

2020

Ontario Cover Crop Feedback Report



Photo: Victoria Snyder

Summary

Cover crop use in Ontario has a long history. Their use has increased in recent years and the creation of the Ontario Cover Crop Action Strategy in partnership with the Ontario Agricultural Soil Health and Conservation Strategy have set new goals to facilitate widespread adoption of cover crops in Ontario. Although the expansion of cover crop adoption in the province is an indication of the benefits that some farms experience with this practice, barriers that hinder widespread cover crop adoption still exist. This makes it an important time to hear from Ontario farmers about the benefits and challenges they have experienced, their needs for research and knowledge transfer, and their feedback on what could enable wider adoption of cover crops in Ontario. To fill these knowledge gaps, the 2020 Ontario Cover Crop Feedback project was developed to provide information to farmers, agronomists, researchers, policy makers, and government organizations that will play an important role in the future of cover crops in Ontario.

For this project, it was important to hear from farms that are currently growing cover crops as well as those that are not. A total of 520 farms that grew cover crops in 2020 took part in the project and reported growing 107,900 acres of cover crops across almost every county and district in Ontario. Of the farms that responded and grew cover crops in 2020, the majority (91%) have observed benefits from growing cover crops with 68% of farms identifying that they have seen improved soil health, 59% observing less erosion, and 57% seeing increased soil organic matter. More than three quarters of farms (77%) that responded and grew cover crops in 2020 reported observing benefits within three years of adopting cover crops. Farms that grew cover crops in 2020 also identified common challenges that they faced while adopting cover crops. The most commonly observed challenges among farms that responded were related to poor cover crop establishment (30%), the late harvest of a cash crop preventing cover crop planting (27%), and the additional costs associated with growing a cover crop (25%).

This project also heard from 211 farms from across Ontario that did not grow a cover crop in 2020 to better understand their reluctance and curiosity about cover crops. Of the farms that did not grow a cover crop in 2020, 52% had not grown a cover crop before but wanted to try in the future, 9% had never grown but did not want to try, and 39% had grown a cover crop in a previous year, but not in 2020. These farms identified additional costs (41%), lack of equipment (36%), late harvest of cash crops preventing cover crop planting (29%), not knowing where to start (24%), and the shortness of the growing season (23%) as being the most common challenges limiting cover crop adoption in Ontario.

Farms that did not grow a cover crop in 2020 identified financial incentives as a potential method for enabling continued use of cover crops on their farm, with 53% identifying tax credits for planting cover crops, payments for storing carbon (43%), and payments from conservation programs (36%) as reasons that might increase the likelihood for growing a cover crop in the future. Technical assistance (40%), greater access to information on cover crop agronomy (29%), more research specific to local areas (26%) and to soil types (20%), as well as local farm tours (16%) and the creation of local networks of cover croppers (11%) were identified as common methods to enable cover crop adoption among farms that did not grow a cover crop in 2020.

This report provides the most up to date picture of current cover crop adoption in Ontario. It documents the current benefits and challenges that farms experience when growing cover crops and provides direction for researchers and policy makers on the steps that could enable further adoption in Ontario.

Authors

This project was designed, conducted and written by two researchers from the University of Manitoba who had previous expertise conducting a cover crop survey and creating a report for the Canadian Prairies. This 2020 Prairie Cover Crop Survey Report can be viewed here: <https://umanitoba.ca/agricultural-food-sciences/sites/agricultural-food-sciences/files/2021-10/2020-prairie-cover-crop-survey-report.pdf>

Callum Morrison is a graduate student at the University of Manitoba specializing in cover cropping on the Canadian Prairies and in Ontario through the Ontario Cover Crop Feedback. Callum has enjoyed connecting with farmers across four Canadian provinces for his research and learning about information dissemination and extension in agriculture. Callum holds a BSc in Agricultural Science from Scotland's Rural College (SRUC) and a MSc in Sustainable Plant Health from the University of Edinburgh.

Dr. Yvonne Lawley is an assistant professor at the University of Manitoba. Her area of research is agronomy and cropping systems. Dr. Lawley's research has focused on several crops including soybeans, corn, and wheat and a range of management practices that include residue management, strip tillage, and cover crops. Her research involves both small plot and on-farm field scale agronomy research. Dr. Lawley enjoys communicating the results of her research to a wide range of audiences including farmers, agronomists, scientists in a range of disciplines, and especially in the classrooms where she teaches at the University of Manitoba.

Contributors

Three individuals with expert knowledge about cover crops and crop production in Ontario contributed to the project design and gave advice on the writing of this report.

Anne Verhallen is a Soils Management Specialist with the Ontario Ministry of Agriculture, Food and Rural Affairs. She conducts field demonstration trials in cover crops, soil quality and irrigation, and offers technical support in the area of cover crops, erosion and compaction control, and other soil management issues related to the production of horticultural crops.

Marty Vermeij is a senior agronomist with the Grain Farmers of Ontario which represents 28,000 grain producers in the province. Marty has experience with agronomy, research, product development, marketing and management roles with seed and crop protection businesses. Marty also has hands-on experience as a farmer and knowledge of production agriculture and farming challenges.

Laura Van Eerd is a professor at the University of Guelph Ridgetown Campus specializing in how sustainable soil management practices impact primary productivity and the environment. Her research program has advanced knowledge on the role of cover crops and other management on soil health attributes and its link to primary productivity, resiliency, and enhancing nitrogen use efficiency while mitigating edge-of-field losses.

Acknowledgements

This survey project would not have been possible without Ontario farmers. We asked you for your feedback about what is happening with cover crops in Ontario, and you had a lot to say about both the opportunities and challenges that you see. When there is so much to do each day and many other surveys asking for your opinions, thank you for taking the time to partner with us in this project.

Many organizations and individuals partnered with us to spread the word about this project. This enabled us to reach farms in every corner of the province. Thank you for taking the time to call your neighbour, send an email, add the survey notice to your newsletter, publish a story about the project, or retweet a post. It was exciting to experience the strength of networks in the agricultural community throughout this project. We can accomplish so much when we work together. Thank you for making time to help make this project a success.

In kind support for this project was provided by the University of Guelph Ridgetown Campus, the Ontario Ministry of Agriculture and Rural Affairs (OMAFRA), and the Ontario Cover Crop Steering Committee organizations: Certified Crop Advisor Association (CCA), Conservation Ontario, Ecological Farmers Association of Ontario (EFAO), Grain Farmers of Ontario (GFO), Innovative Farmers Association of Ontario (IFAO), Ontario Agri-Business Association (OABA), Ontario Federation of Agriculture (OFA), Ontario Fruit and Vegetable Growers Association (OFVGA), Ontario Soil Network, Ontario Soil and Crop Improvement Association (OSCIA), and Soils@Guelph.

The maps in our report were prepared by Myra Van Die.

Where to find this report

You can access a copy of this report at: <https://gfo.ca/agronomy/soil-leadership/>

How to reference this report

Morrison, C.L., and Y. Lawley. 2021. 2020 Ontario Cover Crop Feedback Report, Department of Plant Science, *University of Manitoba*. <https://gfo.ca/agronomy/soil-leadership/>

Introduction

What are cover crops?

Cover crops are defined by the Ontario Cover Crop Strategy (<https://gfo.ca/wp-content/uploads/2020/11/Ontario-Cover-Crop-Strategy.pdf>) as plants seeded into agricultural fields, either within or outside of the regular growing season, with the primary purpose of improving or maintaining soil quality. They are non-commodity crops either inter-seeded into living crops or planted onto bare fields or crop stubble during fallow periods. They have been used for centuries to cover and protect the soil from water and wind erosion, add organic matter, reduce nutrient losses, improve soil fertility, reduce pest populations, reduce compaction, improve soil structure, and protect crops from rapid changes in temperature and moisture.

For this research project, we defined a cover crop as a crop that is planted primarily to provide soil health and other agronomic benefits that is not harvested as a major cash crop. Cover crops that are grazed as annual forage were counted as a cover crop in our definition.

Why are cover crops important?

Maintaining groundcover year-round provides greater protection for soil from water and wind erosion and provides food for soil microbes during periods when they may otherwise have been left "hungry". Plants capture solar energy and fix carbon from the atmosphere that can be returned to the soil, building soil organic matter. This increase in soil organic matter alongside the presence of cover crop roots can assist in the building of stable soil aggregates and increase soil structure and water infiltration.

It is hypothesized that cover crops could play a role in increasing the profitability and resiliency of Ontario's farms by increasing yield, nutrient cycling, and water use efficiency. Cover crops may also play a role in nutrient management by reducing fertilizer costs when using legumes that fix nitrogen, or by growing cover crops that can scavenge excess nitrogen left in the soil after a cash crop harvest which may otherwise be lost. Cover crops may also provide another management tool for weeds, insects, and diseases especially at a time of increasing resistance to current crop control products.

Why is this research important?

Cover crop use in Ontario has a long history. Some farms have been growing cover crops for decades. The creation of the Ontario Cover Crop Action Strategy and the Ontario Agricultural Soil Health and Conservation Strategy (<http://www.omafra.gov.on.ca/english/landuse/soil-strategy.htm>) have brought renewed focus and momentum to reach widespread adoption of cover crops in the province. Although the expansion of cover crop adoption in the province is an indication of the benefits that some farms experience with this practice, barriers still exist that hinder the widespread adoption needed to achieve agronomic and environmental targets for the region. This makes it an important time to hear from Ontario farms about the benefits and challenges they have experienced, their needs for research and knowledge transfer, and their feedback on what can enable wider adoption of cover crops in Ontario. To fill these knowledge gaps, the 2020 Ontario Cover Crop Feedback project was developed to provide information to farmers, agronomists, researchers, policy makers, and government organizations that will play an important role in the future of cover crops in Ontario.

Objectives

This report addresses seven major objectives:

1. Gain feedback on the current extent of cover cropping on farms in Ontario
2. Identify how cover crops are being used on Ontario farms
3. Understand why farms in Ontario are using cover crops
4. Determine what benefits farms have experienced
5. Determine what problems farms have experienced
6. Understand the barriers to widespread cover crop adoption on farms in Ontario
7. Identify what could enable Ontario farms to grow cover crops

Methods

The 2020 Ontario Cover Crop Feedback project was a voluntary online survey of Ontario farms, targeting both farms that did and did not grow cover crops during the 2020 growing season. Farms of all types and sizes in Ontario were invited to take part. Questions were asked to both farms that grew cover crops in 2020 and those that did not grow cover crops in 2020. Questions that were asked to both groups included farm characteristics, motivations, what would enable cover crop use, and where farms source information. Questions regarding cover crop agronomy, benefits, and problems were only asked to farms that grew a cover crop in 2020. Farms that did not grow a cover crop in 2020 were asked about barriers to cover crop adoption. The survey accepted respondents between February and April of 2021. A significant campaign was employed to ensure that the survey obtained responses from as wide a set of farms from as many locations across Ontario as possible. This campaign ensured that respondents came from every county and district across the province (Map 1 and Map 2, see pages 9-10) and represented many different farm types.

The 2020 Ontario Cover Crop Feedback project was supported by the organizations involved in the Cover Crop Steering Committee and was promoted through their existing networks. These and other farm organizations that helped to promote the project were the most common way that farms heard about the project to participate. In total 32% of all respondents heard about the survey this way (Table 1).

Social media was used extensively during the campaign, especially Twitter and Facebook. Facebook posts were made on agricultural, and community Facebook groups across Ontario. These groups varied in size from dozens to tens of thousands of members and ensured participation from all areas of the province. This resulted in 31% of farms identifying that they heard about the campaign through Facebook. Twitter was used extensively, and stakeholders were encouraged to tweet the survey link to encourage participation. Some of these tweets were viewed thousands of times. Approximately 13% of farms that responded heard about the project through Twitter.

Effort was made to reach farms through the news media. Interviews and appearances in local and provincial newspapers, magazines, and radio stations were made. The news media organizations were both general interest and agricultural publications. Of the farms that responded, 6% heard about the project by newspapers, 3% via magazine, 1% via podcast, and <1% via radio.

In addition, environmental organizations, agronomists, seed companies, the Provincial and Federal government, and all stakeholder groups who may be able to assist in the promotion of the project were contacted.

Table 1: Where farms heard about the 2020 Ontario Cover Crop Feedback project. The table depicts the percentage and number of farms that responded that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211). Note that for this question, farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

	Percentage of Farms That Responded		Number of Farms That Responded	
	Farms Growing Cover Crops in 2020	Farms Not Growing Cover Crop in 2020	Farms Growing Cover Crops in 2020	Farms Not Growing Cover Crop in 2020
Farm Organizations	35%	25%	182	53
Facebook	24%	46%	127	97
Twitter	15%	8%	80	16
Newspaper	6%	5%	32	10
Agronomist	6%	5%	30	10
OMAFRA	6%	11%	29	24
Another farmer	4%	6%	21	13
University of Guelph	2%	4%	13	9
Seed supplier	2%	1%	13	3
Magazine	2%	3%	12	7
Web search	1%	2%	7	4
Meeting	1%	3%	6	7
Cover crop strategies	1%	<1%	6	1
Podcast	1%	<1%	4	1
Radio	<1%	<1%	2	1

Farm number and cover crop acres

In total 731 farms responded to the 2020 Ontario Cover Crop Feedback project. Of those that responded, 520 farms reported growing 107,900 acres of cover crops in 2020 (Table 2). An additional 211 farms that did not grow a cover crop in 2020 also participated in the Ontario Cover Crop Feedback project.

The most common window for growing cover crops in Ontario (89%) is between cash crop harvest and the planting of subsequent crops (Table 2). In terms of acres, 94% of cover crop acres reported by farms that responded were grown in this way as a shoulder season cover crop. There are also some farms (23%) that grew cover crops during the main growing season either in place of a cash crop, or in between rows of perennial crops as a full season cover crop. This full season window is primarily used with horticultural and other high value crops and was grown on 6% of the cover crop acres reported by farms that responded in Ontario.

