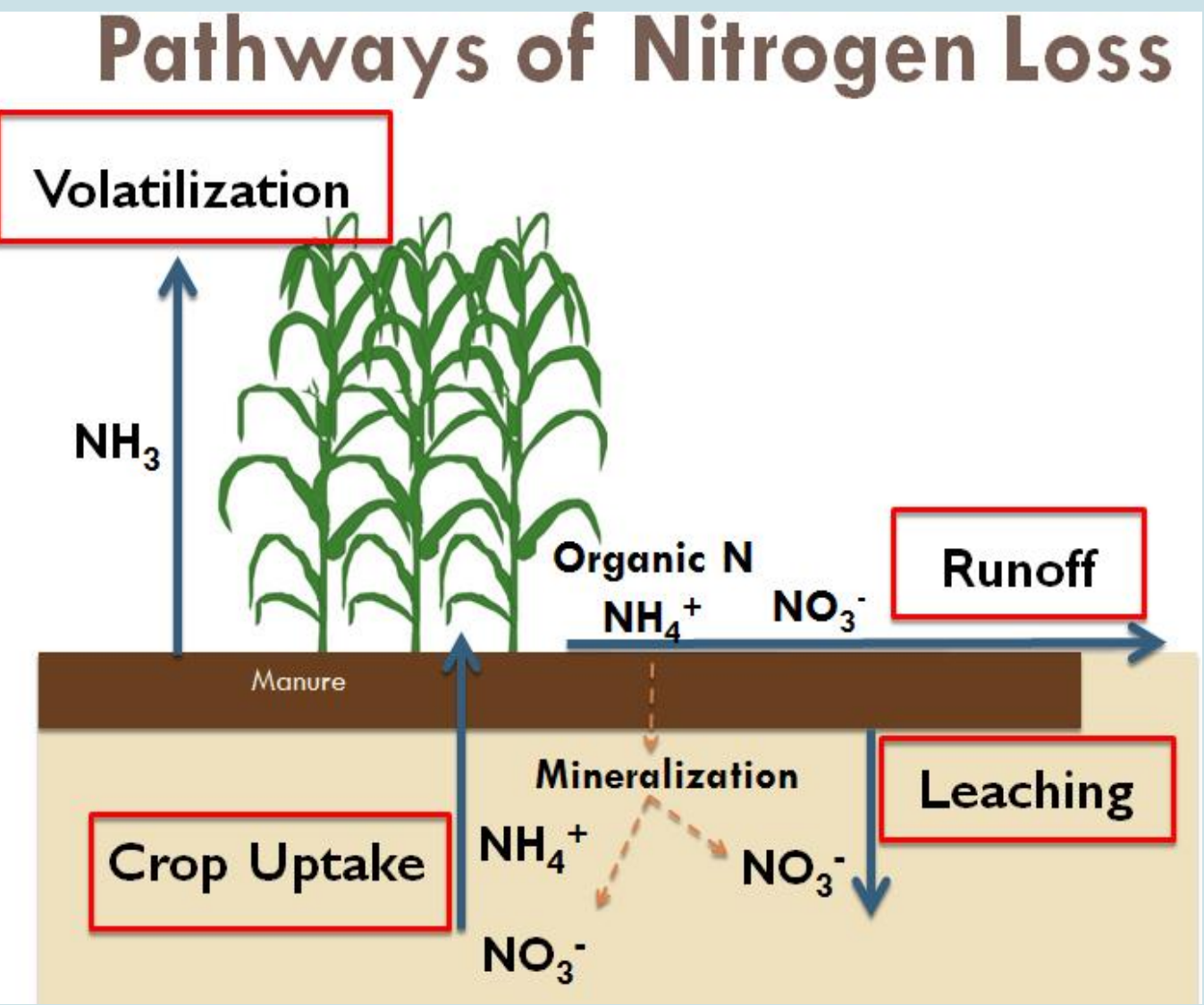
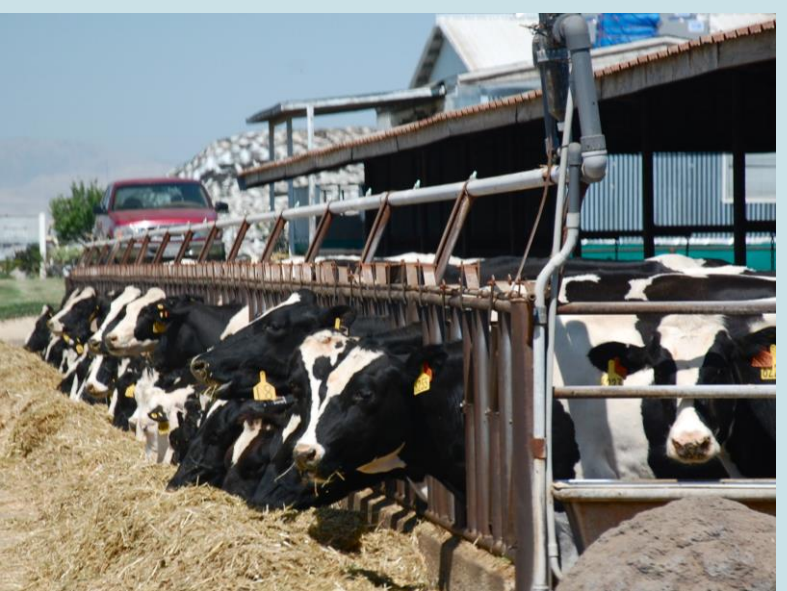


