Chicory-Cereals Intercrop (Year 1)

Project duration: May 2021 – September 2023
Objectives: To evaluate intercropping potential for cereals and chicory (Year 1)
Collaborators: PCDF; Elisabeth Nernberg, ARD

Background

Chicory is a short-lived, broadleaf perennial that has gained the attention of livestock producers for its high production potential, excellent nutritional qualities, and deep taproot. The crop may be seeded alone or as part of a chicory-grass or chicory-legume mixture. For a good summary of chicory cultivation see this agronomy factsheet, prepared by Penn State University. Figure 1 shows second-year chicory plants at PCDF. (Note that the taproot is broken off.)

Figure 1: Year-2 chicory plants, showing 40” of top growth and strong taproot

The trial examines the potential for establishing chicory with a cereal crop. This would provide producers with the opportunity to benefit from a cash crop during the establishment year. In Year 1, the trial measures the impact of the chicory on the cereal crop. In Years 2 and 3, the trial will examine the impact of the chicory on the performance and feed values of various forage mixtures, as detailed in Table 1. Note that the oat, barley and millet in Year 2 will function as a nurse crop for the alfalfa-grass hay crop.

Table 1: Trial treatments for 2021-2023 (4 replications each) (AG=Alfalfa-grass hay)

Treatment	Year 1 (2021)	Year 2 (2022)	Year 3 (2023)
1	Barley	AG + oat	AG only
2	Barley + chicory (3 lb/ac)	AG + oat + chicory (3 lb/ac)	AG + chicory (3 lb/ac)
3	Barley + chicory (4 lb/ac)	AG + oat + chicory (4 lb/ac)	AG + chicory (4 lb/ac)
4	Oat	AG + barley	AG only
5	Oat + chicory (3 lb/ac)	AG + barley + chicory (3 lb/ac)	AG + chicory (3 lb/ac)
6	Oat + chicory (4 lb/ac)	AG + barley + chicory (4 lb/ac)	AG + chicory (4 lb/ac)
7	Wheat	AG + millet	AG only
8	Wheat + chicory (3 lb/ac)	AG + millet + chicory (3 lb/ac)	AG + chicory (3 lb/ac)

9	Wheat + chicory (4 lb/ac)	AG + millet + chicory (4 lb/ac)	AG + chicory (4 lb/ac)

Results

For the results of the 2020 pilot year (chicory seeded to wheat at rates of 0.5, 1, 2, and 3 lb/ac), see the online report, Intercropping: Wheat-Chicory (Pilot Year). The results for the pilot year suggest that the lower seeding rates for chicory (0.5-2 lb/ac) provide unsatisfactory results for establishing a chicory crop, based on the number of plants observed per plot. Consequently, the trial was redesigned (see Table 1).

Figure 2 shows yields for cereals in 2021, grouped according to crop type. Note that dry conditions and heat at flowering severely affected oat yield for all trials at PCDF. There were no statistical differences for yield for grain, which suggests that seeding chicory with a cereal crop does not meaningfully affect yield. However, the results are for one year only, and should be interpreted with caution.

