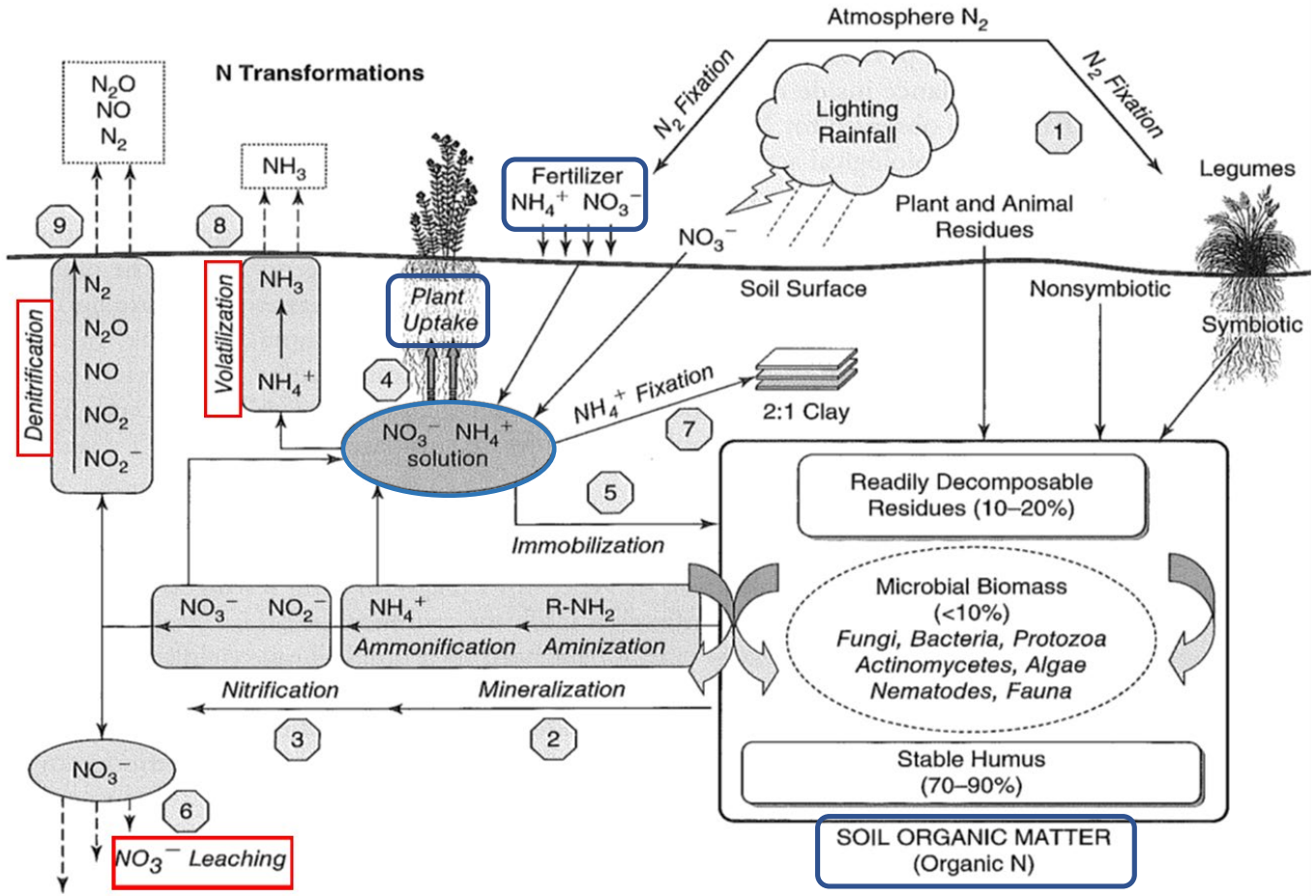
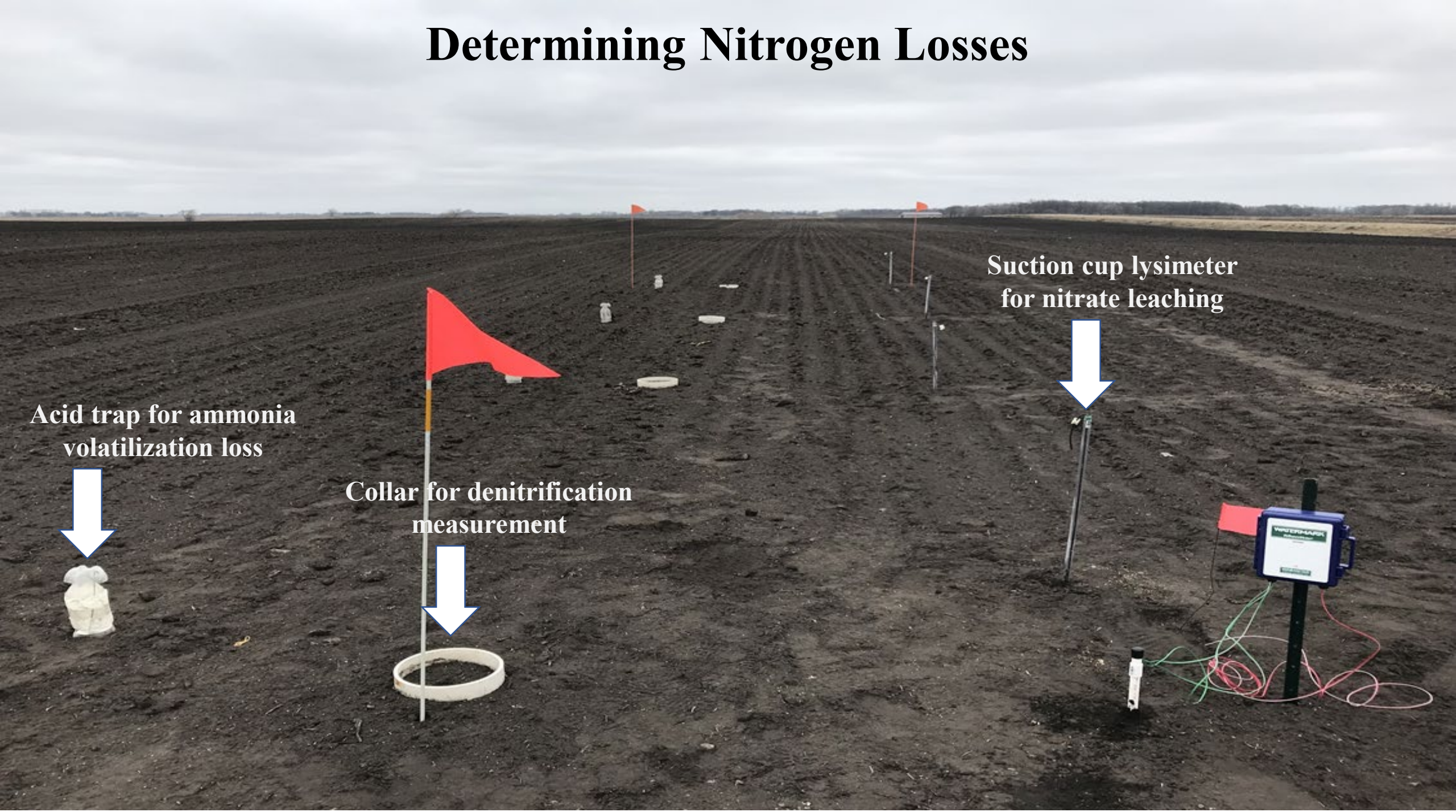
Nitrogen Losses under Spring Wheat Production System
Third yr.
Amitava Chatterjee, Soil Science, NDSU

