

Effect of Different Soil Tillages on Yield and Quality for Maize Crop

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INTRODUCTION

The relationship between crop and technological measures is very important for establishing the most efficient management method for increasing yield, production quality and soil water conservation. This material analyzes the influence of tillage systems: conventional tillage (CT), minimum tillage (MT) and no-till (NT) on corn yield and quality and soil moisture over two years (2023-2024) on a chernozem soil at NARDI Fundulea, Romania. Soil moisture determinations were an integral part of the climatic characterization of the agricultural year and provided annual reference data. In 2023, very low soil moisture values were recorded, differing depending on the tillage system, which led to a minimum value of only 16.0% (400 m3 ha-1) for the CT system with spring plowing, a maximum of 19% (540 m3 ha-1) in the NT system and intermediate values in the MT system with 16% (504 m3 ha-1) for the chisel variant. Statistical analyses showed significant effects of all tillage methods on corn yield and quality and their interactions with other technological links. The average results over two years showed that the highest yields were recorded for MT (4.9 t ha-1), while the averages for CT and NT were lower (4.2 t ha-1 and, respectively, 2.8 t ha-1). The implementation of technological links, associated with a possible climate forecast, will increase the chances of the corn crop in Romania to successfully overcome the vegetation period with deficiencies and provide high and constant yields.

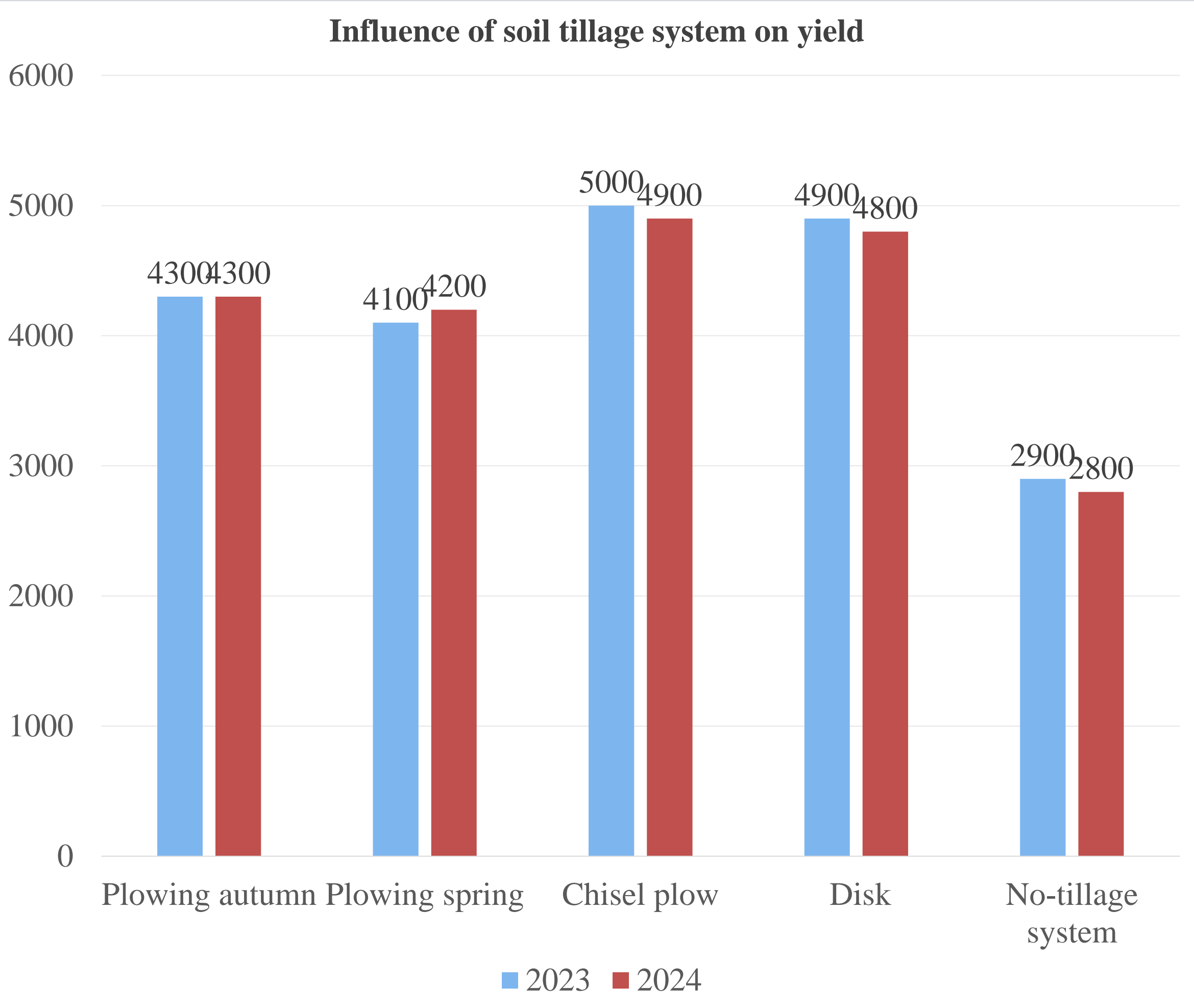
- Efficient soil tillage management is an essential factor in optimizing maize production, especially in the context of current climatic challenges. In recent years, large variations in rainfall patterns have increased the need to comparatively evaluate technologies such as conventional tillage (CT), minimum tillage (MT), and no-tillage systems (NT).
- The primary goal of cultivation systems is to create favorable conditions for plant growth and development, while identifying new solutions to reduce production costs and to maintain—or even enhance—soil fertility.
- The national and international research results reinforce the conclusion that the influence of technological measures is enhanced, positively or negatively, by the type of soil, the characteristics of the cultivar and the climatic conditions of the area (Petcu et al., 2000; Bailey-Serres et al., 2019).

