SOIL HEALTH ASSESSMENT IN FILIPOIU FARM ON THE GREAT ISLAND OF BRAILA

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ABSTRACT

The paper presents the results obtained at the Filipoiu farm on the Great Island of Brăila, which aim to assess soil health in accordance with the requirements of the European Commission through its "Soil and Food Health" (2021) program. A minimum system of soil tillage was applied, works performed with the Joker on the corn crop, in an irrigated system. The fertilizer dose was established as optimal economic (177 kh/ha N, 50 kg/ha P and 22.5 kg/ha K) calculated for an achievable production of 9100 kg/ha of grain corn, the expected production by the farmer of 12800 kg/ha, and the production obtained was 15144 kg/ha, with a difference of 2344 kg/ha (18.3%). Soil samples were collected from three profiles, every 10 cm, up to a depth of 50 cm. Soil structural hydrostability (HA) is very high in the first 10 cm (43%) and high up to a depth of 50 cm; the dispersion (D) represented by the microformations with a diameter of <0.01 mm has extremely high values and leads to very high values of the structural instability index (SI). In all three soil profiles, the texture is dusty-clay, and the carbonate content at a depth of 50 cm has average values (2-8%). The level of nutrient supply is normal and has not been negatively influenced by the production technologies applied. Analyzing the physical and chemical state of the soil, it is possible to appreciate its very good quality, in accordance with the local pedoclimatic conditions and it is capable of providing good quality productions and biomass. The technologies applied through the conservative system have led to a continuous improvement in soil fertility, expressed through the high yields obtained.

Keywords: soil health, alluvial soil, conservative agriculture, fertilization

INTRODUCTION

Sustainable agriculture has emerged as a vital paradigm for addressing the multifaceted challenges faced by rural areas. By offering integrated solutions to economic, social, and environmental problems, sustainable agricultural practices ensure the effective use of technological advancements while fostering continuous growth and diversification. This approach not only addresses immediate technical and economic concerns but also supports long-term resilience and development, positioning rural communities for a more prosperous and sustainable future.

In the European Union, the importance of sustainability is at the core of economic and environmental policies. The "2020 Annual Sustainable Growth Strategy" (European Commission, 2019) underscores the integration of four key dimensions—environmental sustainability, productivity growth, fairness, and macroeconomic stability—as essential drivers of sustainable development. These priorities aim to harmonize economic growth with ecological preservation, ensuring a balanced and equitable approach to development.

Building on this vision, the European Commission's "Soil and Food Health" programme (2021) identifies three farming systems as essential for advancing sustainable agricultural practices. These include:

1.Organic Farming, encompassing certified farms and those transitioning to certification, which focuses on ecological balance and reducing reliance on synthetic inputs;

2.Integrated Crop Management, a system that combines traditional and innovative practices to optimize yields while minimizing environmental impacts; and

3.Conservation Agriculture, which emphasizes practices such as reduced tillage, stubble preservation, crop residues management, cover cropping, and crop rotation to improve soil health and enhance biodiversity.

These strategies align closely with the European Green Deal, which provides an ambitious roadmap for transforming the EU into a sustainable, resource-efficient, and competitive economy. This initiative aims to protect and enhance the Union's natural capital, fostering a modern and prosperous society while safeguarding the health and well-being of its citizens. By emphasizing resource efficiency, biodiversity conservation, and climate neutrality, the European Green Deal establishes a robust framework for sustainable development that is deeply rooted in environmental and social responsibility.

Against this backdrop, sustainable agriculture is increasingly recognized as a cornerstone for achieving the European Union's broader goals of ecological preservation, economic stability, and social equity. This introduction sets the stage for exploring the intricate linkages between agricultural practices, environmental health, and sustainable development within the context of EU policies and initiatives.

MATERIALS AND METHODS

In order to assess the soil quality, soil samples were collected from the Filipoiu farm, located on the Big Island of Brăila, where a conservative agriculture system is applied. A minimum system of soil tillage was applied, works performed with the Joker on the corn crop, and soil samples were collected from three profiles, every 10 cm, up to a depth of 50 cm.

RESULTS AND DISCUSSIONS

For the maize crop, the optimal economic dose of fertilizers (177 kg/ha N, 50 kg/ha P and 22.5 kg/ha K) was calculated for an achievable production of 9100 kg/ha of corn grains, but the expected production by the farmer was 12800 kg/ha, and the production obtained was 15144 kg/ha, with a difference of 2344 kg/ha (18.3%), which shows a balanced fertilization system that offers a high degree of valorization of the nutrients applied with fertilizers.