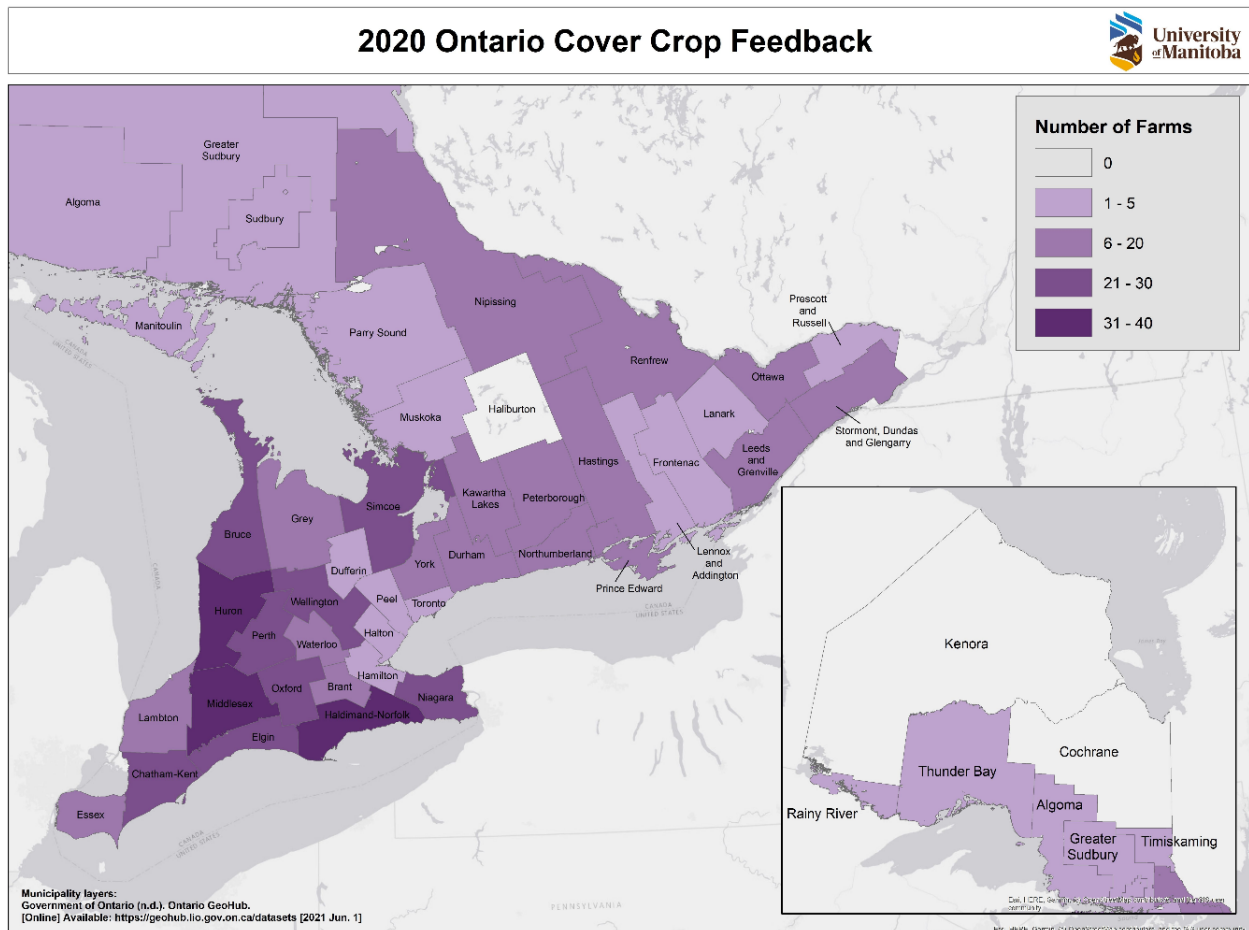
Table 2: Percent and number of farms that responded as growing cover crops to the 2020 Ontario Cover Crop Feedback project and acres of cover crops by cover crop type (N= 520). Note some farms that responded grew both a shoulder and a full season cover crop.

Cover Crop Type	Farms Growing Cover Crops in 2020		Acres of Cover Crops	
	Percentage of Farms That Responded	Number of Farms That Responded	Percentage of Acres Reported	Number of Acres Reported
Shoulder Season	89%	463	94%	101,030
Full Season	23%	122	6%	6,870
Total		520		107,900

Farm distribution

Farms that grew cover crops in 2020

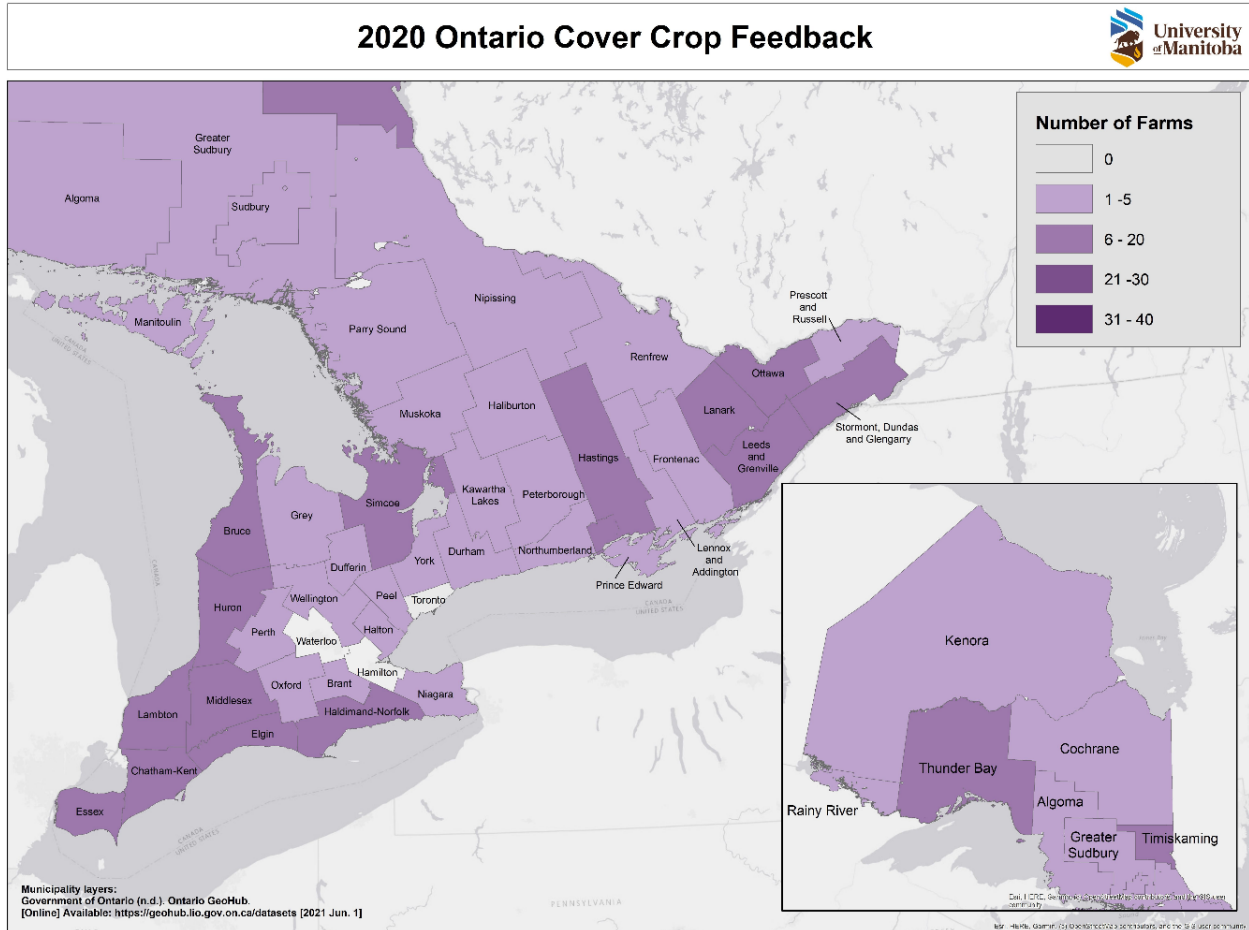
The 2020 Ontario Cover Crop Feedback project found that cover crop use on farms in Ontario is not limited to just a few areas of the province. Cover crops were grown as far north as Rainy River, Thunder Bay, Algoma, Timiskaming, and Greater Sudbury, as far south as Essex County in the extreme southwest of the province and to the east side of the province to Prescott & Russell, and Stormont Dundas & Glengarry Counties. Farms responded and grew a cover crop from every county and district in Ontario with the exception of three (Haliburton, Kenora, and Cochrane). The counties with the most respondents were located in the southwest of the province. These were Huron (40), Haldimand Norfolk (33), Middlesex (31), Oxford (30), and Perth (27).



Map 1: Number of farms in Ontario that responded to the Ontario Cover Crop Feedback project and grew a cover crop in 2020 by county or district (N = 520). Note that for this question some farms identified more than one county where they grew cover crops.

Farms that did not grow cover crops in 2020

It was important for this project to hear from farms that did not grow cover crops in 2020. Farms that participated in the project that did not grow a cover crop in 2020 came from every county and district from Ontario with the exception of three (Hamilton, Toronto, and Waterloo). The counties with the most respondents from farms that did not grow cover crops in 2020 were Ottawa (11), Huron (10), Lambton (9), Stormont, Dundas & Glengarry (8), and Thunder Bay (8).



Map 2: Number of farms in Ontario that responded to the Ontario Cover Crop Feedback project and did not grow a cover crop in 2020 by county or district (N = 211). Note that for this question some farms identified more than one county where they farmed.

Characteristics of farms that responded

The following section on the characteristics of farms that responded contains information about the 520 farms that grew a cover crop in 2020 as well as the 211 farms that did not grow a cover crop in 2020.

Experience with cover crops

Farms that grew a cover crop in 2020

Farms were asked if cover crops had been grown before the 2020 growing season. Of the farms that responded, 95% had previously grown a cover crop, with the most common length of time that farms have been growing cover crops being between 3 and 5 years (26% of farms), followed by 21% of farms growing cover crops for 6-10 years. A large number of farms also responded that they have been growing cover crops for a long time, with 18% of farms that responded having grown cover crops for more than 26 years.

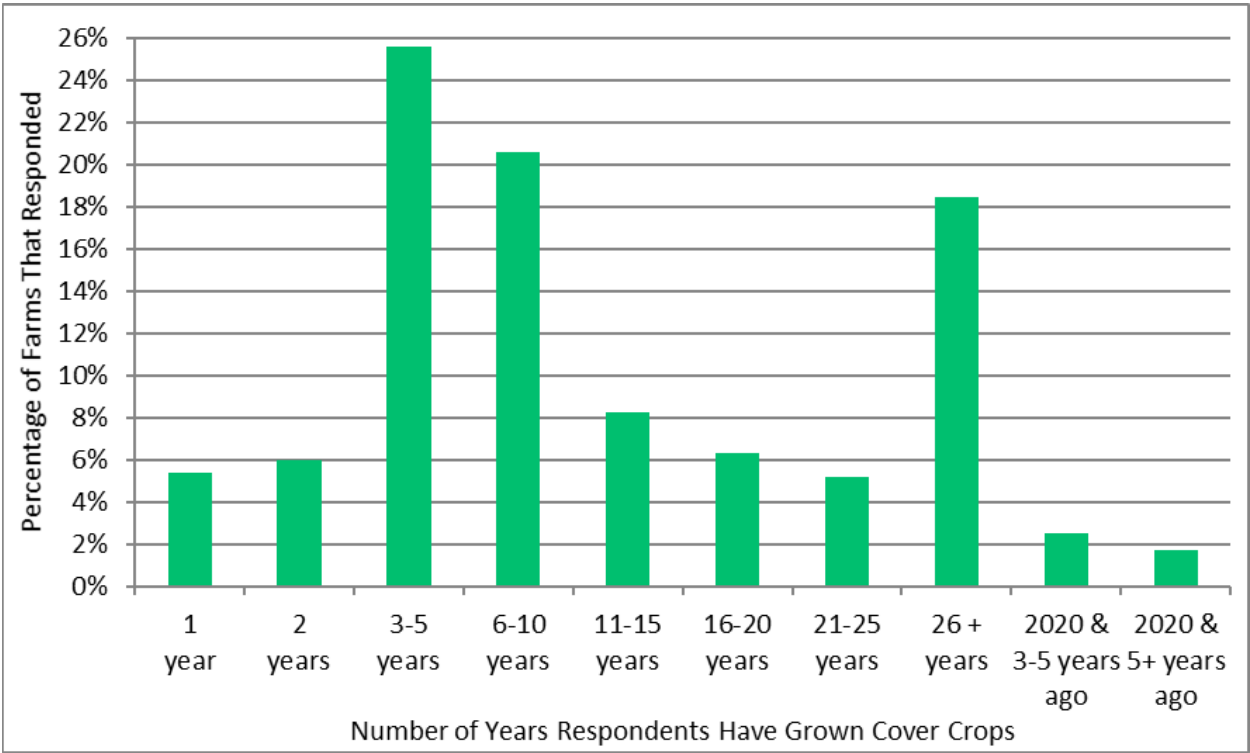


Figure 1: Number of years respondents that grew a cover crop in 2020 have grown cover crops (N = 520).

Farms that did not grow a cover crop in 2020

Farms were asked if cover crops had been grown before the 2020 growing season. Of the farms that responded, 61% of the farms that did not grow a cover crop in 2020 had never grown a cover crop previously. A sizable 52% of farms that responded had never grown cover crops previously but wanted to try growing cover crops in the future. Only 9% of farms that responded had never grown cover crops and had no interest in growing cover crops in the future. These numbers were expected as this project relied on voluntary participation. It was expected that farms with an interest in cover crops were more likely to participate. This should be considered when interpreting the results of this project.

A number of farms, 39%, had some previous experience with growing cover crops. Most of these farms have used cover crops on occasion with 29% of farms that responded using cover crops between once and five times previously. Additionally 10% of farms that responded as not growing a cover crop in 2020, had previously grown a cover crop on 11 or more occasions in the past.

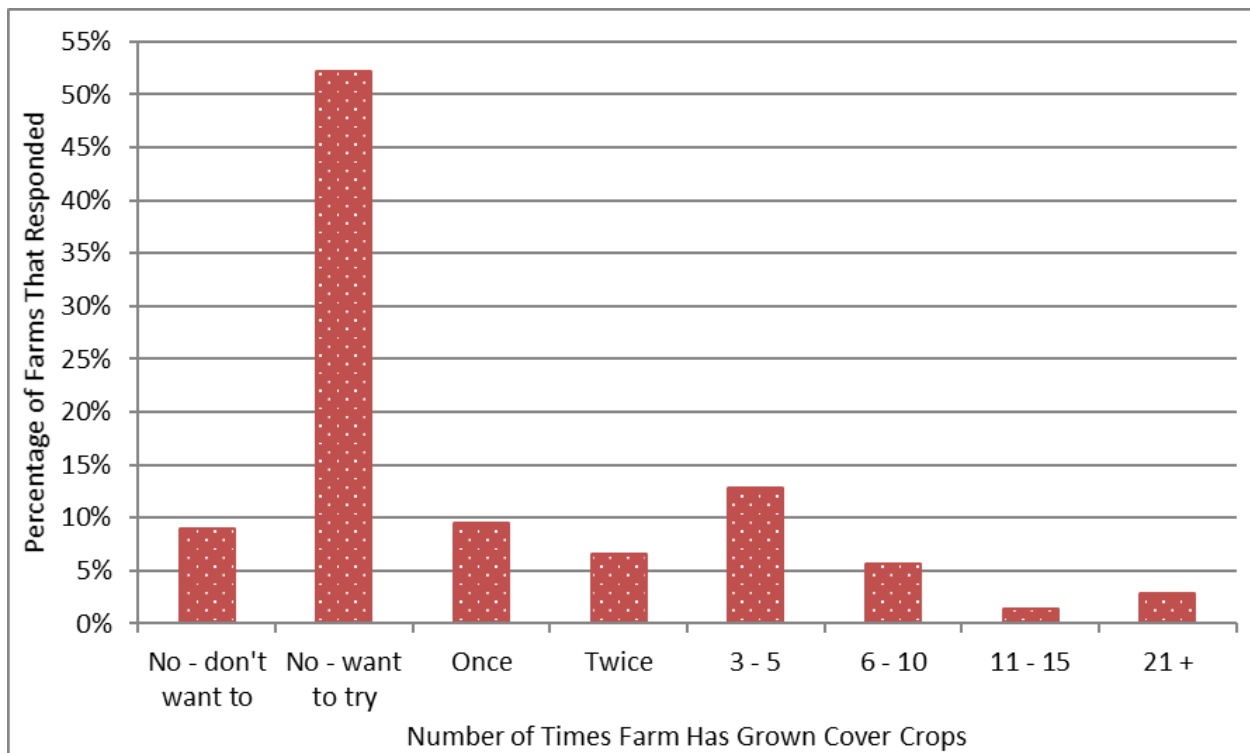


Figure 2: Number of years respondents that did not grow a cover crop in 2020 have grown cover crops in the past (N = 211).

Farm type

Respondents were asked to characterize their farm type by selecting multiple characteristics from a list. Respondents identified as having many different characteristics, with the majority of farms that grew a cover crop in 2020 (76%) identifying their farm as growing field crops. Other common farm types among farms that grew a cover crop in 2020 were livestock (42%), vegetable (23%), fruit (11%), and perennial crops (11%).

Among farms that did not grow a cover crop in 2020, the majority identified their farm type as livestock (60%), as well as field crops (58%). Other common farm types among farms that did not grow a cover crop in 2020 were vegetable (25%), perennial crops (15%), and fruit (14%).

