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THE IMPACT OF SUSTAINABLE AGRICULTURAL TECHNOLOGIES ON THE REDUCTION OF CO₂
EMISSIONS IN THE LOCALITIES OF CARANI AND JAMU MARE

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Abstract: The study presents a comparative analysis of the ecopedological conditions and the impact of sustainable agricultural technologies on the reduction of carbon dioxide (CO₂) emissions in the localities of Carani and Jamu Mare, located in western Romania. The main aim is to assess how organic farming practices contribute to sequestering carbon in the soil and improving the quality of agroecosystems. The research analyzed the main components of the natural environment – relief, lithology, hydrography, climate and vegetation – in correlation with the physicochemical properties of the soils and the applied technological practices.

• **Introduction:**

In the context of global climate change, agriculture has a dual role – being both an important source of greenhouse gas emissions and a potential solution to reduce them. Sustainable agricultural practices can significantly contribute to reducing CO₂ emissions by increasing the capacity of soils to store organic carbon. Agriculture has a key role to play in ensuring food security, maintaining rural livelihoods and managing environmental sustainability. The paper comparatively analyzes two representative areas in western Romania, Carani and Jamu Mare, highlighting the link between ecopedological particularities and the efficiency of ecological agricultural technologies in reducing carbon emissions. The conventional farm in Carani follows intensive agricultural practices characterized by synthetic inputs such as chemical fertilizers and pesticides, mechanized operations, and monoculture cultivation systems. Instead, the organic farm in Jamu Mare adheres to organic principles, minimizing external inputs, increasing biodiversity, and focusing on soil health through natural amendments and crop rotation.

- **Material and method:** The paper entitled *"Ecopedological characterization and the impact of sustainable agricultural technologies on the reduction of CO₂ emissions in the localities of Carani and Jamu Mare"*, investigates several key indicators of agricultural sustainability, including soil composition and fertility, crop production levels, pesticide use and carbon sequestration capacity. The study was carried out in two representative localities: Carani, located in the Vingăi Plain, and Jamu Mare, located in the contact area between the Gătaiei Plain and the West Hills. The analysis included the characterization of relief, lithology, hydrography, climatic conditions and soil types, according to the methodology of ICPA (1987) and the Romanian Soil Taxonomy System (SRTS, 2012).

Conclusions:

Alternative solutions have been identified to increase energy efficiency and reduce carbon dioxide emissions. Fixing carbon dioxide from the atmosphere in soil and biomass, together with the use of alternative technologies to reduce CO₂ emissions, are key directions in protecting the environment and managing climate change globally. Also, the accumulation of carbon in the soil helps to improve its properties and stimulates the activity of microorganisms in the soil ecosystem. Limiting the intensity of tillage leads to a decrease in the volume of emissions produced.

• **Results and discussions**

This paper presents the technologies of wheat cultivation in a conventional and organic system within two different farms.

