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LiDAR-Based Potato Crop Suitability Mapping

The aim of this project is to enhance New Brunswick's food security strategy, especially in terms of expanding farming activities across forested lands deemed most suitable and accessible for farming by way of automated GIS and LiDAR-DEM based soil and crop assessment procedures.

Project Description

- The area of interest is along the Upper Saint John River Valley, from Edmundston to Hartland (approx. 5,400 km^2).
- Suitability mapping accounts for physical soil properties (soil depth, texture, coarse fragments, density per soil mapping unit), slope, soil drainage, and climate.
- Drainage is topographyically quantified by way of the cartographic depth-to-water (DTW) index, suitable slopes are limited to a 0 to 10% slope range, and climate constraints pertain to a high-resolution elevation-adjusted weather-station records that inform about growing degree (GGD) and frost-free (FFD) days.
- Suitability rating is based on the following expression:

$$\left[\frac{(R_{Topsoil} \times R_{Subsoil} \times R_{depth\text{-}to\text{-}Compaction} \times R_{Coarse\ Fragments} + 0.33\ R_{Calcareousness})}{\max\ [R_{Topsoil} \times R_{Subsoil} \times R_{depth\text{-}to\text{-}Compaction} \times R_{Coarse\ Fragments} + 0.33\ R_{Calcareousness}}\right]^{0.3} \times R_{DTW} \times R_{GDD} \times R_{FD} \times R_{Slope}$$

Project Description Cont'd.

- This formula is evaluated for each 1 m^2 pixel-by-pixel once the rasterized data layers have been established for each rating factor.
- Ratings (R) will vary from 0 – poor crop suitability, to 1 – good crop suitability.

Applications

- Assessing farm-to-farm and in-field variation in soil type, soil quality and related potato crop yields.
- Improving soil conservation and erosion reduction practices.
- Visualizing soil drainage and guiding water flow from field-to-field and farm-to-farm.
- Assessing the effectiveness of existing infrastructure placements at channels –road crossings.

References

- Colpitts, M. C. *et al.* 1995. Forest Soils of New Brunswick.

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