ray sensor if the magnitude of the errors are acceptable for the desired use. Overall, the results support NIR, gamma ray and XRF curves as potential covariates for soil clay content prediction, though there is room for improvement, for example, by testing other prediction methods or pre-processing the curves.
Keywords: Proximal soil sensing; Geophysics; Multivariate modeling; Near-infrared diffuse reflectance; X-ray fluorescence
Financial support: Embrapa; CNPq

(4145 - 2672) Prediction of Soil Organic Carbon using Neural Network with Vis–NIR spectra in highlands of Itatiaia National Park, Rio de Janeiro

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Visible and near-infrared reflectance (Vis–NIR) techniques are alternative methods to conventional chemical laboratory soil analyses for many soil attributes, including soil organic carbon. Besides, Vis–NIR techniques are fast, environment friendly, and non-destructive of samples. In this study soil organic carbon (SOC) was predicted applying Vis–NIR, and the spectrums on 305 soil samples by using a FieldSpec 4® spectrometer (350–2500 nm). The study area is located at the western region of Rio de Janeiro State, in the highlands of Itatiaia National Park (INP) that has its highest point at 2.791,6 m. Conditioned Latin hypercube sampling (cLHS) method was used to design the collection of samples from 90 soil profiles. The INP plateau has a relatively expressive area of organic soils, located in the valleys formed among the rocky outcrops. Organic carbon was also measured in all samples in the laboratory by using the dry combustion method. Prediction was performed with Neural Network using the R package neuralnet. The RMSE for normalized 0-1 values was of 0.067 and the R^2 0.90. The technique shows potential for large application, and it is especially important in areas of limited access such as the INP. Considering the SOC is an important indicator of soil quality and degradation, it is also relevant for the management plan of the INP, since the good correlation with Vis–NIR techniques allows for future monitoring by using remote sensing tools.
Keywords: Keywords: Soil properties; organic soils; chemometrics; remote sensing.
Financial support: CAPES, TEMPUS PUBLIC FOUNDATION, FAPERJ.

(1469 - 2887) Qualitative evaluation of soil organic matter using Vis-NIR diffuse reflectance spectroscopy in an agroecological production system in Seropédica, Rio de Janeiro (Brazil)

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Soil organic matter (SOM) is a key component to understand and monitor soil quality and processes, providing information on agronomic and ecological use and management of agroecological production systems. Visible and near infrared reflectance (Vis-NIR) has presented potential as a non-invasive and non-destructive method to characterize soils and their chemical, physical and mineralogical attributes. The aim of this study was to compare SOM contents and associated Vis-NIR spectral curves among areas with different agroecological production systems/treatments.The experiment was carried out in 2014 at the *Sistema Integrado de Produção Agroecológica* (Integrated System of Agroecological Production), in Seropédica city, Rio de Janeiro state, Brazil. The area has Planosols and was divided in two sub-areas: Sub-area 1 (3578 m²) – for organic vegetables production with (3051 m²) and without shading screens (527 m²), and Sub-area 2 (4676 m²) – for biomass production (straw) with 3982 m² of elephant grass cv. Cameroon (*Pennisetum purpureum*) and 694 m² of shrub legumes (*Gliricidia sepium*). A total of 246 soil samples were collected at a depth of 20 cm on a 0.5 by 0.5 m regular grid. After air-drying, they were sieved (2 mm) and analysed for SOM via wet oxidation. Then, Vis-NIR reflectance spectral curves (350-2500 nm) were obtained in the laboratory and interpreted qualitatively in relation to the SOM contents and chemical groups. The screen-covered area (36 samples) showed the highest SOM contents (1,55% of SOM and 25% of reflectance on average) whereas the shrub legumes area (27 samples) showed the lowest SOM contents (0,86% of SOM and 30% of reflectance on average). The sun-exposed organic vegetables area (120 samples), and elephant grass area (63 samples) showed similar Vis-NIR curves and intermediate SOM contents of about 1,43% of SOM and 28% of reflectance on average. The spectral curves of soils from the four areas/treatments showed absorption peaks at the same wavelengths, related to water and C-H, O-H, C-O, N-H and S-H groups. On the other hand, higher SOM contents produced lower Vis-NIR reflectance (albedo), enabling to rapidly (qualitatively) screen and monitor SOM contents among the different agroecolgical production system/treatments.
Keywords: Organic farming; Tropical soils
Financial support: CNPq; UFRRJ; Embrapa Solos; Embrapa Agrobiologia.

(7630 - 1940) Soil analysis through portable fluorescence X-ray (pXRF) spectrometer: predicting sum of bases (SB) and cation exchange capacity (CEC) in tropical soils.

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Traditional methods to evaluate important soil chemical properties such as cation exchange capacity (CEC) and pH require laborious chemical analysis that are often expensive and time consuming. As an alternative to these methods, some studies have recently introduced the use of portable X-ray fluorescence (pXRF) spectrometry as a means to infer soil properties. However, such analyses are still scarce in tropical soils and, thus, need to be evaluated. This work further studies this possibility by utilizing data obtained via pXRF to predict the sum of bases (SB) and the CEC of Brazilian soils. 594 samples of soil A horizon were collected in 6 Brazilian states and subjected to laboratory analyses of SB and CEC. The samples were also analyzed by a Bruker® pXRF S1 Titan, in triplicate for 60 seconds using Trace mode. Ordinary least square (OLS) and random forest (RF) methods were used to create SB and CEC predictive models with 70% of the total data. The models were further validated by calculating the root mean square error (RMSE), mean error (ME) and R^2 using the remaining 30% of the data. Results by the RF method were evaluated through the mean of squared residuals (MSR) and the percentage of explained variance obtained from the generated models. The models achieved through OLS to predict SB and CEC, respectively, are given by: $SB = 2.5411 + 38.2560CaO + 14.0360Cl - 13.8962K_2O + 7.6625Mn + 7{,}0441Rb$ ($R^2 = 0.45$); and $CEC = 8.838 - 4.9681Al_2O_3 + 38.0318CaO - 9.1297K_2O + 13.1336Ni + 36.2903Y + 4.1521Zn - 14.2889Zr$ ($R^2 = 0.31$). Random forest resulting mean of squared residuals (MSE) and explained variance were 8.52 and 52.83% for SB and 22.52 and 29.36% for CEC. Random forest models performed better in validation tests when compared to OLS, providing overall higher R^2 (0.8 vs. 0.63 and 0.59 vs. 0.54, for SB and CEC models, respectively), as well as lower RMSE (1.95 vs. 2.6 and 3.13 vs. 3.78) and ME (1.32 vs. 1.92 and 2.41 vs. 3.04). pXRF spectrometry can ease the efforts to gather important information about tropical soils and the models generated show it is conceivable to apply and further improve this idea for these