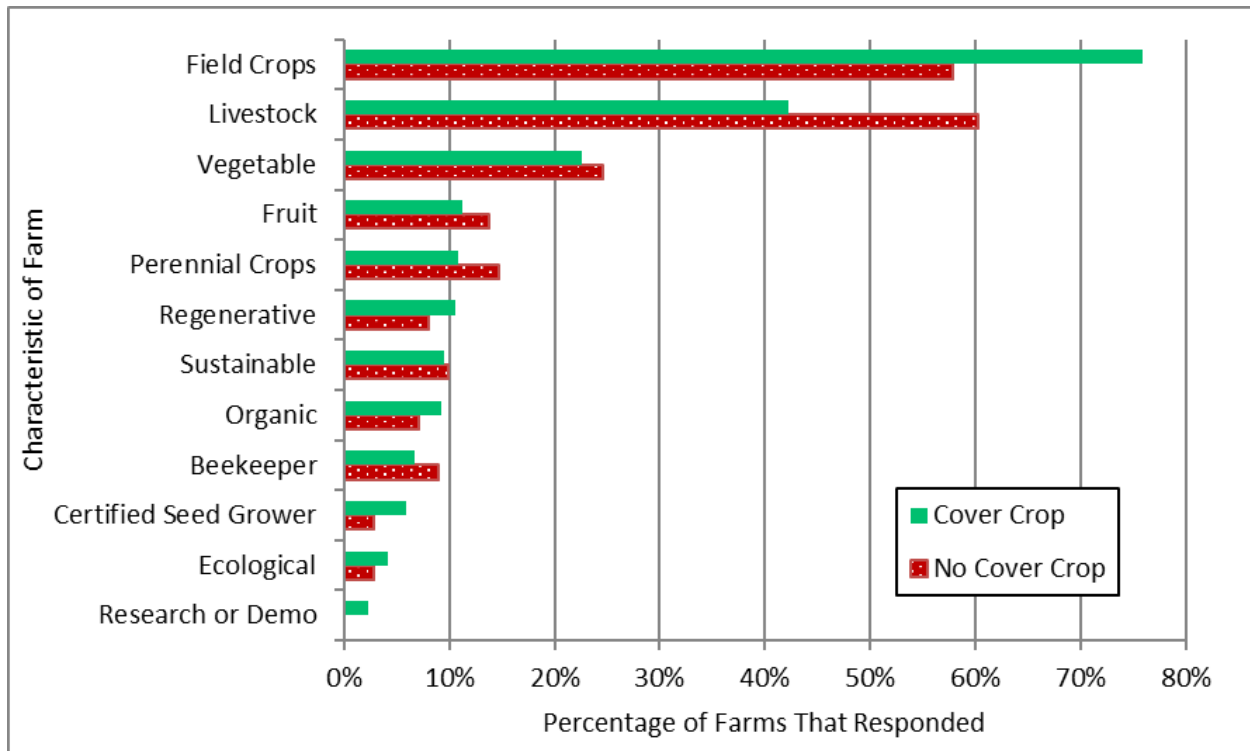


Figure 3: Characteristics of farms that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211). Note that for this question farms were asked to select all answers that applied from a list and may have selected two or more answers.

Farm size

Farms of different sizes responded to the Ontario Cover Crop Feedback project. They ranged in size from only a few acres to farms of more than 10,000 acres. The most commonly occurring farm size (the statistical mode) among farms that grew cover crops in 2020 and those that did not grow a cover crop in 2020 were both between 180 and 499 acres.

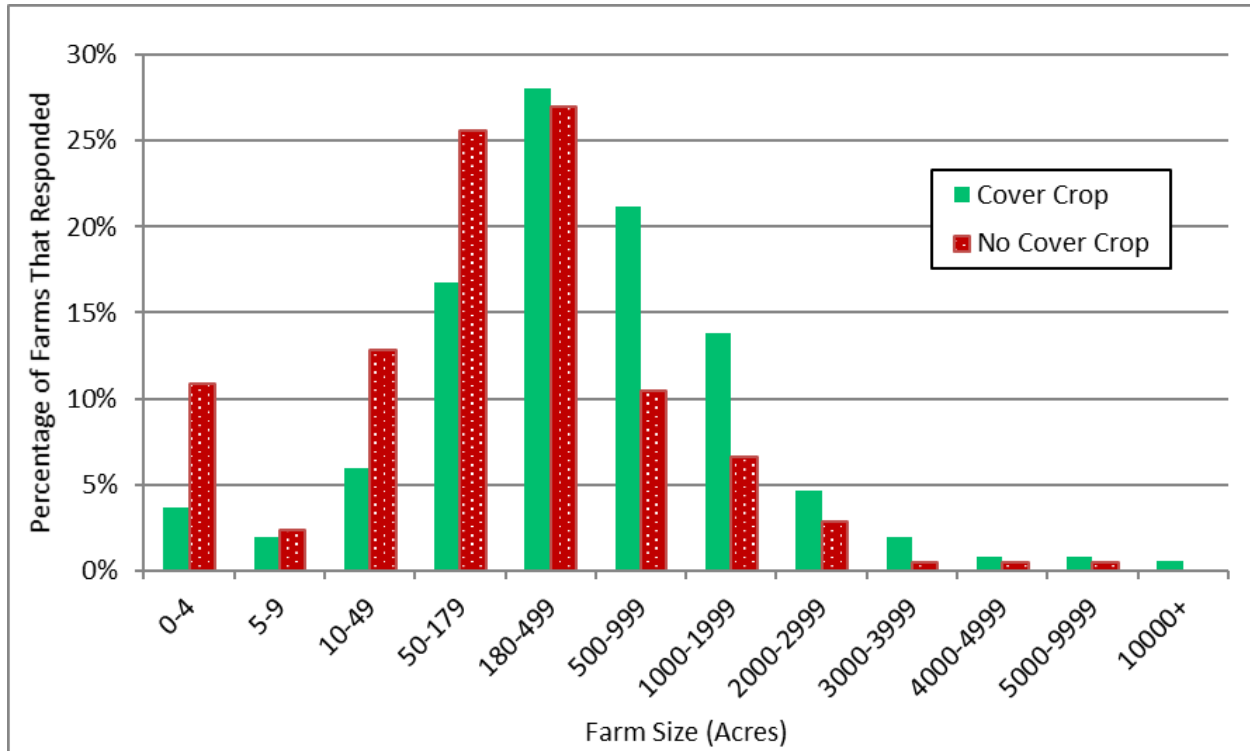


Figure 4: Distribution of farm size for farms that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211).

Livestock species

Slightly over half (51%) of the farms that grew a cover crop in 2020 and two thirds (66%) of farms that did not grow cover crops in 2020 had livestock as part of their farm operation.

The most common livestock species on farms that grew a cover crop in 2020 were beef cattle (21%), followed by chickens (eggs) (11%), dairy (11%), chickens (meat) (10%) and pigs (8%). The most common livestock species on farms that did not grow a cover crop in 2020 were beef cattle (32%), followed by chickens (eggs) (23%), chickens (meat) (16%), pigs (12%), and sheep (12%).

You may notice that the proportion of farms that have livestock in Figure 5 is different from the percentage of farms that identify livestock as a characteristic of their farm in Figure 3. This is because two different questions were asked to tell different parts of their farm story. The question asked for Figure 3 was to characterize their farm type and the question for Figure 5 asked farms to select all livestock species they had on their farm as part of their business. For this reason, some farms that have livestock as a small part of their business may not have identified as a livestock farm in Figure 3 but may still have selected that they had livestock as part of their farm business in response to the question for Figure 5.

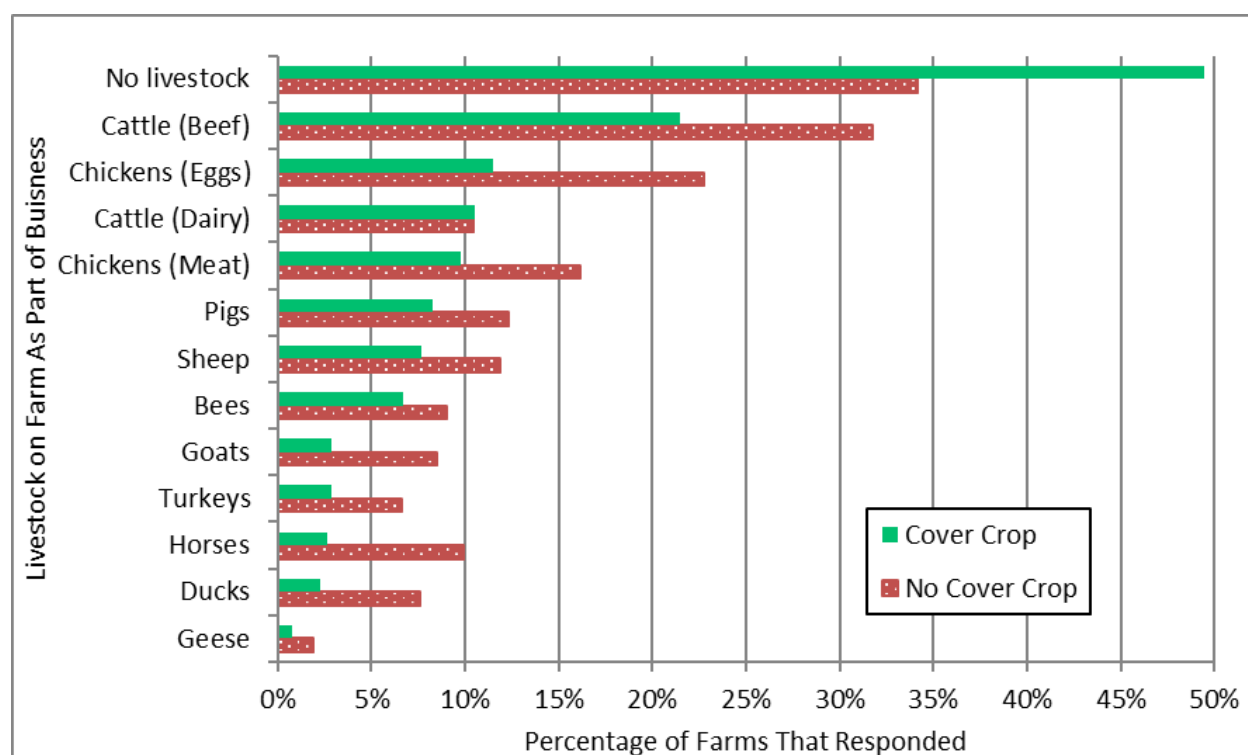


Figure 5: Livestock on farms that were part of their business for both farms that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211). Note that for this question, farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

What crops do these farms grow?

Farms were asked to identify which crops were grown on the farm. The most commonly grown crops by farms that grew cover crops in 2020 were all annual grain crops - soybean (71%), grain corn (67%), and winter wheat (66%). The most commonly grown crops on farms that did not grow cover crops in 2020 were soybean (50%), grain corn (38%), and alfalfa (33%).

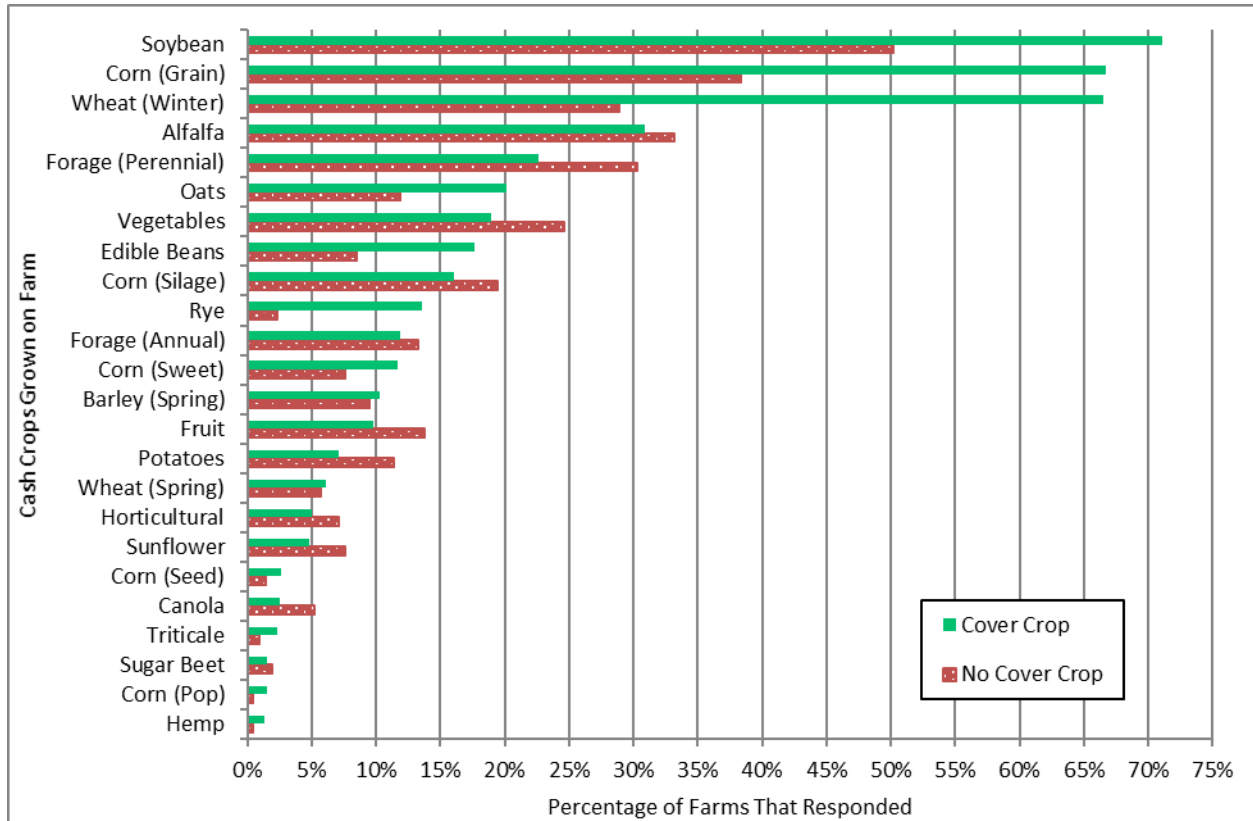


Figure 6: Cash crops grown on farms that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211). Note that for this question, farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Were farms that responded organic?

Most farms that responded were not organic for both groups including 84% of farms that grew cover crops in 2020 and 79% of farms that did not grow cover crops in 2020. Only 6% of farms who grew cover crops were certified organic on either all (4%) or part (2%) of their operation, and only 1% of farms that did not grow cover crops in 2020 were certified organic. A further 10% of farms with cover crops and 20% of farms that did not grow cover crops were not certified as organic but reported using organic management practices.

Table 3: Farms that responded by organic designation. The table depicts the percentage and number of farms that responded that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211).

Organic Designation	Farms Growing Cover Crops in 2020		Farms Not Growing Cover Crops in 2020	
	Percentage of Farms That Responded	Number of Farms That Responded	Percentage of Farms That Responded	Number of Farms That Responded
Not organic	84%	437	79%	166
Organic management	10%	53	20%	43
Certified organic: All	4%	20	1%	2
Certified organic: Some	2%	10	0%	0

Tillage practices

Of the farms that responded, both farms that grew cover crops in 2020 and farms that did not grow cover crops in 2020 were more likely to use reduced till, no till or strip till, with only 21% of farms that grew a cover crop in 2020 and 28% of farms that did not grow a cover crop in 2020 utilizing conventional tillage.

Table 4: Tillage system practiced on farms that responded. The table depicts the percentage and number of farms that responded that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211).

