Evaluating an alfalfa-corn silage intercrop to enhance forage production, profitability, & soil and water health

This project evaluates an alfalfa-corn silage intercropping system for ruminant forage to increase land use efficiency, improve nutrient management, and enhance soil and water conservation in the upper Midwest. This project is continued through December 2025. There are three potential harvest times for the system in the years after Yr 1 alfalfa establishment: spring alfalfa harvest, corn silage/alfalfa harvest, and possibly an additional alfalfa harvest as days stay warmer in the fall. Treatments included 1. 30" corn control, 2, 60" corn, 3. alfalfa in 30" corn, 4. alfalfa in 60" corn, and 5. alfalfa only. The goal of this study is to assess the effect of intercropping on corn and alfalfa growth, development, and yield. We will also calculate system costs to determine revenue and net returns in year 2+. Measurements include early season and post-harvest plant population, corn height and corn stage weekly, alfalfa height weekly, alfalfa plant density, and corn silage yield and quality (NIR for milk/ton and milk/acre). The plant height was taken at the tallest natural point of 6 plants in five points per strip. Baseline soil samples were taken fall 2023 before manure application and will be compared with samples at the end of the trial.

The trial location was cultivated on 16 May 2024 with equipment to (4") depth. Corn was planted in an east-west orientation because of field access points on May 17, 2024 at 32K/acre in all treatments. Alfalfa was seeded 6 days later at 19 lb/acre PLS in 7.5" drill spacing on May 23, 2024.. Corn was glyphosate tolerant Brevant B06F91Q (Corteva Agriscience, Indianapolis, IN) with comparative maturity RM 106-day; alfalfa was variety R4042 with roundup ready and fall dormancy group 5 (RR FD5). Alfalfa was seeded at a greater rate than recommended for concurrent establishment with a corn silage nurse crop to account for the weather-related delay in alfalfa seeding, persistent wet spring conditions, and for alfalfa persistence in post-establishment years; alfalfa in a dual crop system is subject to additional suppression stress and extensive wheel traffic compaction from field operations including manure application, chemical application, strip tillage, corn planting, and harvest of corn plus alfalfa harvests.

All of our normal weed control was applied including glyphosate and fungicide/insecticide for quality forage production. Pesticides were applied N-S so that the sprayer did not compact the E-W alfalfa interrows. Specifically, Round-up Powermax 3 was applied at 28 oz with Shepard DRA adjuvant on Friday, May 31, 2024. On 27 June 2024 Round-up PowerMax 3 was applied again at 28 oz/acre and Warrant at 2 qt/acre. Delaro 325 Fungicide and Fullscale was applied August 7, 2024 for Potato Leafhoppers. Limited leafhopper damage was observed. Comon leaf spot was observed in late summer.

In the first year, we had one harvest of the system for the corn silage with a Kemper chopper on September 10, 2024. Alfalfa only plots were cut with a diskbine on September 12, 2024 and raked and baled on September 15, 2024. Specifically, our custom harvester used a CLAAS 8-row forage harvester with Kemper head. We measured the weight of each harvested strip by chopping the forage into a feed mixer with scale, which we ran alongside the chopper, and collected a forage sample from each strip after we emptied the feed mixer. We took forage samples for each strip after emptying the mixer for forage analysis (protein & amino acid, carbohydrates, minerals & ash, and fermentation products) and stored separately in plastic bags. The NIR reported yield in tons/acre @ 35% DM and forage quality with milk/ton (lbs), and then we could calculate total value of the system with milk/acre (lbs). Iowa State University conducted a formal analysis on the experiment results thus far.

