

## Soybean – (Year 3 of a 6-Year Crop Rotation)

**Project duration:** Spring 2018 – Fall 2023

**Objectives:** To assess the economic and agronomic impact of a 6-year rotation, using integrated management practices.

**Collaborators:** Parkland Crop Diversification Foundation

### Background

The use of green manures for fertility has the potential to reduce fertilizer inputs during the following cropping year. In 2018, a green manure was planted and terminated in late July, with some regrowth. The green manure yielded 6100 lb/ac (dry), resulting in an estimated 152 lb/ac of available N. However, some of this N was only slowly available as the plant material decomposed. Further, a relatively low legume-to-cereal ratio (35-65) may have tied up some available N during the decomposition phase. A spring 2019 soil test showed 115 lb/ac available. AC Goodeve wheat was planted on the site on May 14, with N fertilizer added according to the treatments and costs shown in Table 1. Figure 1 shows the full six-year rotation for the trial. Soybean was seeded in 2020.

Table 1: 2019 added N (lb/ac) and costs by treatment

<b>Treatment</b>	<b>Added N (lb/ac)</b>	<b>Total N (lb/ac)</b>	<b>Cost N/ac (\$0.50/lb)</b>
No added Nitrogen	0.0	115.0	\$0.00
10% added Nitrogen	9.7	124.7	\$4.84
20% added Nitrogen	19.4	134.4	\$9.68
40% added Nitrogen	38.7	153.7	\$19.35
60% added Nitrogen	58.1	173.1	\$29.03
80% added Nitrogen	77.4	192.4	\$38.71
100% added Nitrogen	96.8	211.8	\$48.38

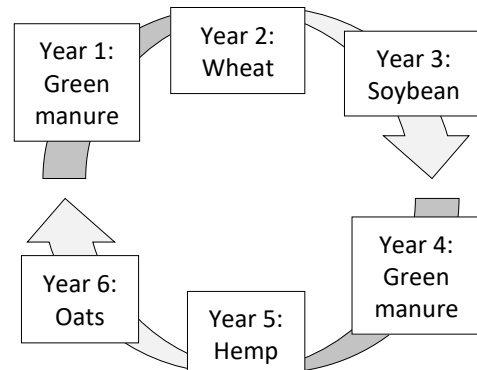


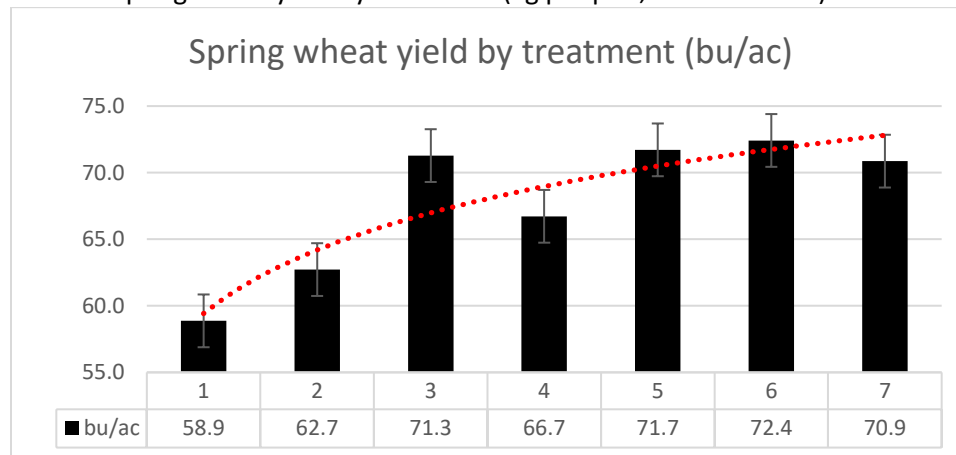
Figure 1: Six-Year Rotation Schematic

### Results

#### 2019

Average yields for spring wheat by treatment are show in Table 2. The red line shows the trend for yield.

