAL AND METHOD

The research was conducted in Didactic-Experimental Station UASM of being among long stay, founded in 1970, located in Anenii Noi district, about 26 km from Chisinau. Anenii Noi district is located at latitude 46.8827 29.2304 longitudes and altitude of 18 meters above sea level bud. Rayon composed of 45 municipalities,

including and Chetrosu.

As a subject was chosen agro maize that has both common features and significant differences. It is common place - Moldova's Central Area on the outskirts Codrilor regime weather, soil type, and the difference lies in the degree of anthropogenic action, expressed by tillage technology. The research aim in this paper is to evaluate some physical properties compared to growing maize under the influence of conservative technologies and conventional tillage and weather conditions.

In this work they were carried out research in the crop rotation of maize and maize monoculture, for 34 years. Some physical properties were evaluated: soil moisture thermostatic by the method of weighing and drying the samples in an oven at a temperature of 105°C and the bulk density effected by means of cylinders, also penetration resistance was determined in the field using penetrometer. Penetration resistance classification is according penetration resistance values shown in Table 1.

Table 1.

Classes' penetration resistance values (after Canarache A., 1990)

Name	The values (kgf/cm ²) (I.C.P.A., 1987, vol. 3)	Meaning	
Very small	Under 11	Normal growth of roots Partial limitation roots Roots cannot penetrate	
Small	11-25		
Medium	26-50		
Very big	51-100		
Extremely big	101-150		
	After 150		

RESULTS AND DISCUSSIONS

The research was conducted under agrocenoses maize and maize monoculture in crop rotation (34 years), applying technology conventional tillage and conservation.

Crop rotation within a properly drawn rotation provides a number of benefits for the agricultural ecosystem, helping to relieve the physical and chemical composition of the soil, the disappearance of pests, and weeds present in some crop fields weeding. (<http://www.akademos.asm.md>).

According to the researchers ICCC "Selection", especially the scientist B. Boincean rational use of crop rotation in growing and processing crops lead to a significant increase in productivity. Thus, sugar beet production may be increased by about 10-30%, and up to 40% maize and the sunflower 10-20% (Boincean B., 2003; 2004).

Monoculture maize was expanded in our country fertile soils, lower, shallow ground water, subjected to the wettest springs temporary excess moisture - land on which wheat not recovered as much as maize. It can be appreciated however that the prolonged monoculture reduces humus content, structure degrades, there is a progressive acidification of the soil, pests and diseases are proliferating (www.agricultura-romania.ro).

The research was focused on changing the physical properties of soil - moisture, bulk density and physico-mechanical - penetration resistance under maize agrocenoses applying conventional tillage system and conservative. Research conducted in this paper of on the 0-120 cm layer, soil moisture and bulk density in 0-50 cm layer and penetration resistance in the 0-50 cm layer in agrocenoses permanent crop maize are shown in Table 2, and the results agrocenoses maize in the crop rotation research (after maize) are shown below in Table 3.

Table 2

Agroindices and soil moisture based on the tillage system under agrocenoses maize monoculture, SDE Chetrosu, May 2016

Depth, cm	Mousture, %		Apparent density, g/cm ³		Soil resistance to penetration, kgf/cm ²	
	Plowing	No-till	Plowing	No-till	Plowing	No-till
0-10	13.55	12.75	1.09	1.42	8.5	14.5
10-20	15.62	15.78	1.10	1.35	9.4	23.7
20-30	18.63	19.22	1.19	1.32	10.2	20.9
30-40	20.68	19.57	1.20	1.29	16.3	22.6
40-50	20.16	19.97	1.13	1.25	19.6	21.0
50-60	19.39	20.12				
60-70	18.25	19.52				
60-70	18.25	19.52				
70-80	18.72	19.04				
80-90	18.58	17.93				
90-100	17.9	17.7				
100-110	17.05	17.44				
110-120	17.0	16.59				

Comparative evaluation of moisture in maize monoculture cenosis (34 years) and maize in rotation (after maize) with conservative system and conventional tillage is shown in Fig. 1 and observed that good soil moisture (not essential) is greater than the version of No-till research compared to maize variant in crop rotation and monoculture maize (34 years).

