

Heterogeneity of soil organic carbon content in an old tree line and its relation to some tree properties

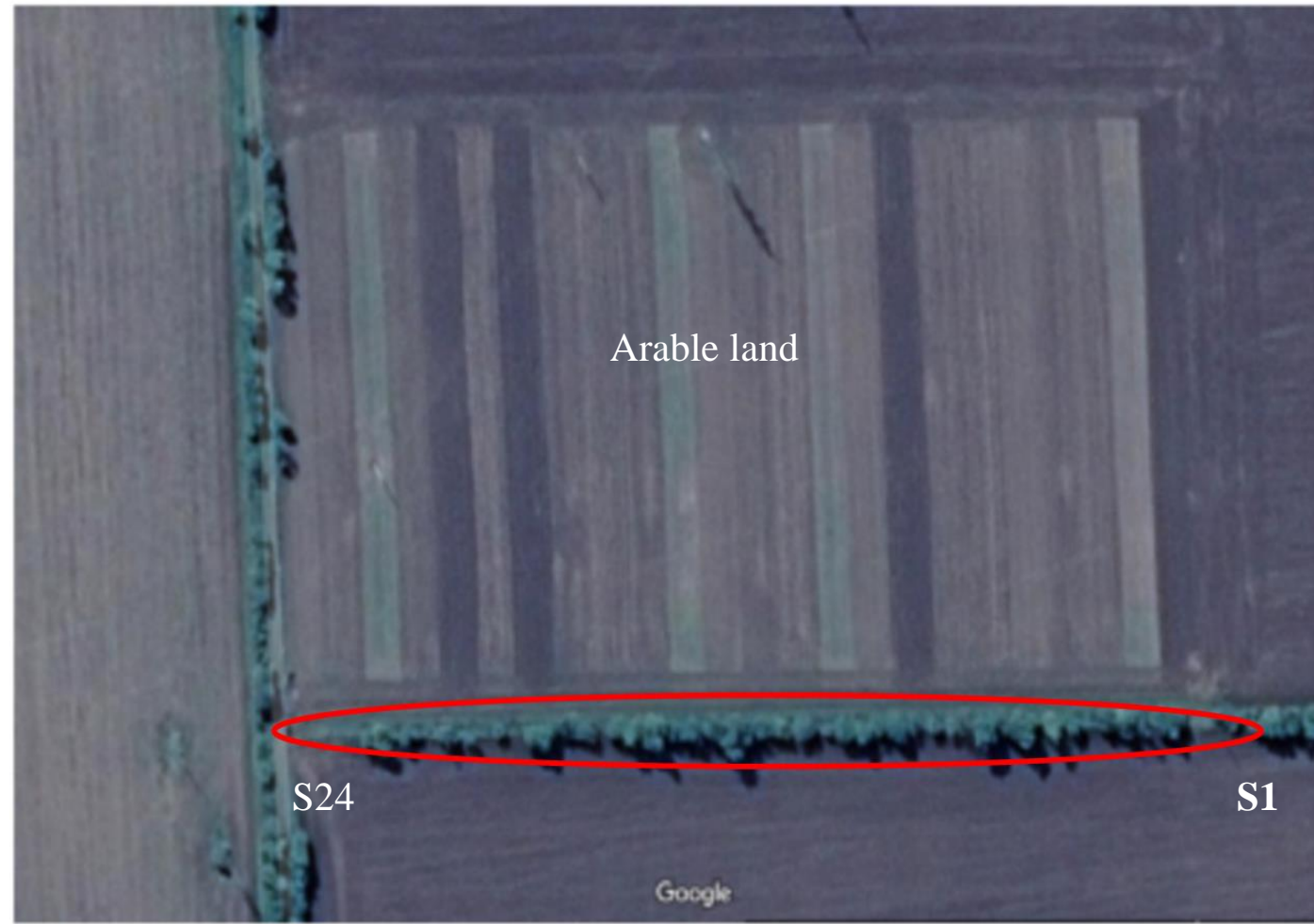
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➤ Aim of the study:

- ❑ effect of tree density on the distribution of soil organic carbon content in small scale of woodland

➤ Case Study:

- ❑ A tree line (woodland) located at Józsefmajor, SZIU.



➤ Sampling:

- ❑ The experiment was arranged in a randomized block design
- ❑ The plot size is 6m×13m
- ❑ Sampling was performed in 24 plots from 0-10 cm depth
- ❑ Tree trunk circumference and their numbers in each plot were measured.

➤ measurement:

- ❑ Technique of Near Infra-Red Spectrometer used for soil organic carbon measurement using agro care scanner

Agro care Scanner



➤ Data Analysis:

For finding correlation between tree density and soil organic carbon, simple regression was used, also this method used for comparing SOC and tree trunk circumference.

