Project Identification

1. **Project Title:** Cover Crop Variety and Seeding Date trial for Weed Suppression Under Organic Management System
2. **Project Number:** 20190427
3. **Producer Group Sponsoring the Project: Saskatchewan Conservation Learning Centre**
4. **Project Location(s):** Project was located near the Conservation Learning Centre on an organic producer collaborators land (River Lot 32, 46, 26 W 2nd)
5. **Project start and end dates (month & year):** Started June 2020 and completed by February 2022
6. **Project contact person & contact details:**

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Objectives and Rationale

7. Project objectives:

The purpose of this project was to showcase potential cover crop options for the region and show how seeding dates could affect their success. This project also aimed to demonstrate how no-till management works in an organic setting by direct seeding into the cover crop variety trial in year two.

8. Project Rationale:

The Conservation Learning Center (CLC) was directly approached by local organic producers in the Prince Albert area who were interested in cover-cropping. The organic farmers were searching for an annual grass that would grow tall and thick enough to fall down and form a mat to suppress weeds and retain moisture. Sustainable cropping practices, such as cover crops, can improve soil health and suppress weeds. Cover crops are increasing in popularity throughout the United States and Europe thanks in part to their benefits and agricultural producers' continuing efforts to farm more sustainably. Studies conducted in these regions have found that cover crops reduce soil erosion and add organic matter and carbon to the soil, which improves soil structure, tilth, and water permeability (Dabney et al., 2007; Hartwig and Ammon, 2002; Teasdale, 1996). Cover crops have been recognized for many years as a sustainable cropping practice that can improve soil health and supress weeds. Winter cover crops have been shown to increase soil moisture in northern latitudes because they act as a snow trap and provide soil cover in the spring, which slows water runoff and allows water to infiltrate soil. Local producers were also interested in direct seeding into the mat for continued weed cover, improved soil health, and reducing tillage. Legume cover crops can fix atmospheric nitrogen which can then be utilized by the subsequent crop. Non-leguminous crops are generally used to reduce soil erosion and nitrate leaching. Although it is recommended to have an N fixer like peas in a cover crop mix, growers have found that the pea straw breaks down too quickly the following year. However, when grown together with fast growing cereals, legumes can help to close the canopy and further supress the weed growth.

Additionally, many cover crop varieties are capable of supressing annual and perennial weeds. For example, Sudan-grass can reduce Canada thistle by up to 20% (Bicksler and Masiunas, 2017). When planted in the fall, Sudan-grass can quickly emerge and outcompete late season weeds. It is also capable of quickly producing a large amount of biomass that naturally terminates in the fall, forming a thick mat that covers the ground. This thick mat has the potential to reduce weed seed germination in the spring and help conserve moisture. The extensive root system typical of cover crops like Sudan-grass has been shown to break up and reduce soil compaction. Similar results have been found for other large biomass producing cover crops such as winter and spring oats (Brennan and Smith, 2005).

In August 2019, a local producer near the CLC seeded a few small plots of annual grasses in their garden. It appeared that spring forage oats would be a good candidate for weed control and direct seeding. The producer was also interested in sorghum-Sudangrass but found that an August seeding date was too late in the season. It was hypothesized that an earlier seeding date would increase biomasses for the annual cover crops. The producer was involved with the

creation of this project and aided the CLC with the trial. This demonstration is very relevant and has a high potential to be adopted and incorporated into local producers' operations.

This study benefits local organic producers in the region, as well as organic producers throughout the province. Organic farming is on the rise; from 2014 to 2017 the number of organic producers in Saskatchewan rose 25% (Arnasen, 2018). This is likely due to the consumer demand for organic products and a premium offered to organic crops. In 2018, there were 964 organic farmers in Saskatchewan and they managed over 1.15 million acres of certified organic land. Among this certified land, 616,700 acres (over 53%) were seeded to field crops, such as wheat, oats, barley, lentils, pea, and flax. According to the 2018-19 Saskatchewan provincial survey of organic producers, the top priorities for growers were related to soil health, fertility, and nutrient balancing. As synthetic fertilizers are not permitted in the organic production systems, many organic producers face nitrogen limitations, in particular those who do not have livestock operations on their farms. Managing cover crops in order to balance the input and outputs costs has become a major concern. The second production issue brought up by producers was weed control. Weeds of particular concern were perennial including Canada thistle, quack grass, and others. Other issues identified by organic producers included increasing soil biodiversity, managing crop rotations, and adopting environmentally-friendly farming systems (Wang).