In the second year, alfalfa was cut in all plots on May 16, 2025 and raked on May 18. Hay was baled and wrapped as baleage because of wet conditions and slower drying. Each bale was marked for plot identification for further nutrient testing. Because the farm has not yet used the bales, we have not yet measured the RFV or bale weight. On May 26, liquid manure was applied to the trial very carefully for even application on each strip, waiting for good conditions to prevent over-application. On May 29, all corn only plots were conventionally tilled, and on May 31, the alfalfa-corn plots were strip tilled. Corn was planted in corn only and alfalfa-corn plots on June 1. Alfalfa suppression at a partial rate of 2,4-D was applied on June 11. The alfalfa only treatments were cut and baled a total of three times during the growing season. The same pesticide and fungicide schedules were followed in year 2 as in year 1. The same chopping equipment was used in year 2 as in year 1, with corn silage harvest on September 26.

We modified the manure applications schedule to spring instead of fall, since we did not take a fall cutting in year 1. We also expect multiple passes instead of a single pass for a spring and fall alfalfa harvest.

The delay in field operations in the second year was because of critical tiling work that needed to be done in a western field prior to working the eastern field site.

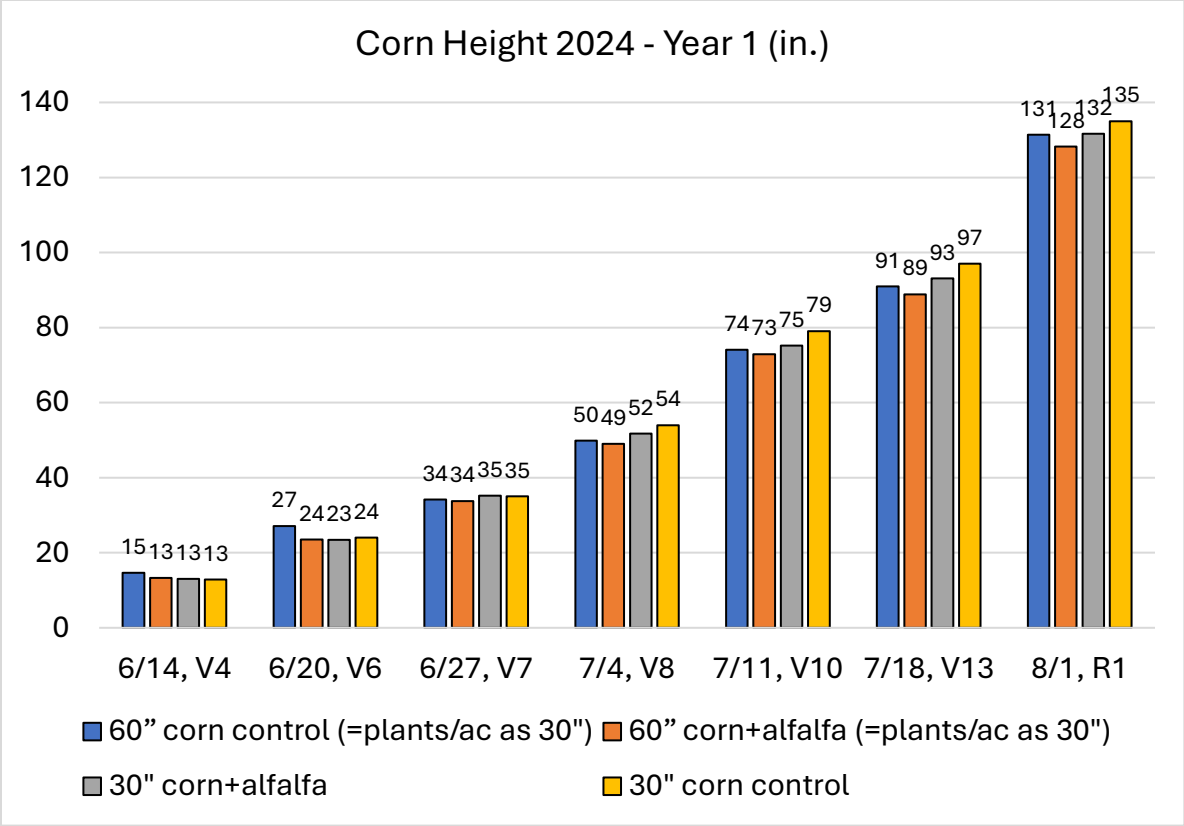
Yr 1 Results:

- The 60” corn + alfalfa had **fewer corn plants** at V2 and R6 than other corn treatments, possibly from wheel traffic. At R6, the 30" corn alone also had fewer corn plants than the 30” corn + alfalfa.