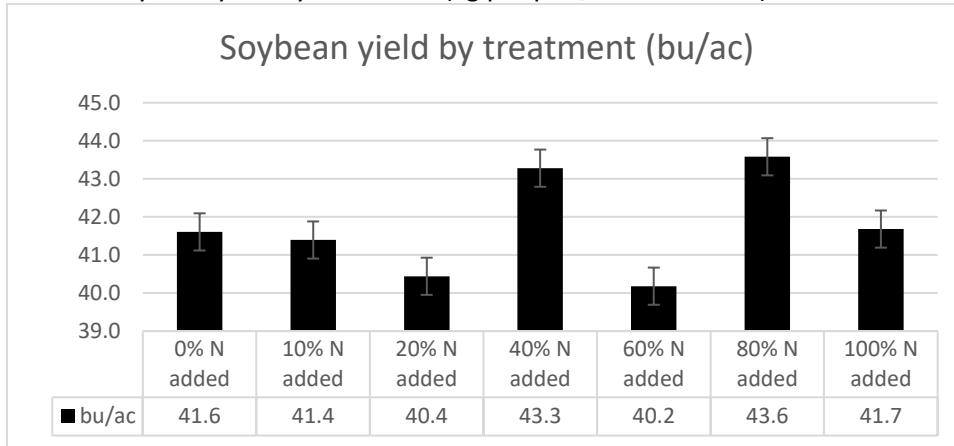
Table 2: Spring wheat yield by treatment (kg per plot, 14% moisture)



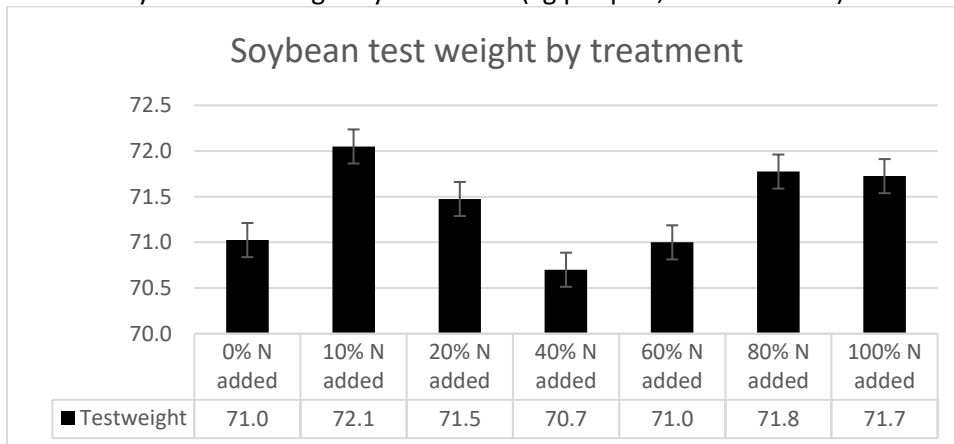
**2020**

The site was seeded to soybean in 2020. Start-up P and inoculant was applied with the seed, but no N was applied. Average yield for soybean by treatment is shown in Table 3. Average test weight for soybean by treatment is shown in Table 4.

**Table 3: Soybean yield by treatment (kg per plot, 13% moisture)**



**Table 4: Soybean test weight by treatment (kg per plot, 13% moisture)**



**Observations**

The average spring wheat yield for each treatment (Table 2) indicates a responsiveness to added nitrogen over the amount provided by the green manure in 2018. Table 2 appears to indicate a decrease in yield for treatment 4; however, the reduced yield for that treatment can be attributed to poorer plant establishment in some plots.

Table 5 shows a summary of statistical information for spring wheat and soybean. Average yield and test weight do not differ significantly between treatments for either spring wheat or soybean.

In 2021, a green manure will be planted on the site.

Table 5: Summary of statistical information yield and test weight for spring wheat and soybean

Treatment	Yield (bu/ac)		Statistical significance (yield)*		Test weight		Statistical significance (test weight)*	
	Wheat	Soybean	Wheat	Soybean	Wheat	Soybean	Wheat	Soybean
No added Nitrogen	59.9	41.6	A	A	56.1	71.0	A	A
10% added Nitrogen	62.7	41.4	A	A	56.2	72.0	A	A
20% added Nitrogen	71.3	40.4	A	A	56.5	71.5	A	A
40% added Nitrogen	66.7	43.3	A	A	55.7	70.7	A	A
60% added Nitrogen	71.7	40.2	A	A	56.1	71.0	A	A
80% added Nitrogen	72.4	43.6	A	A	56.2	71.8	A	A
100% added Nitrogen	70.9	41.7	A	A	55.6	71.7	A	A
CV (%)	10.3	5.4			3.4	1.2		

\* Treatments not marked with the same letter are statistically different from other treatments.

### Materials & Methods

Experimental Design: Random Complete Block Design  
 Entries: 7 treatments  
 Seeding: May 14  
 Harvest: Sept 11

### Agronomic info (2020)

Previous year's crop: Spring wheat  
 Soil Type: Erickson Loam Clay  
 Landscape: Rolling with trees to the east  
 Seedbed preparation: Zero-till