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Working Towards Global Pedotransfer Functions for Available Soil Phosphorus

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Even though there are a large number of investigations that estimate available soil phosphorous (P), there is a paucity of global data on available soil P. Given the need to make a global assessment of soil quality and health, one of the significant challenges in our modern world is to develop low cost, accurate approaches to predict available soil P that are useful to scientists around the world. We conducted a global meta-analysis using data on available soil P from 738 sites, 640 in the USA and 149 in 14 other countries. Four different methods of determining available soil P, New Zealand (NZ), acid oxalate, Bray and Mehlich were represented in the dataset. Inputs evaluated for inclusion in the pedotransfer functions to predict available soil P were clay (C), fine silt, (FSi) coarse silt (CSi), very fine sand (VFS), fine sand (FS), medium sand (MS), coarse sand (CS), very coarse sand (VCS), organic carbon (OC), pH, calcium (Ca), magnesium (Mg), potassium (K), iron (Fe), aluminum (Al), and manganese (Mn). Available soil P was estimated for: 1) the entire dataset, 2) only the USA, and 3) the non-USA dataset. Results showed that the best models to estimate available soil P were obtained for the NZ method (using the co-variates C, FSi, CSi, VFS, MS, CS, OC, Fe, Al, Mn, Ca, Mg, and pH) and for the acid oxalate method (using the co-variates C, FSi, Fe, Al, Mn, Ca, and Mg). Although estimation of available soil P determined with the acid oxalate method was poor for the entire dataset, good estimates were obtained for the USA and non-USA datasets separately. Models for the Bray and Mehlich methods only predicted available soil P well for the non-USA dataset. Using pedotransfer function models we developed to estimate available soil P could provide an efficient and cost effective way to estimate global distributions of a soil property that is important for a number of agricultural and environmental reasons.