

Results of the 2022 Vermont Farmer Conservation & Payment for Ecosystem Services Survey

Vermont Payment for Ecosystem Services Technical Research Report #3a

Prepared for the Vermont Soil Health and Payment for Ecosystem Services Working Group by

Alissa White

June 2022

Table of Contents

RESULTS OF THE 2022 VERMONT FARMER CONSERVATION & PAYMENT FOR ECOSYSTEM SERVICES SURVEY	1
TABLE OF CONTENTS.....	2
INTRODUCTION	5
METHODS	5
KEY FINDINGS.....	6
SECTION 1. FARM CHARACTERISTICS	7
Q1. How many acres do you farm?.....	7
Q2. What are the main agricultural goods produced and sold from your farming operation?	8
Q3. What is your gross annual farm income?	9
Q4. What is your farm ownership model?.....	10
Q5. Is any part of your farm under organic certification?	10
Q6. How would you describe the most common soil texture on your farm?	11
Q7. What bodies of water do you have on your property?.....	11
SECTION 2. ECOSYSTEM SERVICES	12
Q8. Prior to this survey, were you familiar with the term ecosystem services?.....	13
Q9. Prior to this survey, were you familiar with the connection between your farming practices and ecosystem services? ...	13
Q10. Please rank these five ecosystem services based on which are most important to you, with 1 being the most important and 5 being the least important.....	14
Rationale for ranking of ecosystem services importance	15
Q11. Which of the following ecosystem services do you already consider when making management decisions on your farm?	16
Q12. Are there any other ecosystem services that you believe should be prioritized by agricultural programs and policy for Vermont farms?.....	17
SECTION 3. COMPENSATION & PROGRAM ELEMENTS	18
Q15. Please rank the top three forms of payment or compensation you would accept for increasing or sustaining soil health.	19
Q13. Have you done soil health testing beyond your routine or required soil tests?	21
Q14. Are you familiar with any of these soil health indicators?	21
Q16. If you were to be given a direct monetary payment for increasing or sustaining soil health, what form should this take?	22
Q25. Privacy or efficiency. Which of the following is most important to you?	23
Q26. Do you think that technical assistance/education for farmers would be a necessary component of the program? (including application and other paperwork, soil testing, and data reporting).....	23
Q17. Would you allow a 3rd party to conduct the advanced soil measurements on your farm to participate in a program? ...	24

Q18. Would you prefer to receive technical assistance so that you may eventually conduct these soil measurements yourself?	24
Q19. Which aspects of the program should you be compensated for?.....	25
Q20. Approximately how much time do you think it would take you to collect data on your management practices, conservation strategies, soil test results and other areas of your farm operation and report it to a new PES program?	26
Q21. How many total hours do you think it would take you to collect a basic soil sample from each field on your farm?.....	27
Q22. If a program required you to share basic soil testing results and management practices for each field every year, what is the hourly rate you believe you should be paid for completing data entry? Please type your response in "per hour" format..	28
Q23. If a program required you to conduct basic soil sampling on your farm, what is the hourly rate you should be paid for doing that work?	29
Q24. If a program required you to conduct advanced soil testing (aggregate stability, bulk density, etc.) what is the hourly rate you should be paid for doing that work? Please type your response in "per hour" format.	30
Q27. If a program compensated you based on how your soil test results compared to soil health threshold goals set by the program, how much do you believe you should be compensated for meeting those goals? Please type your answer in the box below and make sure to include units such as "per acre", "per field", etc. We understand this is a complex question with many factors.	31
Q28. Please share your greatest concern(s) with entering a new conservation program	32
SECTION 4. CONSERVATION PRACTICES AND CURRENT INCENTIVE PROGRAMS	33
Q32. What conservation practices do you implement on your farm?	33
Extent of incentive program support for conservation implementation	36
Precision feed management.....	38
Nutrient Management Planning by farm size.....	39
Q33. Please rank your top three reasons for implementing conservation practices.	40
Q34. Please rank your top three reasons for enrolling in conservation programs.....	41
Q35. What state or federal conservation programs have you enrolled in? (including currently enrolled) (check all that apply)	42
Q36. Do you grow corn, soybeans, or other row crops that are subsidized by the government?	43
SECTION 5. MOTIVATIONS, CAPABILITY & BELIEFS	45
Perceived vulnerability.....	45
Perceived capability.....	45
Innovative intent.....	46
Responsibility	46
Soil health & farming	47
Climate change belief.....	47
SECTION 6. INFORMATION SOURCES	48
SECTION 7. RESPONDENT CHARACTERISTICS & DEMOGRAPHICS	49

Acknowledgements

The development and circulation of this survey was coordinated by Nour El Naboulsi in his role as a UVM Research Assistant in the winter of 2022 with support from many people on the UVM research team, primarily Lindsey Ruhl, Alissa White, & Heather Darby. Lindsey Ruhl led development of the survey section on conservation implementation. Members of the Vermont Soil Health and Payment for Ecosystem Services Working Group were integral to developing and distributing the survey. Farmers and farmer groups across the state of Vermont contributed to refining the survey language and encouraging participation from farmers.

