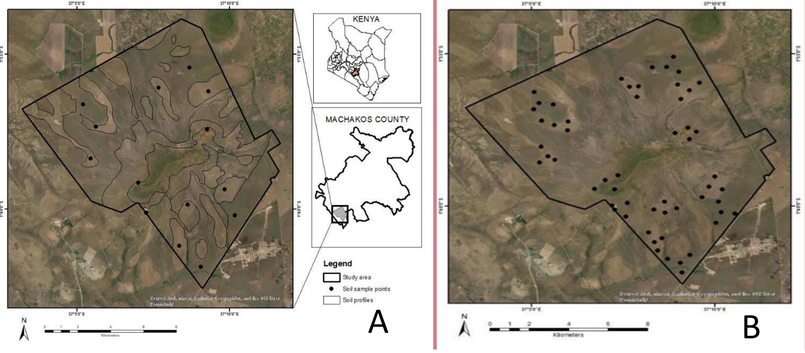

Data points from which samples were collected (A) and data points generated from different profiles (B). Source : Author

The challenge

- A lack of clear understanding of soil conditions can lead to overgrazing, soil erosion, and nutrient depletion, resulting in reduced forage quality and diminished livestock productivity.
- The project tackles the lack of detailed soil information necessary for effective pasture management and sustainable land use at Kapiti research station, Kenya

Our innovative approach

- Our approach combines machine learning with satellite remote sensing to produce accurate, spatially explicit soil maps, improving upon traditional, labor-intensive soil surveying techniques.

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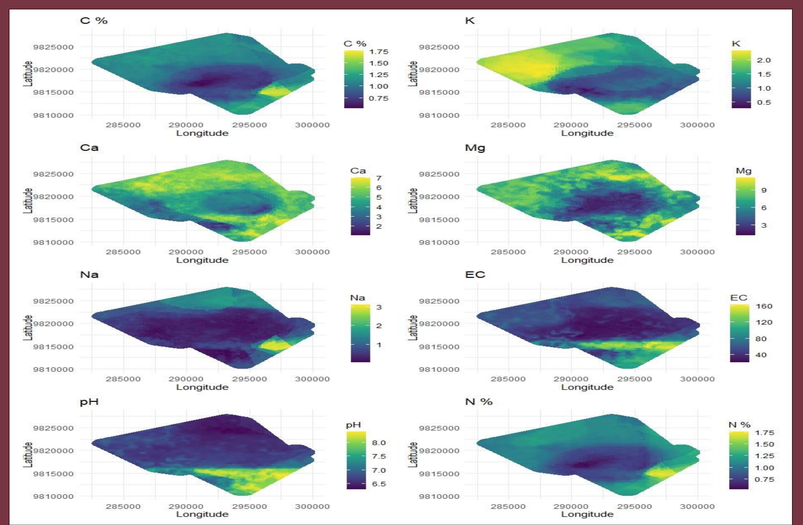
Machine learning based gridded/ digital soil mapping for Kapiti Research Station and Wildlife Conservancy, Kenya

- Digital soil mapping (DSM) is an invaluable tool for providing detailed, spatially explicit information on soil properties across large and often heterogeneous landscapes.
- Digital Soil Mapping leverages modern technologies, satellite remote sensing, machine learning algorithms, and geostatistical models to create high-resolution soil maps.
- Soil co-variates and predictors primarily based on satellite remote sensing data and in-situ soil sampling help delineate soil mapping units.
- Predicted maps for soil parameters such as carbon percentage, magnesium, sodium and potassium were generated using random forest models.



Predicted maps for soil parameters across Kapiti Ranch. Source: Author

Outcomes

- The predicted soil maps, validated against field data, confirm the model's accuracy in identifying key soil properties critical to pasture health
- Soil data from 14 geo-coordinates across Kapiti Conservancy, with multiple depth layers, supported the creation of high-resolution soil maps covering 13,000-hectare
- Stakeholders can implement targeted interventions that improve soil health, enhance forage quality, and optimize livestock production.

Next steps

- Digital soil mapping can be applied across other semi-arid landscapes, enhancing land management practices where soil variability impacts ecosystem health
- It has potential applications in climate-smart agriculture, precision land management, and natural resource conservation across varied ecosystems.
- We aim to scale this DSM approach to other regions, providing a scalable, data-driven solution for sustainable land and pasture management.

Partners

The International Livestock Research Institute thanks all donors & organizations which globally support its work through their contributions to the CGIAR Trust Fund. cgiar.org/funders