Intercropping alfalfa and sainfoin with sunflower boosts forage production, soil health, and biodiversity

Md Shazzadul Islam
Department of Plant Sciences
Advisor: Dr. Marisol Berti

NDSU NORTH DAKOTA STATE UNIVERSITY

Resilience

Intensification of crop production

Reduced crop diversity

Soil erosion

Loss bio diversity

Nutrient losses

GHG emissions

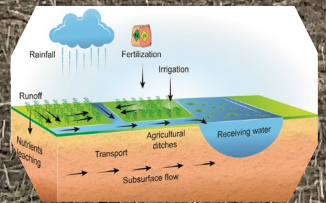
Reduced Ecosystem quality

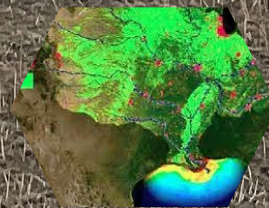
CO_2

CH_4

N_2O

Produce more from the same area of land while reducing negative environmental impacts, conserving natural resources, and enhancing healthy ecosystem services (FAO)





What can we do?

Sainfoin

Alfalfa

- **Conservation tillage:**
- No-till, minimum tillage

- **Increase crop diversity**
  - Use cover crops
  - **Use N_2-fixing legume crops**
  - **Intercropping**
  - **Integrate perennial legumes**

- **Increase nutrients use efficiency**
  - Reduce nutrient losses
  - Enhance soil microbiome

Agricultural Resilience

NRCS incentive (~$50)!!

Increase
Crop diversity

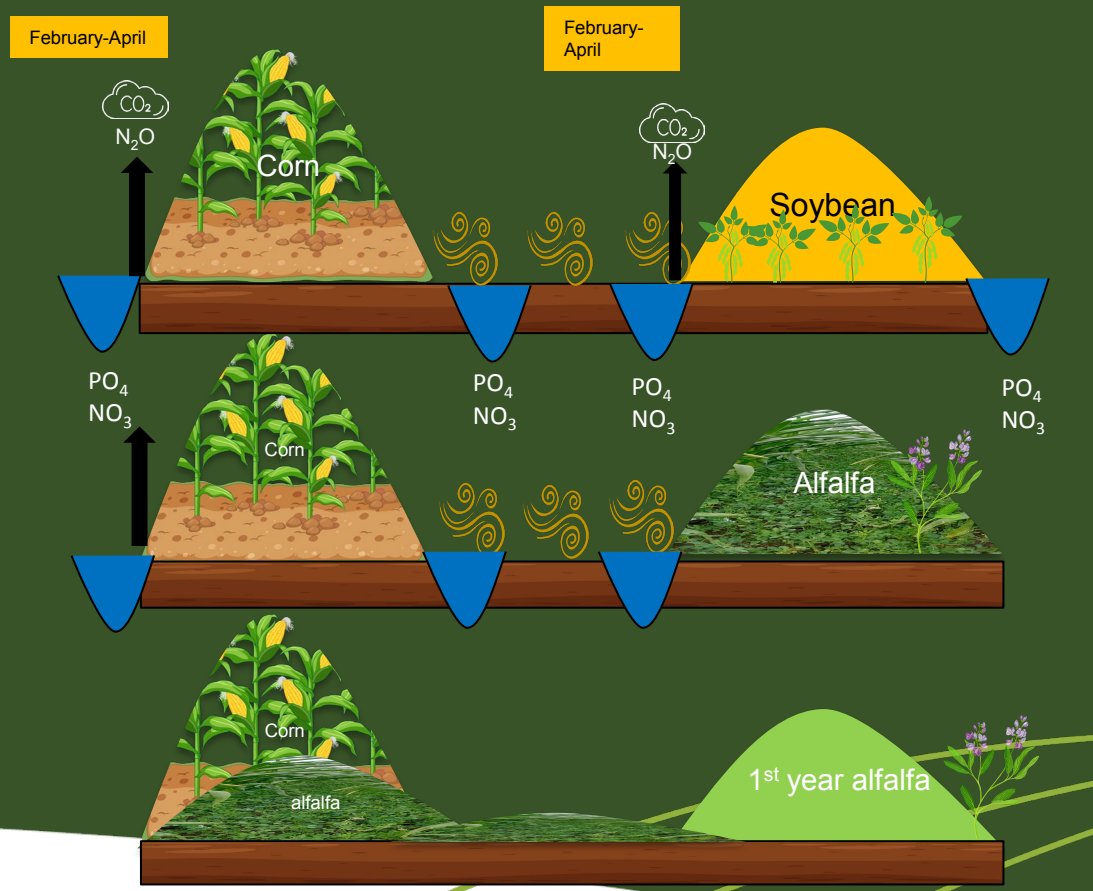
Integrating alfalfa into annual cropping systems

