

GRID SOIL SAMPLING FOR LIVESTOCK FARMS: FEATURES OF EIGHT CASE STUDIES

Primary Cases

Dairy Farm #1: Liquid Manure (Case 1)

Straight-forward case with one field and one nearly-square zone of moderately high phosphorus (P). Emphasis is on economics of grid soil sampling and zonal manure management. Good introductory case.

- High nutrient (for dairy) liquid manure
- Soil test P values range from Very Low to Very High (5-47 ppm Bray 1-P)
- Crop rotation is four years of alfalfa and four years of corn silage
- Alternative manure application rates analyzed are whole-field N rate, zonal N rate, and zonal P rate

Hog Farm #1: Liquid Manure (Case 3)

Easily analyzed case with one field and a well-defined but irregular area of high P with boundaries straightened for zonal application.

- Soil test P values range from Low to Very High (3-115 ppm Bray 1-P)
- Crop rotation is corn, corn, soybeans
- Alternatives analyzed are whole-field N rate, zonal N rate, and zonal P rate
- Field slopes and soil erosion are discussed, with erosion estimates compared for tillage options

Purchased Poultry Manure (Case 7)

The only poultry manure case study. Two different crop rotations among three fields make this a more challenging case.

- Crop rotation on two fields is continuous corn, and corn going into alfalfa on a third field
- Soil test P values on the continuous corn fields range from Low to Medium (7-14 ppm Bray 1-P), and are all in the Very High range (25-70 ppm) for the field going into alfalfa
- Alternatives analyzed are whole-field N rate and whole-field P rate for corn, and zonal P-removal rate for alfalfa
- Time of manure incorporation after application is analyzed for impact on manure value
- Tillage and manure incorporation options to minimize potential soil erosion are discussed for these sloping fields

Dairy Farm #3: Solid Manure (Case 8)

Easily analyzed case with one field containing a well-defined area of low P. The low nutrient manure and sufficiently large low-P zone lead to clear selection of one manure application alternative among three analyzed.

- Soil test P values range from Low to Very High (7-110 ppm)
- Crop rotation is corn silage, grain corn, and soybeans
- Alternatives analyzed are whole-field N rate, zonal N rate, and zonal P rate
- Options for tillage and manure incorporation are analyzed with the Minnesota P Index for P loss risk and RUSLE2 for soil erosion

(Supplemental Cases summarized on next page)

Supplemental Cases

Dairy Farm #2: Liquid Manure (Case 2)

Challenging case with irregularly shaped field and high P area combined with low nutrient analysis liquid manure. Selection among alternative manure application strategies is not straight-forward so presents good opportunity for discussion.

- Low nutrient analysis manure
- Soil test P values range from Low to Very High (7-94 ppm Bray 1-P)
- Crop rotation is four years of corn silage following four years of alfalfa
- Alternatives analyzed are whole-field N rate, zonal N rate, and zonal P rate
- Options for tillage are analyzed with the Minnesota P Index for P loss risk and RUSLE2 for soil erosion

Hog Farm #2: Liquid Manure (Case 4)

Most of this large field is in the Very High soil test P range, presenting the primary challenge in this case.

- High nutrient analysis manure
- Soil test P values range from Low to Very High (7-98 ppm Bray 1-P)
- Crop rotation is corn, corn, soybeans
- Alternatives analyzed are whole-field N rate, zonal N rate, and zonal P rate
- Timing of manure application to reduce N loss is discussed
- Options for tillage are analyzed with RUSLE2 for soil erosion on the moderate to low slopes of this field

Beef Farm #1: Solid Manure (Case 5)

Almost all of this large field is in the Very High soil test P classification, limiting manure application options. The N:P:K ratio of the low nutrient analysis manure also presents a problem. Applying manure at the crop P removal rate is considered.

- Low nutrient analysis manure, especially regarding N
- Soil test P values, almost all in the Very High class (18-282 ppm Bray 1-P)
- Crop rotation is corn, corn, soybeans
- Alternatives analyzed are whole-field N rate, zonal N rate, whole-field crop P removal rate, and zonal crop P removal rate
- Tillage and manure incorporation methods to limit soil erosion and P runoff are discussed

Beef Farm #2: Solid Manure (Case 6)

Three separate irregularly shaped hilltop fields in a dissected landscape, all with different soil test P distributions, make this a challenging case but typical in southeast Minnesota. Alternatives for each field are analyzed separately and then combined across fields.

- Medium to low nutrient analysis manure
- Soil test values ranging from Medium to Very High (11-70 ppm Bray 1-P)
- Crop rotation is corn, soybeans
- Alternatives analyzed are whole-field N rate, zonal N rate, zonal P rate, and whole-field crop P removal rate
- Options for tillage and manure incorporation are analyzed with the Minnesota P Index for P loss risk and RUSLE2 for soil erosion