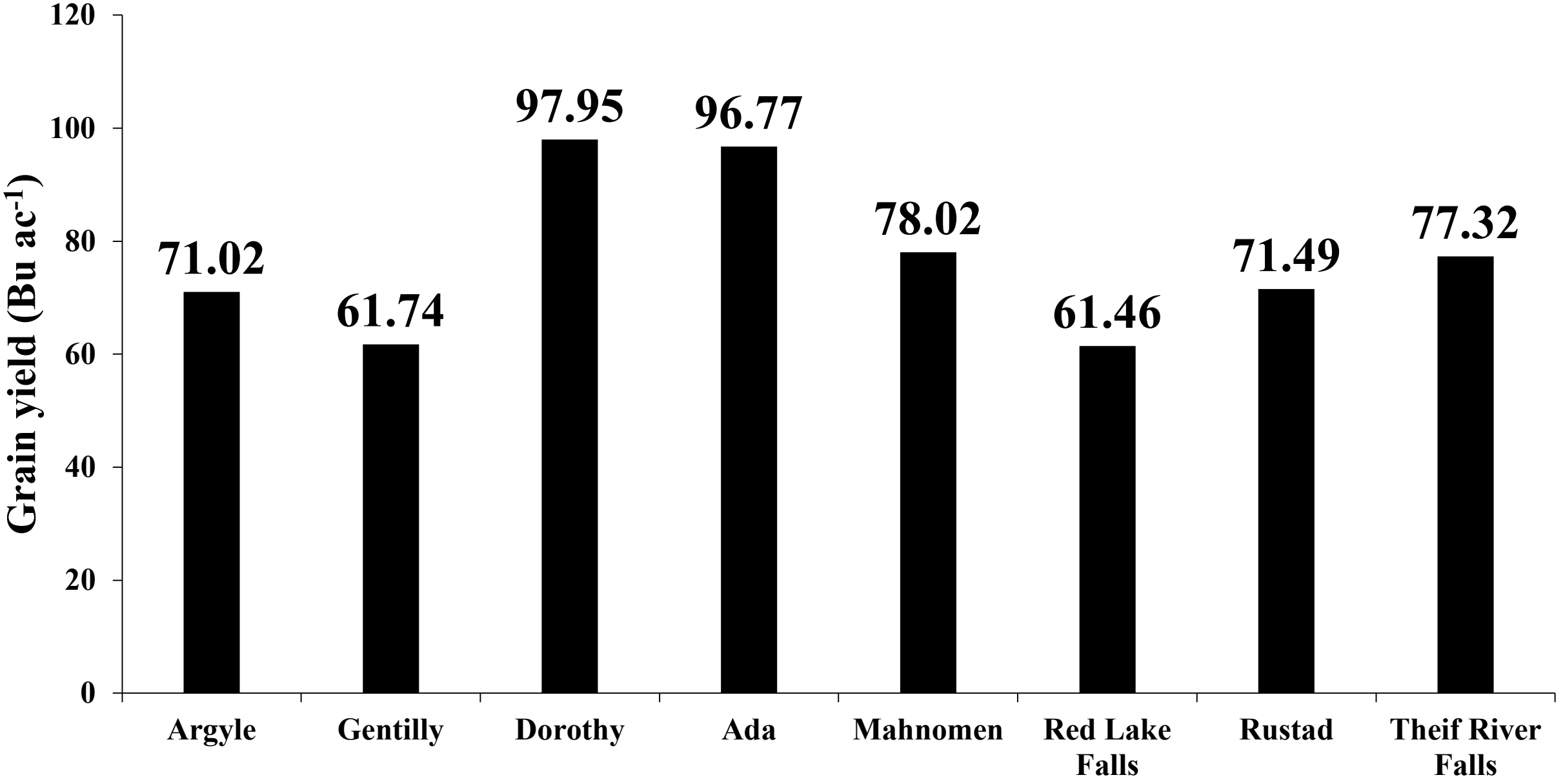


	Argyle	Gentilly	Dorothy	Mahnomen	Ada	Red Lake Falls	Thief River Falls	Rustad
Location	48.306293, -96.936783	47.785976, - 96.458359	47.920593, -96.495371	47.508676, -95.898595	47.3957, -96.6842	47.831450, -96.246421	48.034397, -96.244160	46.720405, -96.697679
Previous Crop	Soybean	Soybean	Soybean	Soybean	Soybean	Soybean	Soybean	Soybean
Cultivar	Westbred 9590	Westbred 9590	Linkert	Trigger	Shelly	Ingmar	Valda	Bolles
Planting Date	April 25th	May 9th	May 15th	May 10th	May 14th	May 10th	May 9th	May 7th
Texture	Sandy Clay Loam	Sandy Clay Loam	Sandy Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Loam	Sandy Loam	Sandy Clay Loam
BD ($Mg\ m^{-3}$)	1.23	1.39	1.40	1.31	1.65	1.37	1.24	1.17
Soil OM%	5.2	5.1	3.8	5.7	3.7	2.9	4.2	5.7
Soil pH	8.2	7.1	8.2	7.1	7.8	8.0	8.3	7.8
Soil EC (mmhos cm^{-1})	0.48	0.52	0.32	0.48	0.69	0.42	0.24	0.49
Soil N (0-6") lb/ac	38	70	71	55	84	26	7	18
Olsen-P ppm	21	18	10	19	24	11	11	20
Soil K ppm	361	242	80	159	189	97	103	278
Fertilizer Application	140 lbs N/ac with N serve	Urea applied (145 lb N/ac 10/24/18. Starter 100lbs/ac of MESZ (12-40-0-10-1)	135 lbs N, 95 anhydrous ammonia applied on 10/18/18.	142 lbs of 82-0-0. 75 lbs of 11-52-0. 150 total lbs of N/ac applied at planting	160 lbs N, 59 lbs P_2O_5	120 lbs N applied on 11/3/18.	90 lbs N/ac in spring.	110 lbs N/ac applied on 10/29/18.