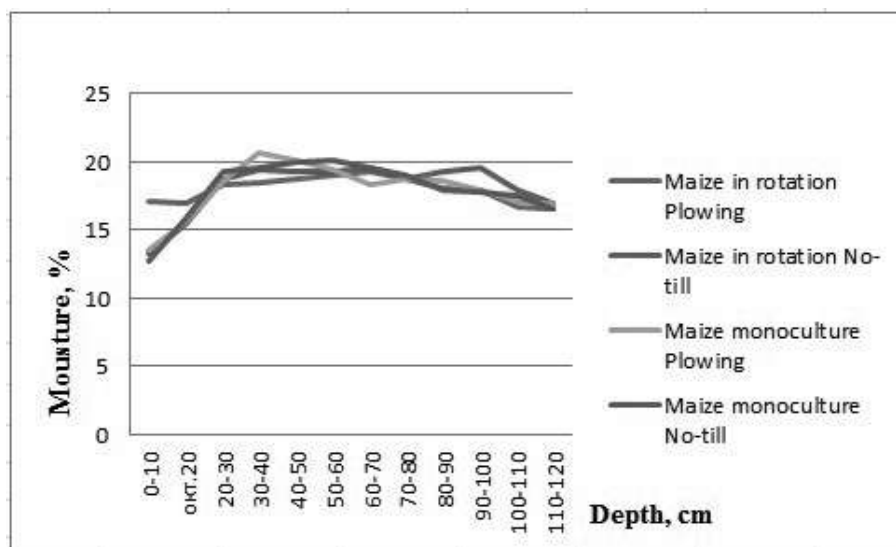


Fig. 1. Soil moisture depending on tillage system under agrocenoses maize and maize monoculture in crop rotation (34 years), SDE Chetrosu, May 2016

The apparent density is relatively independent ownership, knowledge of which provides physical characterization of soil elements independent, which can only be deduced in some cases from other properties. A soil belonging to a genetic type with a certain texture, with specific chemical properties, can have very different bulk density values, and vice versa more of the other physical properties of the soil depend, in addition to texture or some chemical characteristics and bulk density. For the characterization of the soil texture and bulk density are the basic characteristics (Canarache A., 1990).

From the data obtained on the apparent density No-till variant research in maize monoculture agrocenoses varies between 1.25 to 1.42 g/cm³, it is greater than plowing variant, ranging within 1.09 to 1.20 g/cm³, the same situation is observed in the maize crop rotation, plowing - density varies between 1.16 to 1.20 g/cm³, while the variant of maize research in crop rotation, No-till is the apparent density 1.19 - 1.35 g/cm³ (Fig. 2).

Table 3

Agroindices and soil moisture based tillage system under maize in the crop rotation agrocenoses, 34 years old (pre - maize), SDE Chetrosu, May 2016

Depth, cm	Mousture, %		Apparent density, g/cm ³		Soil resistance to penetration, kgf/cm ²	
	Plowing	No-till	Plowing	No-till	Plowing	No-till
0-10	17.06	13.27	1.19	1.27	8.4	7.8
10-20	16.88	15.41	1.20	1.35	10.2	11.1
20-30	18.34	18.71	1.16	1.29	15.2	14
30-40	18.5	19,34	1.18	1.21	20.6	19.3
40-50	18.68	19.31	1.20	1.19	20.9	22.5
50-60	18.96	19.23				
60-70	19.33	19.48				
70-80	18.73	18.73				
80-90	18.04	19.29				
90-100	17.85	19.52				
100-110	16.72	17.97				
110-120	16.5	16.9				

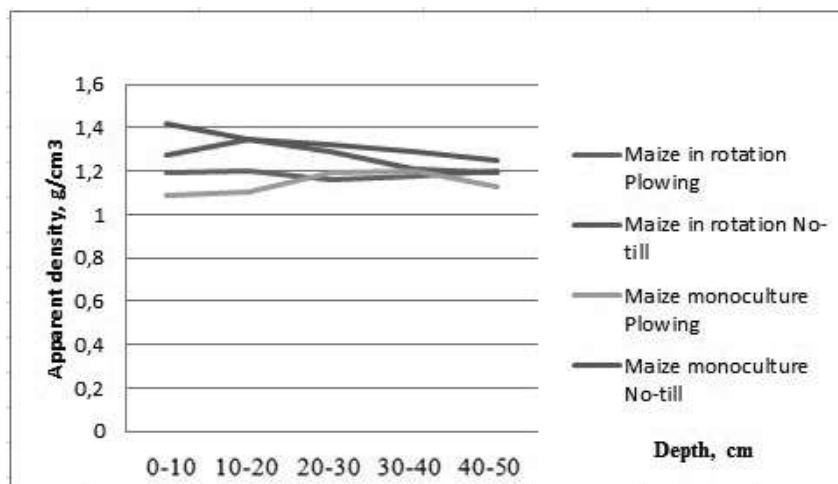


Fig. 2. The bulk density of soil by tillage system under agrocenoses maize and maize monoculture in crop rotation (34 years), SDE Chetrosu, May 2016

Penetration resistance presents special importance in relation to the study and development of the root system in the soil penetration. The similarity between the tip and root penetration is obvious (Greacen E., 1968). According to research by Taylor H. 1966 the penetration resistance values less than 10-15 kgf/cm² is not bad for roots to penetrate the soil, while higher values of 35-40 kgf/cm² root penetration is practically impossible.