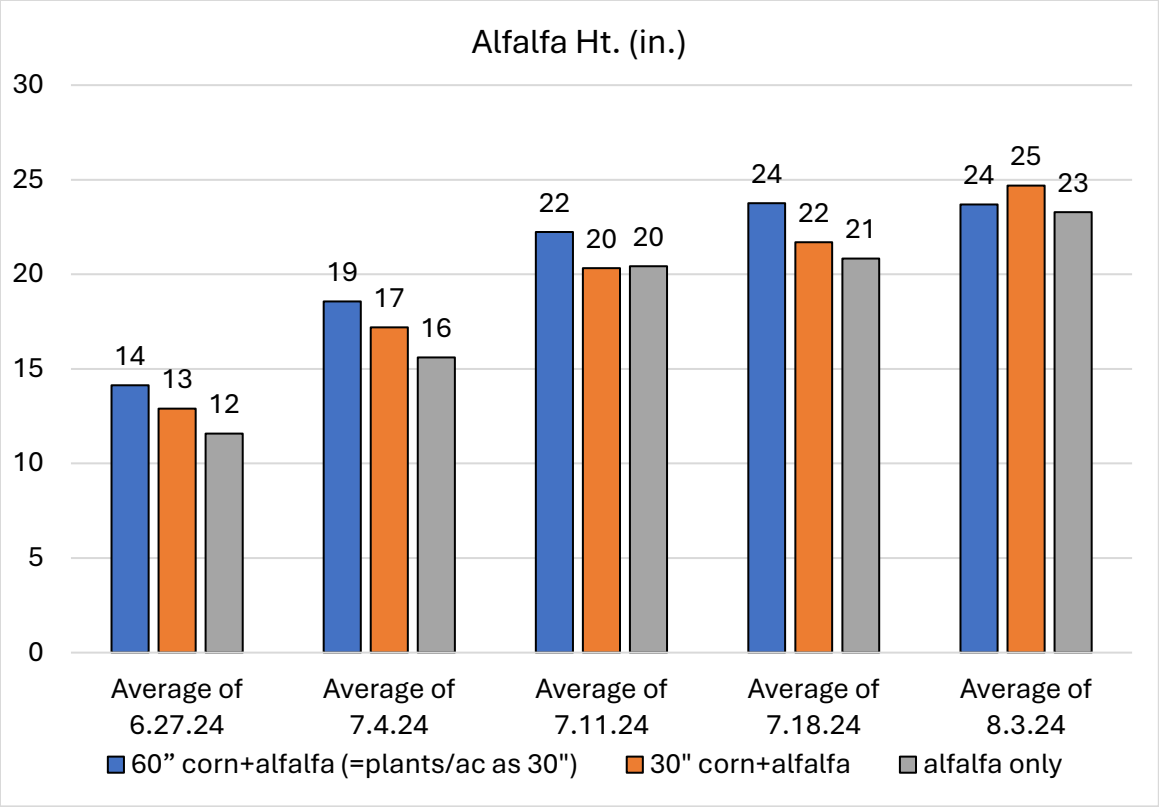
V2 Corn Plant Stand		R6 Corn Plant Stand	
Treatment	Plant stand/acre	Treatment	Plant stand/acre
60" corn alone	31.9K	60" corn alone	30.2K
60" corn + alfalfa	28.1K	60" corn + alfalfa	26.6K
30" corn alone	31.1K	30" corn alone	30.1K
30" corn + alfalfa	32.4K	30" corn + alfalfa	31.5K

- No differences were observed in **maturity** between the intercropped corn and corn alone.