Cover crops are a great tool for organic producers. The lack of demonstrations in the Prince Albert region has limited the amount of relevant information on cover cropping for local producers. Organic farms often rely heavily on tillage to control weeds and to terminate cover crops or green manures. Reducing tillage can decrease fuel and labour costs, and improve soil and water quality. As a result, interest in direct seeding into cover crops has grown. In the United States, it is estimated that a producer's total expense input can be reduced by 20% when growing corn and 30% when growing soybeans in an organic no-till system versus an organic tilled system. While tillage is not completely discontinued in these organic no-till systems, the frequency and intensity of tillage has been reduced. A successful cover crop mat that can be directly seeded into needs to be dense, with high biomass, and primarily weed-free. The equipment needed for such operations can include a roller-crimper to terminate the cover crop and a suitable seeder that can supply enough downward pressure to cut through the cover crop mat (Rodale Institute, 2011). This project demonstrated cover crop varieties that may be suitable for the region, along with evaluating seeding dates.

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Methodology and Results

9. Methodology:

The purpose of this project was to showcase the potential cover crop options for the region and show how seeding dates could affect their success. The trial evaluated six cover cropping varieties and two different seeding dates; for a total of twelve treatments that were replicated four times. The original proposal was to direct seed into the cover crops in year 2. However, there was poor cover crop establishment in year one (2020) and an agreement was made to repeat year one of the trial in year two (2021). Some changes were made such as seeding earlier and increasing seeding rate in order to better establish the cover crop. The demonstration had a randomized complete block design and plots measured 5.25m wide by 7m long. The project was seeded into alfalfa/bromegrass hay stubble using the CLC's Fabro plot seeder. A summary of treatment descriptions and seeding rates can be found in Table 1. A 2x seeding rate for forage oats was included as a producer collaborator who found great potential using forage oats as a cover crop was interested in knowing if increased seeding rates would be beneficial. Different seeding rates were not included for the remaining cover crops in order to keep the size of the demonstration manageable. Agronomic details for both years of the study can be found in Table 3. Since this was managed as an organic demonstration, no other seed treatments, herbicides, fungicides, or harvest aids were used.

Table 1. List of treatments indicating different cover crops and seeding rates used in 2020 and 2021 near Prince Albert, SK.

Trt #	Cover crop type	Variety Seeded	Seeding rate (kg/ha)	
			2020	2021
1	Spring Forage Oat	CDC Baler Oats	100	150
2	Spring Forage Oat 2x seeding rate	CDC Baler Oats	200	300
3	Silage Peas	4010 Peas	135	200
4	Spring forage oats with silage peas	CDC Baler Oats	50	75
		4010 Peas	70	100
5	Sudan-grass	Sorghum-Sudan-grass	22	45
6	Sudan-grass with silage peas	Sorghum-Sudan-grass	11	22
		4010 Peas	70	100

Table 2. Seeding dates used to seed different cover crops in 2020 and 2021 near Prince Albert, SK.

Time of Seeding	Planned (+/- 4 days)	Actual 2020 dates	Actual 2021 Dates
Early	July 15	July 20	June 30
Late	August 1	August 4	July 16

Data collection from this demonstration included a record of plant emergence, plant density counts, spring weed surveys, and biomassing. For plant densities, a one-meter section from the front of rows 2, and 8, and the back of rows 4, and 11 from each plot were counted. Weed surveys were also conducted by counting and recording each weed species type within a $0.25m^2$ quadrat. Plant heights were measured to the nearest centimetre from the front and back of each plot and biomass of weeds and cover crop were collected from the front and back of each plot using $0.25m^2$ quadrat. Dates data analysis was conducted are listed in table 3.