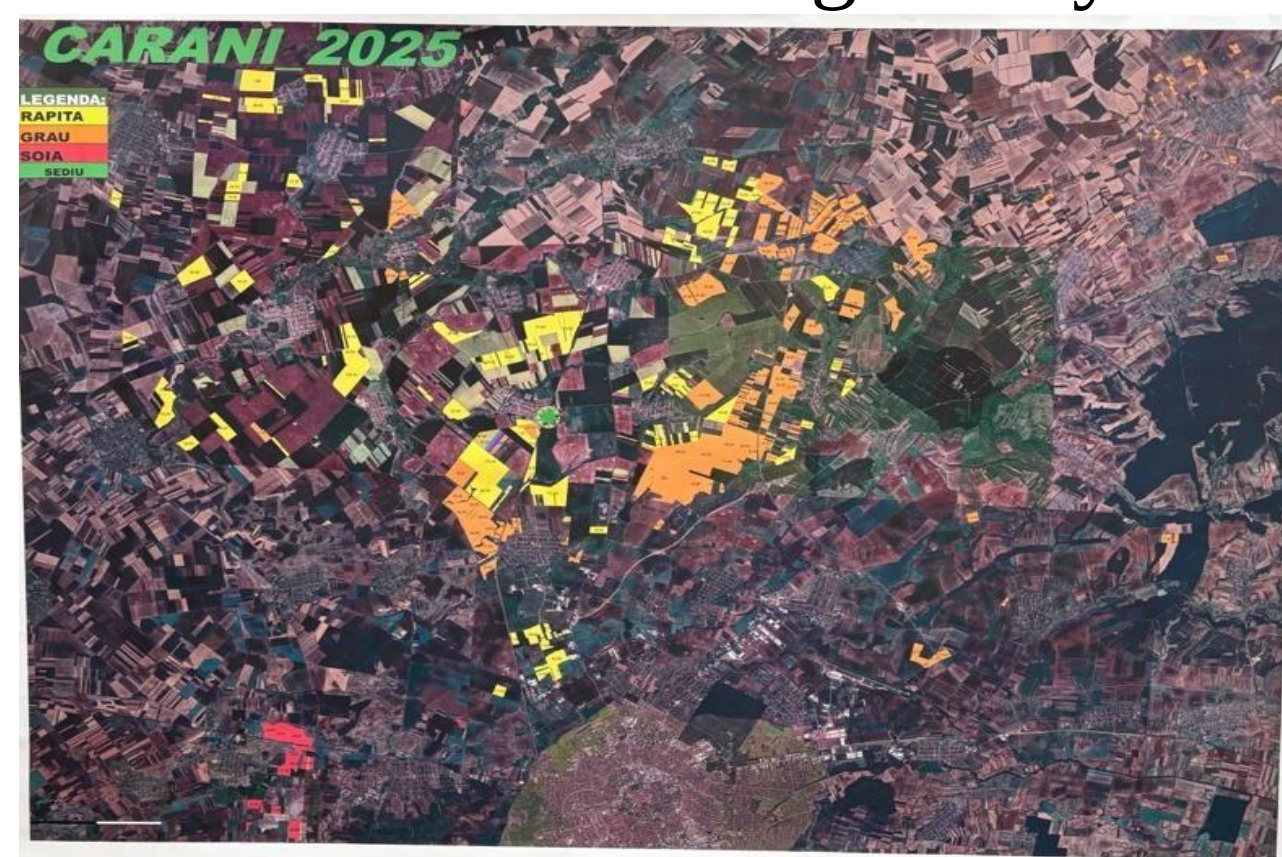
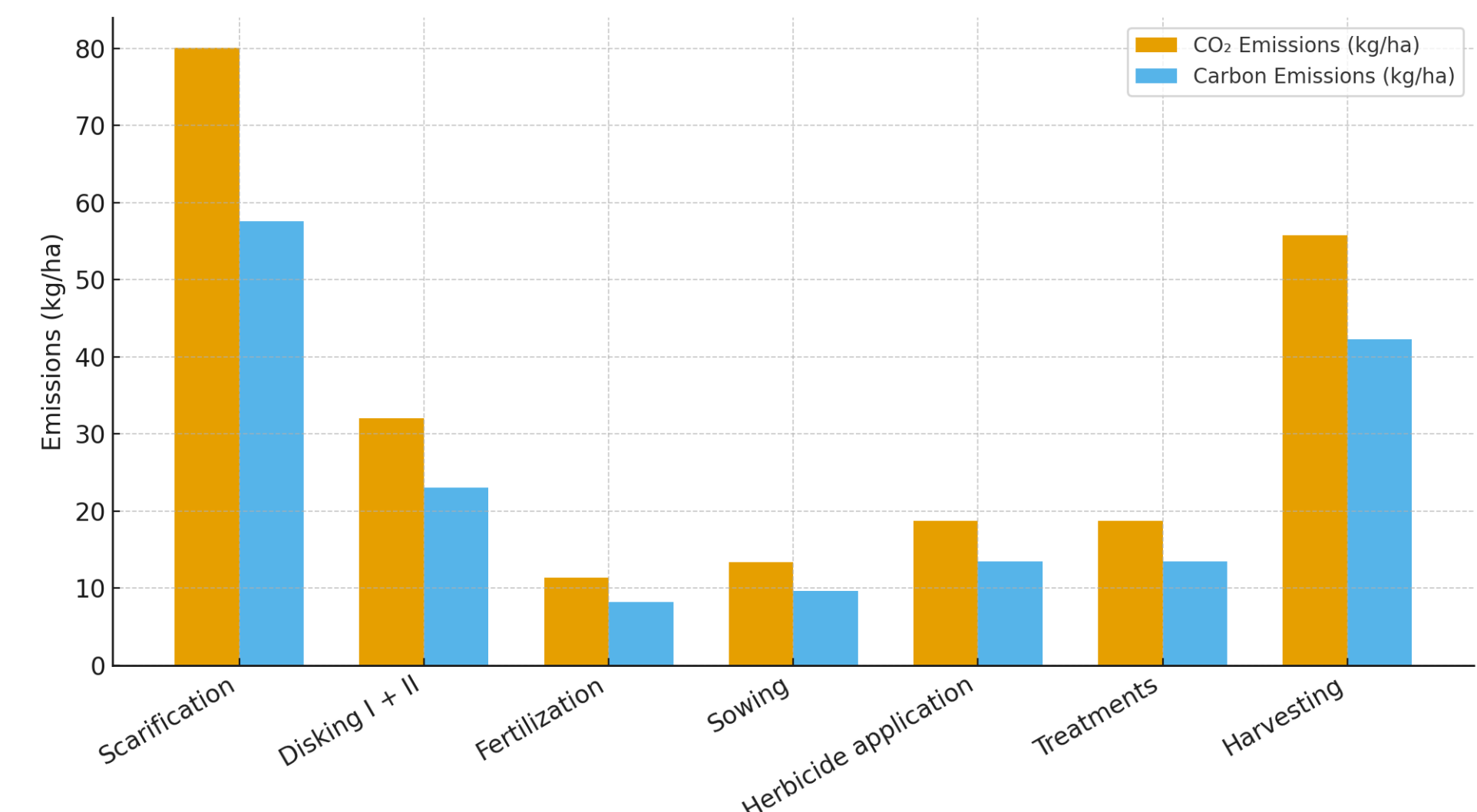


Figure 1. Presentation of conventional farms



Figure 2. : Presentation of organic farms

In the conventional system, the agricultural farm on the perimeter of Carani was studied. Following the taking of soil samples from the wheat crop in the organic system and the performance of the analyses, the following results were obtained:



The determination of the amount of carbon dioxide taken from the atmosphere and stored in biomass is carried out on the basis of the ratio of the molar masses of the component elements. Given that the atomic mass of carbon is 12.0107 g/mol and the molar mass of carbon dioxide is 44.010 g/mol, it follows that carbon dioxide is about 3.6642 times heavier than elemental carbon.

In the ecological system, the agricultural farm on the perimeter of Jamu Mare was studied. The amount of carbon emissions resulting from organic soil tillage in the organic system is 138.4 kg/ha, and from the intensive system 229.67 kg/ha. Carbon emissions from soil fertilization with chemical fertilizers are much higher, respectively by 385.2 kg/ha.