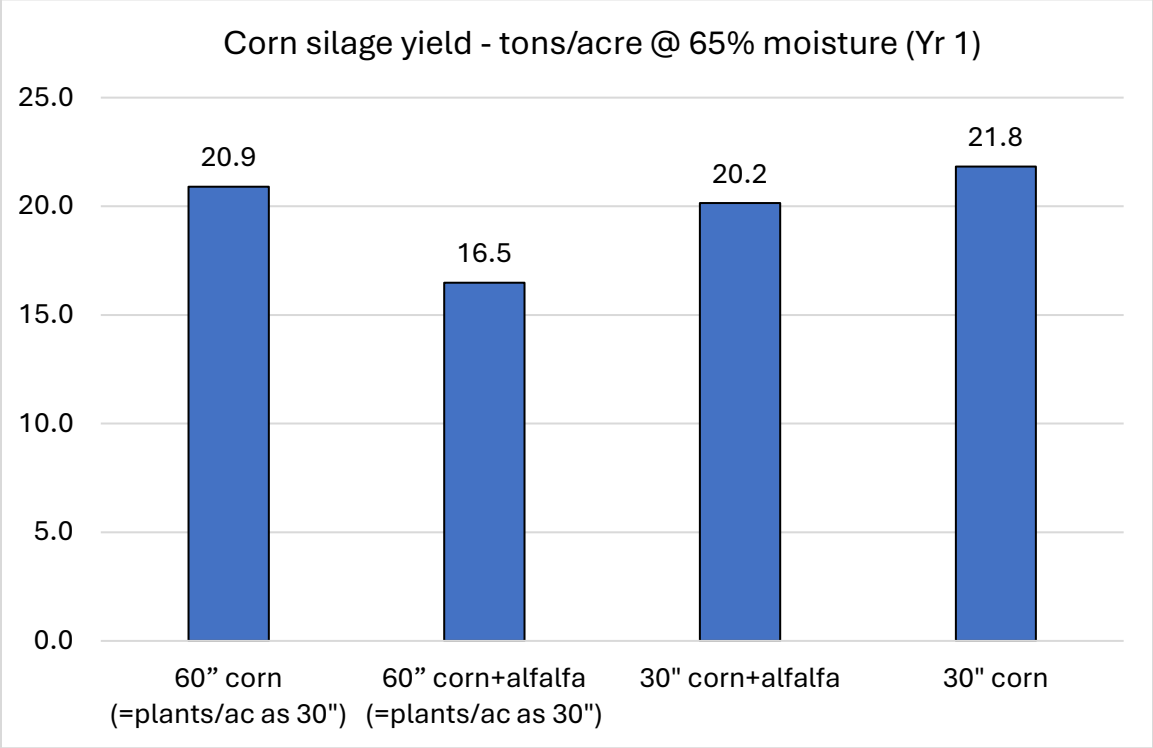
- No differences were observed in **plant height** between the intercropped corn and corn alone.



- **Alfalfa height** was greatest in the 60” corn for several collection dates. Alfalfa height in the alfalfa only and 30” corn + alfalfa was similar on all but one collection date. There was some alfalfa lodging in the intercropped treatments.



