59th Croatian & 19th International Symposium on Agriculture | 11 – 17 February 2024 | Dubrovnik | Croatia

Spatial and temporal variability of soil compaction on different conservation tillage treatments

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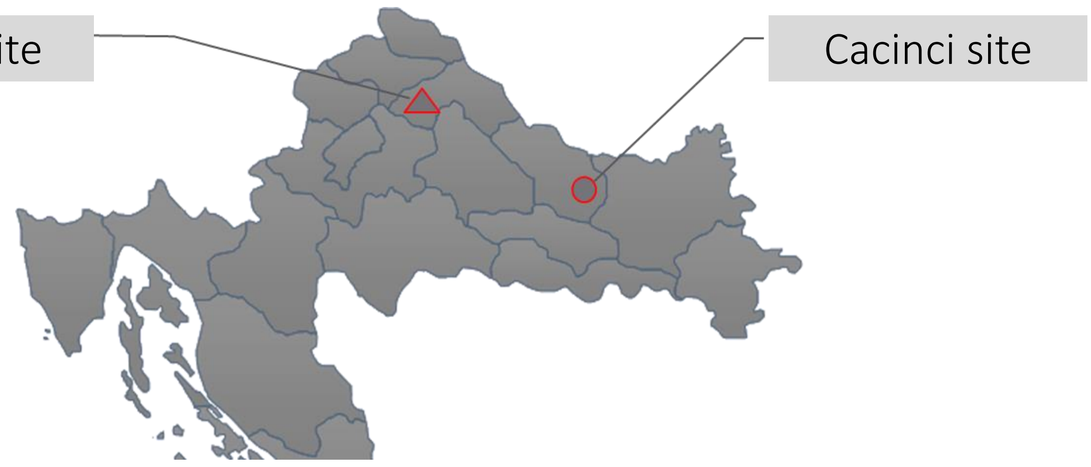
Introduction

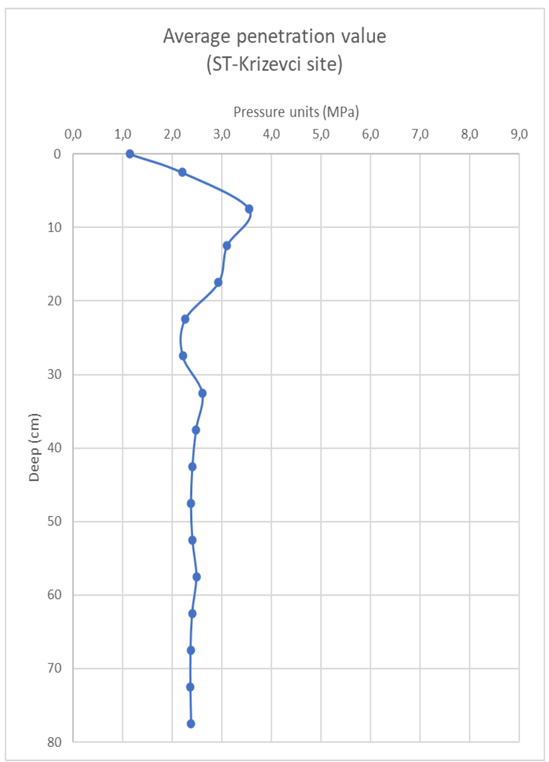
Measuring of penetration resistance is known as one of the best, and also one of the fastest visible indicator of soil compaction.