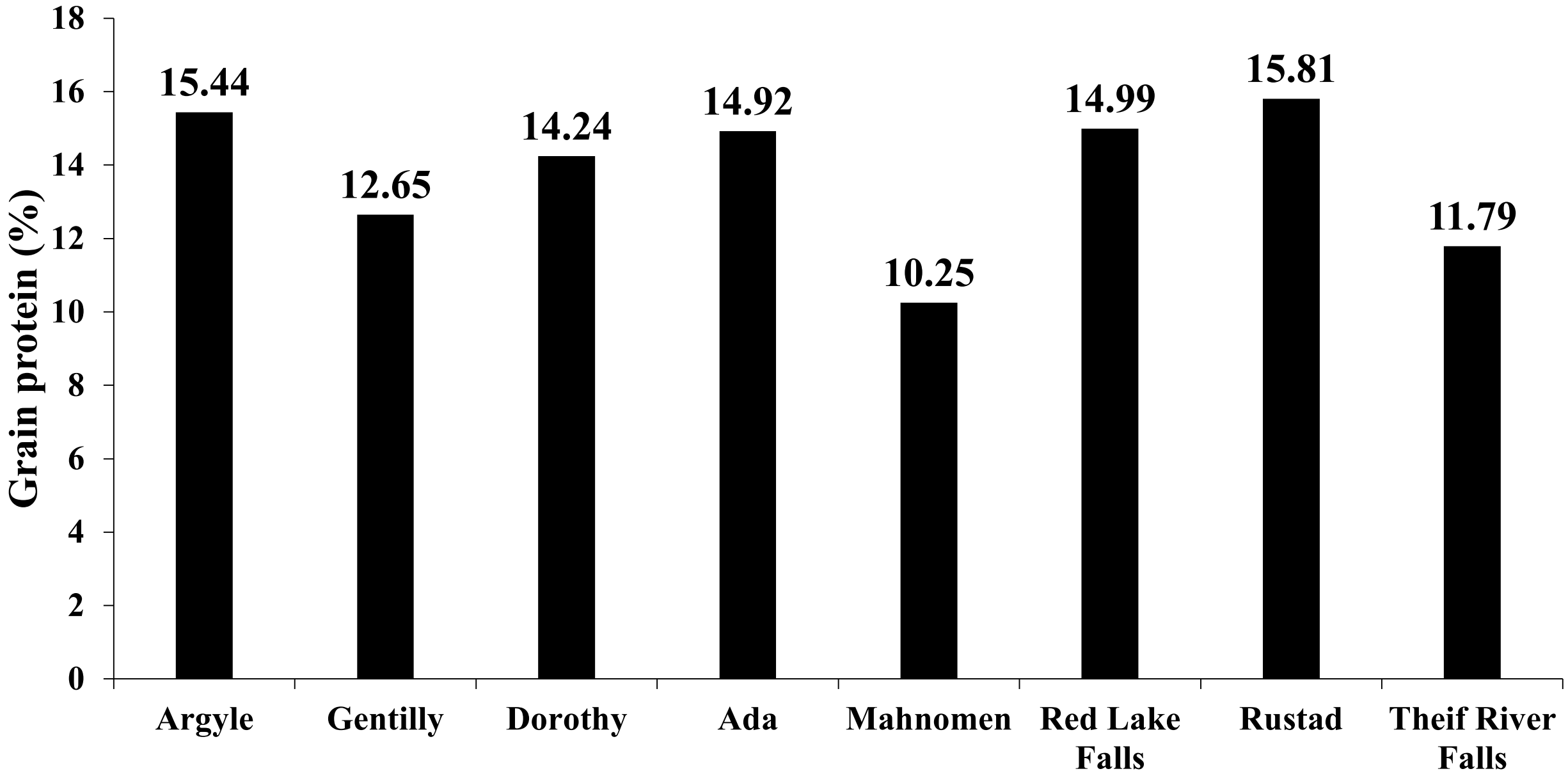
Determining Nitrogen Losses



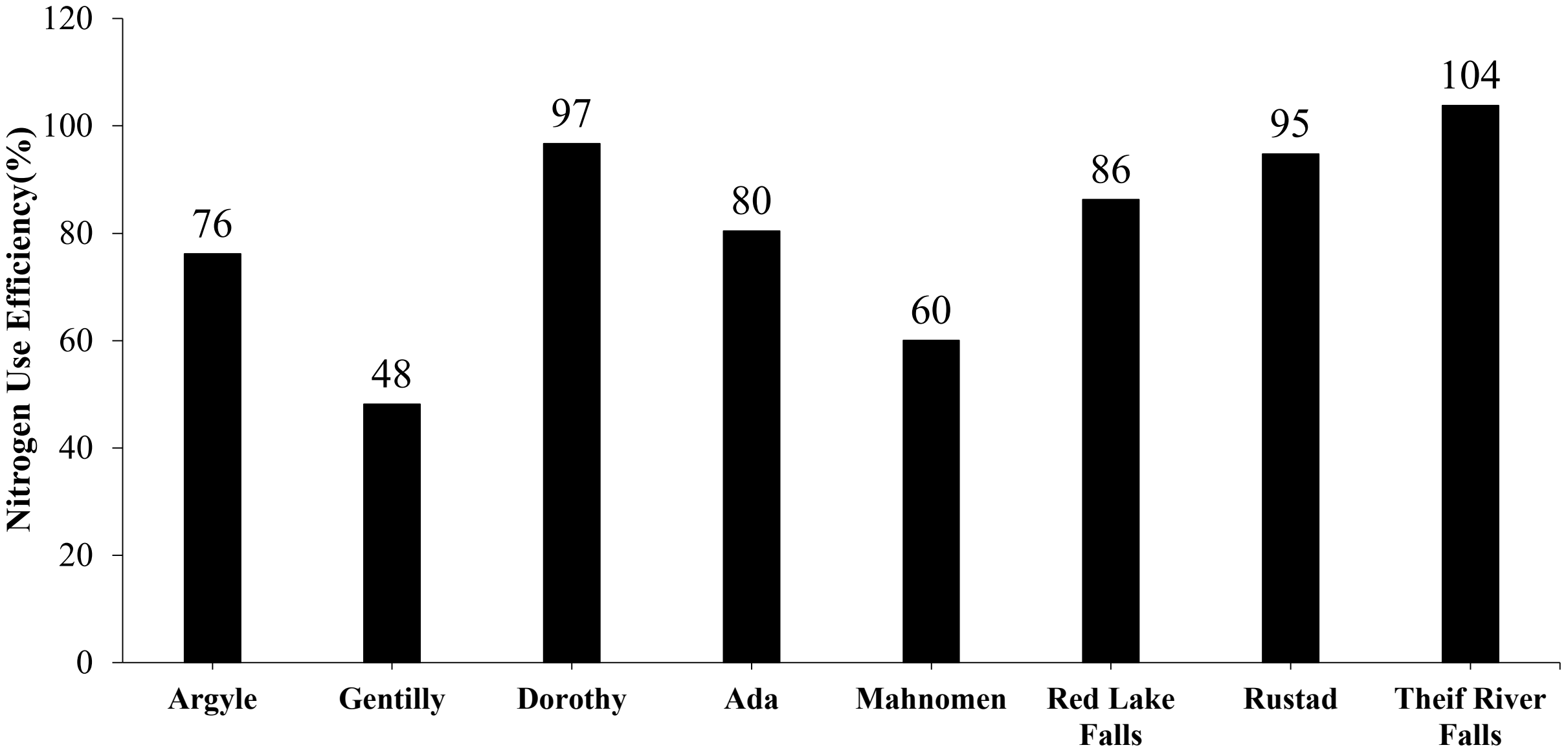