Impacts of fall manure application method and timing on nitrogen conservation for a winter annual and subsequent corn crop

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Introduction

Dairy farmers are typically limited to 6 months of manure storage requiring them to apply manure throughout the spring and fall. In the fall, there is a higher risk of water quality impairment when manure is applied to bare ground.



Objective

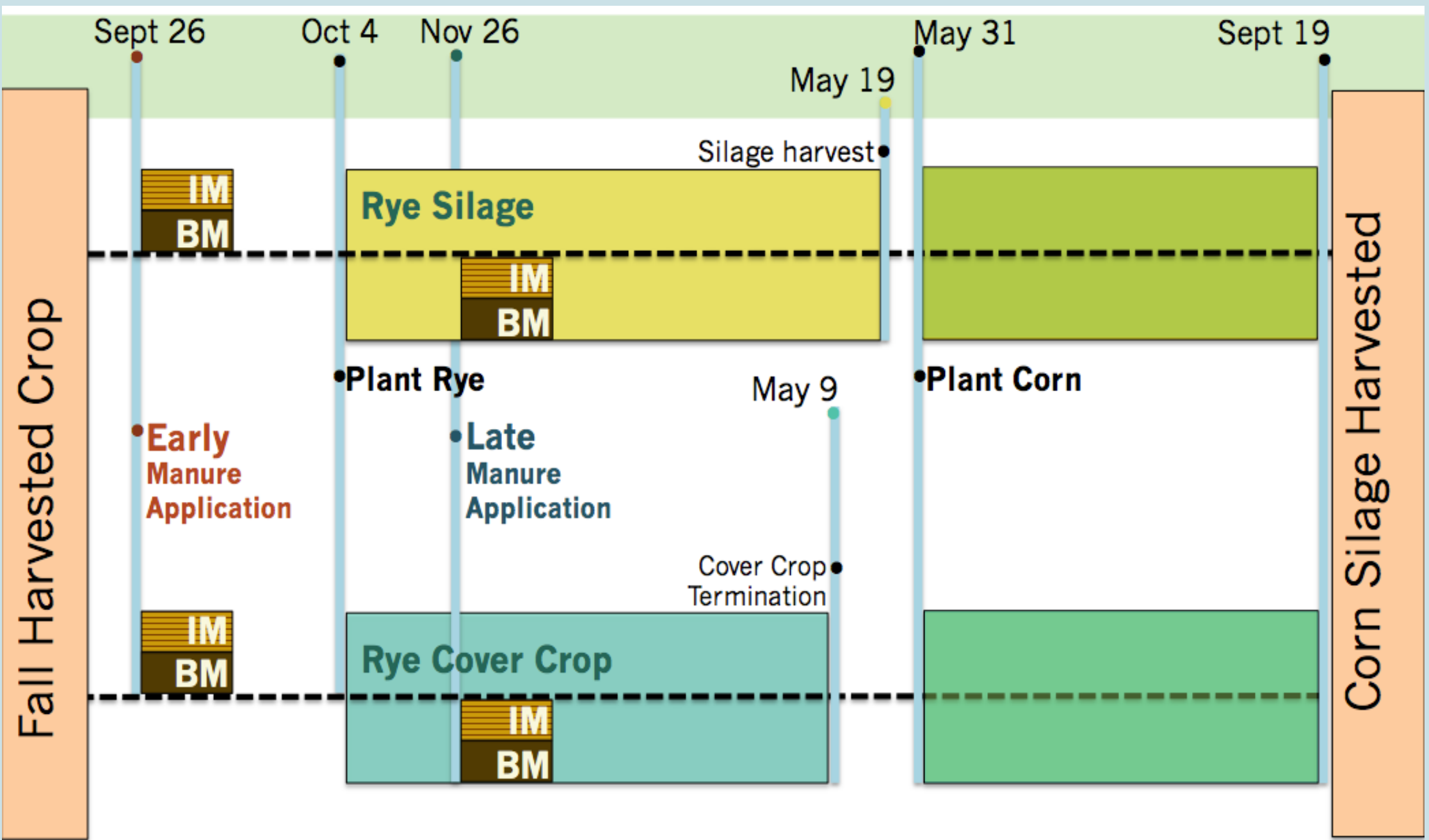
Evaluate different field management strategies that will conserve nitrogen from fall-applied manure for corn (*Zea mays*) silage when cereal rye (*Secale cereale*) is planted in the fall before corn.