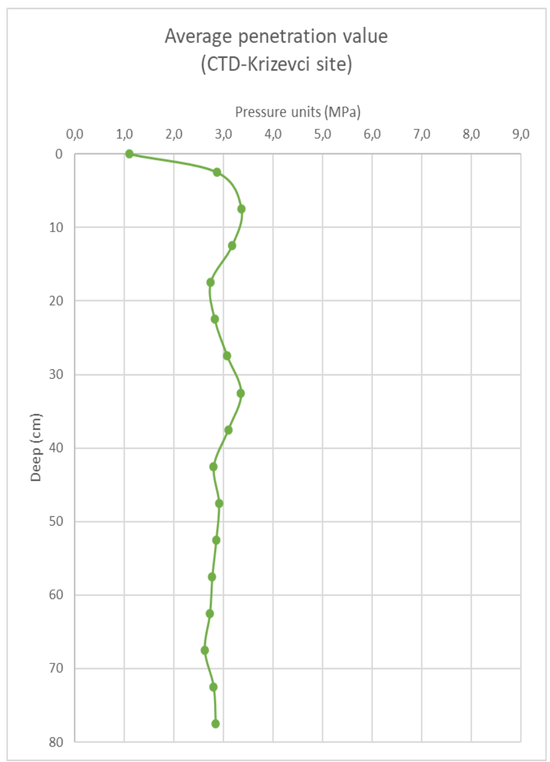
Material and methods

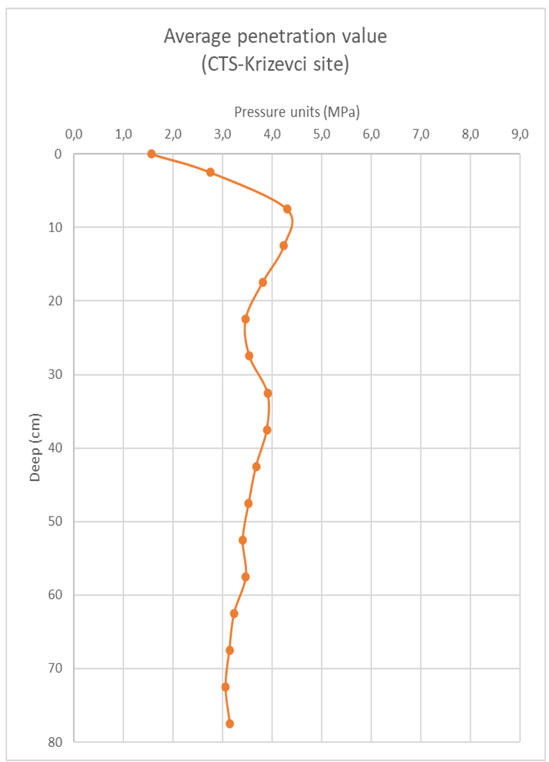
ST	Standard (conventional) tillage deep mouldboard ploughing, up to 30 cm
CTD	Conservation tillage deep (chiseling with minimum 30% of surface covered with plant residues), up to 30 cm
CTS	Conservation tillage shallow (chiseling with minimum 30% of surface covered with plant residues), up to 10 cm