This survey was conducted with support from the Vermont Payment for Ecosystem Services Working Group via the Vermont Agency of Agriculture, Food & Markets, as well as funding from the Vermont Clean Water Initiative Program.

We'd like to acknowledge the farmers who helped develop the survey, the farmers who participated in the survey, the Vermont PES Working Group and the broader network in Vermont that helped get the word out about the survey. Thank you all!!

Recommended Citation

White, A. 2022. Results of the 2022 Vermont Farmer Conservation and Payment for Ecosystem Services Survey. Vermont Payment for Ecosystem Services Technical Research Report #3a. University of Vermont

Introduction

This survey was commissioned by the Vermont Soil Health and Payment for Ecosystem Services Working Group (VT PES Working Group) to gather farmer input on the development of payment for ecosystem services (PES) in Vermont for agriculture. In particular, the survey was intended to help set appropriate levels of compensation for participation in a soil health PES program, although additional information was gathered in the survey to inform the development of a new incentive program. The VT PES Working Group has explored the potential for a performance-based soil health PES program that would compensate farmers on the basis of environmental performance, as indicated through measurable soil health indicators. While much research-based and local knowledge can be leveraged to determine appropriate practice-based payments, information on setting adequate levels of payment for performance-based payment rates is sparse.

This survey report presents data which can be used to gauge the range of payment levels that should be offered by a new soil health PES program in Vermont. It also includes information about Vermont farmers' environmental knowledge and attitudes, program design preferences, opinions and motivations. In the development of the survey, we determined that direct questions about payment rates based on units of ecological outcomes or soil health metrics would not yield meaningful information in a survey format. Instead, we aimed to estimate minimum and preferred levels of compensation based on the time burden required to participate in a performance-based soil health. Accordingly, we asked farmers to estimate the amount of time it would take them to complete soil sampling and data reporting, and then we asked them for fair hourly rates for those activities. Follow-up interviews were proposed to generate more meaningful information about payment levels.

Methods

The survey tool was developed over the course of four months, through an extensive input and revision process between October 2021 and February 2022. The survey questionnaire was edited and revised based on input from the Vermont Payment for Ecosystem Services Working Group, Vermont farmers, UVM researchers, staff from UVM extension, and non-profit advisors. A focus group with 12 farmers in January of 2022 provided discussion and input into the survey questionnaire. Five farmers trialed the draft survey and were interviewed in order to improve it. UVM IRB approved that the survey conformed with ethical standards for research with human subjects, and the survey was administered in an online format using the Qualtrics platform.

A total of 179 farmers in Vermont completed the survey from across the state (Figure 1). Outreach was conducted in multiple phases by the farmer networks and agricultural organizations represented on the VT PES Working Group. Farmers completed the survey online, and also over the phone with the assistance of UVM staff. The survey took an average of 28 minutes to complete.

Summary statistics were generated by a default report from Qualtrics on April 18th. Additional analysis and figures were generated in Excel and R in preparation of this report. No weighting procedure has been completed on this dataset.

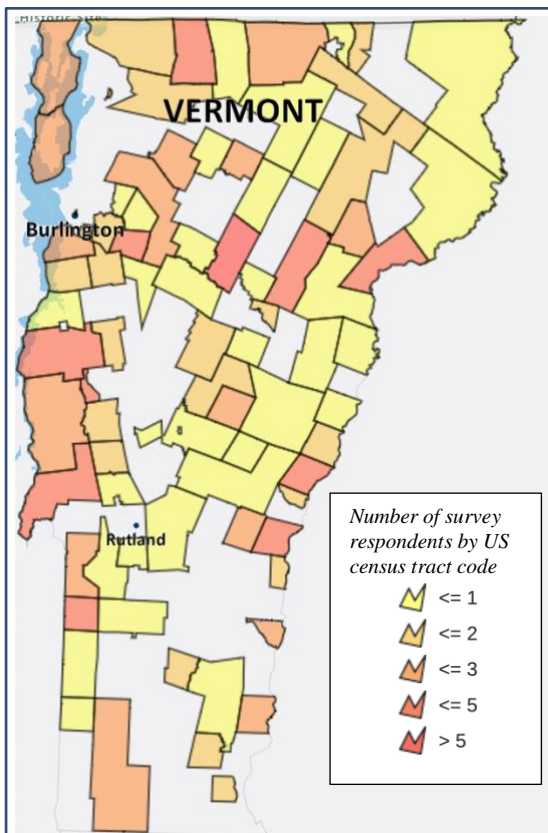


Figure 1. Geographic extent of survey responses.

