2022 INTEGRATING SOLAR CORRIDORS IN CORN SILAGE PRODUCTION SYSTEMS TO MEET AGRONOMIC & CONSERVATION GOALS

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Interseeding is a strategy to plant cover crops directly into a growing crop of corn silage providing for earlier planting to hopefully maximize the conservation and ecological benefits of the cover crop. Farmers are interested in selecting cover crop species for specific value-added benefits.

on the corn row width. Plots were 8’, 10’, 12’, 14’ and 20’ wide for 20”, 30”, 36”, 40” and 60” spacing respectively.

In Trial 1, the entire field was fertilized on 9-May with 200 lbs ac^{-1} of 7-18-36 and the corn was planted on 25-May. The 30” and 60” plots were planted with a John Deere MaxEmerge 1750 4-row planter (Moline, IL). The 20”, 36” and 40” plots were planted with a custom-made

Cover crop mixture	Annual ryegrass (60%)

Table 3. Trial 2 forage

Corn variety	Brevant B90R92Q (90 RM)
Seeding rate (plants ac^{-1})	30" - 30,000 60" - 60,000
Interseeded forage (lbs ac^{-1})	Alfalfa (20)
Planting date	Corn: 7-May Alfalfa: 22-Jun
Fall manure application (gal ac^{-1})	7,000
Starter fertilizer (gal ac^{-1})	32-0-0 (8)
Topdress fertilizer (lbs ac^{-1})	46-0-0 (150)
Herbicide applications (oz ac^{-1})	Glyphosate (24) and Dupont ¡ Resolve®Q (1.25)
Harvest date (corn & alfalfa)	7-Sep

Table 5. On-farm management, Enosburg Falls, VT, 2022.

Location	

Data were analyzed using a general linear model procedure of SAS (SAS Institute, 1999). Replications were treated as random effects, and treatments were treated as fixed. Mean comparisons were made using the Least Significant Difference (LSD) procedure where the F-test was considered significant, at $p<0.10$. Variations in genetics, soil, weather, and other growing conditions can result in variations in yield and quality. Statistical analysis makes it possible to determine whether a difference between treatments is significant or whether it is due to natural variations in the plant or field. At the bottom of each table, an LSD value is presented for each variable (

Table 6. Weather data for Trial 1 and 2, Alburgh, VT, 2022.

Alburgh, VT	May	June	July	August	Sept
Average temperature (°F)	60.5	65.3	71.9	70.5	60.7
Departure from normal	2.09	-2.18	-0.54	-0.20	-1.99
Precipitation (inches)	3.36	8.19	3	4.94	4.4
Departure from normal	-0.40	3.93	-1.06	1.40	0.73
Growing Degree Days (50-86°F)	394	459	674	630	343
Departure from normal	93	-64	-20	-11	-44

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger.
Historical averages are for 30 years of NOAA data (1991-2020) from Burlington, VT.

Table 7. Weather data for the on-farm trial in St. Albans, VT, 2022.

	2022				
St. Albans, VT	May	Jun	Jul	Aug	Sep
Average temperature (°F)	60.5	65.9	72.9	72.2	61.5
Departure from normal	4.53	0.81	2.83	4.22	1.34
Precipitation (inches)	3.22	4.96	5.1	4.79	3.71
Departure from normal	-0.02	0.85	1.00	1.05	-0.22

[redacted]

Trial 1- The impact of corn row width on silage productivity

Harvest population and yield at 35% dry matter were significantly impacted by the row spacing treatments (Table 9). Corn populations were significantly greater in the 30" rows at harvest compared to the other row widths, with 31,363 plants ac^{-1}. All the other treatments had populations below the seeding rate target of 30,000 plants ac^{-1}. Harvest dry matter was not significantly different between the treatments, and all had a dry matter close to the target of 35% and ranged from 35.7-37.6%. Corn yield was highest in the 30" rows (25.5 tons ac^{-1}) but was not statistically different from the 20" rows (24.9 tons ac^{-1}). The 40" and 60" rows had the lowest yields, 18.1- and 18.5-tons ac^{-1} respectively. The higher yields in the 20" and 30" rows are likely because of the higher plant populations at harvest. There were no significant differences in silage quality between the row widths (Table 10).

Table 9. Corn silage yield by row width in Trial 1, Alburgh, VT, 2022.

Row width	**Harvest population**	**Dry matter**	**Yield, 35% DM**
	plants ac^{-1}	%	tons ac^{-1}
20-in.	29144[b]†	36.9	24.9[ab]
30-in.	**31363[a]**	**37.6**	**25.5[a]**
36-in.	28465[b]	36.4	22.3[b]
40-in.	26343[c]	37.0	18.1[c]
60-in.	25573[c]	35.7	18.5[c]
LSD (*p*=0.10) ‡	1674.2	NS§	2.65
Trial mean	28178	36.7	21.9

†

lumens ft^{-2}, was similar for all row widths and the control during the first two weeks after the cover crop was interseeded (Figure 1). This figure provides a visualization of light intensity

Figure 2. Ground cover provided by interseeded forages by corn row width in Trial 2, Alburgh, VT, 2022.

