10 Yield and Nutrient Variability in Glacial Soils of Michigan

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Site specific management (SSM) may have potential for production agriculture but evaluation of SSM is limited and results are mixed. This study assessed the variability of pH, P, K, Ca, Mg and corn (Zea mays L.) yield in fields at Adrian, Durand, and Plainwell, Michigan, sampled at 30.5m grid spacings, evaluated the potential for site specific fertilizer management, and calibrated the Harvest Yield® sensor. Each field averaged optimum pH and medium to high soil tests. Soil fertility within each field, however, ranged from deficient to excessive for most measured parameters. Fertilizer recommendations per hectare were similar for uniform versus SSM. Estimated cost of overfertilization by grid using uniform application was only a few dollars per hectare. Estimated yield loss from underfertilization by uniform fertilization, however, could exceed 2 Mg corn ha⁻¹ at Durand. Grid spacing had little effect on field average fertility or fertilizer recommendations per hectare. Soils in no-tillage management had highly stratified fertility, with no consistent relation between the 0 to 5 cm and the 5 to 20 cm depths. Corn yield was variable but showed little spatial dependence, and was generally not correlated to soil fertility. Soil fertility was spatially dependent but spatial variation of the surface and subsurface were quite different for soils in no-tillage management. The absolute difference between the Harvest Yield® sensor and weigh wagon yields averaged over all transects was less than 5% at any location, although the grain flow calibration coefficient varied by combine. The site specific management of managed inputs and yield mapping at these sites appear to have potential benefits to corn production.

Site specific management (SSM) in agricultural production involves the variable management of soils, crops, and pests according to localized conditions within a field (Carr et al., 1991; Larson and Robert, 1991; Schueller, 1992). The basic steps in SSM include the quantitative assessment of variability within a field and the location specific management of that variability (Robert et al., 1993). The successful application of SSM requires the integration of a myriad