INTRODUCTION

Mapping soil features at high detail usually has high cost, is time-consuming for high number of sampling, and the results are often questionable. The use of proximal sensors allows a quick and cheap recording of data with a very high spatial density.

OBJECTIVES

The present work wants to test the combined use of two proximal sensors, namely visible-near infrared Diffuse Reflectance Spectroscopy (Vis-NIR DRS) and passive γ-ray spectrometers, to obtain high detailed maps of soil C stocks at a depth of 0 to 30 cm (CS30) using a limited number of sampling sites per field (1 sample per hectare).

Vis-NIR DRS was used to increase the number of data points at low cost, whereas gamma-ray maps were used as covariates in the prediction model.

METHODOLOGY

Field proximal soil survey was made by γ-spectroradiometer (“The Mole”, Soil Company) carried out in a backpack and connected to GPS. “The Mole” can measure total gamma-rays emitted from the soils (TC) and the radionuclides contribution (40K, 232Th, 238U), simultaneously with the γ-radiometric surveying, 208 soil samples (0-30 cm deep) were collected with a frequency of 8 samples per hectare.

The samples, previously dried and 2-mm sieved, were scanned by (Vis-NIR DRS), using a Fieldspec 3 Hi-Res, which has bands ranging between 350 and 2500 nm.

RESULTS

The soils showed similar texture, gravel content, SOC, and then CS30, A1, TP1 and TP3 areas showed the highest mean values of TC (> 470 Bq kg^-1), whereas A2 and A5 showed the lowest TC. A3 and A5 were spatially homogeneous, whereas the highest spatial variance was clearly observable in the sites A2, TP2 and A4. This was mainly due to the presence of strongly eroded areas characterized by thin soils, high stoniness, and scarce soil organic matter.

CONCLUSION

This method allows predicting soil carbon stock on fine earth (CS30f) by Vis-NIR spectroscopy with acceptable errors, saving a considerable amount of money and time for conventional laboratory analysis. Using gamma-ray spectroscopy maps as covariates to interpolate CS30 within fields is accurate, although site-specific models are needed. The accuracy of CS30 maps allows their use for several purposes, like comparing the effects of different soil management strategies in agriculture and monitoring the effects of soil erosion on soil carbon pool.