Spring Wheat Grain Yield Across Eight Sites



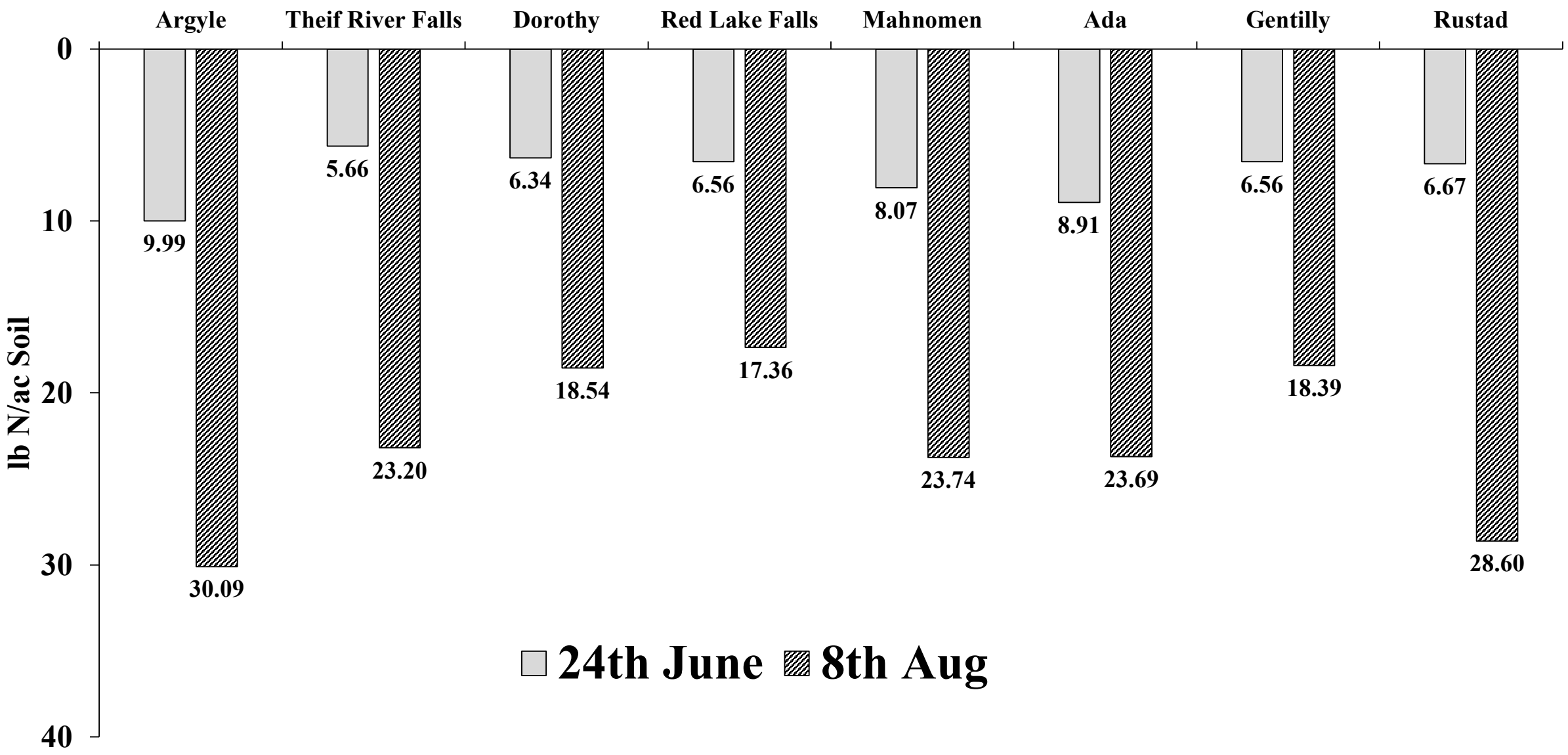
Spring Wheat Grain Protein Content Across Eight Sites