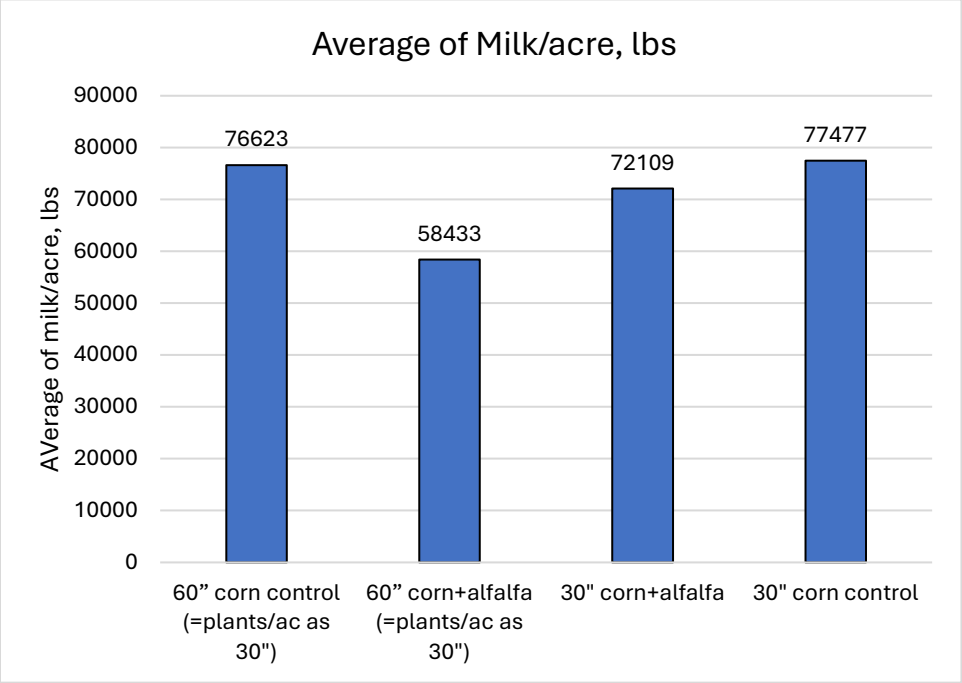
Corn silage yield



- 60” corn, 30" corn, and 30" corn + alfalfa **produced statistically similar corn silage yield**. Only the 60" corn + alfalfa yielded less corn silage than the other systems.

Corn silage feed quality

- Average of Milk/ton, lbs was similar across all corn silage treatments averaging 3,585 milk/ton, lbs. Only the 60” corn+alfalfa had less milk/acre, lbs than the other treatments.



Alfalfa

- Alfalfa stems & plants – alfalfa in 30” corn had fewer stems/m^2 and stems/plant than alfalfa only, but plants/m^2 was similar for all treatments.

Alfalfa plants & stems - 9/16/2024 sample date	**Total stems/m^2**	**Total plants/m^2**	**Avg. stems/plant**
60” corn+alfalfa (=plants/ac as 30")	405	45	9
30" corn+alfalfa	280	49	6
alfalfa only	620	44	14

- The alfalfa in the 30” corn+alfalfa rebounded after corn harvest and looked similar for vigor as the 60” corn+alfalfa and alfalfa only treatments. We will measure alfalfa stems and plants in the spring prior to first alfalfa cutting.

- Alfalfa yield from the alfalfa only treatments averaged 4,018 lb/acre at 18% moisture and 2,489 milk/tons, lbs.