Increase
Profitability
Resilience

Reduce nitrate losses and nitrous oxide emissions

Reduce soil erosion
GHGs

Increase biodiversity



Agricultural Resilience

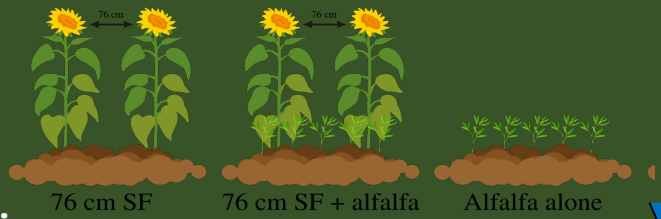
Objectives

Establishing alfalfa/sainfoin through intercropping with sunflowers in a two-year cropping system

- To determine the economic impact of establishing alfalfa or sainfoin intercropped with oilseed sunflower
- To determine the yield and forage nutritive value
- To assess impact of intercropping to arthropod biodiversity

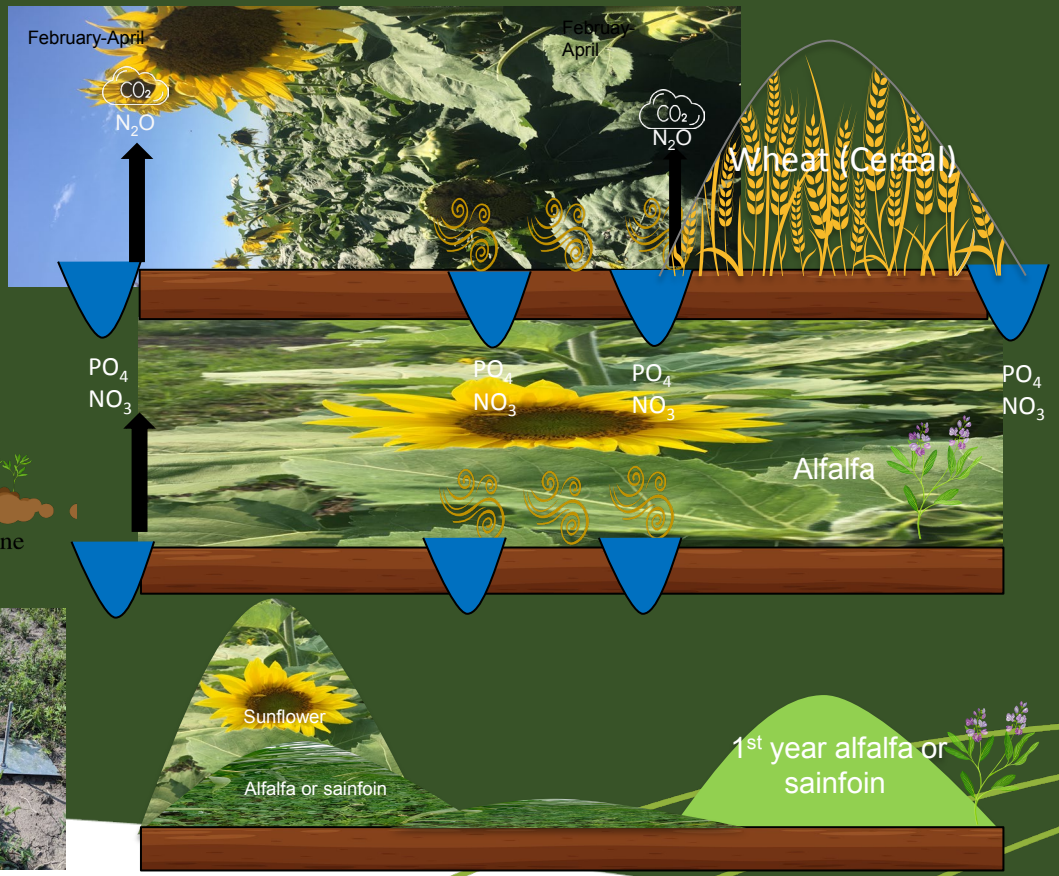
Methods

07 Treatments (alfalfa and sainfoin)
02 Locations (Hickson & Prosper)
02 N rate (40 & 80 N kg/ha)
RCBD



Data collection

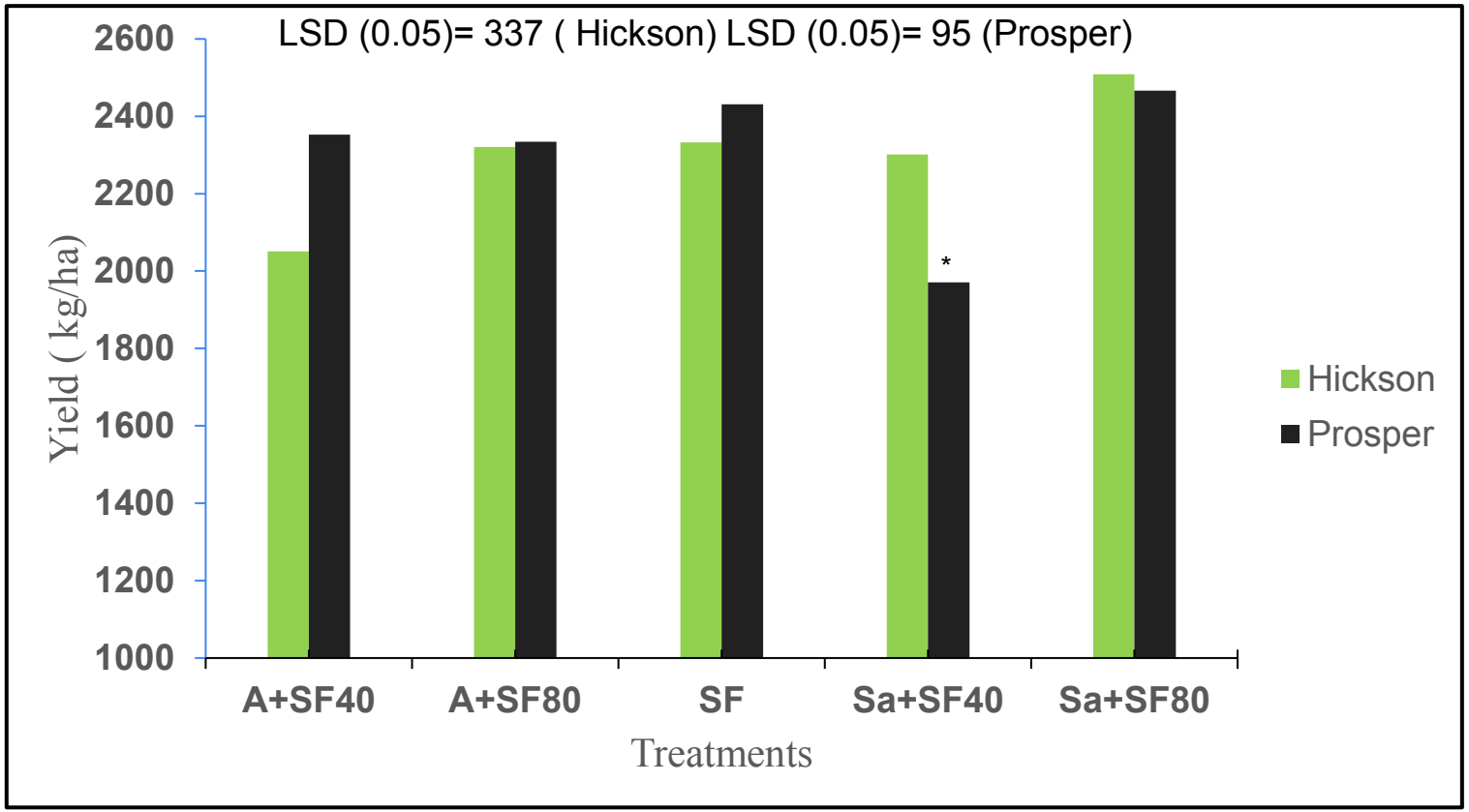
- Achene yield
- Forage yield
- Forage nutritive value
- Insect diversity over time