Tillage Practice	Farms Growing Cover Crops in 2020		Farms Not Growing Cover Crops in 2020	
	Percentage of Farms That Responded	Number of Farms That Responded	Percentage of Farms That Responded	Number of Farms That Responded
Reduced / Min Till	46%	241	44%	93
No Till	24%	126	26%	55
Strip / Zone Till	8%	44	2%	5
Conventional Till	21%	109	27%	58

Land ownership

The majority of farms that responded from both groups owned more land than they rented, with 61% of farms that grew cover crops in 2020 and 81% that did not grow cover crops owning the majority of their land. Only 14% of farms that grew a cover crop and 8% of farms that did not grow a cover crop rented more of their farmland than they owned.

Table 5: Proportion of farm owned or rented on farms that responded. The table depicts the percentage and number of farms that responded that grew a cover crop in 2020 (N = 520) and farms that did not grow a cover crop in 2020 (N = 211).

Proportion of Land Owned	Farms Growing Cover Crops in 2020		Farms Not Growing Cover Crops in 2020	
	Percentage of Farms That Responded	Number of Farms That Responded	Percentage of Farms That Responded	Number of Farms That Responded
All owned	33%	173	56%	119
Most owned	28%	146	25%	52
50 / 50	25%	128	10%	22
Most rented	11%	58	6%	13
All rented	3%	15	2%	5

Cover crop agronomy

The following section on cover crop agronomy only contains information from the 520 farms that grew a cover crop in 2020.

Proportion of farm devoted to cover crops

Of the farms that responded and grew cover crops in 2020, most farms were growing cover crops on only a portion of their land, with 70% of farms growing cover crops on 0 - 39 % of their total land area.

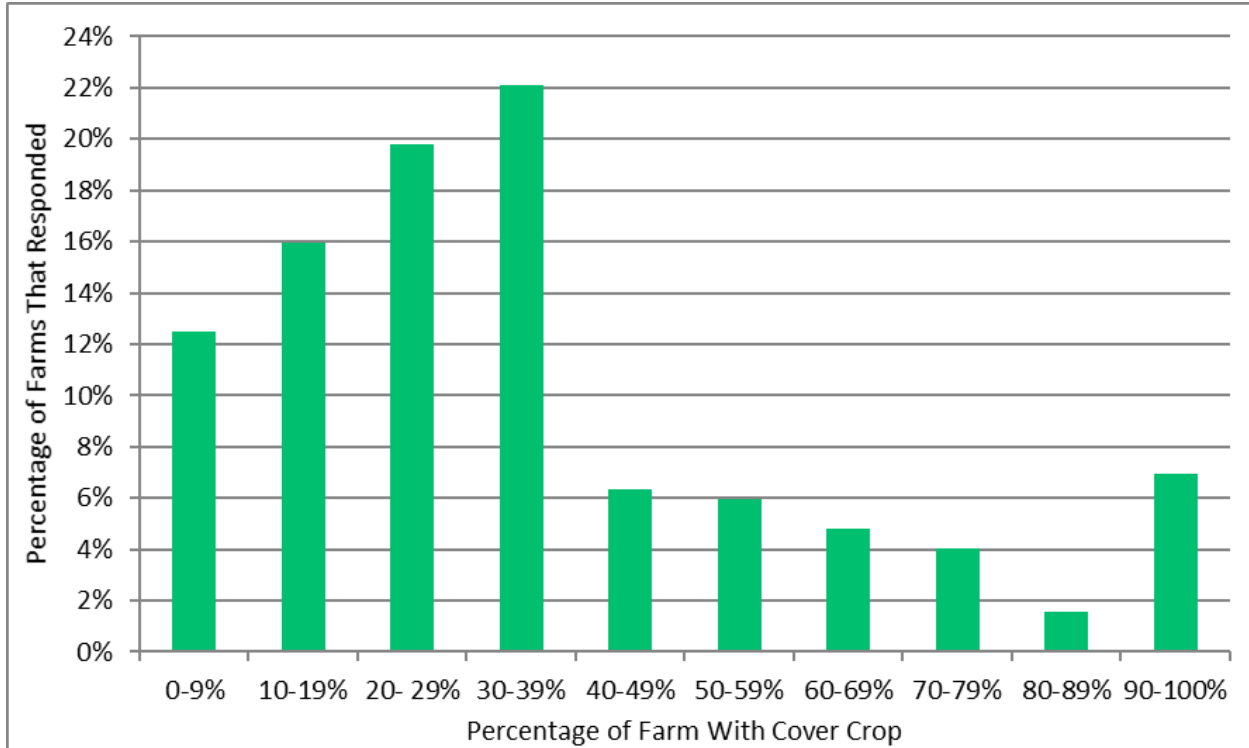


Figure 7: Proportion of farm devoted to growing cover crops on farms that responded (N = 520).

Cash crops grown before cover crops

The most common cash crop that was grown before cover crops among farms that responded were annual grain crops. The majority of farms (60%) grew a cover crop following winter wheat. The next most popular cash crops grown before a cover crop were soybean (21%) and grain corn (15%).

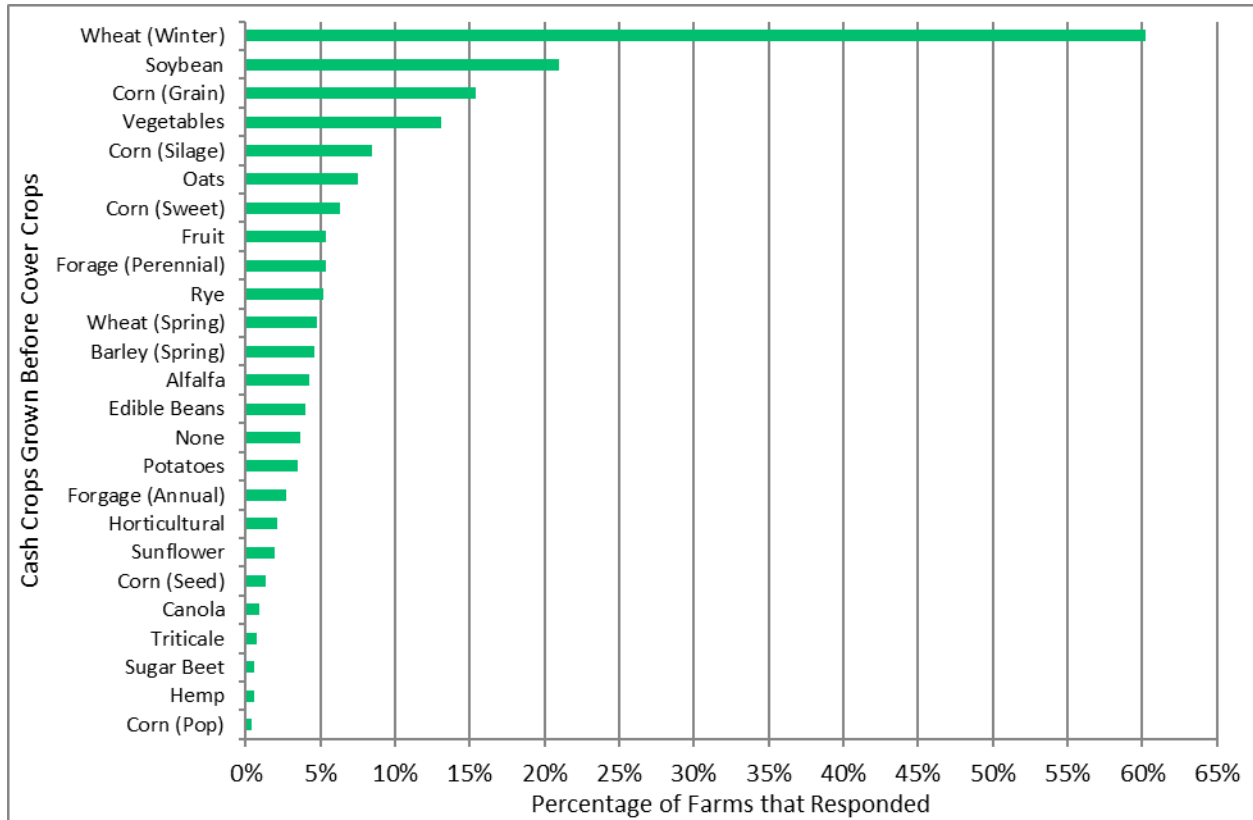


Figure 8: The top 20 cash crops grown before cover crops. The figure depicts the percentage of farms that responded and grew a cash crop before a cover crop in 2020 (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Cover crop species

By far, the most common cover crop grown by farms that responded was oats. Oats were grown by the majority (63%) of respondents, followed by fall rye (41%), radish (39%), and red clover (31%). Of the top 20 most commonly grown cover crops by farms that responded, nine were legumes, six were annual grasses, and two were brassicas. Most species grown by respondents are regarded as cool season species. Out of the top 20 cover crops grown by farms that responded, only three were warm season species (sunflower, buckwheat, and sorghum-sudan grass).

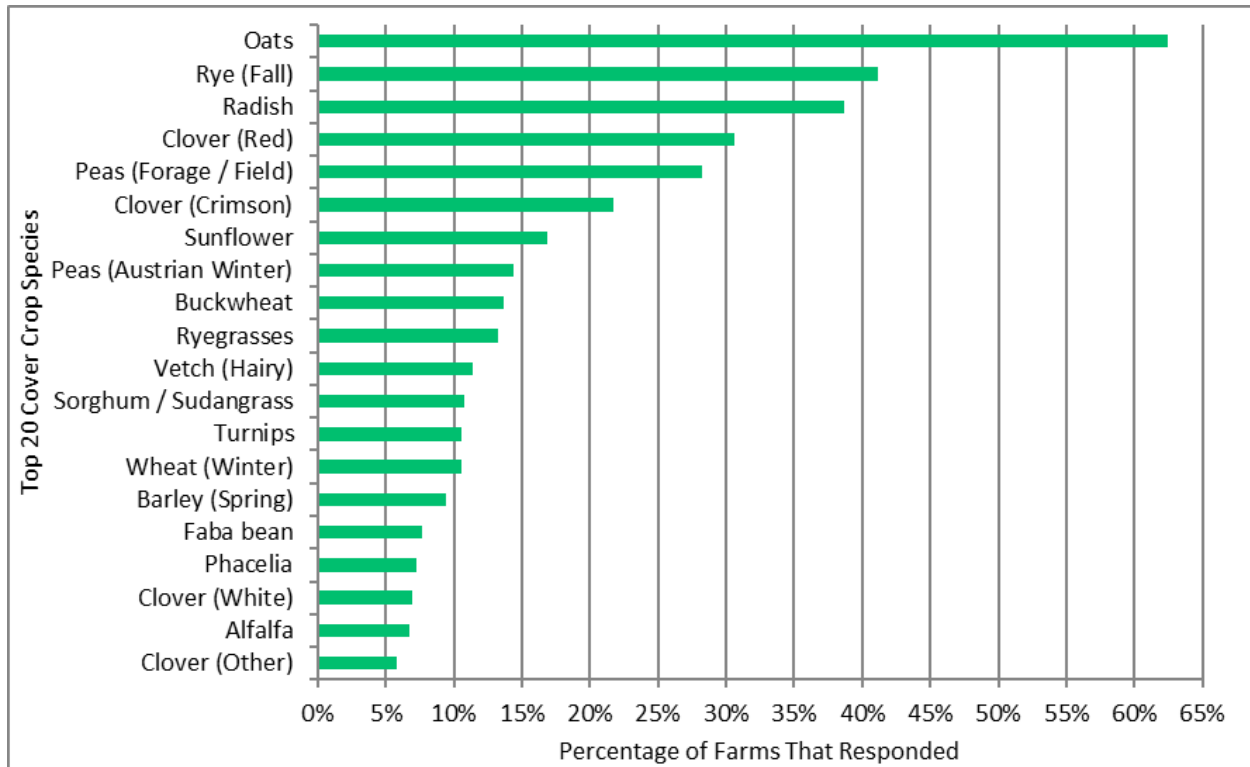


Figure 9: The top 20 cover crop species grown by farms that responded (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Properties of an ideal cover crop

Farms that grew a cover crop in 2020 were invited to select up to three beneficial characteristics of cover crops that would make a cover crop ideal to use on their farm. Limiting the question to three options allowed the most important properties to be more easily identified. It is clear that the most important property identified by respondents was the ability to build soil organic matter, with more than two thirds (68%) of farms that responded selecting this option. Following this were a group of characteristics including the ability to alleviate compaction (27%), low seed cost (26%), the ability to fix nitrogen (24%), and the ability to produce significant biomass (19%).

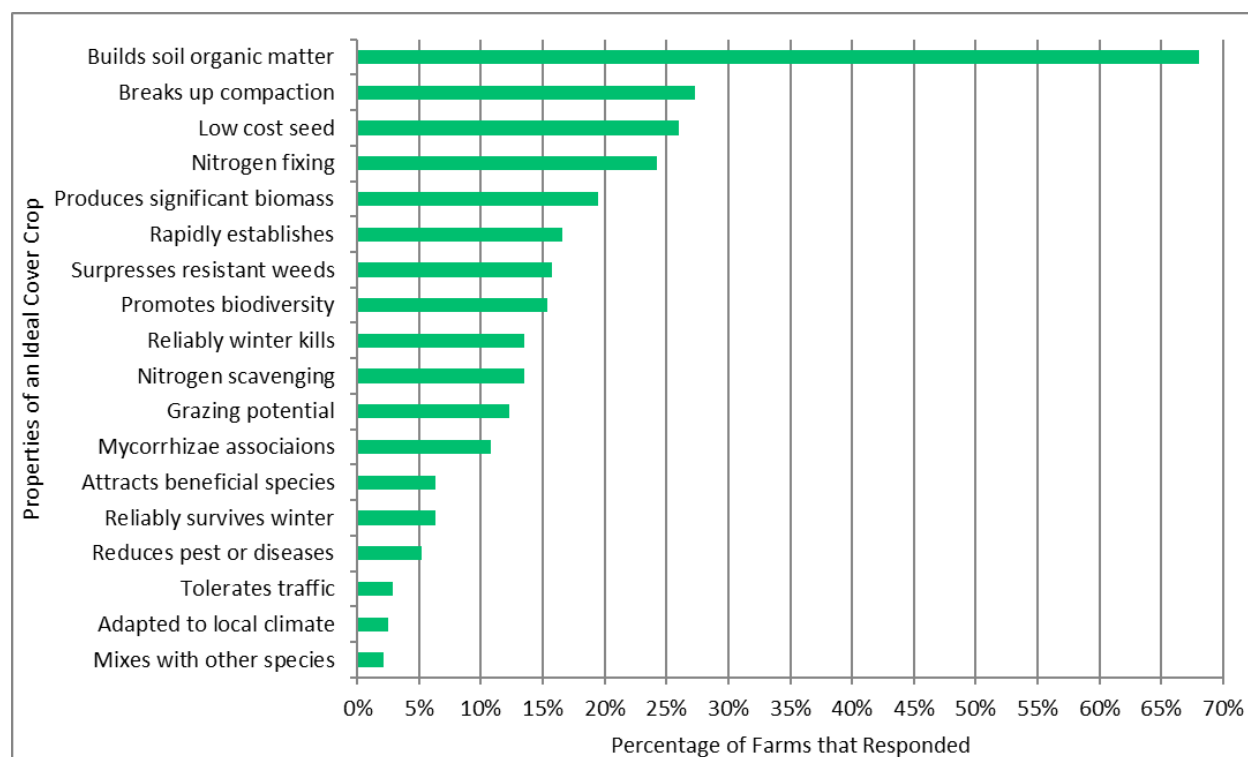


Figure 10: Properties of an ideal cover crop as selected by farms that responded (N = 520). Note that for this question farms were asked to select up to three answers that applied from a list, and so may have selected up to three responses.

Number of species in cover crop

Among farms that responded, simpler cover crop mixes were more common than complex mixes, with 43% of farms that responded growing a cover crop with just one species, and 43% of farms growing a cover crop with 2-3 species. A small proportion of farms grew a cover crop with a larger number of species and 5% of farms that responded grew more than 12 species in their cover crop mix.