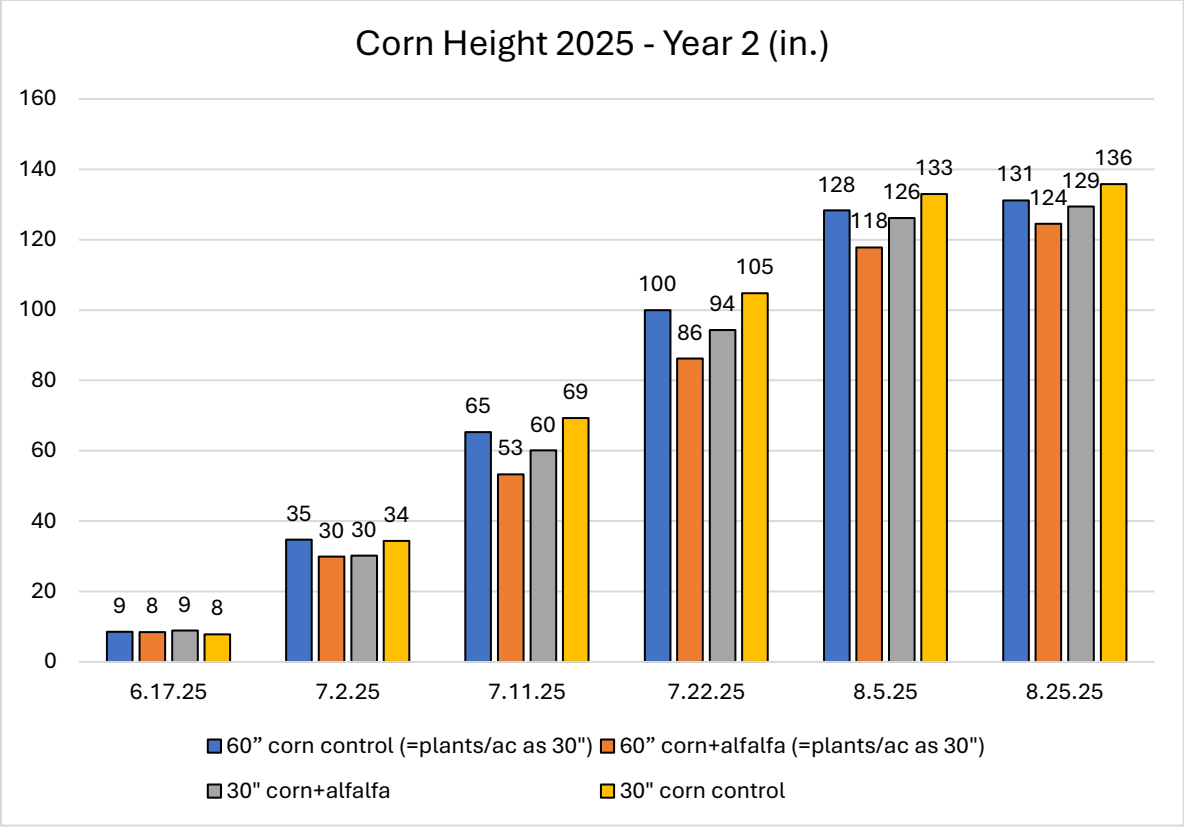
Yr 2 Results:

- At V2, the corn only treatments had a greater plant **stand count** than the corn+alfalfa treatments. At R6, the plant stand counts in the 60" treatments were similar to each other and the 30" treatments were similar to each other. The plant stand counts in the 60" treatments were less than the 30" treatments.

V2 Corn Plant Stand		R6 Corn Plant Stand	
Treatment	Plant stand/acre	Treatment	Plant stand/acre
60" corn alone	31.3K	60" corn alone	29.3K
60" corn + alfalfa	30.2K	60" corn + alfalfa	29.5K
30" corn alone	31.6K	30" corn alone	31.2K
30" corn + alfalfa	30.8K	30" corn + alfalfa	31.1K