Methods

In a three factor factorial experiment arranged in a randomized complete block design, treatments were replicated six times. Research was conducted at the PSU Agronomy Research Farm in Rock Springs, PA and all treatments were fertilized with only a fall manure application and no N amendment in spring.

Compared liquid dairy manure slurry at 54 Mg ha⁻¹

- Applied to a winter rye cover crop vs rye silage
- Injected (IM) vs. broadcasted (BM)
- Applied Early (Sept.) vs Late (Nov) in the fall

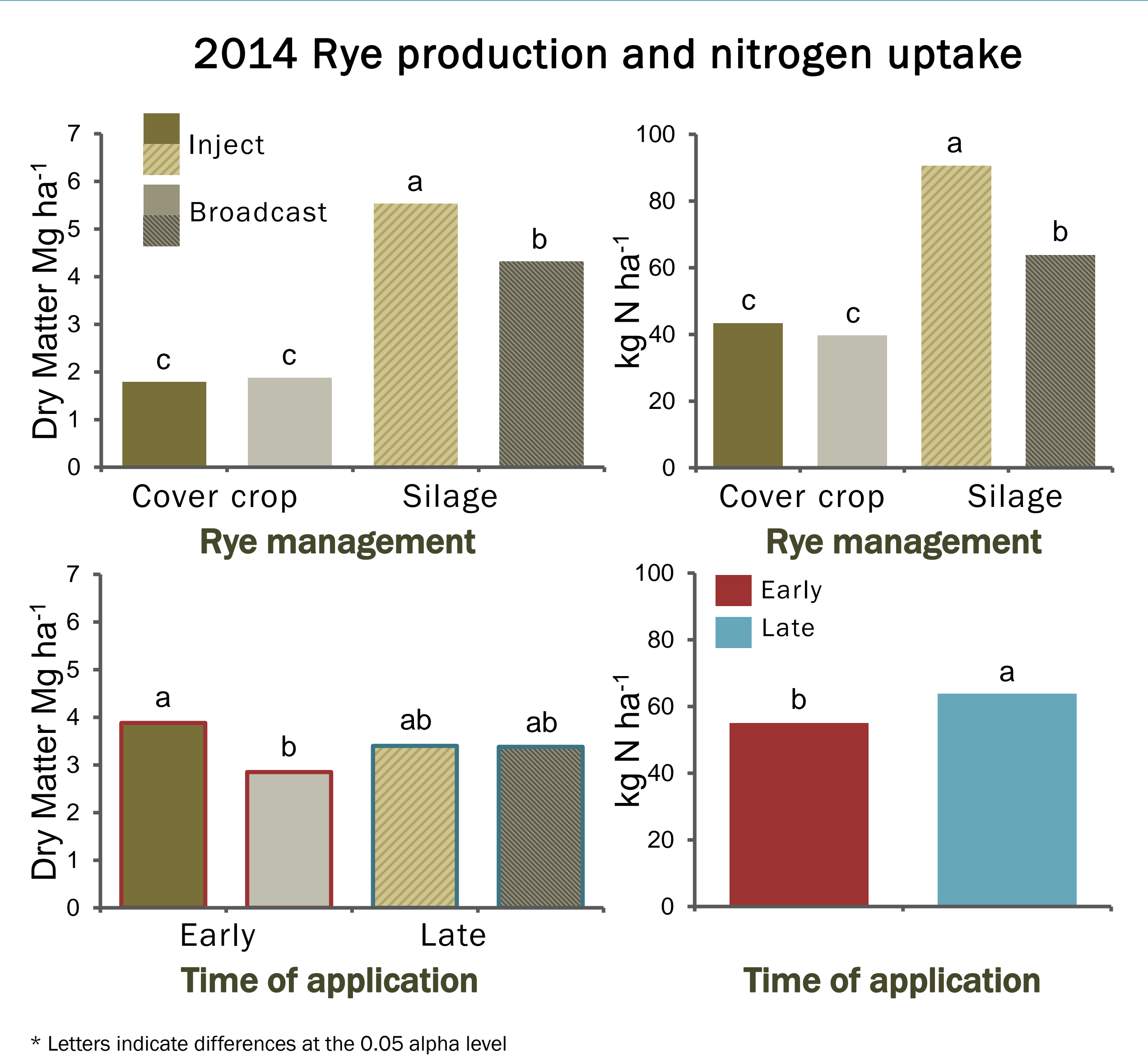


a) Manure injected and broadcasted in September 2013

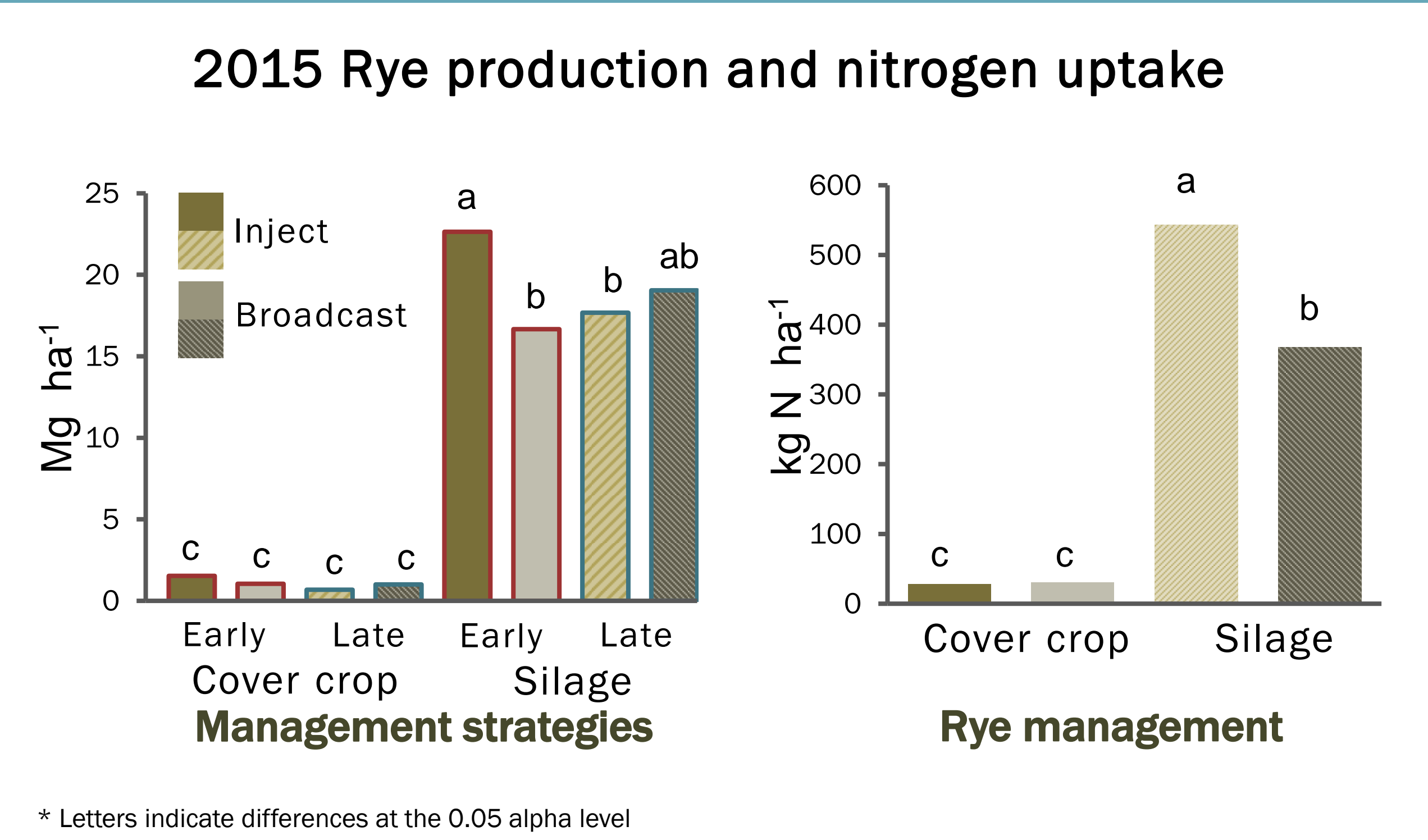


b) Manure injected and broadcasted in November 2013

Results



c) Rye managed as a cover crop and harvested for silage in 2014.



d) Rye damage after replanted on 10/27/2014 and injected manure application 17 days later.



