

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.

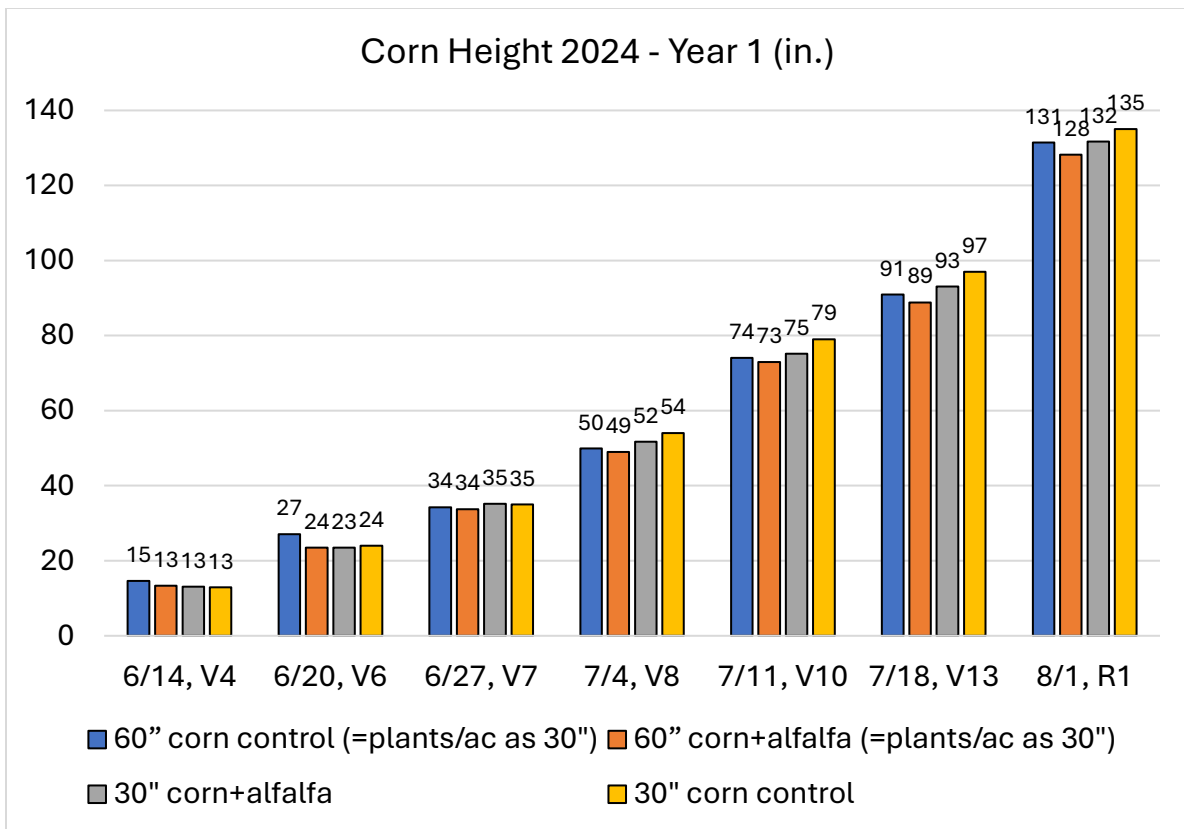
In the first year, we had one harvest of the system for the corn silage with a Kemper chopper on September 10, 2024. Alfalfa only plots were cut with a diskbine on September 12, 2024 and raked and baled on September 15, 2024. Specifically, our custom harvester used a CLAAS 8-row forage harvester with 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.

Yr 1 Results:

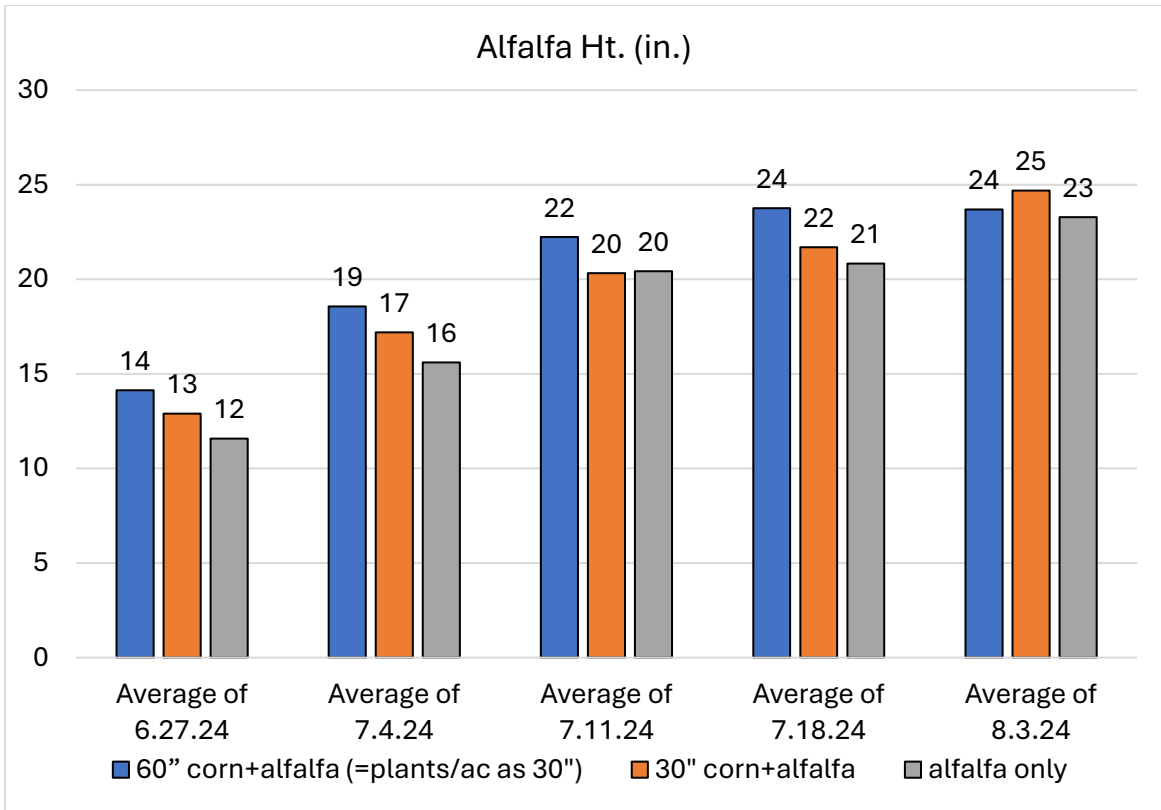
- The 60" corn + alfalfa had **fewer corn plants** at V2 and R6 than other corn treatments, possibly from wheel traffic. At R6, the 30" corn alone also had fewer corn plants than the 30" corn + alfalfa.

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

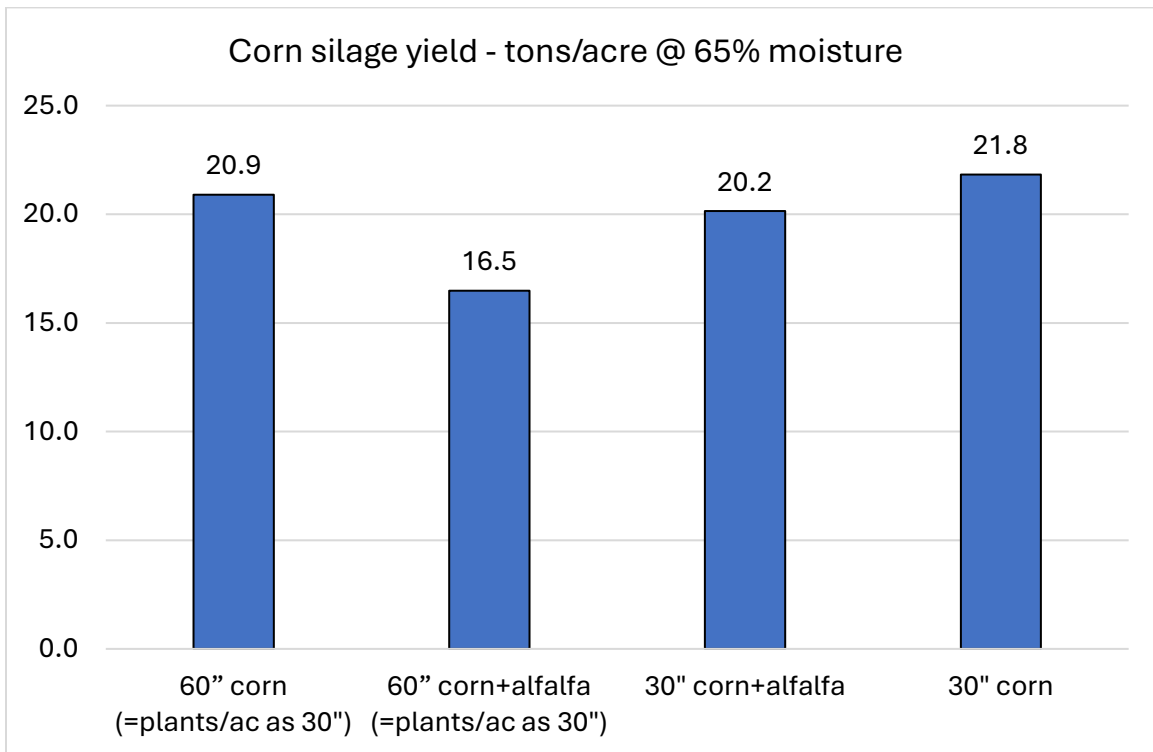
- No differences were observed in **maturity** between the intercropped corn and corn alone.
- No differences were observed in **plant height** between the intercropped corn and corn alone.



