Comparing Plant Essential Macronutrient Concentrations of Various Manure Sources from California Dairies

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BACKGROUND
California dairy manure undergoes annual plant nutrient sampling and reporting.

Various dairy manure sources are composed of essential plant nutrients. California dairy farmers are required to sample all manure sources to comply with the Central Valley Dairy General Order for Existing Milk Cow Dairies¹. Nutrient composition of solid and liquid manure samples are reported in annual reports: nitrogen (N), phosphorus (P) and potassium (K).

OBJECTIVES
Analyze California dairy annual reports.

1. Extract essential plant macronutrient data from Central Valley dairy annual reports.
2. Remove and calculate outliers beyond reasonable biological ranges².
3. Summarize nutrient composition of manure sources, allowing for agronomic recommendations to promote efficient use of nutrients.

METHODS
Compare essential plant macronutrient concentrations between manure sources.

Annual report data from 63 dairies were obtained to extract solid (n=275) and liquid (n=585) manure nutrient data. Macronutrient concentrations for each manure source were reviewed for outlier analysis and compared by source.

Table 1. Manure data size (n) pre- & post-data clean up.

<table>
<thead>
<tr>
<th>Manure Source</th>
<th>Pre-data clean up</th>
<th>Post-data clean up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corral Solids</td>
<td>174</td>
<td>96</td>
</tr>
<tr>
<td>Separator Solids</td>
<td>84</td>
<td>20</td>
</tr>
<tr>
<td>Compost Solids</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Scraped Solids</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Lagoon Liquids</td>
<td>585</td>
<td>381</td>
</tr>
</tbody>
</table>

RESULTS
Nutrient composition variability by manure source.

Cleaned data
Solid manure sample size decreased from 275 to 121 (44% of the original data). Liquid manure sample size decreased from 585 to 381 (66% of the original data) (Table 1). The primary culprit of data size reduction is data outside of TKN standard ranges for both solid (35.6% data removed) and liquid (17.4% data removed) manure.

Comparing average nutrient composition
Nutrient composition by source is presented in Figures 3 and 4. Ranges identified in Figures 3 and 4 are useful for comparison purposes for farmers and consultants to compare individual sample results to reasonable population ranges. When data are outside these ranges, it is important to evaluate sampling methodology to determine if samples represented their source³.

CONCLUSION
Reviewing nutrient analysis allows for enhanced agronomic management.

Greater attention to proper sample collection and preservation may improve sample quality. Improved data will facilitate more accurate agronomic nutrient rate prescriptions when applying manure as a fertilizer and soil amendment. Increased accuracy in nutrient application rates may support greater crop yield and reduce risks of groundwater contamination.

REFERENCES

ACKNOWLEDGEMENTS
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