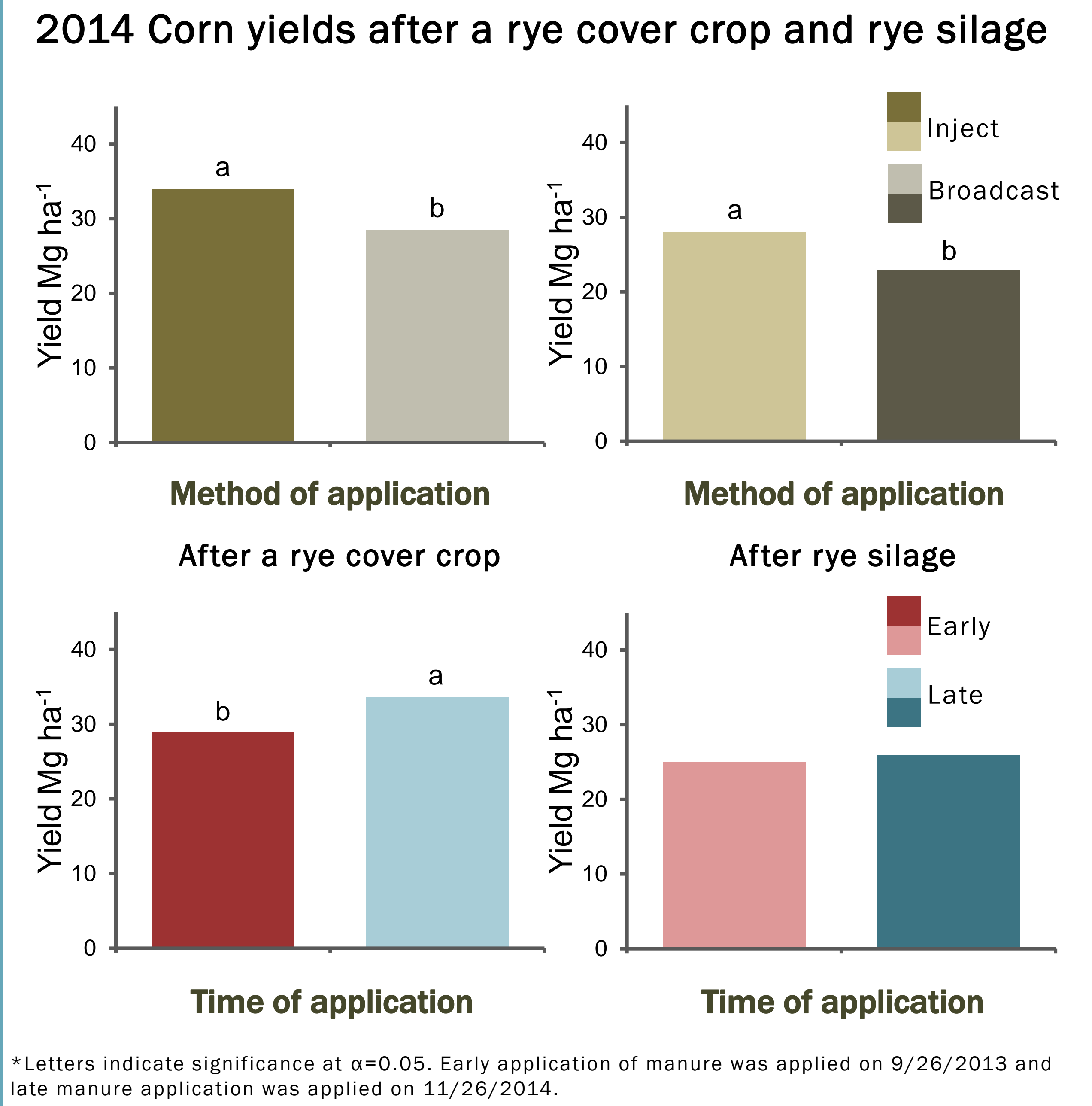
2014 and 2015 Rye silage partial budget (\$/ha)		
	Injected	Broadcasted
Custom hire	\$75	\$50
Production costs- Fixed and variable costs/year	\$476	\$476
2014 Ensiling costs (\$33/Mg)	\$562	\$444
2014 Revenue @ \$80.32/Mg	\$1367	\$1080
2014 PROFIT	\$254	\$109
2015 Ensiling costs (\$33/Mg)	\$2083	\$1546
2015 Revenue @ \$80.32/Mg	\$5577	\$4138
2015 PROFIT	\$2943	\$2066

References

Maguire, R., et. Al. (2011). Manure application technology in reduced tillage and forage systems: A review. *Journal of Environmental Quality*, 40(2), 292-301.
Dell, C., et. al. (2012). Low-disturbance manure incorporation effects on ammonia and nitrate loss. *Journal of environmental quality*, 41(3), 928-937.
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e) Corn silage yields measured in 2015 follow the same trends as 2014.



Conclusions

Managing rye

- No difference in cover crop growth or total N content when manure was injected or broadcasted
- Higher rye silage yields and total N content when manure was injected
- After an early application of manure, more rye produced and N conserved when injected.
- 2014, after a late application of manure, rye produced and N uptake did not differ based on method of application
- 2015, after a late application of manure, rye was damaged by injecting manure soon after a late replanting. Although reduced rye stands, N uptake was greater than when manure was broadcasted.

Managing corn silage

- Corn yields were higher after the rye cover crop than rye silage
- Corn yields after the rye cover crop, were higher when manure was injected and applied later in the fall.
- Corn yields after rye silage, were higher after manure was injected. The timing of fall manure application did not significantly affect corn yields.

Recommendations

- More N is conserved for corn silage when manure is injected later in the fall to a cover crop.
- When harvesting rye for silage, plant rye as soon as weather and time permits; and inject manure after planting to conserve more N for the rye silage crop.
- To produce greater total forage on farm with less fertilizer inputs, inject manure in the fall for double cropped rye and corn silage.