- 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 yield

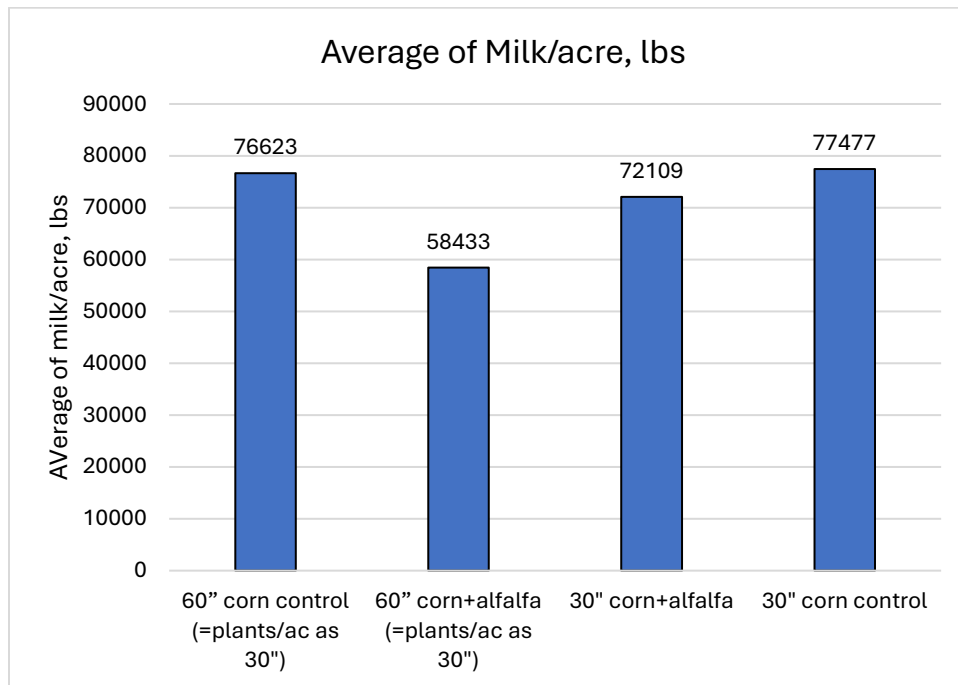


- 60" corn, 30" corn, and 30" corn + alfalfa **produced statistically similar corn silage yield**. Only the 60" corn + alfalfa yielded less corn silage than the other systems.

Corn silage feed quality

We have not analyzed the fermented corn silage. 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/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/m² and stems/plant than alfalfa only, but plants/m² 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.

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 are working with several stakeholder advisors and ag professionals to dial in best alfalfa suppression methods after a spring alfalfa cut. Either real competition or light quality competition from unsuppressed alfalfa for the corn through the early corn stages will decrease corn silage yield in year 2+.

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

The real advantages will only be answered with the second year of the corn silage alfalfa system. These advantages or disadvantages depend on if we can get 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 while producing relatively similar corn silage yield as corn silage only. There are still known benefits of having cover on the soil year-round that this system provides even in the first year, with water retention 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

4 Consultations

1 Tour

1 Presentation

Participation Summary:

80 Farmers participated

5 Ag professionals participated

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 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. The second year of the system will determine adoption; profitability will be determined by the alfalfa and corn silage yield and quality, which is influenced by spring suppression of the alfalfa.