Determination of within-field soil variability using apparent soil electrical conductivity measurements

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The variability of the soils of 3 commercial plots in North-Eastern Iberian peninsula was characterized using ECa sensors.

- **Typic Xerorthent / Typic Calcixerept**
  - From 25 cm to >100 cm depth
  - pH: 8.3  
  - EC: 0.18 dS/m
  - 1-35 % Stones

- **Typic Xerorthent**
  - From 40 cm to >100 cm depth
  - pH: 8.3  
  - EC: 0.24 dS/m
  - 1-35 % Stones

- **Typic Ustorthent**
  - From 40 cm to >100 cm depth
  - pH: 8.4  
  - EC: 0.23 dS/m
  - 1-5 % Stones

EM38 Sensor (Georeva)
Dualem-2 Sensor (Agrarium)
Using the raw data from the sensors, each plot was divided into different zones, and the soils from each zone were characterized.
What was observed? – 1st plot (Calcixerept)

- Clay (%): $R^2 = 0.8475$
- SOC (%): $R^2 = 0.1071$
- P-Olsen (ppm): $R^2 = 0.9557$
- Exchangeable Calcium (ppm): $R^2 = 0.9983$
What was observed? – 2\textsuperscript{nd} plot (Ustorthent)

\[ R^2 = 0.4632 \]

\[ R^2 = 0.969 \]

\[ R^2 = 0.0421 \]

\[ R^2 = 0.0943 \]
What was observed? – 3\textsuperscript{rd} plot (Xerorthent)

- Clay (%): $R^2 = 0.934$
- SOC (%): $R^2 = 0.0124$
- P-Olsen (ppm): $R^2 = 0.6717$
- Exchangeable Calcium (ppm): $R^2 = 0.7058$
What was observed?

Clay content had higher values in the zones with higher ECa content. The correlation with silt and sand was less significant. The levels of SOC did not correlate well with ECa.
What was observed?

ECa was higher in the zones with higher exchangeable calcium content. The levels of other nutrients (N, P, K, Mg and Na) did not correlate well with ECa.

R² = 0.2926

R² = 0.5769
Remarks and suggestions

- Using ECa measures can help to identify the inner variability of one plot, but it isn’t reliable enough to compare in-between plots.
  - The measurements of each plot must be studied separately.
  - Each zone must be characterized to determine what are the causes of the variability in each plot.
- ECa should be used paired with other technologies, such as satellite imaging to allow for better understanding of soil fertility distribution in-between the plot.
What was observed?

ECa was lower in the zones with shallow soil.

ECa was higher in the zones with bad drainage.
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