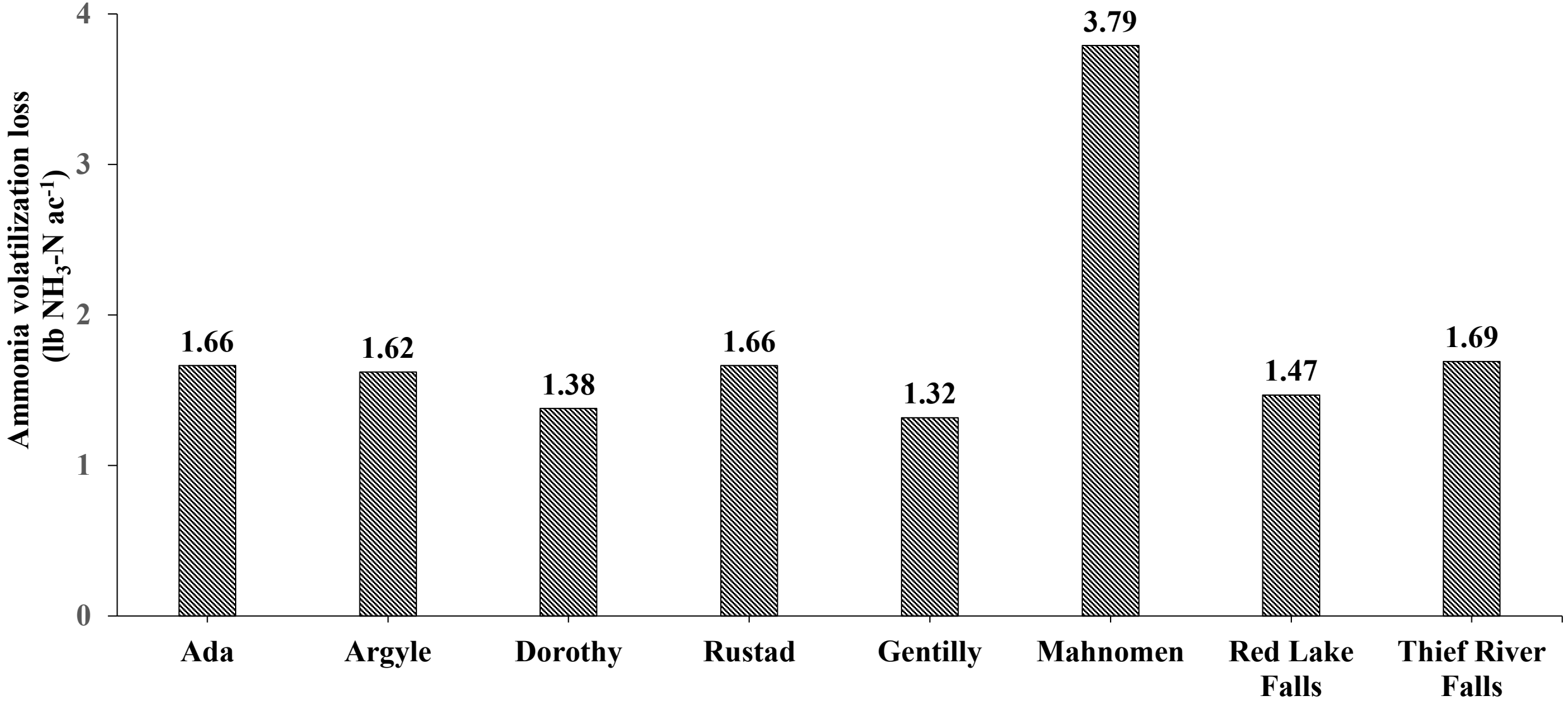
Nitrogen use efficiency (grain-N/fertilizer-N) across eight sites



