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MANAGING PLANT NUTRIENTS WHEN BOTH MANURE AND FERTILIZER APPLICATIONS ARE USED

There are three main sources of plant nutrients available to farmers. They are commercial fertilizers, livestock manure, and municipal sewage sludge or biosolids. There is a preconceived notion that a farmer will only use one of these sources to supplement nutrients supplied by soils. However these sources can be used in combinations very successfully.

When considering the weight of material applied to soil, manures are the greatest, followed by fertilizers, and lastly biosolids (See Table). However, the actual amount of nutrients supplied with fertilizer is still highest because of their greater concentrations compared to organic sources. Typical liquid dairy manure has a fertilizer analysis of 0.4% N, 0.2% P₂O₅, and 0.5% K₂O. A typical fertilizer NPK fertilizer blend, used for a small grain crop, would have a blend analysis of 22-9-18—or about 50 times greater concentrations of plant nutrients compared to liquid dairy manure. Fertilizers are much less expensive to transport compared to manure in order to supply the equal amounts of nutrients to a field. For this reason, the amount of nutrients supplied annually in the US through fertilizer is 20 times greater compared to that applied as biosolids and manure combined. Plus, only a small percentage of cropland receives manure. In Canada, only about 4% of cropland receives manure applications compared to 96% that only receives fertilizer. This excludes some organic crop production land that receives neither manure nor fertilizer.

Relative Use of Biosolids, Manures, and Fertilizers (Approximate US Totals).

Amount	Biosolids	Manures	Fertilizers
Produced (M tonne ¹)	6.3	121	45
Applied to Land (M tonne ¹)	2.5	109	45
Utilization	40%	90%	100%
Nutrients applied (M tonne)	0.03	1.09	22

¹Millions of tonnes; tonnes = 1,000 kg = a metric tonne = 2,204.5 lb = 1.1 ton

Table adapted from "Fertilizers, Manure, or Biosolids", <http://www.hvmsd.org/docs/FERTILIZERS.pdf>

One disadvantage of only using manure compared to a combination of manure along with additional fertilizer is that the balance of nutrients can be less than ideal. For example, a barley crop yielding 100 bu/A (5,300 kg/ha) will take (per acre) 100 lb N, 42 lb P₂O₅, and 33 lb K₂O from the soil. This equates to a N: P₂O₅: K₂O use ratio of 2.7: 1: 0.8, which translates into a higher N requirement than can be supplied from typical manures. To better supply N, P, and K to a barley crop, a farmer could apply additional N fertilizer along with manure to more closely approach the actual nutrient use ratio of the crop.

What can work well for farmers is to apply manure once every 3 years. In the year of application, manure is applied at a rate to supply the N requirements of the crop and excess P and K is supplied. For the next 2 years, only N fertilizer is required as residual P and K from the manure usually satisfies crop demand. Additional low rates of P and K might be used as seed-row starter fertilizer to get crops off to a good start under cool spring soil conditions. This approach works well to grow adequate yields while avoiding excess build up of soil P and K.

It is recommended that soil nutrient content be monitored annually or at least every 3 years, by having representative soil samples analyzed, and the results interpreted by a qualified consulting agronomist, or certified crop adviser. How often manure can be applied and what rates of fertilizer nutrients are required each year will need to be adjusted depending on the crop to be grown, crop yields, nutrient removal in harvested grain or forage, the manure type and its nutrient content, and weather conditions. By using a combination of manure and fertilizer applications, crop nutritional needs can be met while avoiding excess levels of nutrients in your soil.

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For more information, contact Dr. Thomas L. Jensen, Northern Great Plains Director, IPNI, 102-411 Downey Road, Saskatoon, SK S7N 4L8. Phone: (306) 652-3535. E-mail: tjensen@ipni.net.

Abbreviation: N = nitrogen; P = phosphorus.

Note: *Plant Nutrition TODAY* articles are available online at the IPNI website: www.ipni.net/pnt