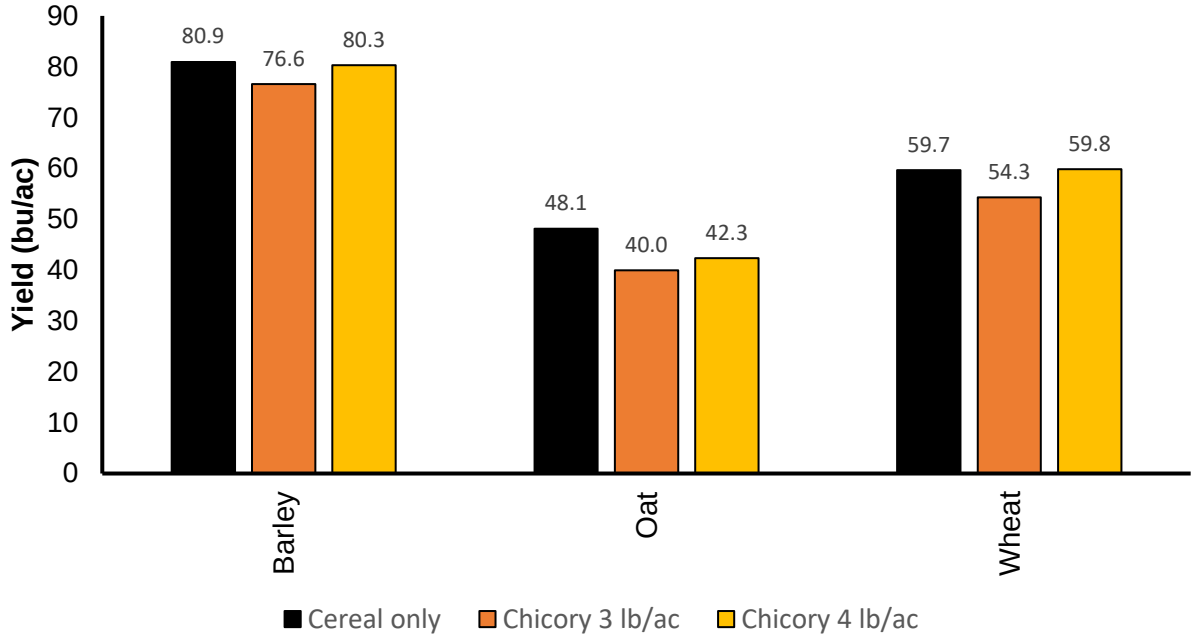

Figure 2: Barley, oat and wheat yield by treatment (bu/ac)

The stand rating for cereals is shown in Figure 3. There was no significant difference in stand rating for cereals crops, which suggests that including chicory in the crop does not meaningfully affect crop stand.

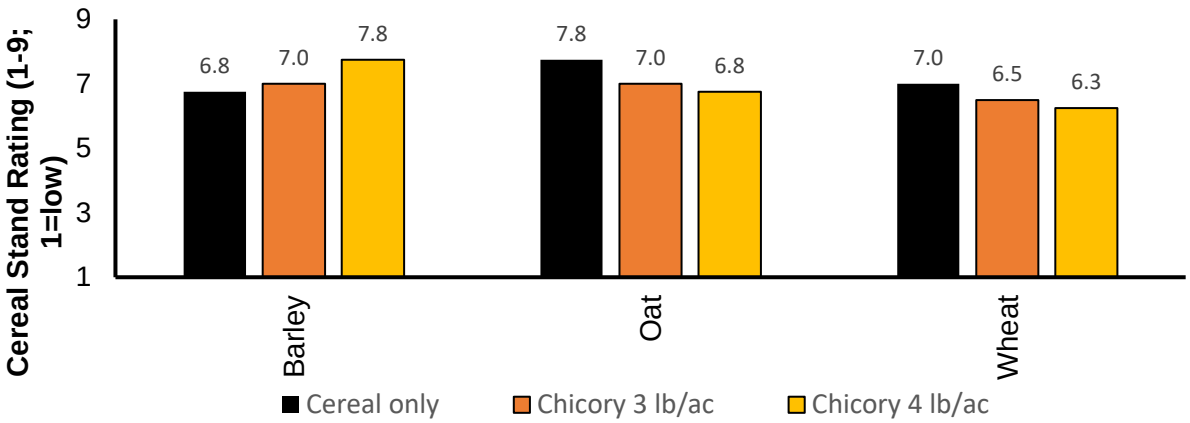

Figure 2: Barley, oat and wheat yield by treatment (bu/ac)
The straw was removed after grain harvest to allow the chicory to continue to grow. Biomass was not collected for the chicory crop, but visual estimates showed that the chicory crop for both seeding rates performed well across all crops, despite the dry growing conditions.

There are no registered herbicides for chicory, making intercropping more challenging. Good weed control prior to seeding is crucial. The trial was hand-weeded.

Table 1: Summary of statistical information for barley, oat and wheat yield

	Seeding rate				Average yield (bu/ac)		
Treatment	Barley	Oat	Wheat	Chicory	Barley	Oat	Wheat
Treatment 1	90 lb/ac	90 lb/ac	90 lb/ac	-	80.9	48.1	59.7
Treatment 2				3 lb/ac	76.6	40.0	54.3
Treatment 3				4lb/ac	80.3	42.3	59.8
CV (%)					13.3	25.8	16.6

Materials and methods

Experimental Design:	Random Complete Block Design
Cereal varieties:	Austensen (barley), Summit (oats), Landmark (wheat)
Entries:	9
Replications:	3
Seeding:	May 14
Harvest:	Sep 2

Data collected	Date Collected
Emergence:	Barley, oat, wheat: May 20-23, Chicory: Jun 2-6
Cereal Heading:	Jul 2-15
Stand rating:	Jul 1
Vigor Rating:	Jul 1
Yield:	Sep 2
Moisture:	Sep 2

Agronomic info

Previous year's crop: Oat Silage
Soil Type: Erickson Loam Clay
Landscape: Rolling with trees to the east
Seedbed preparation: Vertical Tilled

Table 3: Fertility Information

	Available		Added	Type
N	162	lb/ac	27 lb/ac	46-0-0
P	41	ppm	10 lb/ac	11-52-0-0
K	703	ppm		

No herbicide applied (hand weeded)