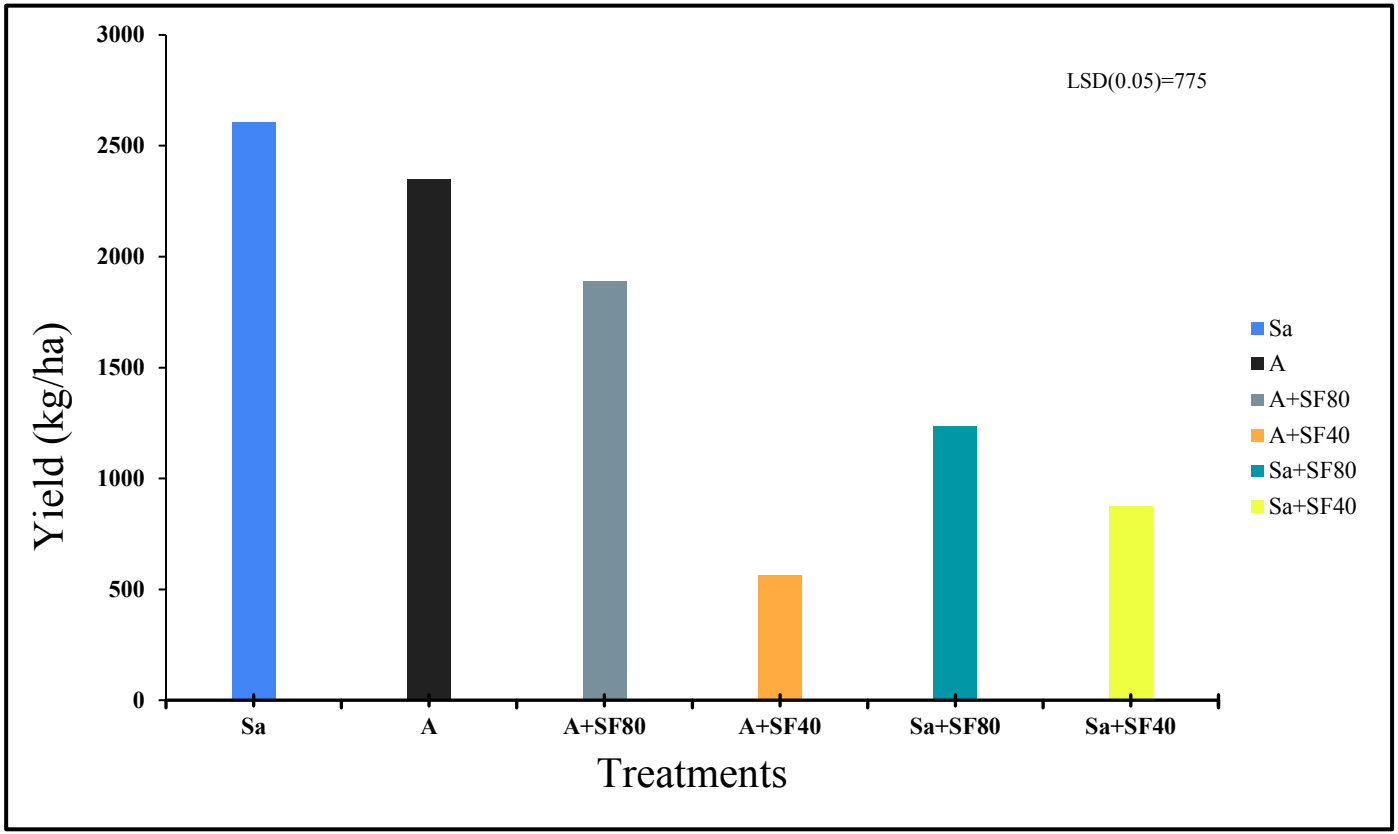
Agricultural Resilience

Results

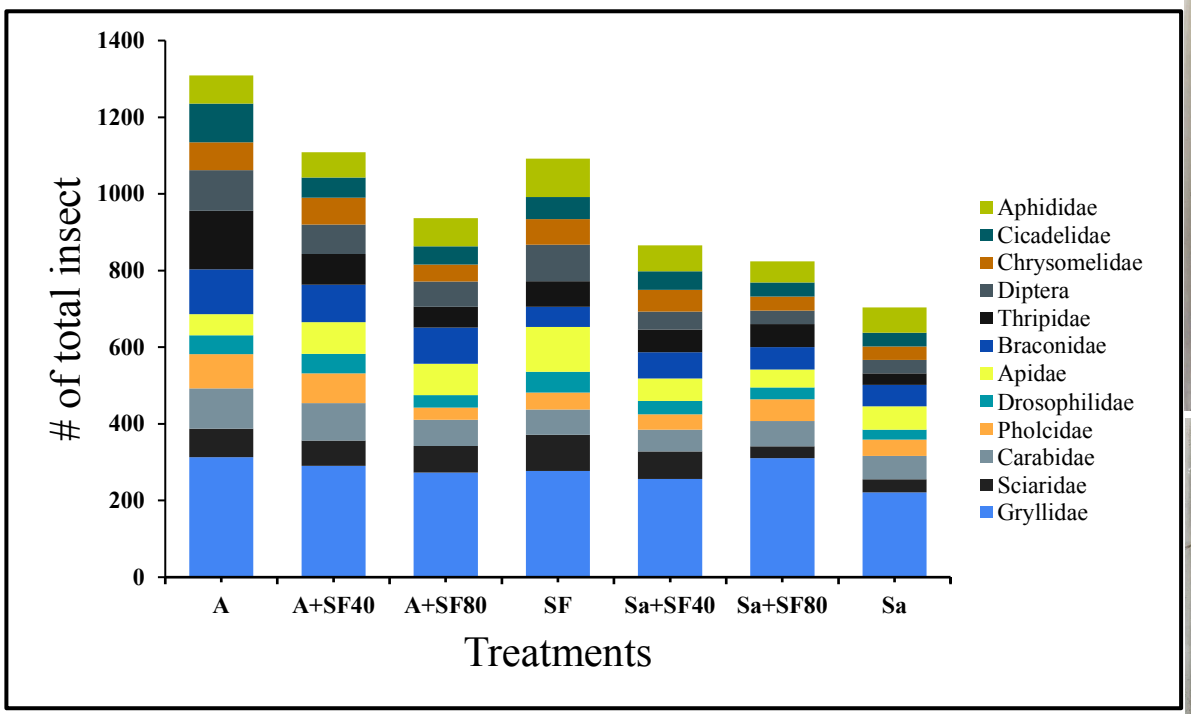
