



Digital soil mapping: A Brief History and Lessons

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Digital soil mapping was formalised in a 2003 paper by McBratney et al. Since the term was introduced, there has been a huge increase on the research and papers in this topic. An IUSS working group was formed, and the GlobalSoilMap project was initiated. The research topic has become a successful formal discipline in soil science. Here we will have a brief look at the history of (digital) soil mapping and perhaps draw some lessons.

The use of computer or numerical models to automatically map the soil is not new, its origin is difficult to pin-point. In 1925, before the age of digital computer and electronic sensors, Bernard Keen and William Haines conceived and built the first on-the-go soil strength sensor, made the measurements and made the first high-resolution digital soil map, and discovered the reality and importance of soil spatial variation. However this work was too far ahead of its time and was not taken up by contemporaries and is now largely forgotten.

Since Jenny's (1941) factorial model was introduced, many have formulated topofunctions or climofunctions etc, however most of these works and empirical functions were not used for mapping, and were mostly exploratory data analysis. The idea of predicting soil across the landscapes with few equations seemed to be too radical.

Work in the 1970s started to look at using remote sensing and infrared spectroscopy to map soil properties. The Laboratory for Applications of Remote Sensing in Purdue, proposed 'Spectral Mapping of Soil Organic Matter' using soil reflectance from the visible and near infrared signal of an airborne scanner. The lab. was very active and has produced lots of innovative research in the field of remote sensing, generating the first soil spectral library, predicting soil carbon from NIR, mapping soil carbon digitally. However maybe they too were ahead of their time, it took another 30 years before the resurgence of the soil spectroscopy work in the 2000s. It is an enormously active area of enquiry today.

Computer-based system approaches were proposed, but on the digitized and scanned soil map which Tomlinson (1978) called digital soil maps. The French work by Legros and Bonneric (1979) has many of the elements which we now would recognize as Digital Soil Mapping. Soil spatial models for carbon mapping started to appear with the advent of digital elevation model (DEM) in the 1980s. Simple linear models have been developed for spatial prediction of soil carbon in a field, which related soil carbon to topographic indices. Regression tree approach and other data- mining tools were then tried at the field, landscape, region, and continents.

These many emerging approaches were then formalised as Digital Soil Mapping in 2003. The success of digital soil mapping is probably a confluence of many factors: the availability of spatial digital data (DEM, Landsat images), the availability of computing power to process large data, the development of data mining tools and GIS, and applications beyond classical geostatistics.

Lessons from this brief history show that confluence of emerging topics and the right timing warrants the success of a paradigm. Research that is too precocious threatens that truly seminal work being unrecognised and unknown. Such work warrants rediscovery. . Researchers in search of new ideas should, perhaps paradoxically , peruse the very old literature.