Data analysis was completed by ANOVA using Statistix 10 software. Any non-parametric data was analyzed using the Kruskal-Wallis test (p=0.05). Post-hoc tests used were LSD for parametric data and Dunn's multiple comparisons test for non-parametric data.

Table 3. Summary of agronomics and data collection dates

Observation/Activity	2021	2020
Seeding Method:	Fabro plot seeder with double disc openers and 10 in row spacing	
Seeding Rates and dates:	**See Tables 1 and 2	
Soil Temperature at Seeding:	Early seeding date: 23.5°C Late seeding date: 24.3°C	Early seeding date: 25.8°C Late seeding date: 20.7°C
Stubble	4 years in Alfalfa / Brome grass hay	
Seed bed preparation	Same location as 2020 Cultivated an additional 4X	Disced 2X Cultivated 3X
Seed Depth:	Intercrops midrow banded Peas: 2 inches Sudan-grass/oats: 1 inch	Intercrops side banded Peas/oats: 1.5 inch Sudan-grass: 0.75 inch
Pea Inoculant:	XiteBio PulseRhizo Liquid (40 mL/15 kg seed)	Nodulator EL LQ (30 mL/6 kg seed)
Emergence:	Early seeding date: July 16 Late seeding date: July 26	Early seeding date: August 3 Late seeding date: August 16
Plant Density Counts:	Early seeded: July 26 Late seeded: August 16	Early seeded: August 12-19 Late seeded: September 3
Weed Species and Quantity:	August 16	August 12 and September 3
Mowing:	On September 8th the early seeded oat treatments were mowed to limit volunteer oats in next growing season. Before mowing, oats measured 95 cm tall and afterwards, they were 50 cm.	N/A No cover crops headed out prior to frost.
Plant Heights:	September 22	September 8
Biomass Date:	September 23	September 8
Legal Land Location:	River Lot 32, 46, 26 W 2nd	
Coordinates of Corners:	N53˚01.573' W105˚45.282' N53˚01.570' W105˚45.238' N53˚01.550' W105˚45.286' N53˚01.546' W105˚45.243'	
Soil Type	Clay loam	
Soil Zone	Black	

10. Results

Weather

The 2020 growing season was cooler and drier than the longer term average (Table 4). Following the early seeding date (July 20) in 2020, there was no substantial precipitation until August 3.

Following the second seeding date, there were a couple small 5-7mm rain events. The early September 8th frost in 2020 terminated the cover crop earlier than in 2021. To increase the amount of time for cover crop growth and to take better advantage of July rains, the cover crop was seeded earlier in 2021. However, the 2021 growing season at the CLC was very hot and even drier when compared to 2020 and longer term averages. The average temperature for the entire growing season was nearly 1˚C warmer and total precipitation was almost 100 mm lower than the long-term average. July was also exceptionally dry (9.6 mm) and hot with 10 days above 30°C. There was no substantial precipitation following both seeding dates in 2021 until late August. The first fall frost occurred on October 2 (-0.9˚C). The complete monthly weather summaries can be downloaded from src.sk.ca/download-weather-summaries.

Table 4. Weather conditions in the 2021 growing season at the Conservation Learning Centre from the onsite SRC weather station.

	May	June	July	August	September	October	Average/Total
				--- Temperature (°C) ---			
2021	10.1	18.3	20.3	17.0	13.5	4.9	14.0
2020	9.2	13.4	17.6	16.1	10.9	1.0	11.4
2012-2020	11.4	15.9	18.5	17.1	11.4	2.9	12.9
				--- Precipitation (mm) ---			
2021	30.1	80.3	8.6	59.9	9.5	13.9	202.3
2020	68.4	91.4	32.2	33.2	31.6	10.1	266.9
2012-2020	40.4	79.6	84.6	42.9	31.2	20.7	299.4

Soil Test Results

In 2020, soil N and P was low, but K, S and most micronutrients were adequate. Soil organic matter was high at 6.5% and soluble salts were low indicating salinity was not a concern. A soil test was completed again spring of 2021 prior to seeding and indicated N and S was high and soluble salts were also slightly higher. High N could be a result of breakdown of organic material from the termination of the hay crop and residue from weeds and cover crops of 2020. Since mobile nutrients N and S and soluble salts have increased in 2021, extreme dry conditions have likely brought those nutrients and salts closer to the soil surface due to evaporation. Soil test results are available in tables 5-6.

