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Organic Carbon and Nitrogen stocks in two soil types of Northwestern Tunisia: Temporal and spatial variation

Ahlem Tlili^{1*}, Imene Dridi¹, and Moncef Gueddari¹

¹ Department of Geology, Faculty of Sciences of Tunis, University of Tunis El Manar, Tunisia
(ahlem_tlili@outlook.com)

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**Soil organic and inorganic carbon stocks and dynamics in agro-ecosystems:
mechanisms, measurements and modelling strategies**

SOIL ORGANIC CARBON

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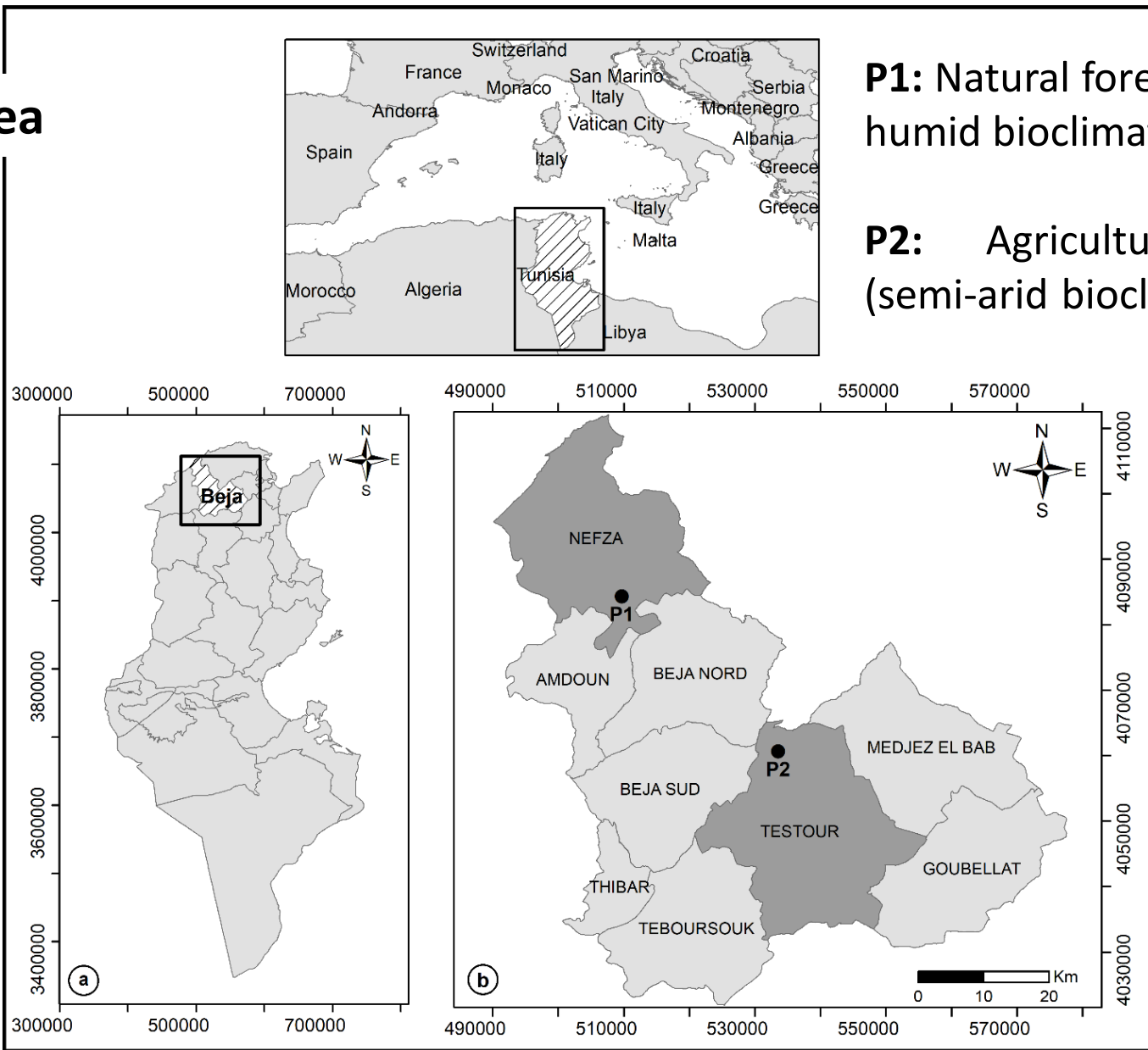
Introduction

- Soil organic matter has generated international interest in carbon and nitrogen sequestration. In reality, small fluctuations in soil organic stock could have large impacts on global warming.
- Therefore, The present research was undertaken to (1) quantify Soil Organic Carbon (SOCs) and Total Nitrogen (TNs) stocks with depth and (2) investigate its dynamic from 1971 to 2019 (over 50 years).