The structural hydrostability of the soil (HA) represented by structural macroformations stable to the action of water, is high up to a depth of 50 cm; the dispersion (D) represented by the microformations with a diameter of <0.01 mm unstable to the action of water has extremely high values and leads to very high values of the structural instability index (SI).

In all three soil profiles, the texture is dusty-clay, and the carbonate content at a depth of 50 cm has average values (2-8%).

After the maize harvest, the soil had a medium content of humus, total nitrogen, mobile phosphorus and mobile potassium. The presence of carbonates in the soil leads to the appearance of tricalcium phosphates with reduced mobility, which increase the level of total phosphorus supply of the soil. It is therefore necessary to increase the dose of phosphorus in order to have enough mobile phosphorus for plant nutrition.

Identification	h (cm)	pH unități pH	Humus %	Nt %	P_{AL} [1)] mg/kg	K_{AL} mg/kg	$S\text{-}SO_4$ mg/kg	Ptotal %	Ktotal %	$T\text{-}NH_4$ me/100g
Pr1	0-10	8,24	3,40	0,241	34	197	44	0,113	1,05	29,02
Pr1	10-20	8,28	3,40	0,211	36	171	35	0,117	1,46	28,52
Pr1	20-30	8,29	3,40	0,219	27	171	36	0,118	1,63	28,52
Pr1	30-40	8,22	3,10	0,208	28	163	36	0,099	1,29	28,52
Pr1	40-50	8,29	2,98	0,209	22	146	39	0,089	1,04	30,52
Pr2	0-10	8,25	3,34	0,213	33	188	36	0,113	1,05	29,52
Pr2	10-20	8,20	3,34	0,218	34	178	38	0,117	1,44	28,52
Pr2	20-30	8,24	3,28	0,218	41	180	31	0,115	1,29	29,52
Pr2	30-40	8,28	3,22	0,209	30	163	36	0,104	0,86	27,52
Pr2	40-50	8,35	3,16	0,205	22	150	35	0,105	0,92	31,02
Pr3	0-10	8,24	3,40	0,223	35	190	36	0,121	1,61	28,02
Pr3	10-20	8,27	3,70	0,228	32	173	40	0,120	1,81	29,02
Pr3	20-30	8,29	3,28	0,212	30	175	30	0,121	1,50	29,02
Pr3	30-40	8,18	3,10	0,203	26	154	26	0,098	0,89	28,02
Pr3	40-50	8,29	3,04	0,199	26	152	32	0,106	1,44	31,52

CONCLUSIONS

Analyzing the physical and chemical condition of the soils from the Filipoiu farm, located on the Big Island of Brăila, reveals very good soil quality, consistent with the local pedoclimatic conditions. The conservative agricultural practices applied have continuously improved soil fertility, as reflected in the high yields achieved. The preservation of favorable physical characteristics (e.g., structural macroformations with high stability against water action, ensuring good permeability) is attributed to the adoption of conservative agriculture and the implementation of an optimal low-pressure central pivot irrigation system. The level of nutrient supply is considered normal and has not been negatively affected by the production technologies applied. The soil meets the criteria for classification as healthy and supports good-quality yields.

The soils of the Filipoiu farm on the Big Island of Brăila exhibit slightly alkaline pH values ranging from 8.18 to 8.35, which are favorable for certain crops but may limit the availability of micronutrients like iron and zinc, necessitating potential adjustments through acidifying fertilizers. The humus content remains stable across profiles (2.98–3.70%), reflecting good organic matter levels that support fertility and soil structure, though maintaining these levels requires continuous organic inputs like cover crops or compost.

Nitrogen levels (0.199–0.241%) are sufficient and align with the applied fertilizer rates, demonstrating the effectiveness of the fertilization strategy in supporting high yields. Phosphorus levels (22–41 mg/kg) show variability, with lower values at deeper layers, suggesting the need for additional applications, especially in carbonate-rich soils, to improve availability. Potassium levels (146–197 mg/kg) are generally adequate, indicating well-managed potassium supply.

Structural stability is high in the upper layers (43%), ensuring good water infiltration and aeration, but deeper layers show high dispersion values (<0.01 mm), which may lead to structural breakdown under stress, highlighting the need for careful water and tillage management. The maize yield achieved was 15,144 kg/ha, surpassing both the expected yield of 12,800 kg/ha and the target yield of 9,100 kg/ha by 18.3%, illustrating the efficiency of conservative agricultural practices and optimal fertilization. These results confirm that nutrient supply is balanced, supporting crop nutrition while preserving soil fertility reserves.

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