Table 5. Basic composite soil test results from Agvise Laboratories.

Year	Depth (cm)	N (lb/ac)	P (ppm)	K (ppm)	S (lb/acre)	Zn (ppm)	OM (%)	pH	Salts (mmho/cm)
2020	**0 to 15**	19	5	293	50	3.26	6.5	6.8	0.57
	15 to 30	13			30			7.4	0.47
2021	**0 to 15**	54	4	284	20	1.52	5.3	6.3	0.42
	15 to 30	43			120+			6.7	0.73

Table 6. 2020 micronutrient, cation exchange capacity (CEC) and calcium carbonate equivalent (CCE) soil analysis at a depth of 0-15cm.

Cl (lb/ac)	B	Fe	Mn	Cu (ppm)	Mg	Ca	Na	CEC (meq)	Carbonate (CCE) (%)
10	0.9	116.1	4.8	0.74	891	4216	31	30.4	3.4

Figure 1. Early (left photos) versus late (right photos) seeding dates of sorghum-Sudan-grass seeded with 4010 forage peas in 2020 (A) vs 2021 (B). Photo taken at same time of year (September 7 or 8th). 2020 cover crops self-terminated after an early September 7th frost in 2020. Biomass was poor and weed pressure high in 2020. Killing frost occurred in October in 2021.

2020 Results

Plant density varied between cover crops as expected due to differences in seeding rates (Table 7; $p<0.0001$). Seeding date did not have an effect on plant density in 2020. Weed pressure was high during year one of the cover crop demo. There was greater weed density in the later seeded cover crops, with weed density doubling for almost all cover crops. The biomass of weeds was greater than or equal to cover crop biomass for both seeding dates, except for forage oats. However, weed pressure was still high in the forage oats. Earlier seeding date did result in greater biomass. Sudan-grass seemed to be affected the greatest by seeding date. Sudan-grass was one of the highest yielding cover crops (3980 kg/ha) when seeded July 20, but was the lowest yielding cover crop (125 kg/ha) when seeded August 4 ($p=0.001$). Sudan-grass was also the tallest cover crop when seeded early and shortest seeded late ($p<0.0001$).

The cover crop demo was deemed to be unsuccessful in 2020 due to low biomass and high weed pressure. The goal of a successful cover crop was to form a thick mat that would cover the soil and suppress weeds, while retaining moisture. As is evident in figure 1A, it was possible to see bare soil, especially for the later seeded cover crops. Weeds were excessive with a lot of volunteer alfalfa visible in the early seeded Sudan-grass with peas and volunteer brome grass in the later seeded Sudan-grass with peas.

Table 7. 2020 mean results of various organically managed cover cropping options and 2 different seeding dates near Prince Albert, SK.

Trt	Seeding Date	Crop	Crop Density†	Weed Density	Crop Biomass	Weed Biomass	Crop Height
			plants/m^2	plants/0.25m^2	kg/ha	Kg/ha	Cm
1	July 20	Spring forage oats	133 abc	10	4697 ab	2263	33 abc
2	July 20	Spring forage oats 2x seeding rate	243 ab	8	4539 a	1437	36 abc
3	July 20	Silage peas	63 bc	15	1358 ab	3531	34 abc
4	July 20	Spring forage oats with silage peas	103 abc	7	2886 ab	1614	28 abc
5	July 20	Sudan-grass	68 abc	8	3980 a	3324	55 a
6	July 20	Sudan-grass with silage peas	59 c	10	2653 ab	3074	42 ab
7	Aug 4	Spring forage oats	148 abc	12	1194 ab	482	19 abc
8	Aug 4	Spring forage oats 2x seeding rate	284 a	18	1803 ab	900	21 abc
9	Aug 4	Silage peas	83 abc	25	735 ab	559	14 abc
10	Aug 4	Spring forage oats with silage peas	139 abc	18	957 ab	978	15 abc
11	Aug 4	Sudan-grass	75 abc	23	125 b	1123	12 bc
12	Aug 4	Sudan-grass with silage peas	60 c	23	349 ab	662	10 c
		p value	<0.0001	0.0002‡	0.001	0.0028‡	<0.0001

†Means with the same letter are not significantly different (P>0.05).
‡Although p value indicates significance according to Kruskal-Wallis, Dunn pairwise comparisons did not detect a difference at p=0.05.