Methods

- For this aim, we selected two soils (P1 and P2) developed under contrasted pedogenetic conditions in the North-West of Tunisia (Beja governorate).
- For both sites, three soil pits were dug (field replicates) during the four soil sampling campaigns that were conducted in 1971, 2005, 2012 and 2019. Thus, 18 samples were taken from three soil depths (0–30 cm, 30–50 cm, and 50–100 cm) in each campaign. Then, the soil samples were air-dried and analyzed for the main physicochemical soil properties according to international standards.

Study area

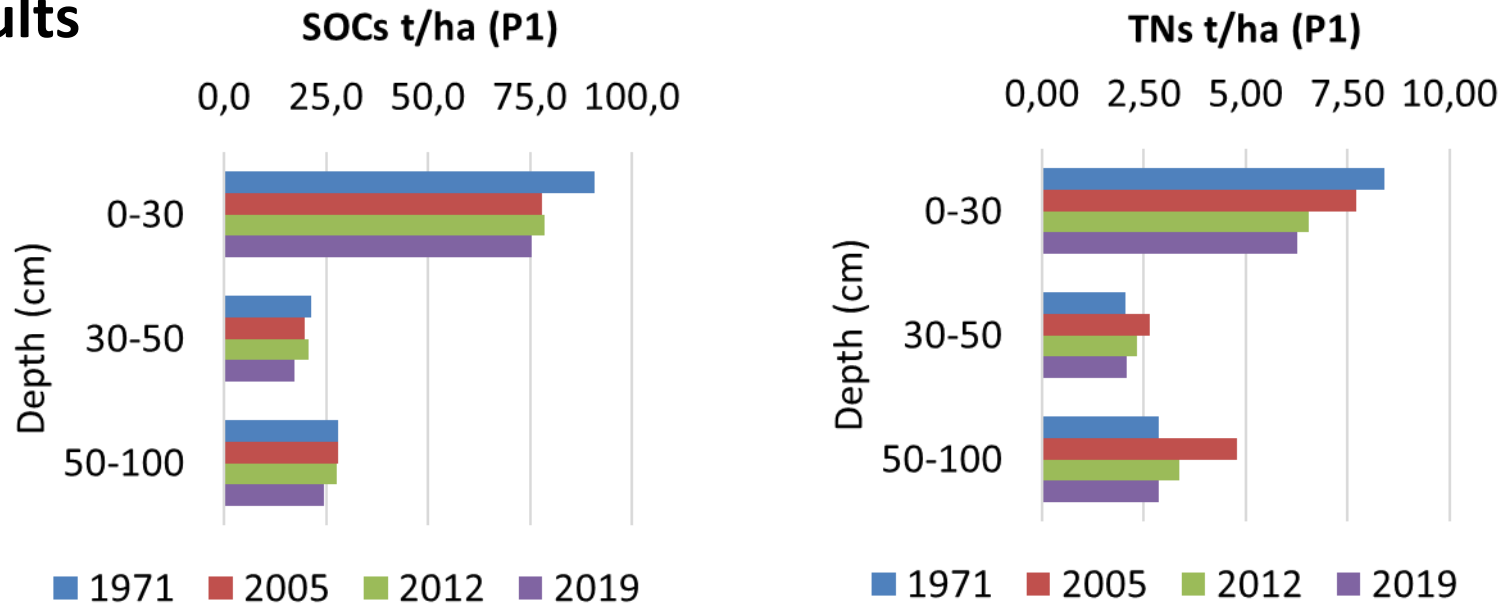


P1: Natural forest (lower-humid bioclimate).

P2: Agriculture land (semi-arid bioclimate).

