COMPARATIVE LAND USE STUDY - MELROSE, MN





A Minnesota Department of Health Study including project partners Emmons & Olivier Resources, Inc., Great Plains Institute, the Minnesota Rural Land Water Association, and with additional support from Dr. Kevin Maarick & Grant Moser of the University of Wisconsin, Stevens Point (Nitrate Leeching Calculator).

Land use comparisons of past (agricultural) and future (solar with prairie) and the use of nitrogen-based fertilizers. Corn, soybean, and rye crops have previously been farmed on the properties and were used in nitrogen calculator scenarios. The agricultural scenarios are being compared to a single scenario simulating future land use of solar arrays with native prairie being planted underneath the panels. The location for comparison was selected based on an area located within a drinking area (DWSMA) which is at-risk for high levels of nitrate contamination based on site geology and relation to drinking water area.

Inputs for each scenario are included based on a 14-acre field, located in Melrose, MN

1.) MANAGEMENT SCENARIO 1

Crop = Corn

Fertilizer (urea, potash, mesz) = 223 lb/acre Yield (poor yield) = 100 bushels/acre Field Organic Matter (OM) = < 2%

- vs.-

Crop = Bluestem Grass

Fertilizer (urea, potash, mesz) = 0 lb/acre Yield (poor yield) = 0 bushels/acre Field Organic Matter (OM) = < 2%

SCENARIO I (corn) - Potential Leachable Nitrogen				
Land Cover: Corn		Land Cover: Bluestem Grass		
Leachable N (lb/acre)	132.7	Leachable N (lb/acre)	17.4	
Nitrate-N (mg/L)) 58.7 Nitrate-N (mg/L) 7.7			
Scenario 1 Totals for Potential Leachable Nitrogen				
Leachable N (lb/acre) 65.8				
Field-Weighted Nitrate-N (mg/L) 29.1				

2.) MANAGEMENT SCENARIO 2

Crop = Corn

Fertilizer (urea, potash, mesz) = 223 lb/acre Yield (poor yield) = 100 bushels/acre Field Organic Matter (OM) = < 2%

- vs.-

Crop = Bluestem Grass

Fertilizer (urea, potash, mesz) = 0 lb/acre Yield (poor yield) = 0 bushels/acre Field Organic Matter (OM) = < 2%

SCENARIO 2 (soybeans) - Potential Leachable Nitrogen				
Land Cover: Soybeans Land Cover: Bluestem Grass		S		
Leachable N (lb/acre)	190.5	Leachable N (lb/acre)	17.4	
Nitrate-N (mg/L)	84.3 Nitrate-N (mg/L) 7.			
Scenario 1 Totals for Potential Leachable Nitrogen				
Leachable N (lb/acre) 103				
Field-Weighted Nitrate-N (mg/L) 46				

3.) MANAGEMENT SCENARIO 3

Crop = Rye

Fertilizer (urea, potash, mesz) = 223 lb/acre Yield (poor yield) = 52 bushels/acre Field Organic Matter (OM) = < 2%

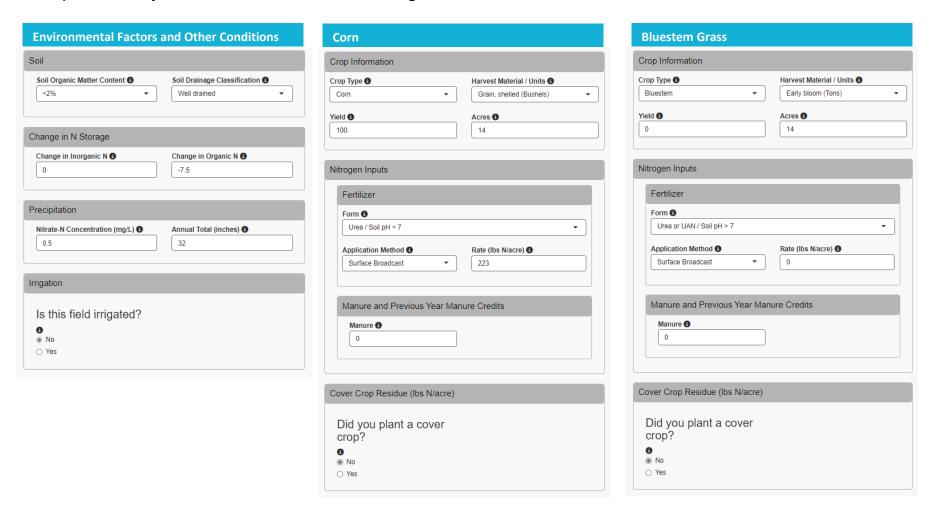
- vs.-

Crop = Bluestem Grass

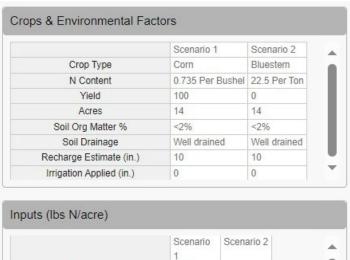
Fertilizer (urea, potash, mesz) = 0 lb/acre Yield (poor yield) = 0 bushels/acre Field Organic Matter (OM) = < 2%

SCENARIO 3 (rye) - Potential Leachable Nitrogen				
Land Cover: Rye Land Cover: Bluestem Grass		S		
Leachable N (lb/acre)	132.7	Leachable N (lb/acre)	17.4	
Nitrate-N (mg/L)	58.7 Nitrate-N (mg/L) 7.7			
Scenario 1 Totals for Potential Leachable Nitrogen				
Leachable N (lb/acre) 75				
Field-Weighted Nitrate-N (mg/L)				

Full Input Summary for Corn vs. Bluestem Grass Management Scenario



NITROGEN BALANCE



	Scenario 1	Scenario 2
Fertilizer	223	0
Manure	0	0
Symbiotic N fixation (legumes)	0	0
Irrigation	0	0
Precipitation	3.6	3.6
Dry Deposition	3.6	3.6
Crop Seed	0	0
Nonsymbiotic Fixation	3	3
Total N Input Per Acre	233.2	10.2

	Scenario 1	Scenario 2	
Harvested material (Main Crop)	70	0	
Ammonia Loss	33.4	0	
Denitrification	13.8	0.4	
Erosion	0	0	
Runoff	0	0	
Miscellaneous Gaseous	2.3	0.1	
Ammonia at Senescence	3.5	0	
Total N Output Per Acre	123	0.5	

	Scenario	Scenario 2	
	1		
Change in Inorganic N	0	0	
Change in Organic N	-7.5	-7.5	
Total Storage Change	-7.5	-7.5	

	Scenario	Scenario 2	
Crop Type	1		
N Content	0	0	
Yield	0	0	
Total Cover Crop Residue	0	0	4

Potential Leachable Nitrogen (Corn vs. Bluestem)			
Land Cover: Corn Land Cover: Bluestem Grass			Grass
Leachable N (lb/acre)	132.7	Leachable N (lb/acre)	17.4
Nitrate-N (mg/L)	58.7	Nitrate-N (mg/L)	7.7
Totals for Field:			
Leachable N (lb/acre) 65.8			
Field-Weighted Nitrate-N (mg/L) 29.1			29.1