Manure Sampling, Analysis & Interpretation

Accurate manure analyses are essential for proper nutrient management planning but manure analyses are only as good as the sample taken. Most manure testing laboratories request a pound or quart of sample and only a very small amount of this sample is analyzed to determine the nitrogen (N), phosphorus (P) and potassium (K) content. Yet, the results are used to determine the nutrients applied across the whole farm for the spreading season. This fact sheet is a guide for getting the most accurate N, P, and K quantities from your manure testing program.

Sample from the spreader
Sampling from the manure spreader gives the most accurate representation of what is actually applied to the field. It also avoids the dangers of personal injury associated with sampling manure storages.

Solid manure
Sample by scooping manure out of the spreader with a pitchfork, shovel or plastic container and avoid large pieces of bedding. Select 4-8 scoops from different places in the spreader, mix well, and draw a sample from this mixture. For daily spread operations sample from three different loads over course of a week or month to generate three independent samples for submission to the laboratory. Solids from piles or bedded packs are highly variable and each different section of the pile or pack should be sampled separately (3 samples per section).

Liquid and slurry manure
Samples should be taken as soon as possible after loading (unless the spreader has a well-functioning agitator) (Figure 1). If a slurry storage (>6% solids) is not well-agitated prior to spreading the nutrient content can be highly variable. In these cases sample when manure is pulled from the top, middle and bottom portions of the storage (3 samples per section), or when the manure visibly changes in solids content. Keep logs that can show to which fields manure from each section of the storage was applied. Sludge that accumulates on the bottom of storages should be tested and spread as a separate manure source.

Sample annually or every major event
If there are no previous sample records, samples should be taken at least twice during the first year and then every spreading event. New York Concentrate Animal Feeding Operation (CAFO) regulations require sampling at least once per year and spreading event.

Submit three samples
Outliers happen in manure analyses. To make sure management plans are not being based on outlier analyses, it is recommended to take at least three samples and have them analyzed separately. The three manure analyses should be compared to identify outliers and if present, outliers should be discarded when determining average manure nutrient content.

Freeze the samples
Fill the plastic sample container provided by the laboratory 2/3 full (Figure 2). Keep the samples cool until they can be put in a freezer to slow down microbial activity. After the three samples are frozen, send them to the laboratory. It is best to mail samples early in the week to avoid thawing in the post office.
What to analyze?
A manure sample should at a minimum be analyzed for:
- Total Kjeldahl nitrogen (TKN).
- Ammonium nitrogen.
- Total phosphorus.
- Total potassium.
- Percent solids.
- Bulk density.

Interpreting the analysis
Manure analyses can be reported in many different ways. Useful conversion factors from test results reported “as is” are:
- Lbs/ton = % * 20
- Lbs/ton = ppm * 0.002
- Lbs/1000 gallons = % * 83.4
- Lbs/1000 gallons = ppm * 0.00834
- Lbs/1000 gallons = 0.24 lbs/ton
- Lbs/ton = 4.17 lbs/1000 gallons

Most manure test results are reported “as is” or on a wet basis. If reported on a dry basis,
- “As-is” = (dry weight / % solids) * 100

To determine manure N credits, both the ammonium-N and the organic-N content of the manure should be known, in addition to method and timing of application. For guidance in determining N credits from manure see Factsheet #4: Nitrogen Credits from Manure.

Total value estimates can be combined with fertilizer application costs for hauling distance break-even analyses or compared with manure handling operational and ownership costs to negotiate the terms of a manure export agreement. For more information on valuing the nutrients in manure see Factsheet #61: Valuing Manure N, P and K Applications.

Table 1: Accurate manure analysis allows for calculation of the economic value of manure (an example).

<table>
<thead>
<tr>
<th>Manure nutrient (lbs/1000 gallon)</th>
<th>Manure value ($/1000 gallon)†</th>
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<tbody>
<tr>
<td>Ammonium-N</td>
<td>8.45</td>
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<tr>
<td>Organic-N</td>
<td>2.50</td>
</tr>
<tr>
<td>P₂O₅ equivalent</td>
<td>7.13</td>
</tr>
<tr>
<td>K₂O equivalent</td>
<td>21.21</td>
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<tr>
<td>Total value</td>
<td></td>
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<tr>
<td>Total value 10,000 gallons/acre</td>
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<tr>
<td>Total value 5000 gallon spreader</td>
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</tbody>
</table>

† Nutrients were valued at $0.50, $0.60 and $0.70 per pound of N, P₂O₅ and K₂O respectively.

Tracking Farm Management Impacts
Testing and recording annual manure analyses can increase your understanding of the nutrient content of the manure and impacts of management changes (Figure 3).

Disclaimer
This fact sheet reflects the current (and past) authors’ best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of particular discharge levels from agricultural land.