➤ Result:

- correlation coefficient for the comparison

Parameter	SOC (%)	P-value	fitting linear model
Tree density	0.481157	0.0173	$SOC = 5.02111 + 0.112902 * \text{Tree number}$
tree trunk circumference	0.51518	0.0100	$SOC = 4.52283 + 0.00414375 * \text{Tree trunk circumference(cm)}$

➤ Conclusions:

- ❖ Both tree density and tree trunk circumference affect SOC, possibly by affecting litter dynamics and completeness of resource utilization.
- ❖ Plots with bigger and older trees can increase amount of SOC

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Introduction

- Soil is an important component of the biosphere in carbon sequestration, which has greater capacity for carbon absorption than plants and atmosphere.
- Soil organic carbon (SOC) content vary with changes in land cover and land use, with substantial losses occurring through disruptions and cultivation.
- Land use largely determines soil organic carbon (SOC) content, which is an important indicator for soil quality, land degradation, and climate change and affects ecosystem functioning, biological productivity, and water quality.
- Trees play a significant role in the capture and preservation of atmospheric CO₂ in vegetation, soils and biomass.
- Therefore, land-use activities, including the conservation and planting of trees and the reintroduction of conventional agroforestry systems with prolonged fallow periods, which increase the amount of litter fall and the supply of organic matter to the soil can be expected to increase SOC and thus boost soil fertility in the lands.

Aim of the study

The aim of this study is

- To investigate the effect of tree density on the distribution of soil organic carbon content in small scale.

Material and method:

Case Study:

- The study site is a tree strip located at the Józsefmajor Experimental and Training Farm (JETP) of Szent István University (47° 41' 30.6" latitude N, - 19° 36' 46.1" longitude E, 110m above sea level.
- The predominant tree species in wood strip is "*Rubus pseudacacia*".
- Also this strip has bushes and grasses. The strip is completely flat without any differences in elevation.

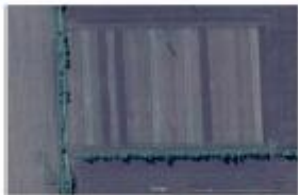


Fig 1. Study site - Wood strip: Sampling points location

Sampling

The experiment was arranged in a randomized block design and the plot size was (6×13m). Sampling was performed on 24 plots from 0-10 cm depth, composite samples of 3 points were collected from each plot below or close to the trees, resulting in 24 soil samples for whole area. Also the number of trees and the tree trunk circumferences were measured.

Measurements

Technique of Near Infra-Red Spectrometer (Wavelength Range: 1300–2600nm MEMS technology) used for soil organic carbon measurement using agro care scanner



Fig 2. Using Agro care scanner for measurement



Fig 3. Study area - Wood strip

Data Analysis

One variable analysis illustrates important characteristics of measured SOC (table 1). According this table measured data has normal distribution. For finding correlation between tree density and soil organic carbon content, simple regression was used (figure 4), also this method was used for comparing SOC content and tree trunk circumference (figure 5).

Result

Result of simple regression between tree density and SOC display in fig (4) and the result of comparing tree trunk circumference with SOC in each plot displayed in fig (5) also table (2) show correlation coefficient for this comparison. As figures and the table show there is significant correlation between tree density and soil organic carbon, and also between tree trunk circumference and SOC, as the table show, the correlation in second factor is more significant.

Table 2. Simple linear regression model correlation SOC and tree trunk circumference and tree density

Parameter	SOC (%)	R-value	Simple linear model
Tree density	0.401097	0.6373	SOC = 0.02115 + 0.12042 * Tree number
Tree trunk circumference	0.03308	0.9338	SOC = 4.82276 + 0.01102 * Tree trunk circumference

Conclusions

According to the result, both tree density and tree trunk circumference affect SOC content, possibly by affecting litter dynamics, root density, and completeness of resource utilization. The present results show that the tree trunk circumference is more important than the tree density in case of soil organic carbon concentration. In conclusion the age and size of trees are more important in SOC accumulation than tree density.

Table 1. Summary Statistics for soil organic carbon content (%)

Count	24
Average	3.2
Median	3.0
Standard deviation	1.3
Coeff. of variation	24.2%
Skewness	0.0
Kurtosis	0.0
Minimum	0.0
Maximum	6.0
Range	6.0
Lower quartile	2.0
Upper quartile	4.0
Interquartile range	2.0
Skull skewness	1.15
Skull kurtosis	-0.64

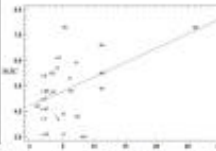


Fig 4. Simple linear regression model correlation SOC content and tree number

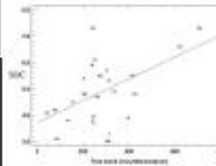


Fig 5. Simple linear regression model correlation SOC and Tree trunk circumference

Acknowledgment

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