

Crop Yield and Soil Chemical Property Trends from Long-Term Manure Use

Ron Wiederholt

Discussion: The long-term cropping systems trial has been ongoing at the CREC since 1987 to compare crop rotations, tillage and fertility treatments. The fertility treatments include 40 and 80 lbs. of commercial N/acre and manure at 40 lbs. of N/acre. The tillage treatments include no-till, minimum till and conventional till. Since the inception of the trial, a lot of data has been gathered and some trends are starting to materialize. Using data from 1999 through 2006, the behavior of the manure treated crops versus those fertilized with commercial fertilizer is very interesting.

Over the 7-year period, the yield of non-leguminous crops including barley, corn, sunflower and hard red spring wheat grown under the manure treatment were at least equal to and in some instances, out-yielded the commercial N treatments. This fact is not too surprising until you realize that the manure applied at a rate of 40 lbs. of N/acre behaved similar to or better than the 80 lbs./acre commercial N treatment. In only one time period (1999-2002) and for one crop (barley) yields obtained from the manure treatments were less than the 80 lbs. of commercial N/acre treatments.

What is even more interesting is the impact manure had on soil chemical properties over the same time period. One result that may help explain why the crop yields from the manure plots was competitive with a higher rate of commercial N is that soil organic matter levels in the manure-treated plots were significantly higher than levels in commercially-fertilized plots. When you throw tillage into the mix, the soil organic matter levels are also significantly higher for no-till and manure than any of the other treatments. The soil nitrate levels at all depths sampled were significantly less for the manure plots versus the 90 or 45 lbs./acre commercial N treatments. Soil pH for the manure plots was also significantly higher than the commercially-fertilized plots. Not surprisingly, soil phosphorous levels were also significantly higher in the manure versus commercial N plots.

Conclusion: Manure can be successfully substituted for commercial fertilizer and long-term manure use has a positive impact on soil chemical properties.

Table 1. Selected comparisons of crop yield and soil properties from the long term cropping systems trial.

<u>Crop Yield Comparisons</u>	<u>1999-2002</u>	<u>2003-2006</u>
Barley	manure < 80 lbs. N	manure = 80 lbs. N
Corn	manure = 80 lbs. N	manure = 80 lbs. N
Sunflower	manure = 80 lbs. N	manure = 80 lbs. N
Wheat	manure > 80 lbs. N	manure > 80 lbs. N
<u>Soil Property Comparisons</u>		
ppm Nitrate	manure < 80 lbs. N	manure < 80 lbs. N
% Organic Matter	manure > 80 lbs. N	manure > 80 lbs. N
pH	manure > 80 lbs N	manure > 80 lbs. N
ppm Phosphorous	manure > 80 lbs. N	manure > 80 lbs. N