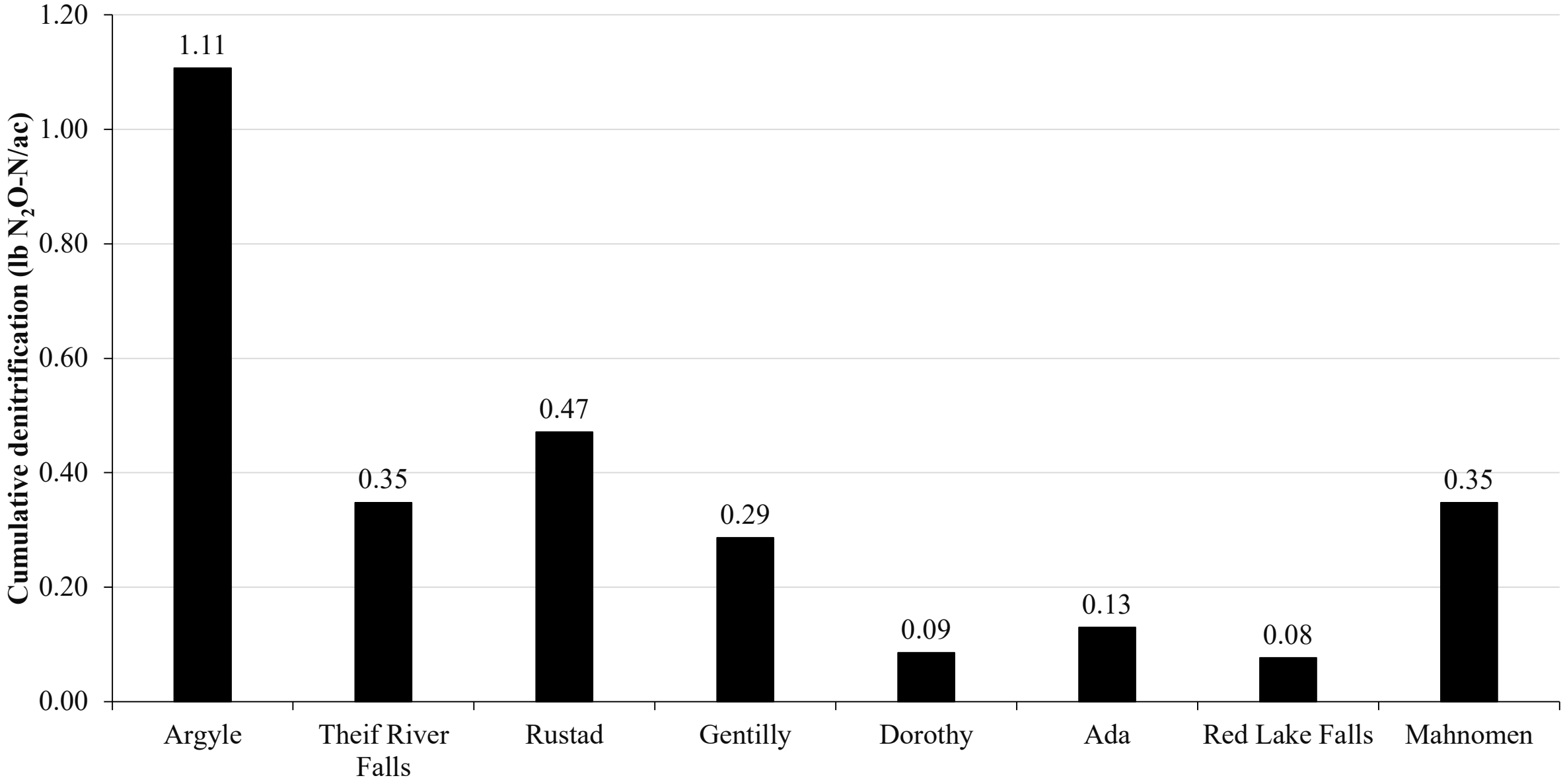
Differences in soil N at 2 ft depth at planting (24th Jun) and at harvesting



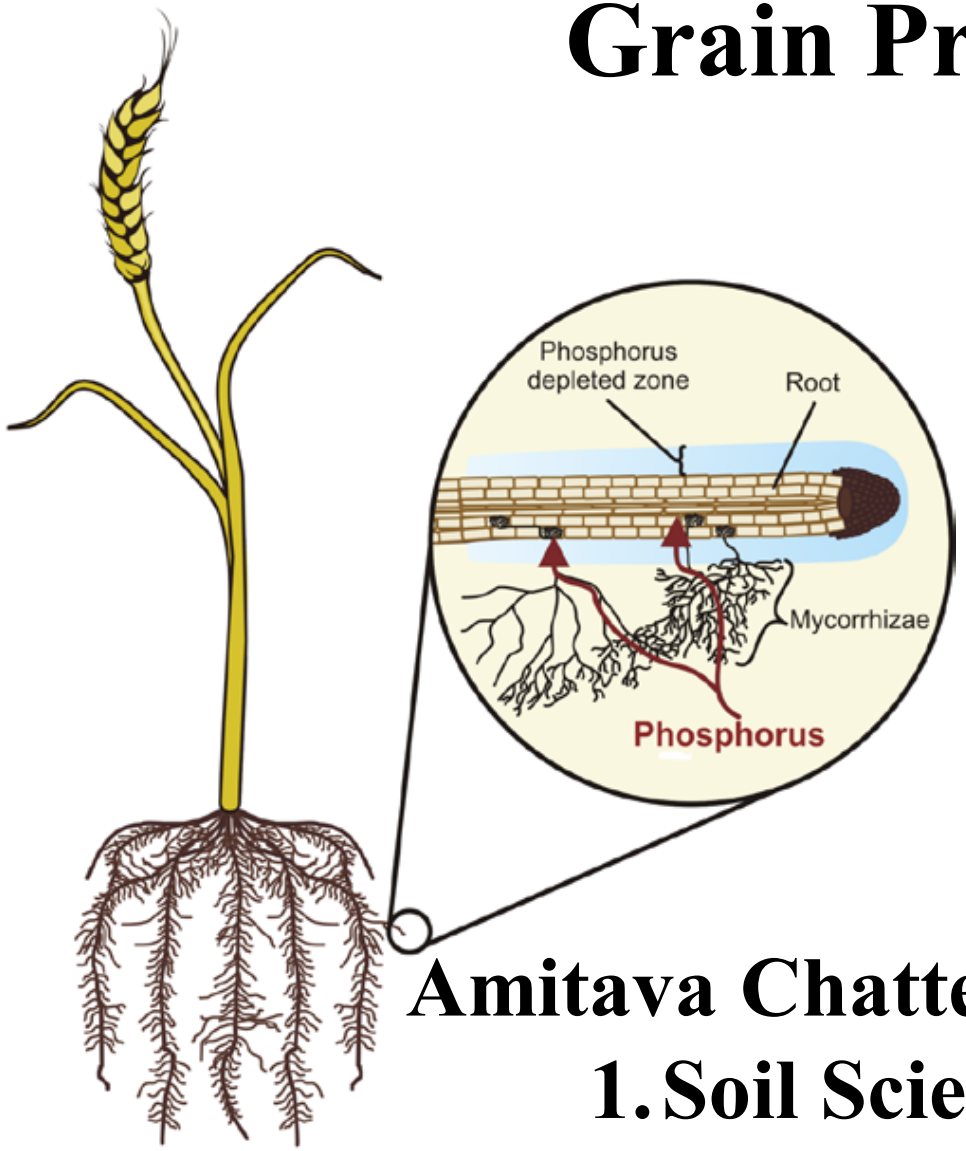
Ammonia Volatilization loss (lb NH_3-N/ac) across eight sites