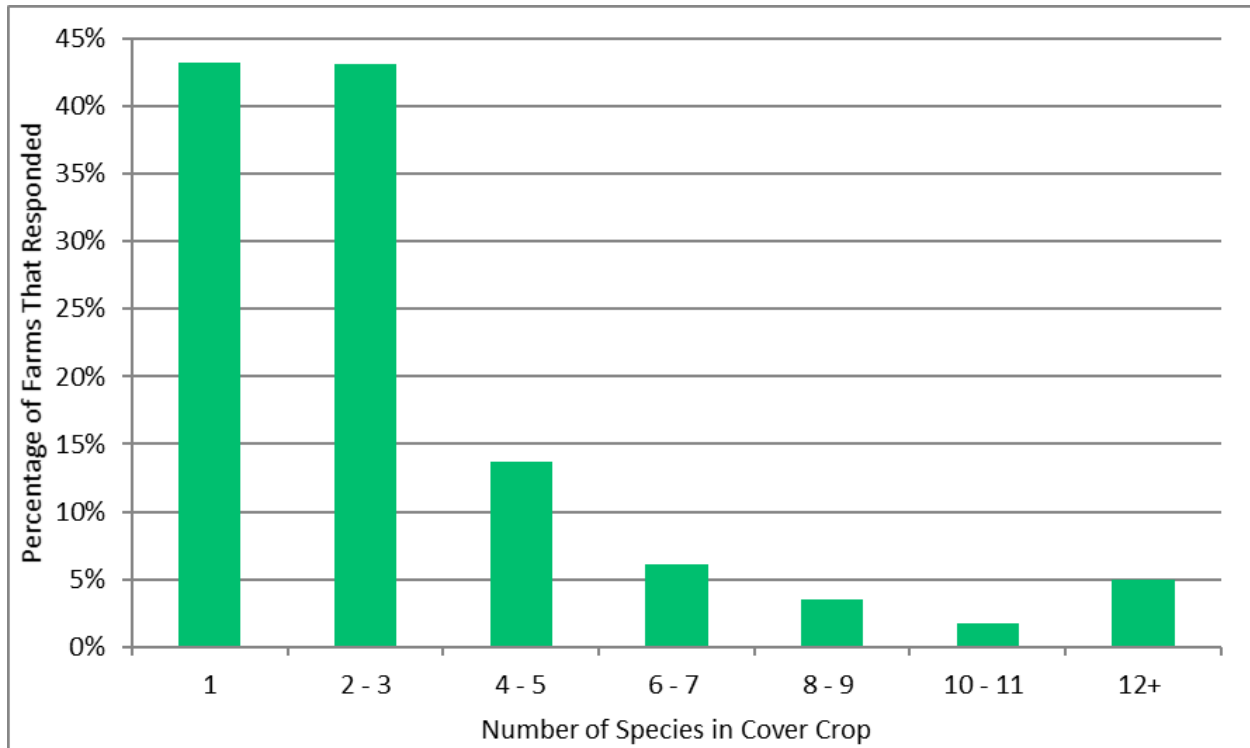


Figure 11: Number of species in cover crop (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Diversity of cover crops over time

A large proportion (43%) of farms that responded indicated that they did not change the number of species in their cover crop, and 39% increased the number of species in the cover crop they grew over time. Only 6% of farms that responded reported that they decreased the number of species in their cover crops that they grew over time. This suggests that although some farms in Ontario have increased the number of species in their cover crops over time, many farms are not making changes.

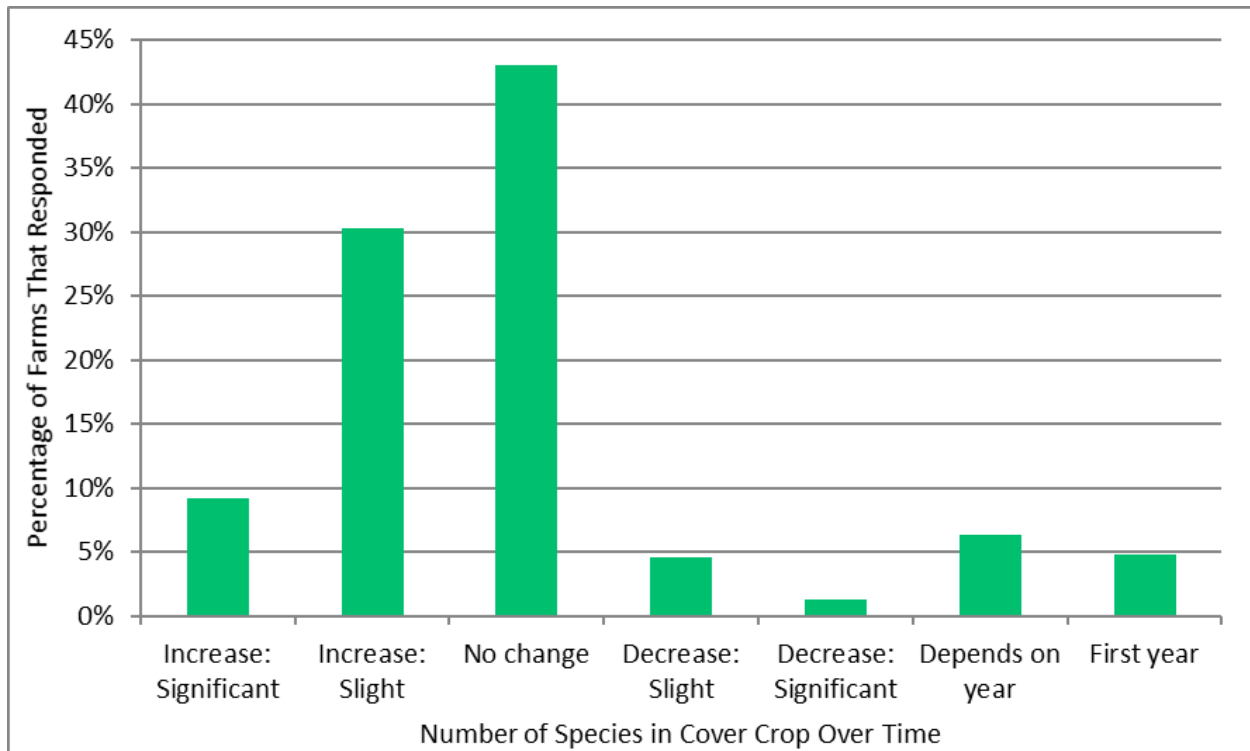


Figure 12: How the number of species in cover crops have changed over time for farms that responded (N = 520).

How cover crops were planted

The most common method of planting cover crops for farms that responded was by seed drill (50%) followed by broadcaster (40%). Other novel methods for planting cover crops included application with fertilizer or manure (11%), use of a cover crop interseeder (5%), or airplane / helicopter (2%).

Table 6: Method of planting for cover crops grown by farms that responded. The table depicts the percentage and number of farms that responded (N = 520). Note that for this question, farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Method of Planting	Percentage of Farms That Responded	Number of Farms That Responded
Seed Drill	50%	258
Broadcaster	40%	208
Tillage or residue management	15%	79
Air Seeder	13%	68
With fertilizer or manure	11%	55
Hand Seeded	7%	38
Inter-seeder	5%	28
Planter	5%	28
Airplane or Helicopter	2%	9

How farms terminated cover crops

The most common method of cover crop termination was via herbicide, utilized by a majority (56%) of farms that responded. Several other methods were also used including selecting cover crops that would winter kill (45%) as well as using tillage or incorporation (33%) and mowing (18%) to terminate cover crops. Only 9% of farms that responded terminated cover crops by grazing.

Table 7: Method of termination of cover crops grown by farms that responded. The table depicts the percentage and number of farms that responded (N = 520). Note that for this question, farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Method of termination	Percentage of Farms That Responded	Number of Farms That Responded
Herbicide	56%	293
Winter Kill	45%	234
Tillage or Incorporation	33%	172
Mowing	18%	92
Will not terminate	12%	62
Grazing	9%	45
Roller crimping	6%	32
Tarp, mulch or black plastic	4%	19

Did the cover crop start as an intercrop?

Farms establish cover crops in a variety of different ways and at different times of the year to fit into their system. The 2020 Ontario Cover Crop Feedback project found that the majority (70%) of farms that responded sowed their cover crop after they have harvested a cash crop either in late summer or in the fall. A smaller proportion of farms sowed cover crops by intercropping into standing cash crops at either an early, mid, or late stage in the cash crop growing season. An additional 15% of farms that responded used frost seeding to intercrop cover crops with cash crops. Frost seeding involves broadcasting seed on frozen ground and allowing the freeze thaw cycle to move seed into the soil allowing for germination to occur when soil thaws and proper temperature and moisture occur for germination, for example red clover frost seeded into winter wheat.

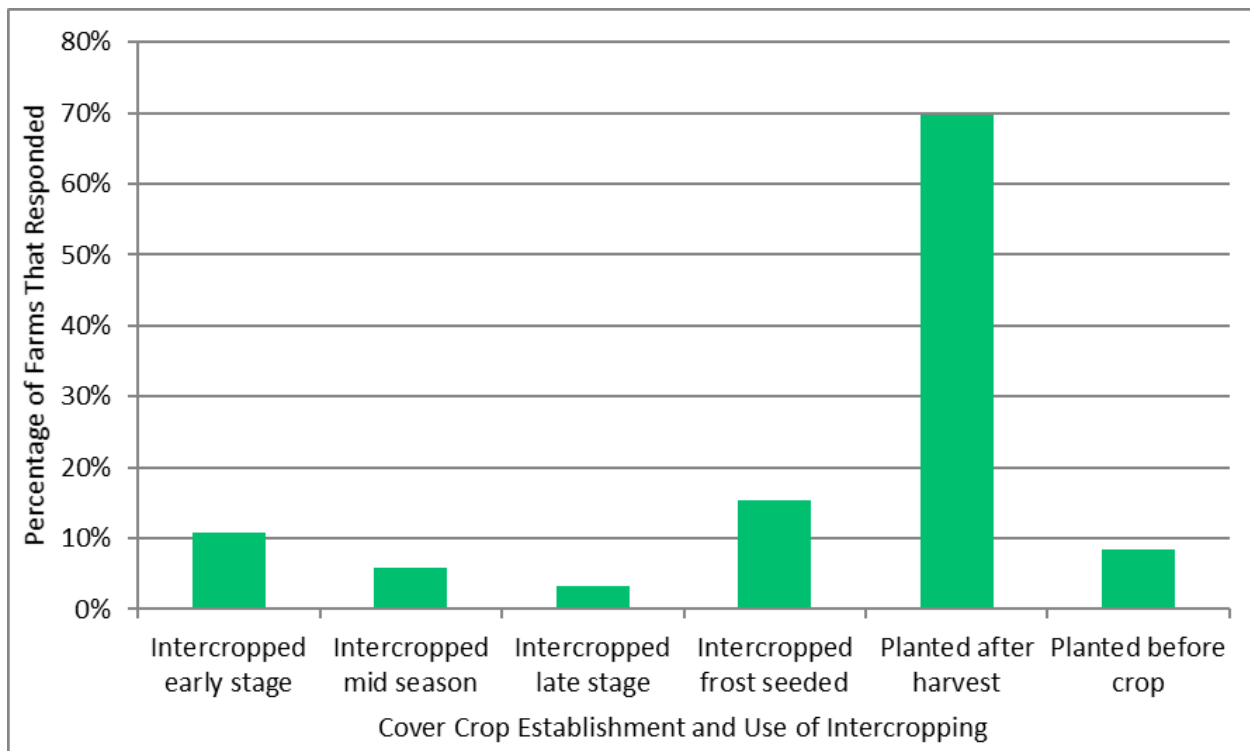


Figure 13: Cover crop establishment and use of intercropping (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Where farms sourced cover crop seed

Although it is more common for a farm that responded to the Ontario Cover Crop Feedback project to source their seed from an agricultural input retailer (47%) or a company that specializes in the sale of cover crop seed (30%), many farms grew their own seed (23%) or sourced seed from another farmer (20%).

Table 8: How farms that responded sourced cover crop seed. The table depicts the percentage and number of farms that responded in each category (N = 520). Note that for this question, farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Where farm sourced seed	Percentage of Farms That Responded	Number of Farms That Responded
Agricultural input retailer	47%	246
Specialist cover crop dealer	30%	157
Grew own seed	23%	121
Another farmer	20%	106
Grain elevator / Ag company	18%	95

Cost of cover crop seed

The amount paid for cover crop seed by farms that responded to the feedback project varied greatly, with some paying less than \$5 per acre, growing their own seed, or sourcing the seed for free. On the other end of the distribution, 4% of farms were paying more than \$70 per acre. However, the most common amount (the statistical mode) spent by farms on cover crop seed per acre is in the range of \$16 - \$20 per acre, with 21% of farms that responded identifying this value.

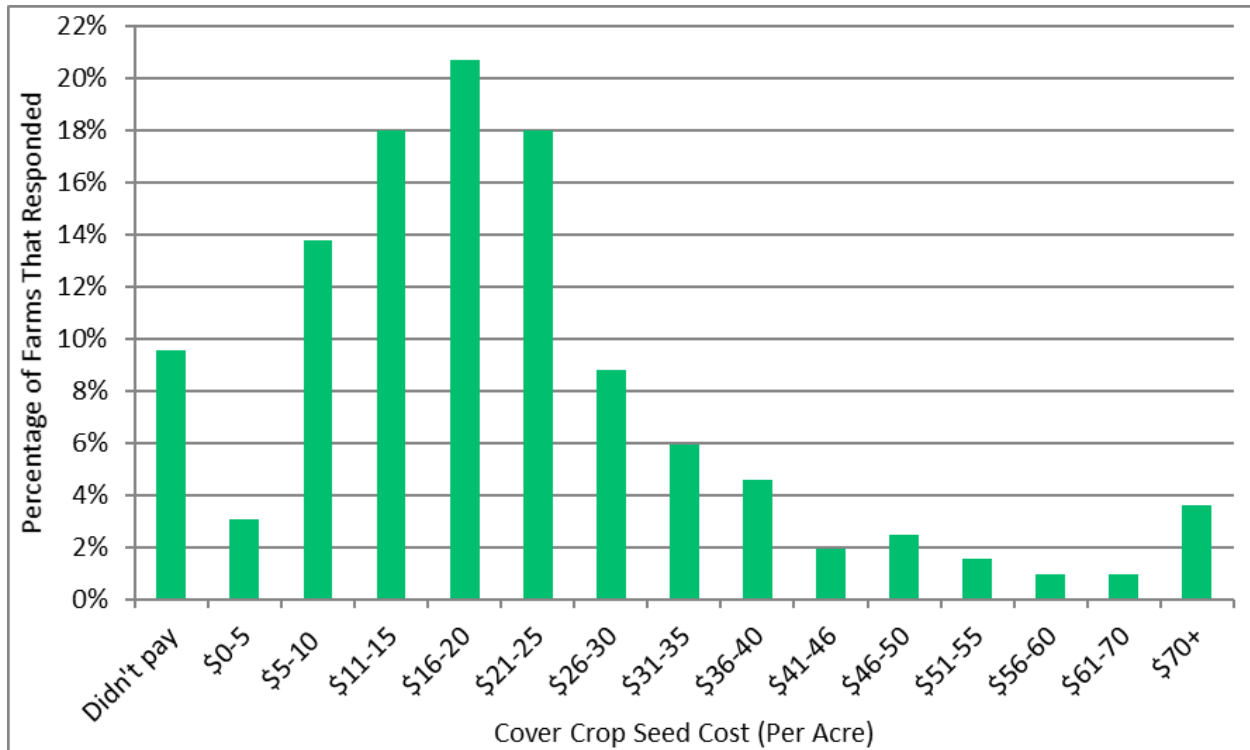


Figure 14: What farms paid for cover crop seed per acre (N = 520). Note that for this question, farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Motivations and Benefits

The following section on the motivations and benefits contains information about the 520 farms that grew a cover crop in 2020 as well as the 211 farms that did not grow a cover crop in 2020.