Year 1 (2020) did not produce a high biomass yielding cover crop for a few reasons. One issue may be the timing the hay field was terminated prior to seeding the cover crop, especially under dry conditions. When the hay field was terminated, the grass stand was tall and thick and needed to be mowed prior to cultivation. The hay stand likely depleted soil moisture reserves, and following cultivation would have further dried out an already dry soil. The brome grass and alfalfa hay stand was also not completely terminated. The hay stand should have been terminated sooner, to allow for more time for additional cultivations that would have prevented volunteer brome grass and alfalfa from appearing in the seeded cover crop. Due to dry conditions, there was concern that further working up of the hay stand would deplete moisture reserves. As evident in Table 8, volunteer brome grass and alfalfa were the most common weed present in the cover crops accounting for 75% of weeds. This was reduced drastically in 2021 to represent only 7% of total weeds (Table 9). Other factors that reduced the

success of cover crops in 2020 include lack of precipitation and an early September frost.

Table 8. Most common weed species and frequency when surveyed in late summer of 2020.

Weed Species	% Frequency
Volunteer Brome Grass	53
Volunteer Alfalfa	22
Dandelion	15
Canada Thistle	5
Smartweed	2
Wild Buckwheat	2
Other	2

Table 9. Most common weed species and frequency when surveyed in late summer of 2021.

Weed Species	% Frequency
Dandelion	61
Canada thistle	18
Horsetail	6
Alfalfa	5
Bromegrass	2
Red clover	2
Wild oat	2
Lambs quarter	2
Pea	1
Barnyard grass	1
Wild buckwheat	1

2021 Results

Even though growing conditions were hotter and drier, cover crops did better in 2021 than 2020 (Table 10). There was slightly lower and patchy emergence in the later seeded cover crops ($p<0.0001$). Cover crop density, height and biomass were all greater than 2020. In 2020, cover crop biomass ranged between 125-4700 kg/ha (Table 7). In 2021, cover crop biomass often tripled and at times are 10x greater than 2020 (Table 10). Weed density and weed biomass was drastically lower and almost non existent in 2021 when compared to 2020. In 2020, weed biomass ranged between 480-3500 kg/ha. Weed biomass was <200 kg/ha for most cover crops in 2021. Similar to 2020, Sudan-grass did very well when seeded early, but poorly when seeded later (Table 10 and Figure 2). Early seeded Sudan grass produced the greatest amount of biomass, and out performed early seeded 1x oats and oats with peas and later seed peas and Sudan-grass with or without peas ($p<0.0001$). Oats were fairly consistent producing high biomass yields at both seeding dates. There was a 5000 kg/ha biomass increase when oats were later seeded at the 2x seeding rate, however this bonus biomass did not occur for the early

seeding date. Figure 1B shows a lusher 2021 Sudan-grass and pea covercrop with minimal weeds when compared to 2020 (1A).