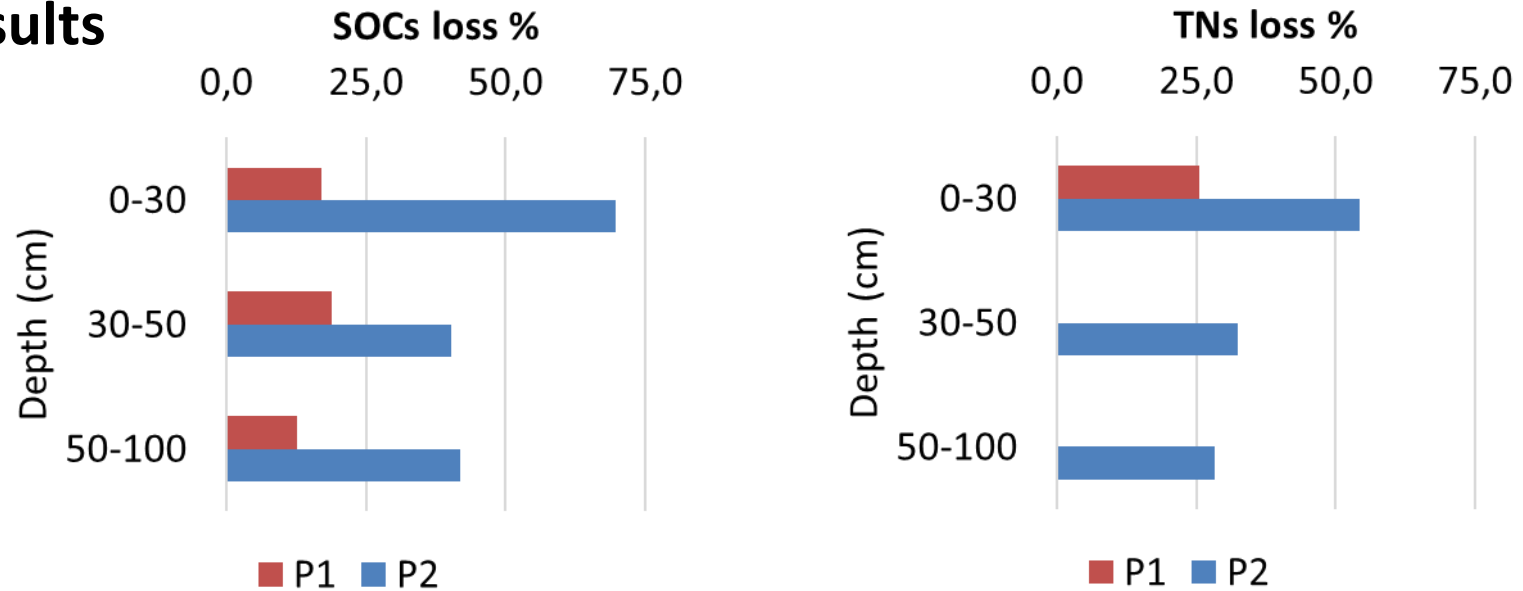
Figure. 1. (a) Location of the study area. **(b)** Localization of the studied soil profile.

Results



- The SOC_s declined in surface and deep horizons during the experimental period (1971-2019) in both sites. The TN_s recorded lower values than SOC_s. Nevertheless, they showed the same behavior.
- In fact, P1 recorded the highest values of SOC_s and TN_s since it was developed under forest vegetation.

Results



- P2 reported an important depletion of soil organic stocks as compared to P1. The loss of SOC and TNs were estimated to be 69.71% and 54.17% in 0-30 cm depth, and 41.94 % and 28.28 % in 50-100 cm depth, respectively.
- This result is due to the difference in soil occupation. Indeed, cropland increases the decomposition of soil organic matter principal source of SOC and TNs, mainly in surface layers. Such a reduction has wider implications on global warming and soil fertility.

Conclusions

- The results showed enrichment in SOC_s and TN_s of superficial horizons to the detriment of the deep horizons.
- The forest cover (P1) recorded higher SOC_s and TN_s than agriculture land (P2) which had the lowest stocks.
- In fact, intensive agriculture without proper management accelerates the mineralization of organic matter as well as the depletion of SOC_s and TN_s, principally in cultivated soils.

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**Thank you very much for your
Interest**

**Contacts:
Ahlem_tlili@outlook.com**