Impact of Row Width

There was a significant difference in ground cover, corn harvest population, and corn yield between the row widths (Table 11). The 60” rows had significantly higher ground cover from the interseeded forages, 28.2%, and the 30” and 40” rows had ground cover of only 6.19% and 3.91% respectively. The wider row spacing allows for better establishment of the interseeded crop, but overall, the forage yields were low and therefore not measured. Corn populations at harvest were highest in the 40” rows, 30,774 plants ac^{-1}, and that was statistically greater than the 30” and 60” rows, both of which were below the target population of 30,000 plants ac^{-1}. Corn yield was highest in the 30” rows, 28.0 tons ac^{-1}, and that was significantly more than the other row spacings. Interestingly, the 40” rows had the highest harvest population but the lowest corn yields, 15.9 tons ac^{-1}, which is 1.3 and 1.8 times less than the 30” and 60” rows.

Table 11. Ground cover, corn silage yield and population by row width in Trial 2, Alburgh, VT, 2022.

Row Width	Ground cover	Corn population	Corn yield, 35% DM

Impact of Forage Type

The interseeded forage type had no impact on the ground cover at harvest, corn harvest population, or corn yield (Table 12). All three

corn silage quality between the different row widths. Unsurprisingly, the wider row widths, 40” and 60”, had higher light infiltration to the soil surface compared to the narrower row widths (20”, 30”, and 36”).

Trial 2 evaluated the impact of row width on silage productivity and interseeded forage establishment. The row widths in this trial were 30”, 40”, and 60” and the forages included alfalfa, orchardgrass, and an alfalfa/orchardgrass mix. The different forages reacted differently to the row widths. For example, orchardgrass alone does not establish well in narrow 30” rows, but does better in wider row widths with increased light availability. Alfalfa established well even in the 30” rows, and there was little difference in dry matter yield between the alfalfa and orchardgrass/alfalfa mix when interseeded into 30” rows. This indicates that most of the biomass in those mixed treatment was from the alfalfa and not the orchardgrass. Expectedly, all the interseeded forages performed best in the 60” row widths, and ground cover at the time of corn harvest was highest in the wider rows. Corn populations at harvest were statistically greater in the 40” row widths, but that did not result in high yields. The 40” rows had a statistically lower corn silage yield compared to the other treatments and was likely due with difficulties harvesting this row spacing with a standard corn chopper. More research still needs to be done on selecting hybrids that will perform well at high seeding rates. Flex ear hybrids have the potential to make up for lower populations and still produce adequate yields by increasing ear size when planted at those low seeding rates. Nonetheless, majority of

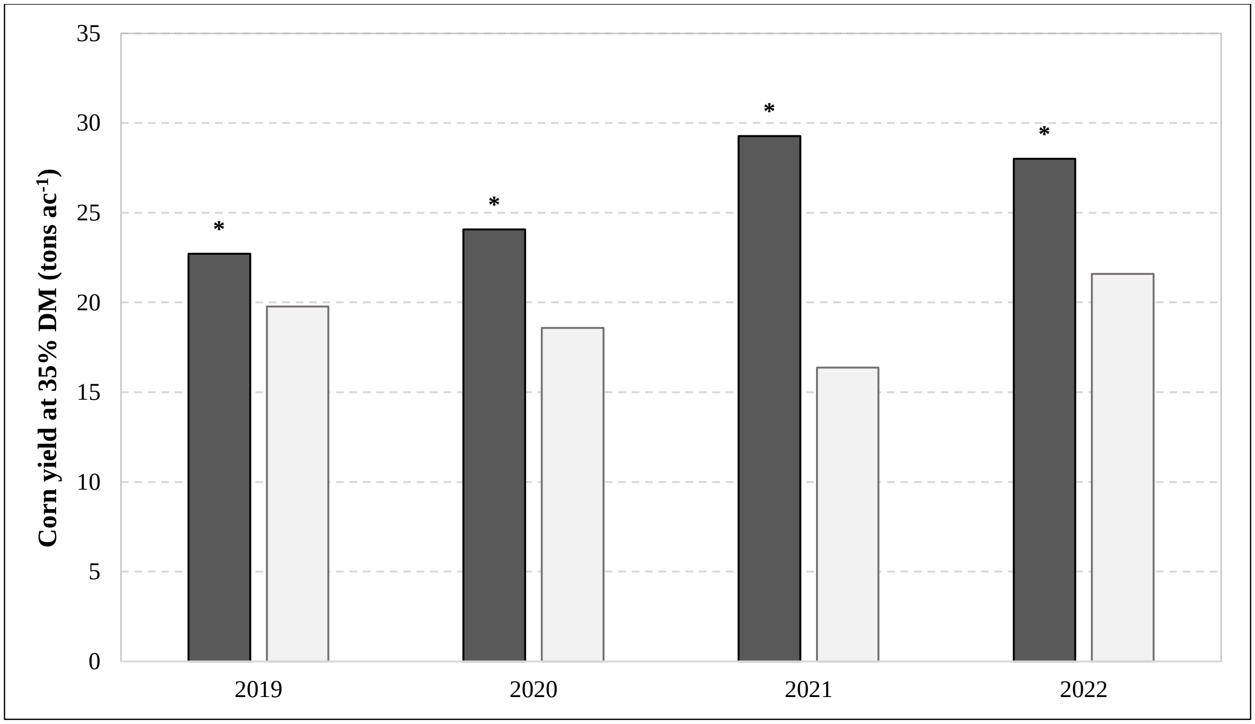

Figure 3. Corn silage yield in 30" and 60" rows by year, Alburgh, VT, 2019-2022. An asterisk (*) indicates a statistically significant (p=0.10) difference between treatments for that year.

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