



# Forage Production of Alfalfa Established in Silage Corn vs. Conventional Production Systems

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## RATIONALE & OBJECTIVES

- Intercropping of corn silage with interseeded alfalfa is being developed as an alternative method for establishing alfalfa to improve the productivity, profitability, and environmental sustainability of forage production.

### Objectives:

To compare crop growth, yield, and quality of forage produced from intercropping systems to conventional systems for establishing alfalfa.

## STUDY DESCRIPTION

### Plot Layout:

Cropping treatments were replicated four times in small plots arranged in a randomized complete block design.

### Locations:

Independent experiments were seeded during 2020 and 2021 at a rainfed location in Wisconsin and an irrigated location in Idaho. Both locations had silt-loam soils.

### Cropping Treatments:

- Early interseeded alfalfa sown at corn planting.
- Early interseeded alfalfa sown at corn planting with prohexadione (PHD) treatment.
- Late interseeded alfalfa sown at the corn vegetative emergence (VE) stage.
- Late interseeded alfalfa sown at the corn VE stage with PHD treatment.
- Corn silage followed by spring-seeded alfalfa in year 2.
- Spring-seeded alfalfa.
- Summer-seeded alfalfa planted after harvest of barley grain and straw.
- Late-summer-seeded alfalfa planted after corn silage harvest.

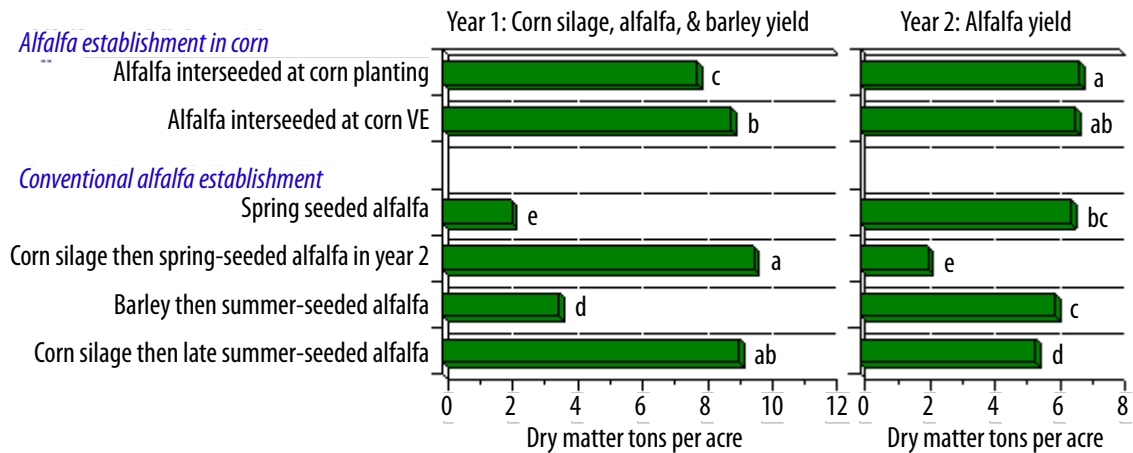
### Analyses:

Crop production and corn silage quality, soil moisture content, crop nitrogen uptake, and alfalfa establishment in year 1. Alfalfa forage production and quality in year 2.

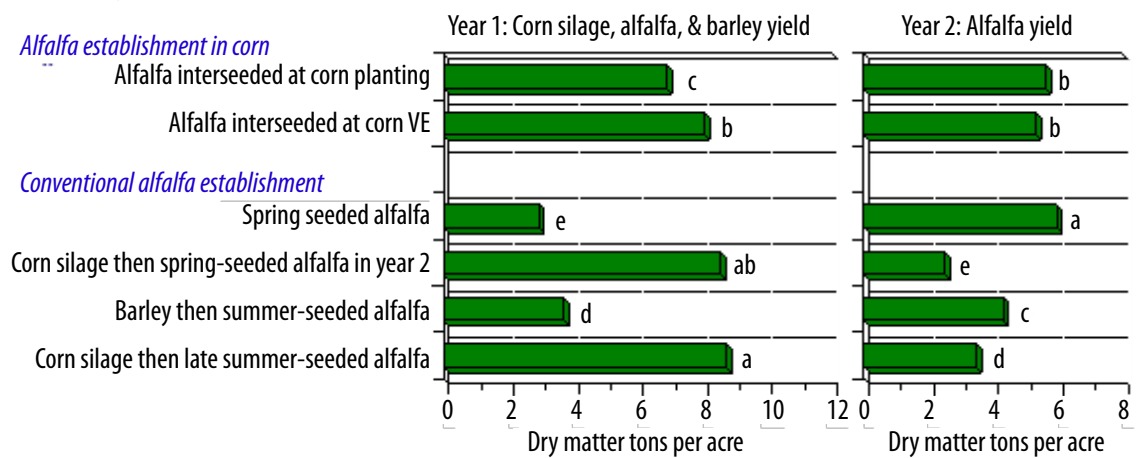
## RESULTS

- Growth, foliar health, and establishment of interseeded alfalfa in this study were favored by below normal rainfall and application of fungicide plus insecticide on alfalfa seedlings in Wisconsin and by arid irrigated conditions in Idaho.
- Biomass and nitrogen accumulation of early interseeded alfalfa was two-fold greater than late interseeded alfalfa.
- Growing corn with early-interseeded alfalfa reduced soil water content by 8 to 18% in mid-June during prolonged dry conditions in spring.
- Application of PHD growth regulator on alfalfa seedlings did not influence stand density or yield of interseeded alfalfa established under relatively dry growing conditions.
- Averaged across states and seeding years, yields of intercropped corn silage were 19% lower with early interseeding and 6.6% lower with late interseeding compared to solo-seeded corn. Yields of intercropped corn in year 1 were 2- to 4-fold greater than spring-seeded alfalfa or barley grown prior to summer-seeded alfalfa. (**Figures 1 and 2**).
- Yields of interseeded alfalfa in year 2 were comparable to or somewhat lower than spring-seeded alfalfa (**Figures 1 and 2**). High yields of interseeded alfalfa were favored by early harvest of corn silage (near September 1<sup>st</sup>) the prior year. Insufficient fall growth during establishment limited yields of summer-seeded alfalfa, especially following corn.
- Cropping treatments had minor effects on forage quality of corn silage and alfalfa.

**Figure 1.** Average yields in Wisconsin. Yields with no common letter are different at  $P = 0.05$ .



**Figure 2.** Average yields in Idaho. Yields with no common letter are different at  $P = 0.05$ .



## CONCLUSIONS/SUGGESTIONS

- Overall, alfalfa-corn intercropping produced higher total yields and forage of comparable quality compared to conventional production systems.
- Alfalfa should be interseeded at the VE stage to minimize competition with corn and allow good establishment of alfalfa.
- Additional studies in Wisconsin indicate moderate corn populations ( $\leq 30,000$  plants per acre), early corn harvest (1<sup>st</sup> week of September), and fungicide/insecticide application are required to ensure good establishment of interseeded alfalfa.
- In arid irrigated environments like Idaho, higher corn populations may be used, fungicide is not needed, but early corn harvest is still required.
- Additional intercropping research is underway to improve alfalfa establishment under wet growing conditions and to enhance nitrogen use efficiency and yield of corn silage.