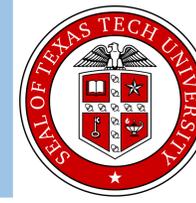


Potential of a Low-Cost Color Sensor to Determine Soil Organic Carbon



Introduction

- Soil analyses are **essential** for agriculture; they allow for an optimal yield of crops.
- Conventional methods are **expensive**, destructive, take a lot of **time**, and cannot be done **in-situ**.
- Research has followed a trend of looking for **faster** ways to accurately determine soil characteristics.
- **PXRF (Portable X-Ray Fluorescence)** spectroscopy is a reliable method for determining **multi-elemental** soil data on-site, yet the instrument is expensive.
- A study from Clemson university used **Nix Pro** color sensor to determine and **map soil color**.
- **Color** is directly related to **soil fertility** properties (e.g., organic matter, gypsum and calcium carbonate).

Objective

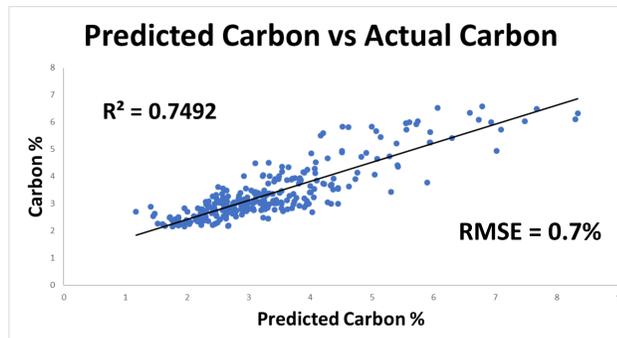
- Determine the viability of using Nix Pro color data to **predict** total soil organic carbon content.

Methods

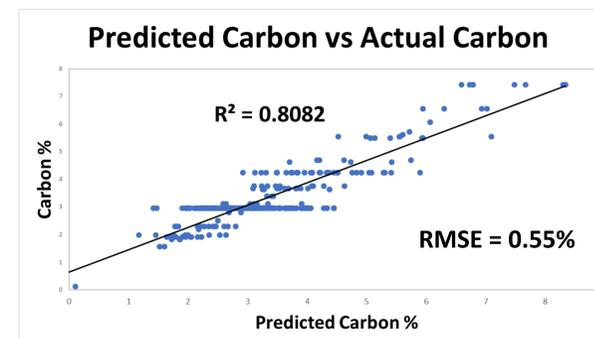
1. 25 soil cores were collected from **Romania** at a depth of 120 cm, separated at a 10 cm interval, and shipped to TTU. **300 samples** in total.
2. The samples were oven **dried** at 105°C for 24 hours, ground and sieved to pass 2 mm.
3. All samples were scanned with **PXRF** and **Nix Pro** sensors and tested for **pH** and **EC**.
4. 20 g of each sample were sent to a commercial lab to determine **total C and N** via combustion.
5. **Color** and **elemental** data was processed using XLSTAT. **Both** Nix and PXRF variables were **added** to the regression models.

Results

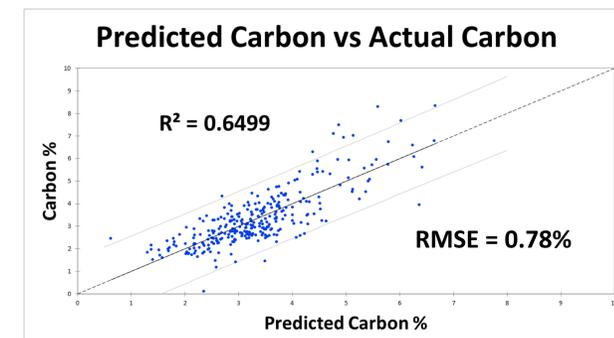
Random Forest



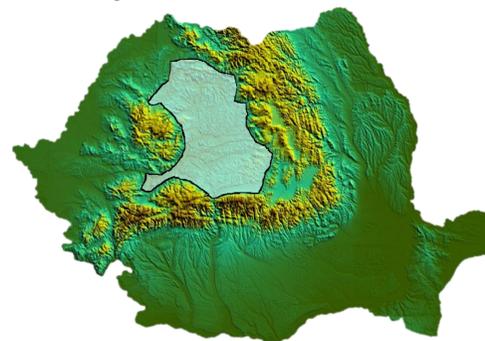
Decision Tree



Linear Regression



Transylvanian Plain, Romania



Conclusions

- **Nix Pro** has the **potential** to predict soil organic carbon when complemented with PXRF data.
- Regressions show **promising** results for further validation.



PXRF

Further Research Should Target:

- Predicting other soil properties (e.g., **CaCO₃**, **moisture**, **soil contaminants**).
- Creating and validating regressions **solely** using **Nix Pro** color data.
- Performing **financial analyses** to quantify savings for substituting traditional methods with Nix Pro.
- **Replicating** this study in different types of soils.



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