Research in both versions of No-till plowing and so on maize monoculture and maize in rotation penetration resistance increases with depth, comparing maize crop in rotation with maize permanent soil tillage - No-till 0-50 cm layer resistance the penetration is higher in maize monoculture, ranging within 14.5 to 23.7 kgf/cm², explained is a more rapid development of the plant and the roots, due to keeping water in the soil. Both variants research into crop rotation of corn and maize monoculture (34 years) soil moisture (not essential) is greater than the version of No-till research (Fig. 3).

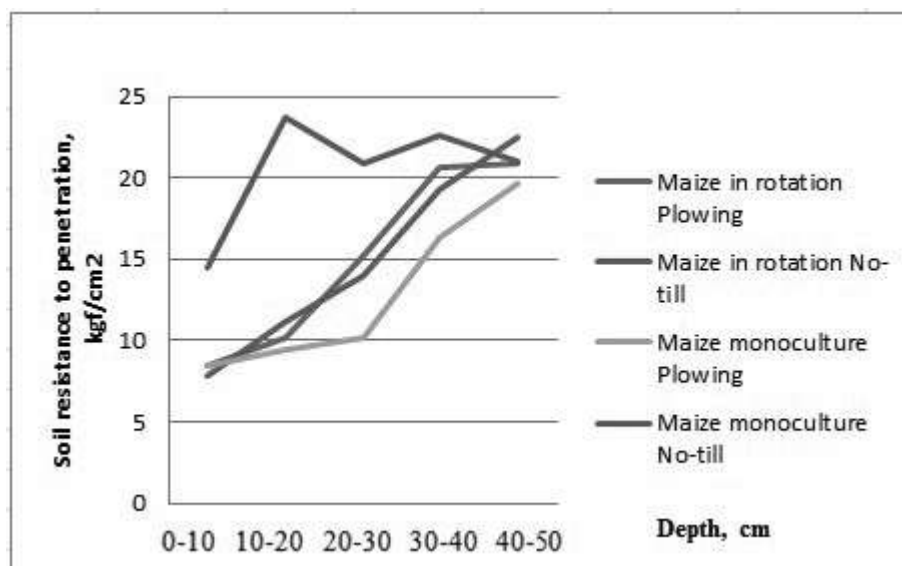


Fig. 3. Soil resistance to penetration by tillage system under agrocenoses maize and maize monoculture in crop rotation (34 years), SDE Chetrosu, May 2016

CONCLUSIONS

The conservative tillage systems choice of crop rotation is more needed than in conventional systems, having beneficial effects on both the soil by improving biological activity and the supply of nutrients and the mass development of root in better control of weeds, diseases, pests and plants grown in increasing the productivity. In the conservative system of tillage soil moisture is kept within 40-50 cm, giving the possibility to plants to grow better and faster, covering the soil with leaves, which results in slowing the growth of weeds.

The apparent density of the No-till variant research in maize monoculture agrocenoses varies between 1.25 to 1.42 g/cm³, is greater than plowing variant, ranging within 1.09 to 1.20 g/cm³, this observing and maize in the crop rotation, No-till bulk density ranging between 1.16 to 1.20 limits g/cm³, plowing - having bulk density limits from 1.19 to 1.35 g/cm³, while penetration resistance both versions of maize research different technologies of tillage increases with depth.

BIBLIOGRAPHY

1. Andriucă V. *Agricultura conservativă – componentă a agriculturii durabile și agriculturii de precizie*. În: Conferința Științifico-practică Internațională. Chișinău, 2015. pp. 18.
2. Boincean B. *Productivitatea culturilor de câmp în asolament și în cultura permanentă*. În: Universitatea Agrară de Stat din Moldova: Lucrările științifice, 2003, vol. 12, p. 100-102.
3. Canarache A. *Fizica solurilor agricole*. Ed. CERES. București, 1990. 268 p.
4. Căinărean Gh. *Conceptul managementului durabil al terenurilor*. In: ACSA. Managementul durabil al terenurilor. Chișinău, 2015. pp. 10.
5. Căinărean Gh. *Practici de bază, instrumente și echipamente ale gestionării durabile a terenurilor*. In: ACSA. Managementul durabil al terenurilor. Chișinău, 2015. pp. 50.
6. Greacen E. Farrell, D., Cockroft, B. *9th Int. Congr. S. Sci.*, Adelaide, 1. pp. 769-779.
7. Rusu, T., 2001. *The influence of Minimum Soil Tillage upon the soil, yield and efficiency*. PhD Thesis, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca.
8. Taylor, H., Roberson, G., Parker, J. *Soil Sci.*, 102. pp. 18-22.
9. Боинчан Б. Северооборот и урожайность полевых культур на чернозёмных почвах Молдавии. În: Севооборот в современном земледелии. Сборник докладов Международной научной конференции. Москва: Издательство МСХА, 2004, с. 43-49.
10. ***<http://www.agrimedia.ro/articole/tehnologia-de-cultura-a-porumbului-pentru-boabe-cultivat-in-sistem-neirigat>.



Rindera umbellata



Alyssum gmelinii

The Red Book of the Republic of Moldova, Third edition. 2015