Sunflower achene yield

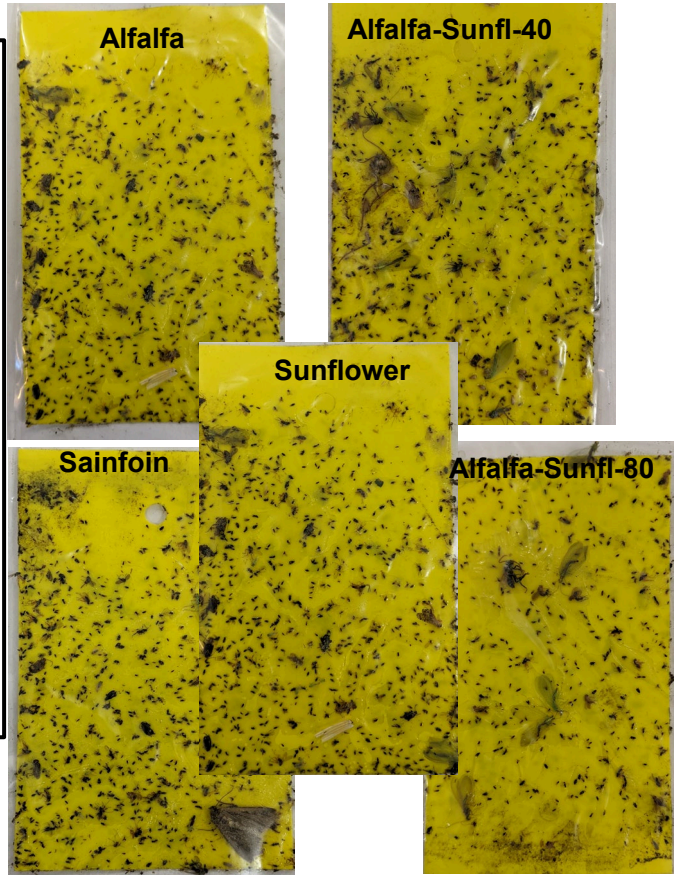


Alfalfa/sainfoin forage yield (establishment year)