Goals for cover crops

Farms that grew a cover crop in 2020

Farms grow cover crops to meet specific goals. These goals can vary greatly depending on the realities of an individual farm. These goals are the basis from which farms decide on a cover crop and what management will be employed

Among farms that grew a cover crop in 2020, the most common reasons identified as to why cover crops were grown by respondents to the Ontario Cover Crop Feedback project were to build soil health (85%) and to increase soil organic matter (83%). Other common responses provided by a majority of farms that responded were for erosion control (67%), weed suppression (65%), keeping living roots in the soil (64%), and to feed soil microbes (59%). Half of farms that responded grew a cover crop to improve infiltration of water into the soil.

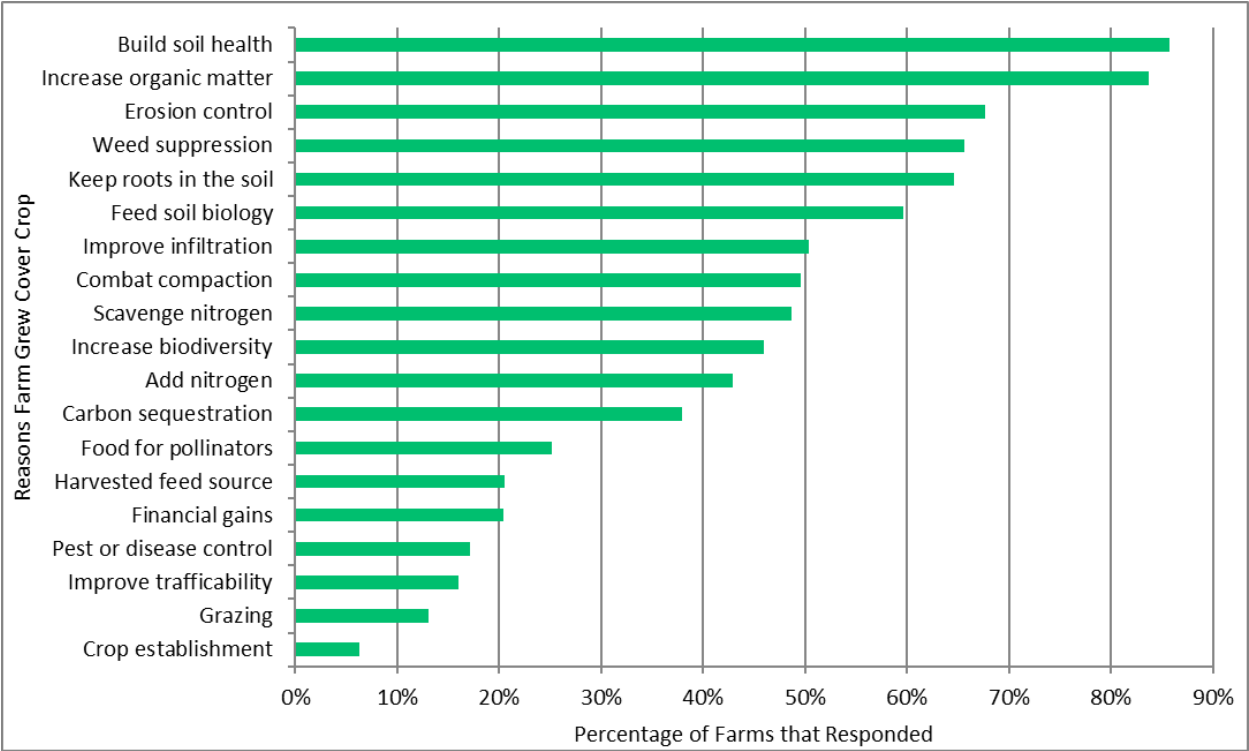


Figure 15: Reasons why farms that responded grew cover crops (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Farms that did not grow a cover crop in 2020

Among farms that did not grow cover crops in 2020, the most common reasons identified as to why cover crops may be grown in the future were to build soil health (69%), to increase soil organic matter (67%), and for weed suppression (53%). Other common responses were for erosion control (48%) and to feed soil biology (46%). Only 8% of farms that responded identified that the farm was unlikely to grow cover crops in the future.

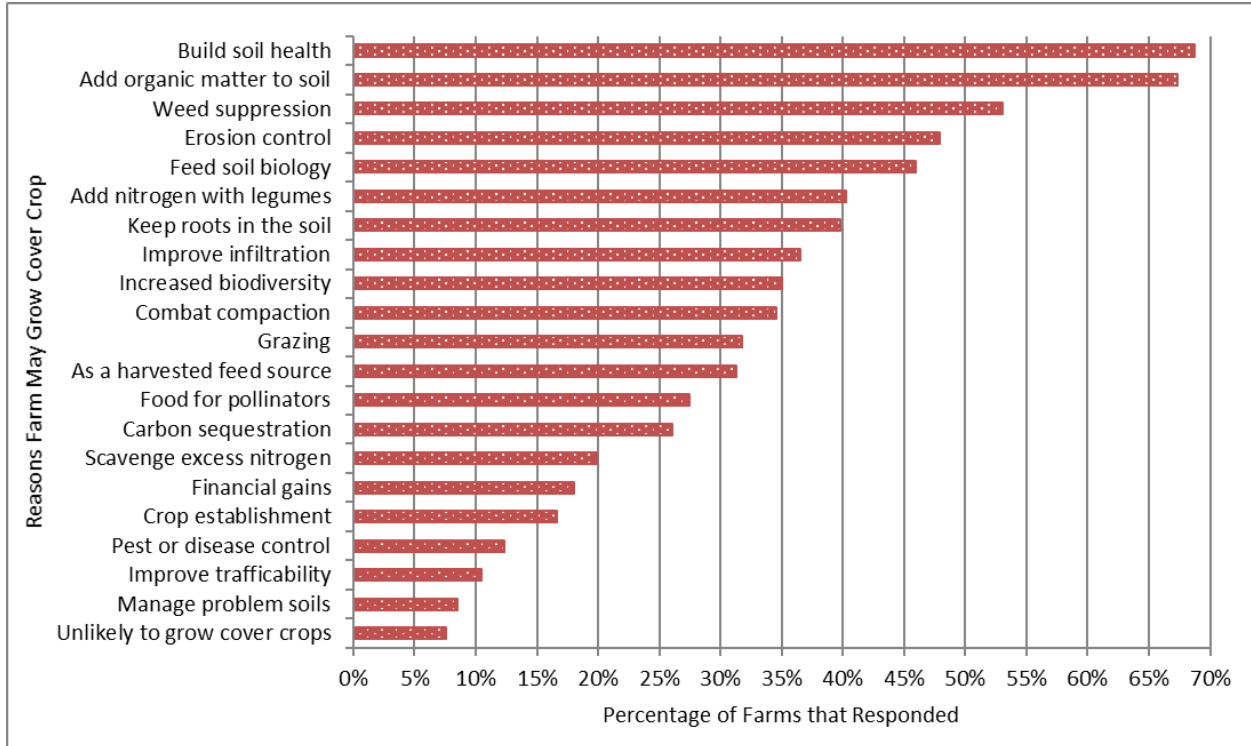


Figure 16: Reasons farms may grow cover crop in future for farms that responded and did not grow a cover crop in 2020 (N = 211). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Benefits experienced with cover crops

Respondents that grew a cover crop in 2020 were asked to identify the benefits that have been observed from using cover crops. The majority of farms (91%) that responded reported seeing benefits from growing cover crops, with most farms (68%) reporting seeing improved soil health. The majority of farms that responded also reported seeing less erosion (59%) and increased soil organic matter (57%). An increased abundance of earthworms (44%) and increased infiltration (41%) were also featured in the top five most common benefits experienced with cover crops.

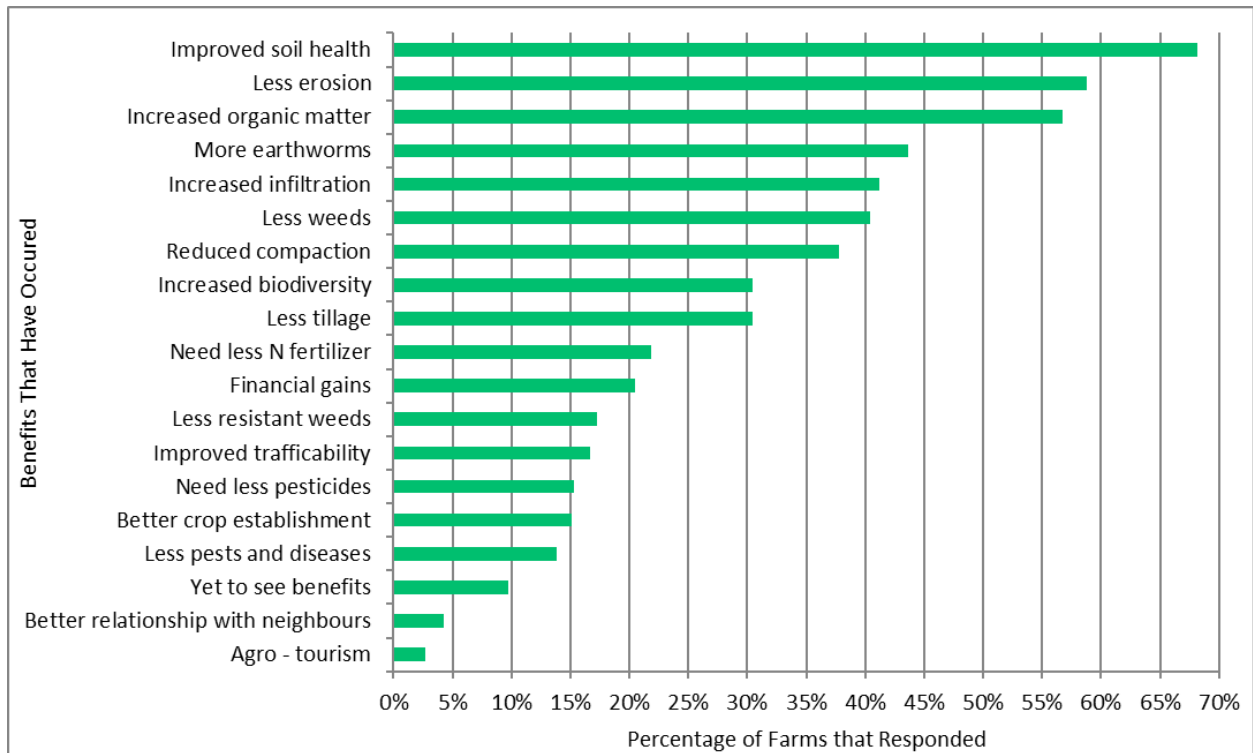


Figure 17: Benefits that have occurred with growing cover crops for farms that responded (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

How long it took for farms to observe benefits

One of the most frequently asked questions surrounding cover crop use in Ontario is how long does it take to see benefits when using cover crops, and so the 2020 Ontario Cover Crop Feedback project asked farms how many years it took to see benefits. Over three quarters of farms (77%) saw benefits from growing cover crops within three years. Over 40% of farms that responded saw benefits from growing cover crops within one year.

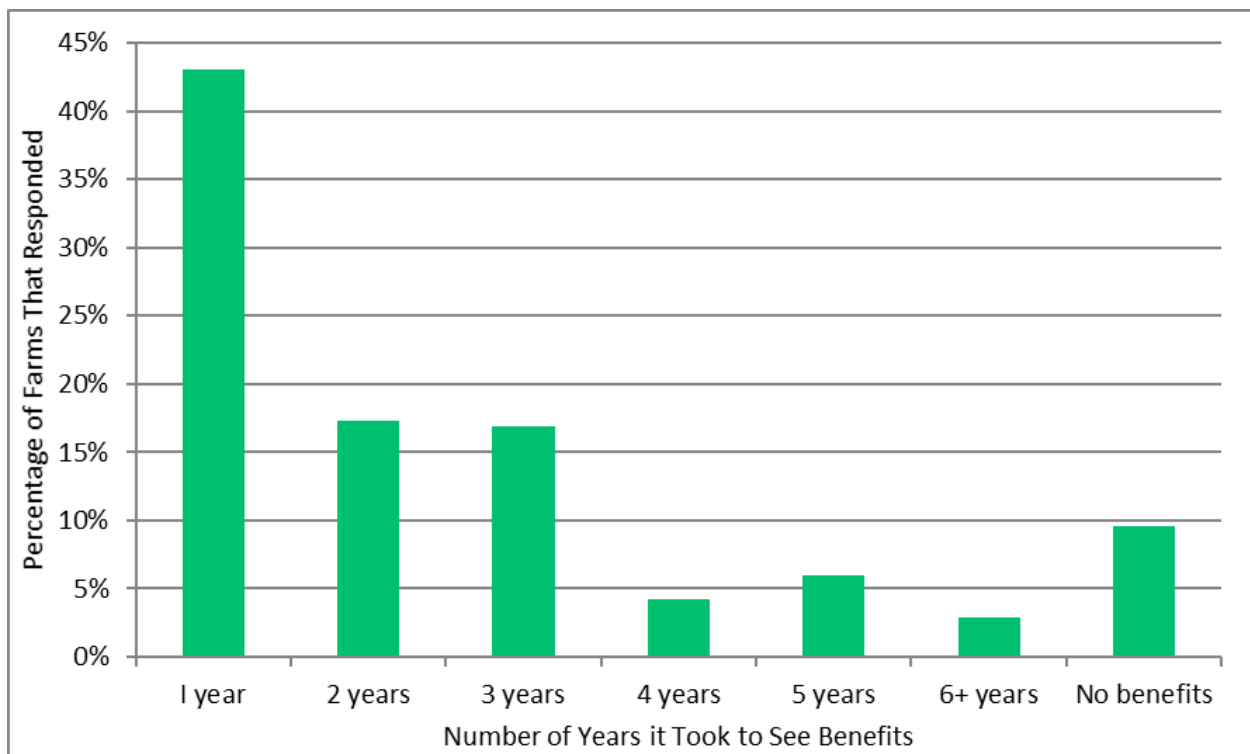


Figure 18: Number of years it took for farms that responded to see benefits from cover crops (N = 520).

How cover crop acres changed over time

It was hypothesized that many farms in Ontario initially start using cover crops on a small proportion of their farm area. Over time, cover crop acres are likely to be increased if it is determined that cover crops have a fit in their rotation. It is important to ask if farms increased or decreased cover crop use over time, as a trend in either direction may indicate the level of confidence respondents have for using cover crops on their farms. A farm is hypothesized to increase or not change cover crop acres if there is confidence that cover crops have a place on their farm.

Almost half (49%) of farms that responded increased the number of acres of cover crops they grew over time, and 30% identified no change in cover crop acres. Only 2% of respondents reported that their farm decreased cover crop acres over time. These results indicate that respondents see a fit for cover crops use on their farms.