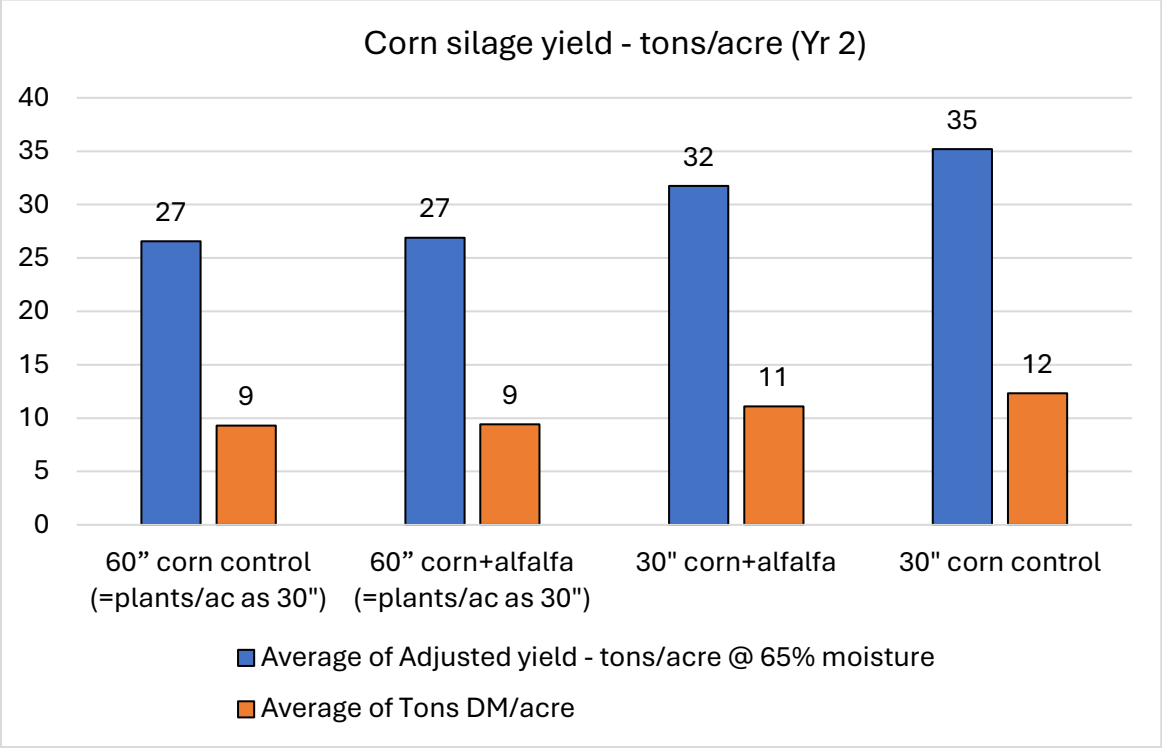
- **Maturity** of the corn in the intercropped treatments lagged corn only treatments until the reproductive stages.

- The **plant height** of the corn-only treatments were taller than the intercropped corn.



- **Alfalfa height** was not measured in year 2 because of the mowing and suppression.

Corn silage yield



- **Corn silage yield** in the 60” corn + alfalfa is similar to corn yield in the 60” corn only. Corn yield in the 30” corn + alfalfa is statistically similar to corn yield in the 30” corn only. We have not yet added in the spring cut alfalfa harvest for total forage production in either the 60” corn + alfalfa or 30” corn + alfalfa.

Feed quality

Fresh corn silage from yr 1 and yr 2 has been analyzed with NIR. We have analyzed the fermented corn silage from yr 1 and will compare with yr 2 when the fermented corn silage from yr 2 is analyzed. The corn silage for each treatment was placed in a separate nylon bag within an on-farm bunker feedpile. The bags will be removed for feed quality analysis when the bunker is opened.

Average of milk/acre, lbs will be compared across treatments after alfalfa is weighed and analyzed so total system output is compared.

Alfalfa

- **Alfalfa stems** – stems/m^2 was similar in all three alfalfa treatments in the spring, but greater for the alfalfa only treatment in the fall. This was a result of the over-suppression of the alfalfa in the spring in the corn-alfalfa intercropping strips.
- Alfalfa weight from the spring cutting and RFV will be tested when fed out.

Alfalfa plants & stems	**Spring Total stems/m^2**	**Fall Total stems/m^2**
60” corn+alfalfa (=plants/ac as 30")	697	34
30" corn+alfalfa	604	22
alfalfa only	623	522

Lessons learned

What did you and/or others learn from this grant?

We learned that it’s possible to establish alfalfa in corn silage with yield similar to the corn silage only. We learned that there is ample interest from ag professionals and farmers in a corn silage-alfalfa system that can provide multiple cuttings of alfalfa and corn silage for better land use efficiency and soil conservation.

How has this affected your farm or ranch operation?

We want to be good stewards of the land and further our social responsibility. This project has allowed us to reach out to ag professionals and farmers who have great ideas to make this system work on our farm and other farms.

Did you overcome your identified barrier, and if so, how?