Biodiversity

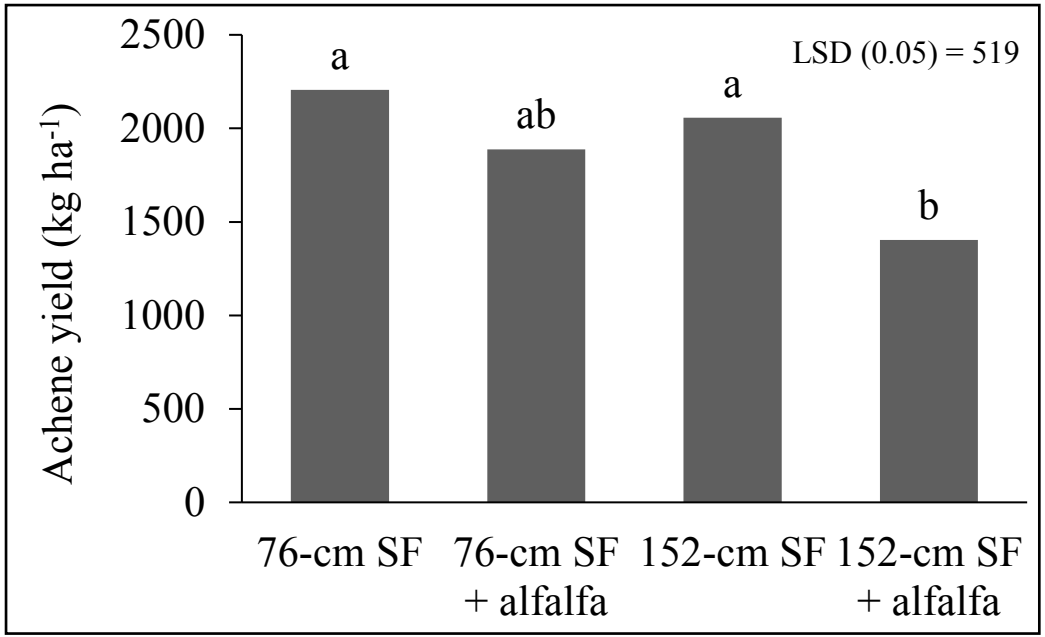




- 19 families identified so far

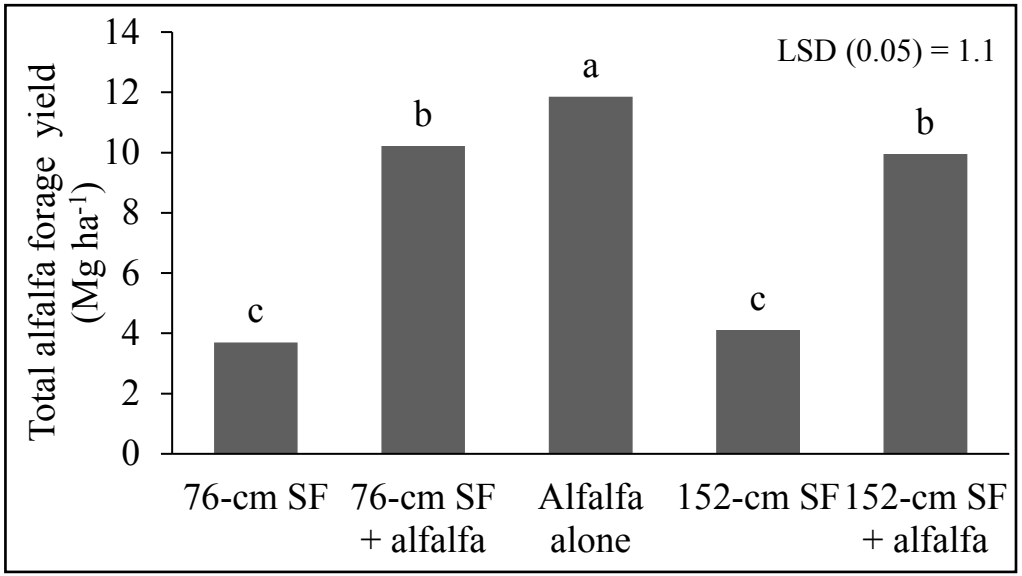
Sunflower/intercropping

- Sunflower yield impacted by treatments
- Oilseed content and fatty acid profile not impacted



Alfalfa forage yield- first production year

- Intercropping alfalfa with sunflower at different row spacings did not impact alfalfa stand counts or height in Year 2
- It did impact total seasonal yield (difference in Cut 1), but was greater than newly spring-seeded alfalfa



Alfalfa in the 76-cm SF and 152-cm SF was planted in early-spring 2022.

Conclusions

- Sunflower achene yield was not influenced by intercropping
- Alfalfa established well under the sunflower canopy, no differences in stands
- Forage yield of alfalfa in the first production year was lower in alfalfa coming from intercropping compared with alfalfa alone
- Sainfoin plant density was affected by intercropping
- Insect diversity was higher in intercropped plots

Acknowledgements

USDA-NIFA-ASAFS. Establishing alfalfa in intercropping with sunflower and sorghum to improve alfalfa yield and profitability, Award no. 2022-70005-38225

Thank you!

marisol.berti@ndsu.edu