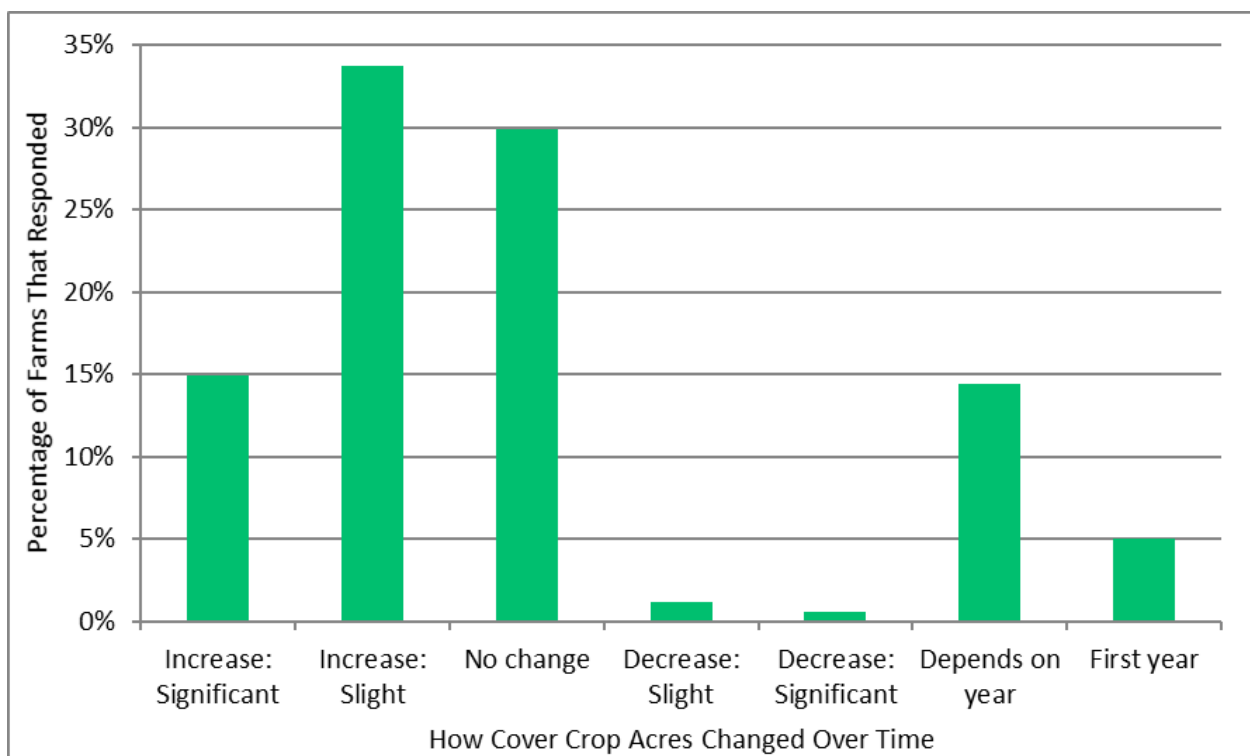


Figure 19: How cover crop acres changed over time on farms that responded (N = 520).

How cover cropping influenced tillage

Growing cover crops may impact the use of tillage in different ways. Using cover crops may reduce tillage as they are often growing at the time of year when tillage is typically practiced, such as the fall or spring. In contrast, the use of tillage could also increase if used for cover crops termination. Tillage can be associated with negative soil health outcomes, including an increased risk of erosion and loss of soil carbon. Therefore, it is important when assessing the positive and negative influences of cover crop use in Ontario to understand how the use of cover crops affected tillage. Of the farms that responded, the largest proportion (44%) identified that tillage had decreased on their farms with the use of cover crops. A lower percentage of respondents (34%) identified that cover crops had no change on the use of tillage on their farm. Another 17% identified that their farm had seen an increase in the tillage used on the farm.

When interpreting this question, it is important to note the tillage practices used by the participating farms by referencing Table 4. Most farms that responded and grew a cover crop in 2020 are already using some form of conservation tillage, with only 21% utilizing conventional tillage.

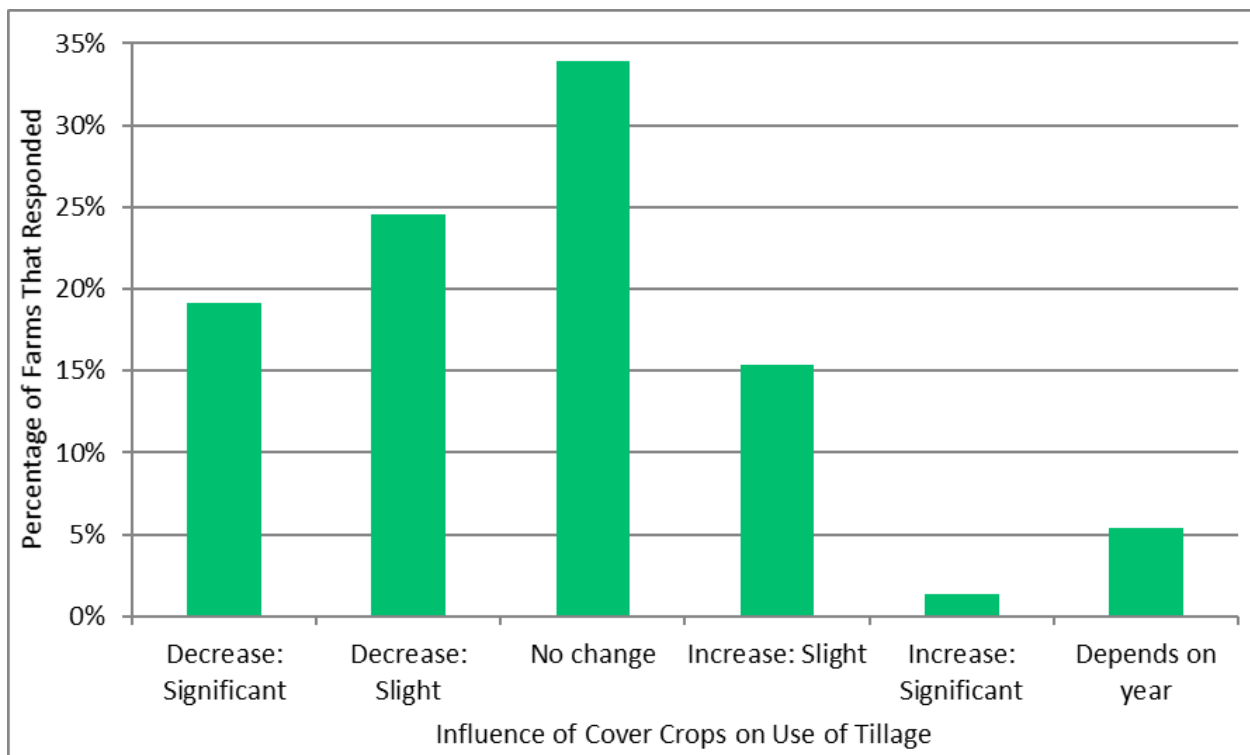


Figure 20: Influence of cover crops on use of tillage on farms that responded (N = 520).

How cover cropping influenced farm profit

The impact of cover crops on profitability is an important question. A sizable proportion (37%) of farms that responded identified they saw an increase in farm profit and 31% identified that cover crops resulted in no change to their profit. Only 4% identified that their farm had seen a reduction in their farm profit with cover cropping. Although at first glance these results may be seen to suggest that cover crops may be having a neutral or even positive effect on farm profit in Ontario, it is important to note that a substantial proportion (28%) of farms that responded were not able to identify the influence of cover crops on farm profit. This group did not know how cover crops affected farm profit or identified that it depends on the year. This is an important area for future research and extension.

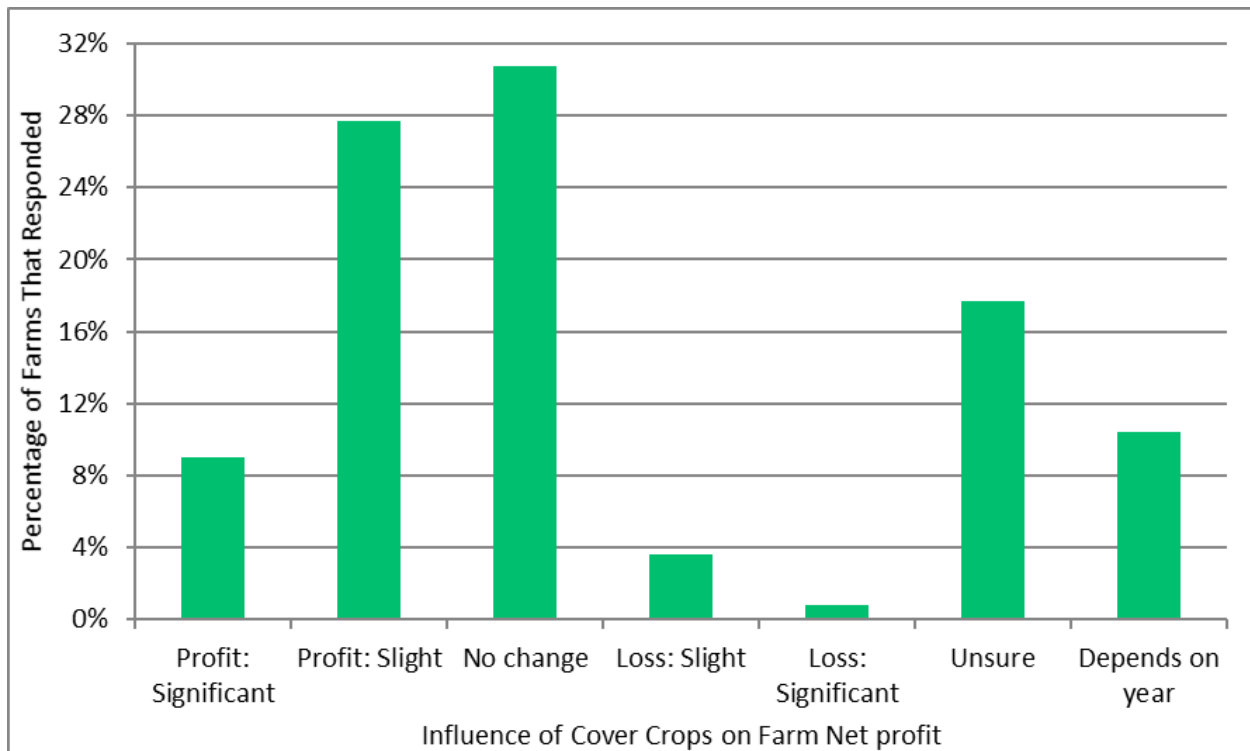


Figure 21: Influence of cover crops on farm profit for farms that responded (N = 520).

Challenges and barriers

The following section on the challenges and barriers contains information about the 520 farms that grew a cover crop in 2020 as well as the 211 farms that did not grow a cover crop in 2020.

Challenges experienced with cover crops

Farms that grew a cover crop in 2020

It is crucial that any investigation into cover crop use in Ontario not only draws attention to the benefits of cover crops but also to the challenges and risks associated with cover crop use. By measuring the risks associated with cover crop use in Ontario, farms can gain important insight into what risks they may encounter, be able to take an informed approach for growing cover crops and have a better idea of how to mitigate problems if they arise. Identifying the most common problems farms are facing when growing cover crops in Ontario also directs researchers and policy makers to the areas of greatest need for enabling cover crop use.

The 2020 Ontario Cover Crop Feedback project identified that the majority (82%) of farms that responded have experienced at least one problem over the years they have been growing cover crops. The most common problem experienced by Ontario farms that responded was a cover crop being too sparse or not growing at all due to poor establishment (30%). Other common problems included the late harvest of a cash crop preventing cover crop planting (27%), the additional costs associated with a cover crop (25%), and the shortness of a growing season (21%). Interestingly, only one farm out of the 520 that responded selected the option “the old system worked better.” This could be seen as one of the strongest indicators that the farms that responded are confident cover crops have a place on their farms.

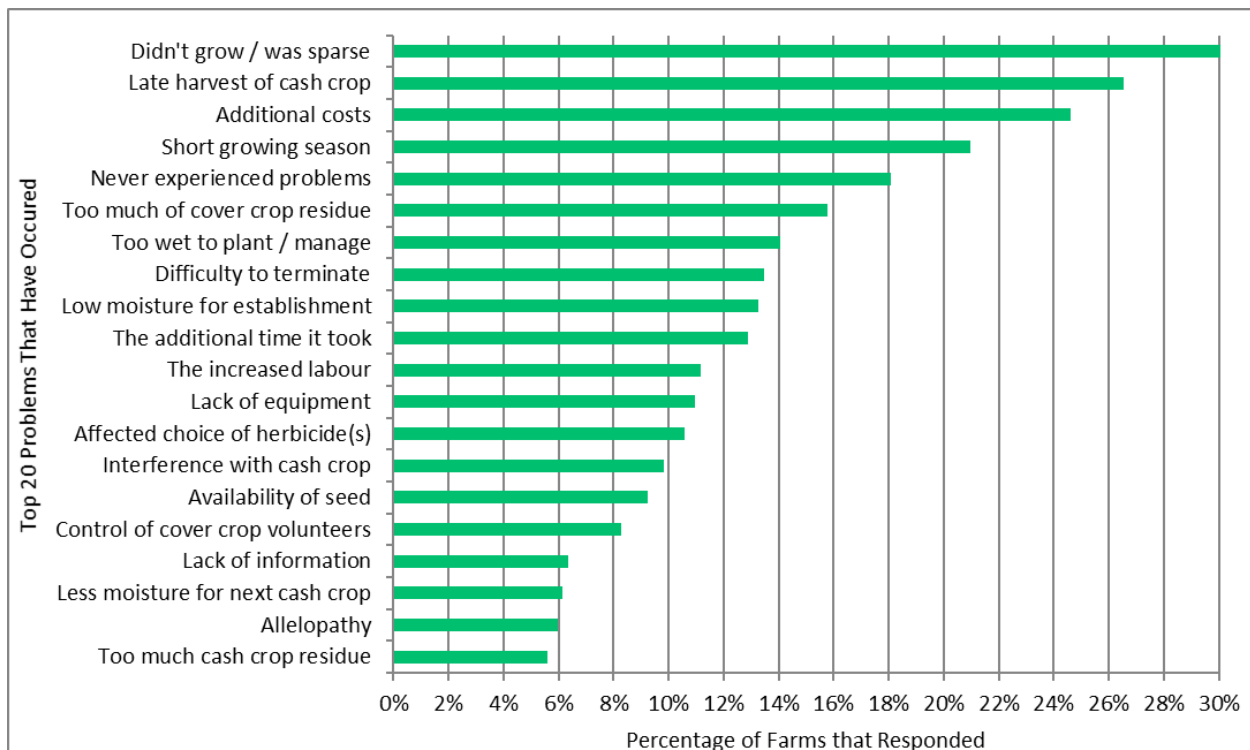


Figure 22: Problems experienced when growing cover crops for farms that responded (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Barriers limiting new adoption

Farms that did not grow a cover crop in 2020

It is crucial that any investigation into cover crop use in Ontario draws attention to the barriers that are limiting cover crop adoption. By identifying challenges associated with cover crop adoption in Ontario, researchers and policy makers will have accurate information when designing measures to assist farms adopting cover crops.

The 2020 Ontario Cover Crop Feedback project asked farms that did not grow cover crops in 2020 to select challenges that limited their use of cover crops from a list. The most common challenges that were identified included the additional costs associated with growing cover crops (41%) followed by lack of equipment needed to grow cover crops (36%). Other common problems included the late harvest of a cash crop preventing cover crop planting (29%), farm didn't know where to start (24%), and the shortness of a growing season (23%). Interestingly, 8% of farms selected that challenges do not limit their cover crop use.