METHODOLOGY

- This study investigates the impact of different soil tillage methods on maize yield and quality, based on data collected over two agricultural years, 2023–2024, on a cambic chernozem in southeastern Romania (Fundulea), under non-irrigated conditions. The cultivated maize hybrid was Magnus, a simple, semi-early hybrid developed at NARDI Fundulea.
- The five experimental variants analyzed included two conventional tillage operations: autumn plowing and spring plowing; two minimum tillage operations: chisel and disk; and one no-tillage system.

Year	Variant Soil tillage	Yield (kg/ha)	Quality of Yield		
			WTS (g)	HW (kg/hl)	Humidity (%)
2023	A1	4300	252	77,8	14,1
	A2	4100	263	79,0	14
	B1	5000	269	78,1	14,4
	B2	4900	247	78,6	14,6
	C1	2900	225	77,7	14,9
2024	A1	4300	251	77,5	14,7
	A2	4200	267	78,3	14,4
	B1	4900	262	78,9	13,5
	B2	4800	238	78,3	14,4
	C1	2800	222	76,8	14,2

*Witness variant; A1 - plowing autumn (22-25 cm) + disk (8-10 cm), A2 - plowing spring (22-25 cm) + disk (8-10 cm); B1 - chisel plow (18-20 cm) + disk (8-10 cm); B2 - disk (10-15 cm) + 2 passes; C1 - No-tillage system (direct sowing).



RESULTS AND DISCUSSION

- The highest yield during the analyzed period was recorded in 2023 in the experimental variant with minimum tillage (chisel), where 5000 kg/ha were obtained. Conversely, the lowest yield, 2800 kg/ha, was obtained in 2024 in the no-tillage variant.
- Regarding quality, the best results were also observed in the minimum tillage variant, with values of 269 g for WTS and 78.1 kg/hl for HW.
- For the average yield across the two agricultural years studied, the highest value was recorded in 2023, with 4900 kg/ha, while the lowest average yield was obtained in 2024, at 2800 kg/ha, in the no-tillage variant.

CONCLUSIONS

- Tillage systems are very important for the maize crop and decisively establish the start of vegetation and the evolution of the crop at key moments through the possibilities of storing and preserving water and increasing the efficiency in control weeds by decreasing the seed reserve in the superficial layer.
- The yield and quality of the maize crop are directly influenced by the tillage system. The highest productions were recorded with the MT system (4.9 t ha-1), while the averages of the CT and NT systems were lower (4.2 t ha-1 and 2,8 t ha-1), in the unfavorable climatic conditions of the years 2023/20