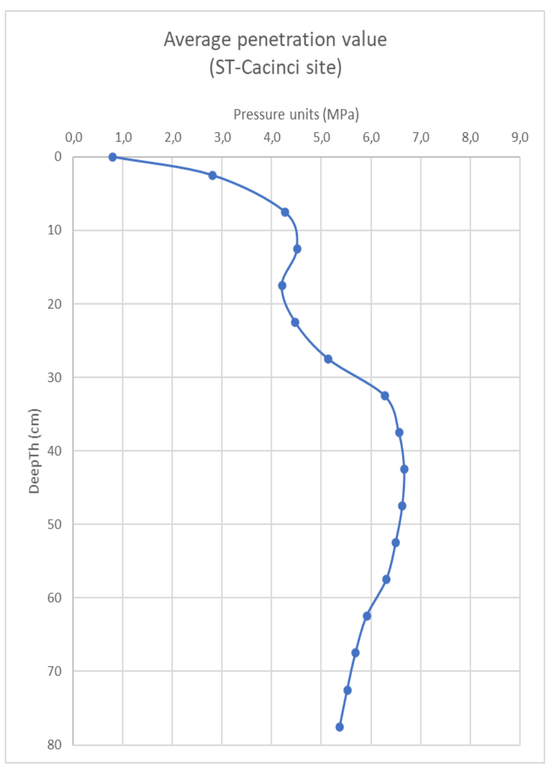


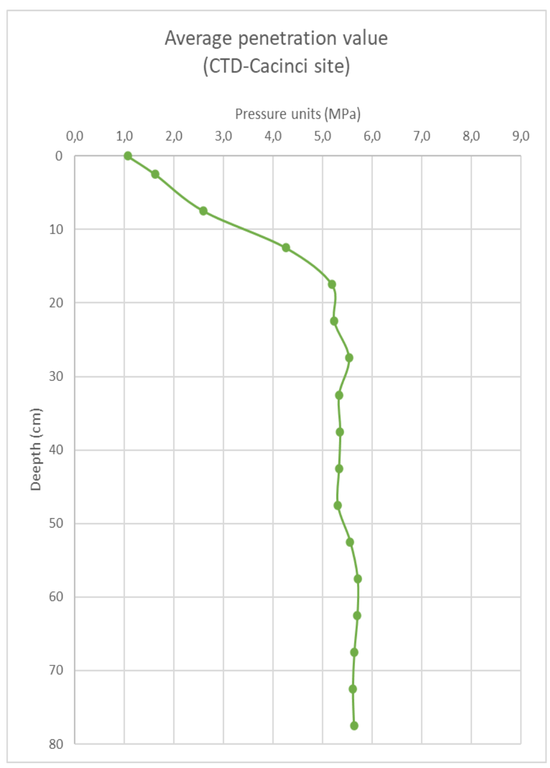
Grown crops (same on both sites) were as follows: maize (2021), soybean (2022), winter wheat (2022/2023), and soybean as a second crop after winter wheat (2023). Penetration resistance measurement was performed three times per vegetation year (beginning, middle, and end of vegetation). The penetration resistance was measured according to geolocated square grid design.

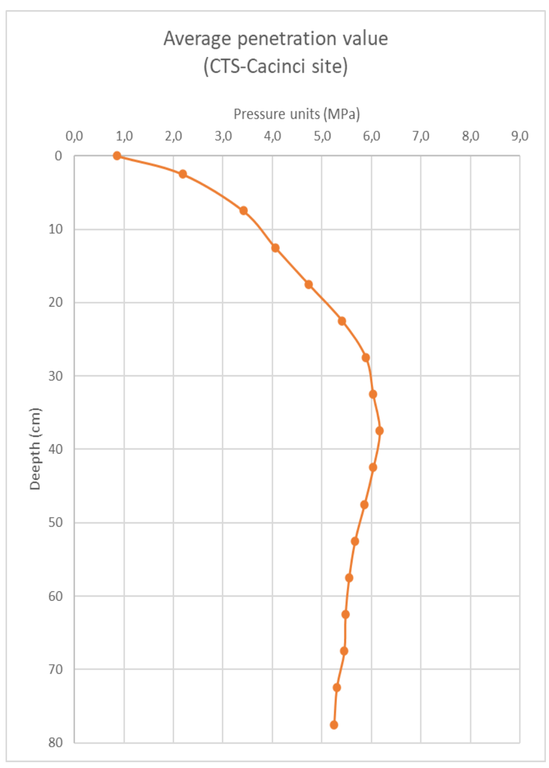












Results

(after third year of experiment)

The values of penetration resistance found in the soil roughly ranged from 1.0 up to 10.0 MPa. These high variations depend on a few factors, but primarily on tillage treatments and soil physical status (basically soil moisture).

Conclusion

(after third year of experiment)

Penetration resistance increased with the depth. Penetration resistance is inversely proportional to conservation level (as crop residues on soil surface increase, penetration resistance decreases).

Acknowledgements: This work has been fully supported by Croatian Science Foundation under the project "Assessment of conservation soil tillage as advanced methods for crop production and prevention of soil degradation – ACTIVEsoil" (IP-2020-02-2647)