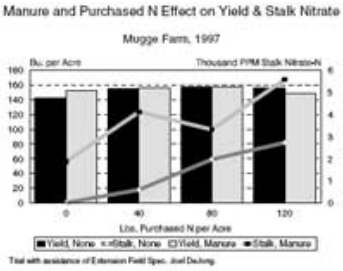
Livestock Manure--Crop Response and Economics

Two PFI cooperators in western Iowa posed research questions that apply to the crop nutrient needs on their organic farms, specifically. **Jim and Lynn Boes** (Atlantic) and **Ken Rosmann** (Harlan) have nearby sources of poultry manure. They wanted to know if purchasing some of this poultry manure would be a cost-effective way to import nutrients into the farming system.

Jim Boes worked with Extension Crops Field Specialist Mike White to compare purchased poultry manure to no manure at all. In fact, the entire field had a manure history, from livestock wintered there and from previous years' applications. Table 1 shows a 13-bushel average difference between treatments, but this cannot be taken too seriously, given the 29.4-bushel LSD from the trial. With no statistical difference due to purchased manure, the $29 cost would appear an unnecessary expense. Still, Jim says some of his soils could really use the phosphorus in the poultry product. First-year corn might not be the best crop to receive the purchased manure, at least on fields like this one.

Figure 3. Corn stalk nitrate-N and yields from manure and sidedress nitrogen, Mugge Trial



Ken Rosmann and Extension Crops Field Specialist Richard DeLoughery set out to compare purchased poultry manure to beef manure generated on the farm (see page 4 sidebar). They went to some lengths to monitor the crop's nutrient status throughout the season, and they factored in all the associated costs for each type of manure. They observed no difference in yields between corn receiving beef manure and corn fertilized with poultry manure, even though the poultry manure was applied at a higher rate than intended while the beef manure was applied more lightly than planned.

Dick DeLoughery's report mentions the field variability that made it difficult to measure the effects of manure treatments. That variability was also a factor in the trial of manure and nitrogen rates that **Paul and Karen Mugge** (Sutherland) carried out with assistance from Extension Crops Field Specialist Joel DeJong. They set up this trial as a "split-plot" experiment. The "main factor" was nitrogen rate - four different levels of sidedressed N: 0, 40, 80, and 120 lbs per acre. Each main factor plot was "split" into with-and-without ("±") liquid swine manure injected at the rate of 3,200 gallons per acre in late April. The late spring soil nitrate test averaged 31 and 20 parts-per-million (ppm) in the manured and unmanured soils, respectively. Mid-season tissue samples collected by Joel DeJong confirmed that sidedressing additional nitrogen increased leaf nitrogen concentration (Table 5). End-of-season stalk samples also showed the effects both of manure and of sidedressed N (Table 5 and Figure 3).

So far, everything was fairly predictable, but crop yields raised new questions. There was the suggestion of a yield response to the first incremental addition of N, especially in the unmanured corn. But there was also indication of a yield reduction at the highest sidedress rate, especially in the manured corn. Was this just field variability? Both trends were not statistically significant. Interestingly, the downturn at high N occurred principally in two neighboring replications in the middle of the field. Was there something different in that part of the field? Would it appear another year? This would seem like pure speculation, except that ISU scientists also occasionally observe corn yield reductions at high N rates. They are now using technologies associated with precision agriculture to come to grips with the potential phenomenon.