Our identified barrier to system adoption is really the alfalfa suppression and timely alfalfa harvesting in year 2+. We will continue working with several advisors and ag professionals to dial in best alfalfa suppression methods after a spring alfalfa cut. Either real competition or light quality changes from unsuppressed alfalfa for the corn through the early corn stages will decrease corn silage yield in year 2+. Also, earlier alfalfa cutting, suppression, and corn planting are planned for 2026 with remaining alfalfa stands.

What are the advantages and disadvantages of implementing a project such as yours?

These advantages or disadvantages depend on a spring alfalfa cutting and then possibly a second fall alfalfa cutting for feed quality, quantity, and labor. In the first year, we established alfalfa in corn silage and producing relatively similar corn silage yield as corn silage only. There are still known benefits for year-round cover that this system provides in the first year, retaining water and decreasing runoff. During big rainfall events, the soil stayed put.

If asked for more information or a recommendation concerning what you examined in this project, what would you tell other farmers or ranchers?

A very important piece to establishing alfalfa in corn silage is to be patient for a planting window for the right soil conditions, especially with the increased spring rainfall events.

We would also restate what we learned that led to a delay in the trial, make sure you know how to manually adjust the implements and consider what is possible for cutter bar height in your fields. These were the two biggest problems in our first years.

Educational & Outreach Activities

5 Published press articles, newsletters
Participation summary:
160 Farmers/Ranchers
5 Agricultural service providers

Education/outreach description:
Adam Hurtgen and Hurtgenlea hosted 20 farmers and ag professionals during our August 22, 2024 on-site field day. We distributed field day handouts for findings thus far and for a larger perennial groundcover initiative (regenpgc.org). Iowa State University Research Scientist Dr. Cynthia Bartel also presented this system at the December 4, 2024 VitaPlus meeting in New Glarus, Wisconsin, to 60+ farmers and ag professionals. At both events, farmers and ag professionals were interested in the increased forage production and natural resources conservation benefits of this system.

In 2025, Hurtgenlea was selected for a World Dairy Expo virtual farm tour based on environmental stewardship, quality genetics, technology advancements, diversification and more. The SARE trial was featured in our virtual tour. Our virtual tour had about 80 attendees during the live presentation, with the virtual tour to be posted in January 2026. The articles and interviews below were based on the WDE virtual farm tour. From our survey at the end of the talk, farmers who responded said they were interested in this system.

Mid-West Farm Report. SARE Grants Turn Ideas Into Action At Hurtgenlea Holsteins. Published Oct 9, 2025 by Stephanie Hoff. https://omny.fm/shows/mid-west-farm-report-madison/sare-grants-turn-ideas-into-action-at-hurtgenlea-holsteins

Mid-West Farm Report. This Wisconsin Dairy is Milking Data for Success. Published Oct 22, 2025 by Stephanie Hoff. https://omny.fm/shows/mid-west-farm-report-madison/this-wisconsin-dairy-is-milking-data-for-success#description

Wisconsin Agriculturist. Wisconsin dairy farm embraces robots, health monitoring and intercropping. By Jim Massey on October 9, 2025. https://www.farmprogress.com/dairy-cattle/wisconsin-dairy-farm-embraces-robots-health-monitoring-boluses-and-intercropping

World Dairy Expo Virtual Farm Tour. Madison, Wisconsin, September 30, 2025. ~80 attendees (initial reach prior to online posting expected January 2026; WDE virtual farm tours receive 1,000-14,000 views). About: The WDE virtual farm tours feature four farms in the nation. The four dairies

to be featured during WDE 2025 showcase environmental stewardship, quality genetics, technology advancements, diversification and more.

Dairy Star World Dairy Expo Special Edition. New ways to farm: Hurtgen farm offers virtual tour during WDE. Circulation 17,276. Page 36, World Dairy Expo Dairy Star Special Edition. By Tiffany Klaphake on Saturday, September 13, 2025. https://dairystar.com/specialsections/