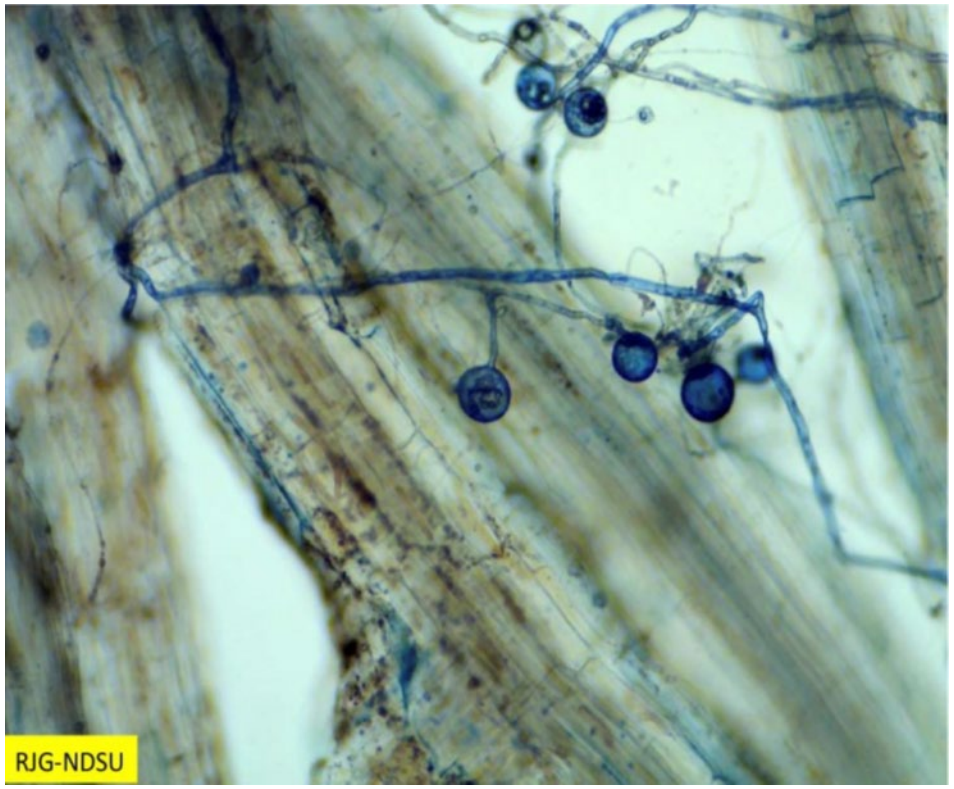


Denitrification loss of nitrogen (N_2O-N) across eight sites



Mycorrhizal Inoculation to Enhance Wheat Yield, Grain Protein, Nutrient Uptake





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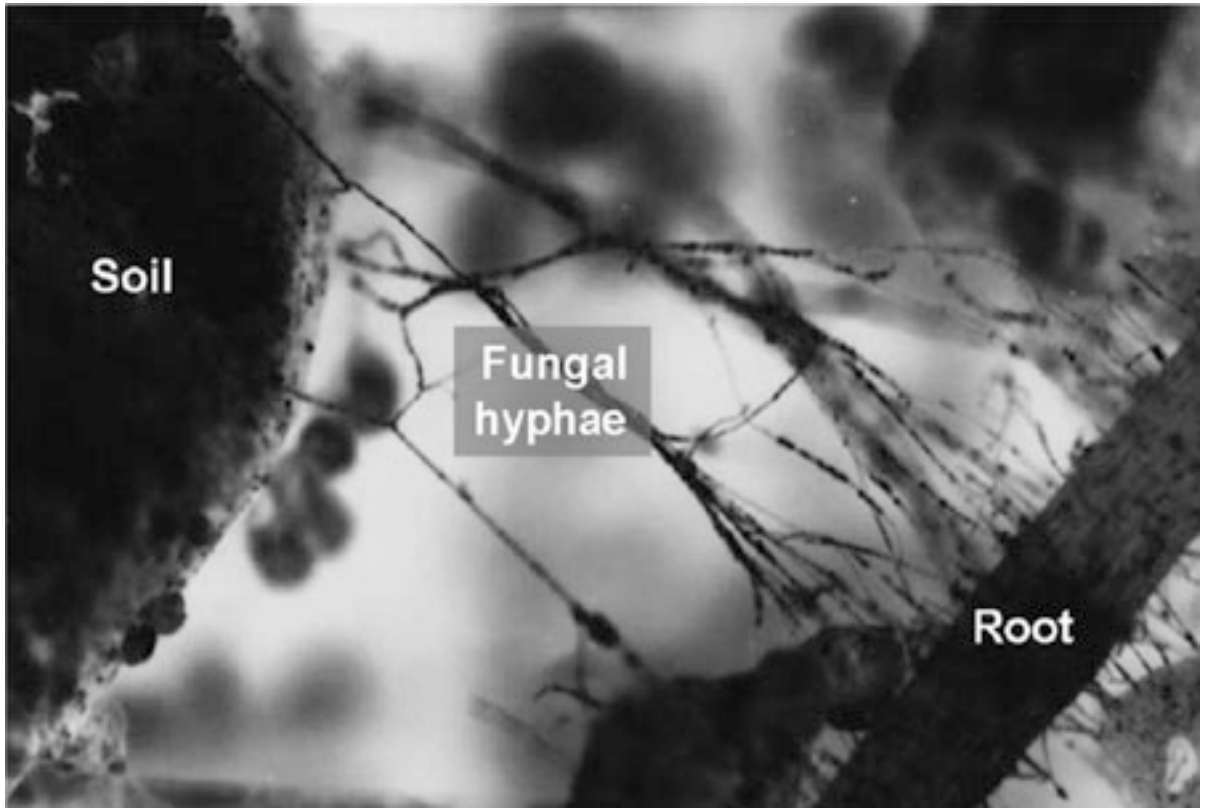
NDSU