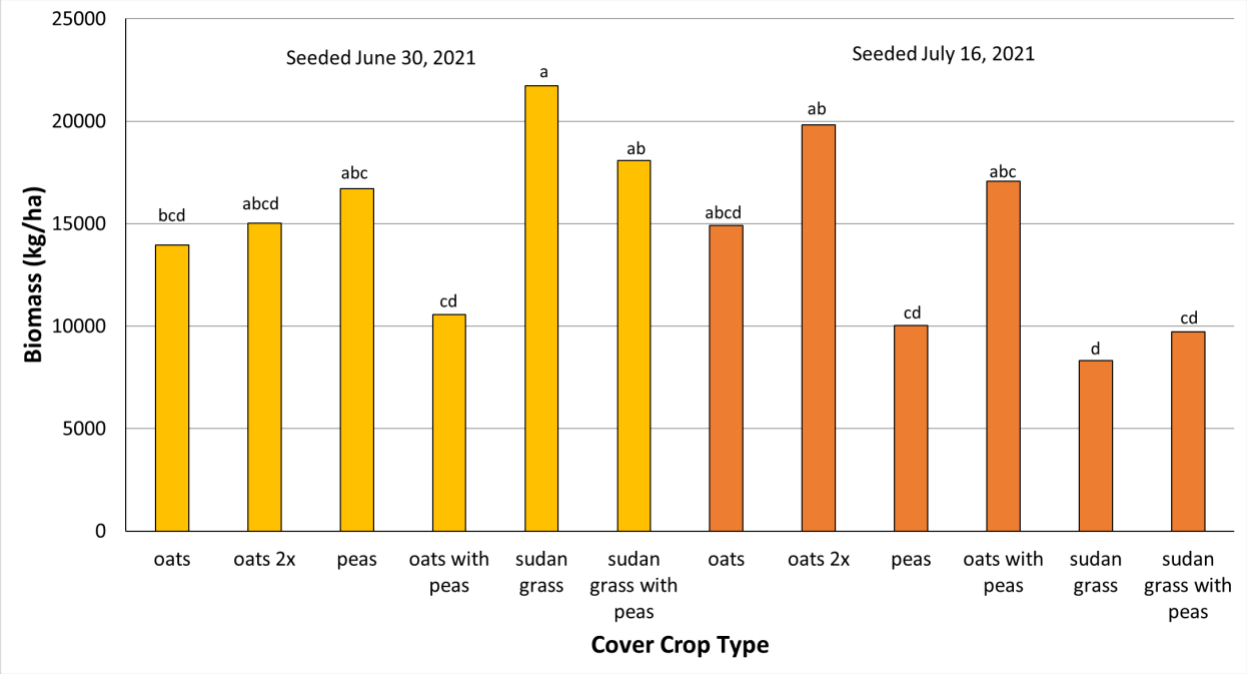

Figure 2. Mean biomass of various organically managed cover crops seeded at two different dates in 2021 near Prince Albert, SK. Means with the same letter are not significant (P>0.05). Yellow bars indicate earlier seeding date (June 30), orange bars are later seeded cover crops (July 16).

Table 10. 2021 mean results of various organically managed cover cropping options and two different seeding dates near Prince Albert, SK.

Trt	Seeding Date	Crop	Crop Density†	Weed Density	Crop Biomass	Weed Biomass	Crop Height
			plants/m^2	plants/0.25m^2	kg/ha	Kg/ha	Cm
1	June 30	Spring forage oats	243 ab	5	13970 bcd	610	62 abc
2	June 30	Spring forage oats 2x seeding rate	381 a	2	15028 abcd	174	68 ab
3	June 30	Silage peas	112 abc	2	16697 abc	183	40 cd
4	June 30	Spring forage oats with silage peas	178 abc	3	10552 cd	163	54 bcd
5	June 30	Sudan-grass	122 abc	3	21740 a	127	79 a
6	June 30	Sudan-grass with silage peas	102 abc	4	18086 ab	236	65 abc
7	July 16	Spring forage oats	158 abc	1	14924 abcd	156	59 abc
8	July 16	Spring forage oats 2x seeding rate	278 ab	0	19816 ab	27	61 abc
9	July 16	Silage peas	90 bc	0	10023 cd	50	60 abc
10	July 16	Spring forage oats with silage peas	144 abc	0	17083 abc	27	65 abc
11	July 16	Sudan-grass	66 c	2	8325 d	166	32 d
12	July 16	Sudan-grass with silage peas	88 bc	0	9730 cd	38	46 bcd
		p value	<0.0001	0.007‡	0.0122	0.2162	0.0001

†Means with the same letter are not significantly different (P>0.05).
‡Although p value indicates significance according to Kruskal-Wallis, Dunn pairwise comparisons did not detect a difference at p=0.05.