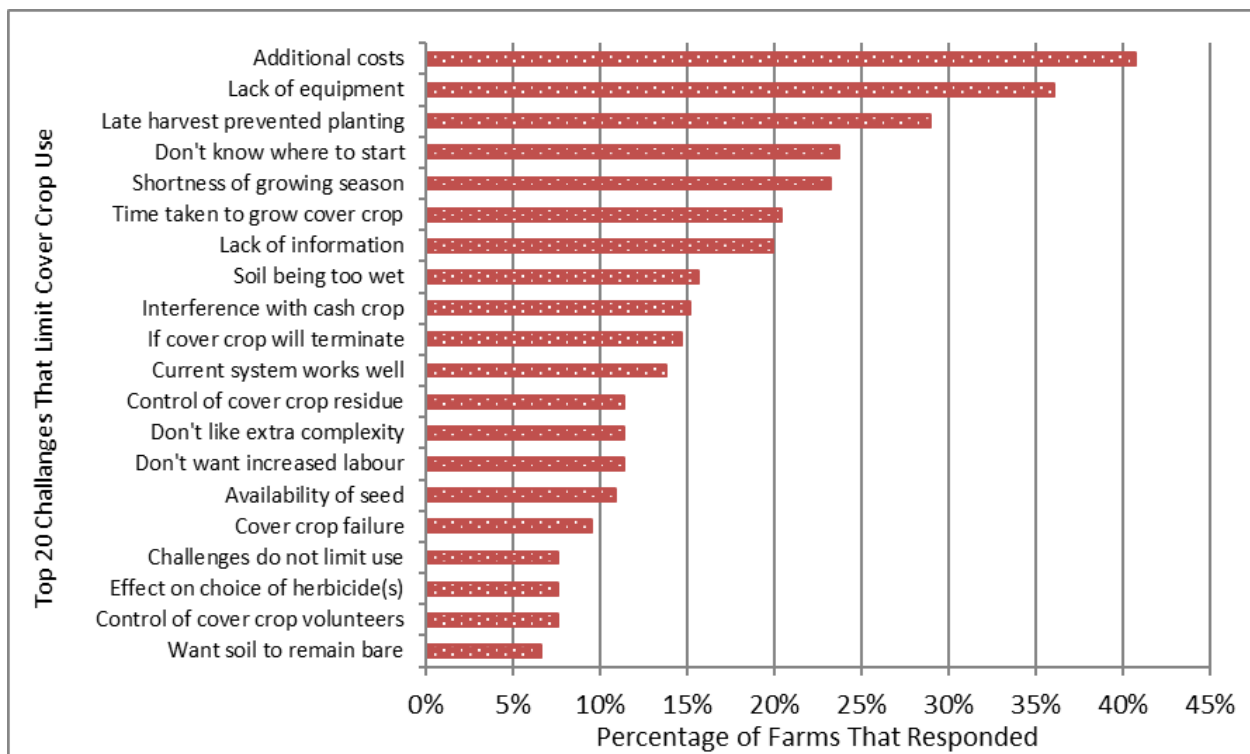


Figure 23: Top 20 challenges that limit cover crop use among farms that responded and did not grow a cover crop in 2020 (N = 211). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Enabling adoption

The following section on enabling adoption contains information about the 520 farms that grew a cover crop in 2020 as well as the 211 farms that did not grow a cover crop in 2020.

What would enable cover crop use?

Farms that grew a cover crop in 2020

One of the major goals of the 2020 Ontario Cover Crop Feedback project was to determine measures that could be taken to support farms in Ontario using cover crops and enable cover crop use. Farm responses indicate that payments for storing carbon (59%), tax credits for planting cover crops (57%), and payments from conservation or watershed groups (45%) would enable cover crop use.

Two responses related to crop insurance were identified by respondents: insurance premiums for growing cover crops (24%) and 13% of farms that responded identified that acceptance of cover crops by crop insurance would enable cover crop use.

Additional information was also identified as a need to enable cover crop use. Several respondents identified greater access to economic data related to cover crop use (22%), technical assistance on cover crop agronomy (21%), scientific data supporting cover crop use (19%), and information on cover crop agronomy (17%) would enable cover crop use.

Farms also identified the need for local information and networks, research specific to their area (16%), local farm tours (13%), and the creation of a local network of cover croppers (11%) would enable cover crop use.

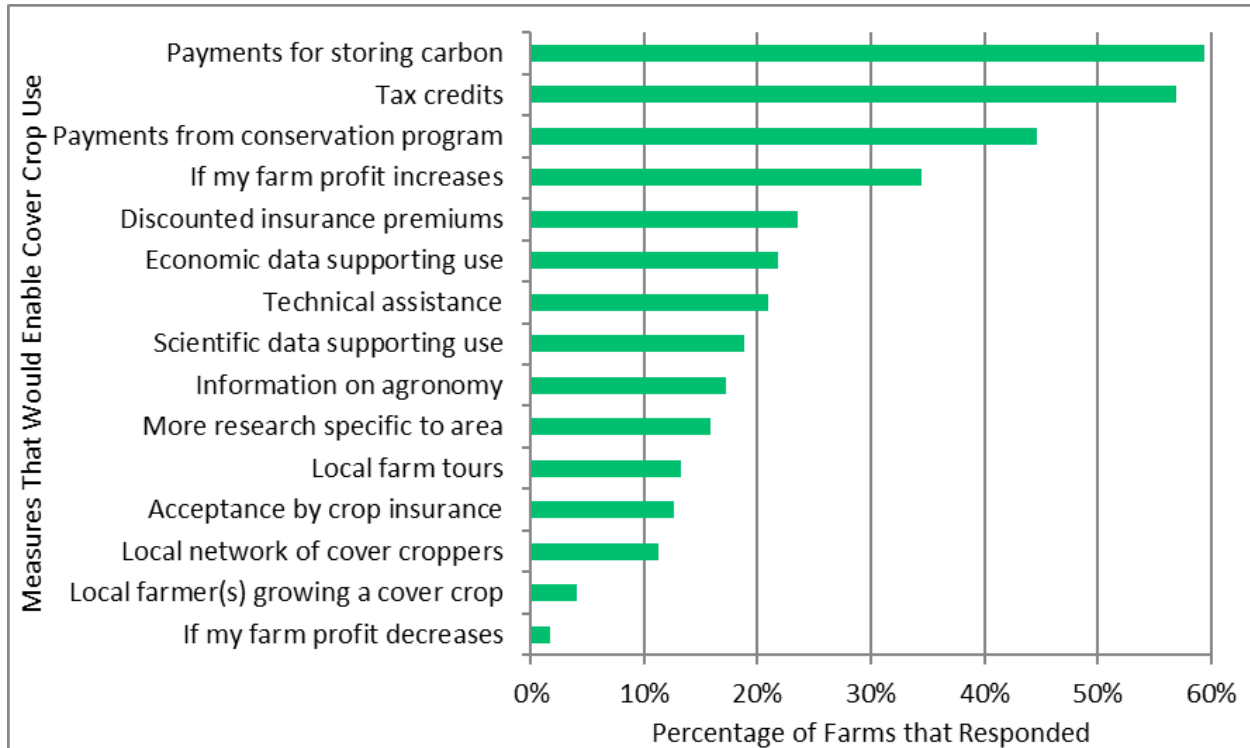


Figure 24: What would enable cover crop use for farms that grew a cover crop in 2020 (N = 520). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Farms that did not grow a cover crop in 2020

One of the major goals of the 2020 Ontario Cover Crop Feedback project was to determine measures that could be taken to support farms in Ontario that may be interested in cover crops and enable cover crop adoption. Farm responses indicate that tax credits for planting cover crops (53%), payments for storing carbon (43%), and payments from conservation or watershed groups (36%) would enable cover crop use.

Two responses related to crop insurance were identified by respondents. They include discounted crop insurance premiums for growing cover crops (21%) and 10% of farms that responded identified that acceptance of cover crops by crop insurance would enable cover crop use.

Additional information was also identified as a need to enable cover crop use. Several respondents identified technical assistance on cover crop agronomy (40%) and information on cover crop agronomy (29%) would enable cover crop use.

Farms also identified the need for local information and networks, indicating research specific to area (26%), research specific to soil type (20%), local farm tours (16%), and the creation of a local network of cover croppers (11%) would enable cover crop use.

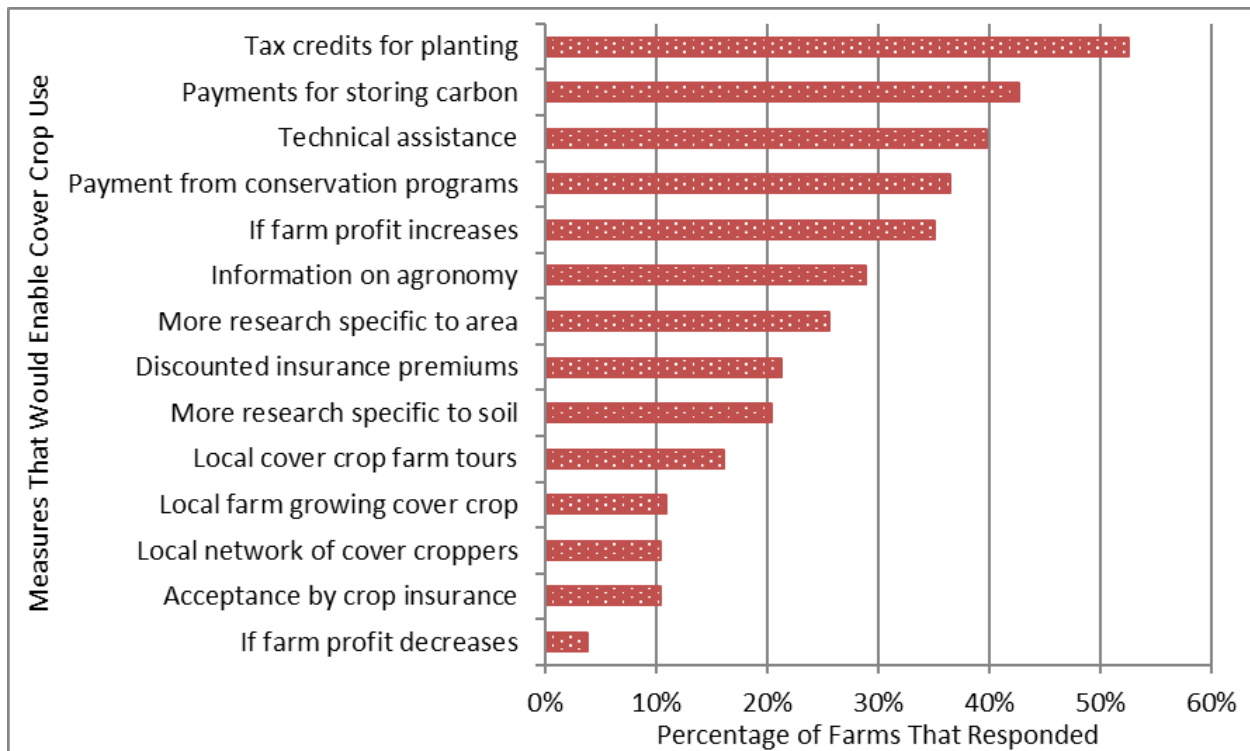


Figure 25: What would enable cover crop use for farms that did not grow a cover crop in 2020 (N = 211). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

Where farm gets information

An essential part of the dissemination of any new practice is how farms access information. It was therefore important that the project included a question to asked farms where they source information regarding cover crops and farming in general. This can help identify effective channels for disseminating extension information about cover crops. The most common source of information for farms that grew a cover crop in 2020 (60%) and those that did not grow a cover crop in 2020 (55%) were other farmers.

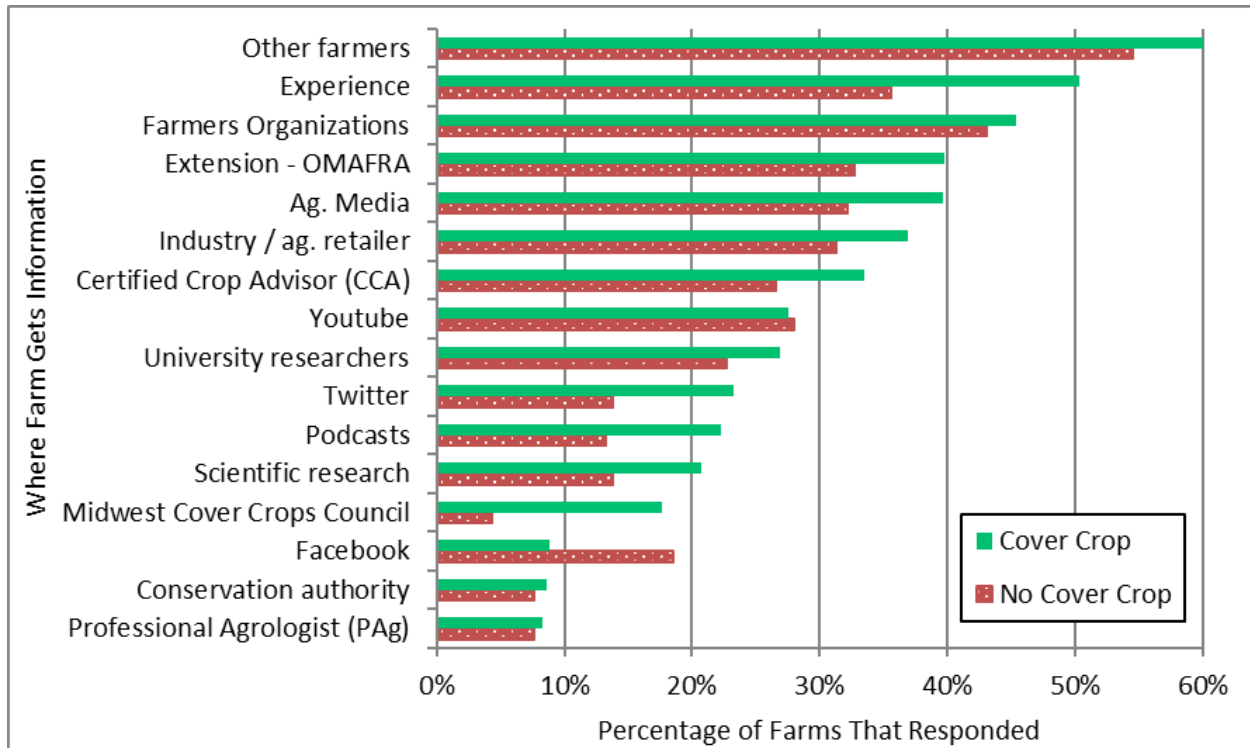


Figure 26: Where farms get information about cover crops and farming (N = 520 for farms that grew a cover crop in 2020 and N = 211 for farms that did not grow a cover crop in 2020). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.



Major findings

In total, 731 farms took part in the 2020 Ontario Cover Crop Feedback project. Of those, 520 farms grew 107,900 acres of cover crops in Ontario in 2020. An additional 211 farms took part that did not grow a cover crop in 2020. Feedback from these Ontario farms revealed that cover crops were grown across every county and district across Ontario in 2020 with the exception of Haliburton, Cochrane and Kenora. This demonstrates that it is possible to grow cover crops across a wide range of locations and environments in Ontario. Farms identified that cover crops are providing soil health and agronomic benefits. At the same time, they also identified common challenges and barriers that may currently be limiting widespread adoption of cover crops in Ontario.

The Ontario Cover Crop Feedback project revealed that 91% of farms that responded and grew cover crops in 2020 have observed at least one benefit from growing cover crops, with 68% of farms identifying that they have seen improved soil health with cover cropping, 59% observing less erosion, and 57% seeing increased soil organic matter. More than three quarters (77%) of farms that responded observed benefits within three years of adopting cover crops. Farms also identified common challenges faced while adopting cover crops in Ontario. The most commonly observed issues among farms that responded were related to poor establishment and growth (30%), late harvest of cash crop preventing cover crop planting (27%), and the additional costs associated with growing a cover crop (25%).

Of 211 farms that responded but did not grow a cover crop in 2020, 52% had not grown a cover crop before but wanted to try in the future, 9% had never grown but did not want to try, and 39% had grown a cover crop in a previous year but not in 2020. These farms identified that additional costs (41%), lack of equipment (36%), late harvests of cash crops preventing cover crop planting (29%), not knowing where to start (24%), and the shortness of the growing season (23%) as the most common challenges limiting cover crop adoption in Ontario.

Feedback from farms that did not grow a cover crop in 2020 indicated that financial incentives would enable the use of cover crops on their farm. This included tax credits for planting cover crops (53%), payments for storing carbon (43%), and payments from conservation programs (36%). Other measures to enable adoption were also identified including technical assistance (40%), greater access to information on cover crop agronomy (29%), more research specific to local areas (26%) and to soil types (20%), as well as local farm tours (16%) and the creation of local networks of cover croppers (11%).