Mycorrhiza can increase yield and stress tolerance

- Increased plant nutrient, particularly phosphorus, and water supply by extending the volume of soil accessible to plants
- Increase drought tolerance
- Mobilization of N and P from organic polymers from organic matter
- Root colonization can provide protection from parasitic fungi and nematodes
- Tillage and non-mycorrhizal crops (potato, sugarbeet) in rotation reduce the population



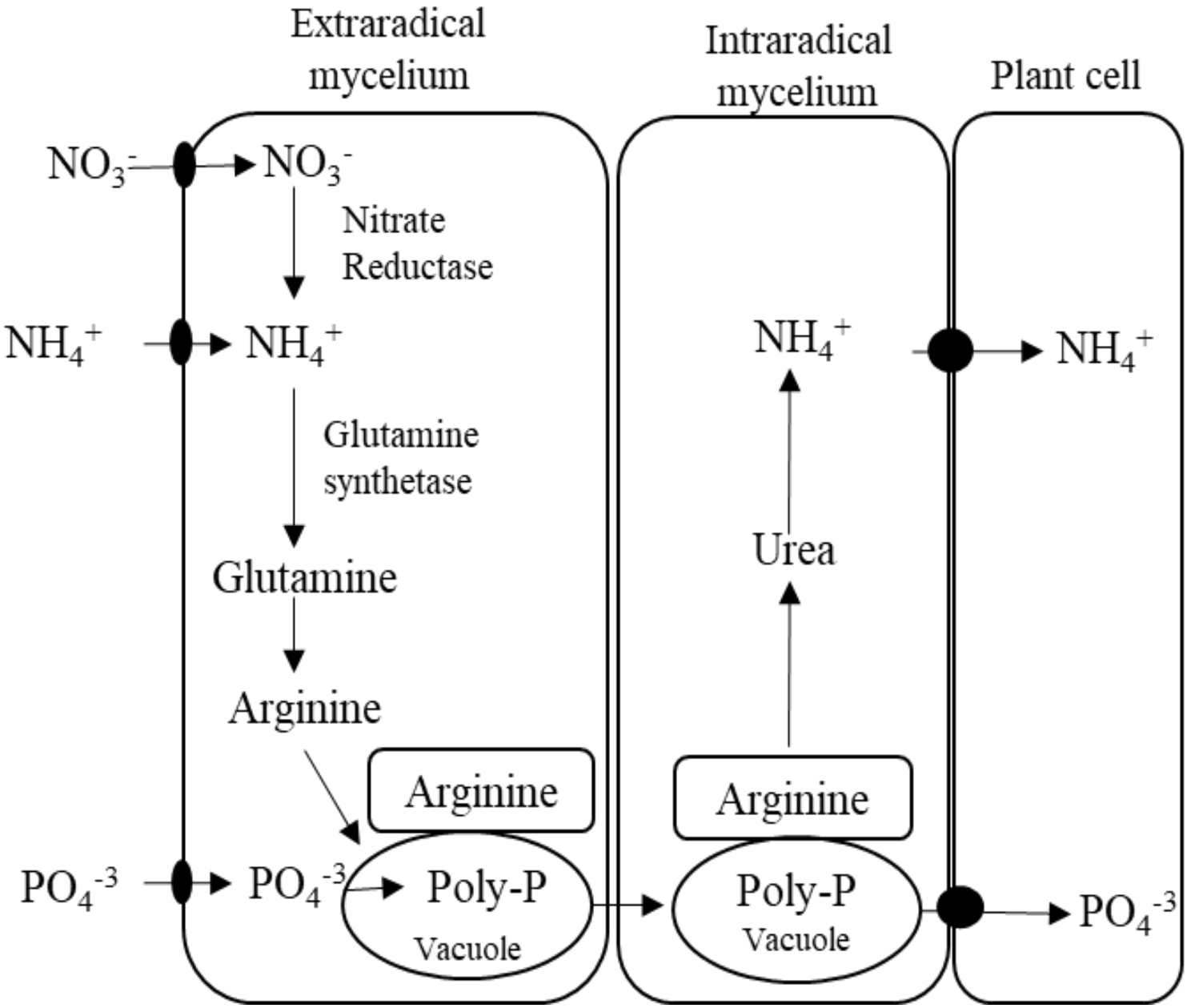


Figure: Transport of nitrogen and phosphorus between arbuscular mycorrhizal fungi and plant

Workplan

1. Twenty wheat fields across western Minnesota
2. Inoculation with commercial mycorrhizae strains in strip
3. Representative soil samples to determine initial soil properties
4. Gather information about crop, fertilizer, and soil management
5. At tillering stage, plant and rhizosphere soil samples will be collected from control and inoculated
6. Soil and root samples will be analyzed for the colonization of mycorrhiza using microscopy and phospholipid fatty acid
7. Grain yield and protein content will be compared between inoculated vs. control