This demonstration was showcased at the CLC's 2021 Virtual Field Day. A YouTube video was created and posted on August 17, 2021 and has had 30 views. The project was also shared at the Virtual 2022 AgriARM Research Update held on January 13, 2022 that had 185 attendees. Both videos are still available to view and can be accessed through the Conservation Learning Centre's website. Due to Covid-19, an original planned in person organic Field Day was put on hold. This trial may be featured in 2022 at an organic production themed field day. A fact sheet will be created for this project.

11. Conclusions and Recommendations

It is possible to successfully grow cover crops in this region even under drought conditions. Seed bed preparation should be done well in advance to ensure good weed control and to prevent excessive drying of the soil prior to cover crop seeding. This is especially true under drought conditions. As was evident in year 2 of the study when seeding rates were increased,

seeding heavy was beneficial. Forage oats consistently performed well as a high biomass cover crop. Increasing seeding rate may have helped when oats were seeded late, but there were no differences in the 1x or 2x seeding rates when seeded early. If seeding Sudan-grass in this region under drought conditions, it needs be seeded earlier than mid-July as it is very sensitive to early fall frosts and does best under warm and wet conditions. Seeding early can help extend the growing season of cover crops, especially during years that experience an early September frost like 2020. Seeding early can also help take advantage of June and July precipitation. However, seeding early may result in additional cover crop maintenance such as mowing, which was necessary in 2021 for the early seeded oat cover crops to prevent seed set and volunteer oat plants in the future cash crop. Cover crop mixtures can be beneficial for microbes, N fixing, and as a backup for if the other cover crop species fail. Since 2020 and 2021 were excessively dry years, these results may not be relevant under more typical growing conditions for this region.

The CLC is hopeful to receive funding in 2022 to continue this project and carry out the originally planned direct seeding of a cash crop into the various cover crops. It would be beneficial to determine which cover crops continue to offer moisture and weed suppression in year 2. It would also be of interest to see the benefits of potential increased N available to the subsequent cash crop from incorporating a legume into the cover crop mixture.

Supporting Information

12. Acknowledgements

The Conservation Learning Centre graciously acknowledged the Ministry's support through signage directly in field with the project, verbally during the Field Day and on the Field Day agenda handed out to all visitors. The CLC would also like to thank local organic producers for help developing and carrying out this demonstration.

Abstract

13. Abstract/Summary

In order to showcase potential cover crop options for the region and show how seeding dates could affect their success, a cover crop demonstration was initiated in 2020. Species selected included forage oats, sorghum Sudan-grass, and forage peas. The goal of the cover crop was to produce high biomass, self-terminate, conserve soil moisture and offer weed suppression. In 2020, low soil moisture at seeding, minimal precipitation and an early September frost limited cover crop biomass and resulted in high weed pressure. The trial was restarted in 2021. To improve the likelihood of success, seeding rates were increased and seeding dates occurred earlier. Even though growing conditions were hotter and drier, cover crops did better in 2021 than 2020. While cover crop biomass only ranged between 125-4700 kg/ha in 2020, cover crop biomass was up to 10X greater in 2021. Weeds were also greatly reduced in 2021 and almost non-existent. Early seeded Sudan-grass produced the greatest amount of biomass, and out performed early seeded 1X oats and oats with peas and later seeded peas and Sudan-grass with or without peas. However, Sudan-grass was a poor performing cover crop when seeded later. Oats were fairly consistent producing high biomass yields at both seeding dates. It is possible to successfully grow cover crops in this region even under drought conditions. Seed bed preparation should be done well in advance to ensure good weed control and to prevent excessive drying of the soil prior to cover crop seeding. If seeding Sudan-grass in this region under drought conditions, it needs be seeded earlier than mid-July as it is very sensitive to early fall frosts and does best under warm and wet conditions. Seeding early can help extend the growing season of cover crops. However, early seeding may result in additional cover crop maintenance such as mowing. Cover crop mixtures can be beneficial for microbes, N fixing, and as a backup for if the other cover crop species fail. Since 2020 and 2021 were excessively dry years, these results may not be relevant under more typical growing conditions for this region. This demonstration was showcased at the CLC's 2021 Virtual Field Day and has had 30 views. Results were also shared at the 2022 AgriARM Research Update with 185 live attendees.