Key Findings

- **99%** of Vermont farmers believe improvements in soil health have **benefits for the environment** off their farm, **95%** of Vermont farmers believe they should take additional steps beyond required practices to **protect soil health**, and **90%** of Vermont farmers believe they have a responsibility to **be part of climate solutions**.
- **94%** of Vermont farmers believe they have the **knowledge and technical skill to enhance soil health** on their farm, yet only **58%** have the **financial capacity** to do so.
- **92%** of farmers ranked **direct monetary payment** among their preferred form of compensation and **66%** of farmers ranked **tax incentives** as their preferred form of compensation. Debt forgiveness, technical assistance, crop insurance, health insurance, lower interest loans and retirement funds were ranked among the top three forms of compensation by **20%** to **28%** of respondents.
- **62%** of farmers prefer that application for new conservation incentive programs should be combined with existing conservation incentive program paperwork as much as possible to save time. **15%** believe their data privacy is more important and enrollment paperwork should not be shared between programs. **23%** had no preference.
- **46%** of farmers prefer the spatial basis for payments to be per acre, **40%** prefer whole farm scale.
- **Minimum level of compensation.**
 - The survey suggests an **average minimum level of compensation for the enrollment burden of \$1000**, plus a performance-based payment, will incentivize applicants. Rates should be differentiated by farm size due to the difference in time required to collect data and report from larger farms.
 - **40%** of farmers felt they should be compensated for the **burden of enrollment** associated with a new PES program.
 - **80%** of farmers felt they should be compensated for the **burden of data collection, tracking and sharing** associated with a new PES program. Most farmers estimated it would take a few days to collect that data (20 hours), and the median hourly rate for this work should be \$35 per hour. Based on this data, we estimate the lower end of compensation for enrollment and data reporting burden at an average of **\$700 per farm**. Rates should be differentiated by farm size.
 - **82%** of farmers felt they should be compensated for the **burden of soil sampling** associated with a new PES program. Most farmers estimated it would take a 4 – 9 hours to collect basic soil samples from all of their fields. The mean hourly rate for this work should be \$32 per hour. Based on this data, we estimate the lower end of compensation for soil sampling burden at **\$288**.
 - **80%** of farmers felt they should be compensated on the basis of **soil health performance** associated with a new PES program.
- **Preferred level of compensation**
 - Among the 48 responses that suggested per acre compensation, the median rate was \$100/acre, and the mean rate was **\$206/acre**. The range of suggestions spanned from a minimum of \$2/acre to a maximum of \$3500/acre. Among the 12 respondents that suggested whole farm compensation levels, the mean level was **\$5,000 per farm**. The range of suggestions spanned from a minimum of \$50 per farm to a maximum of \$50,000 per farm.

Section 1. Farm Characteristics

Q1. How many acres do you farm?

Table 1. Size of respondent's farm in acres.

Size of farm in acres	% of respondents
1-9	21.39%
10-49	19.79%
50-179	17.65%
180-499	28.34%
500-999	9.63%
1000-1999	1.60%
2000+	1.60%

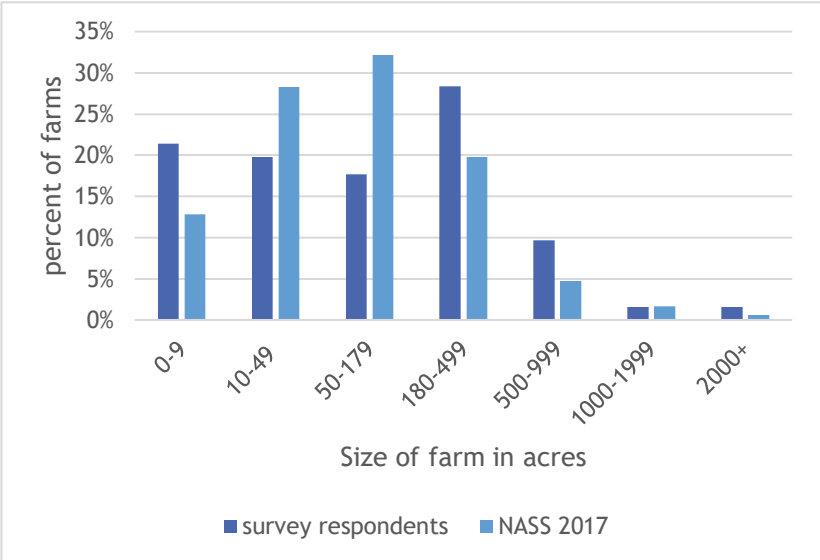


Figure 2. Comparison of our survey respondents with the NASS survey of Vermont farms in 2017.

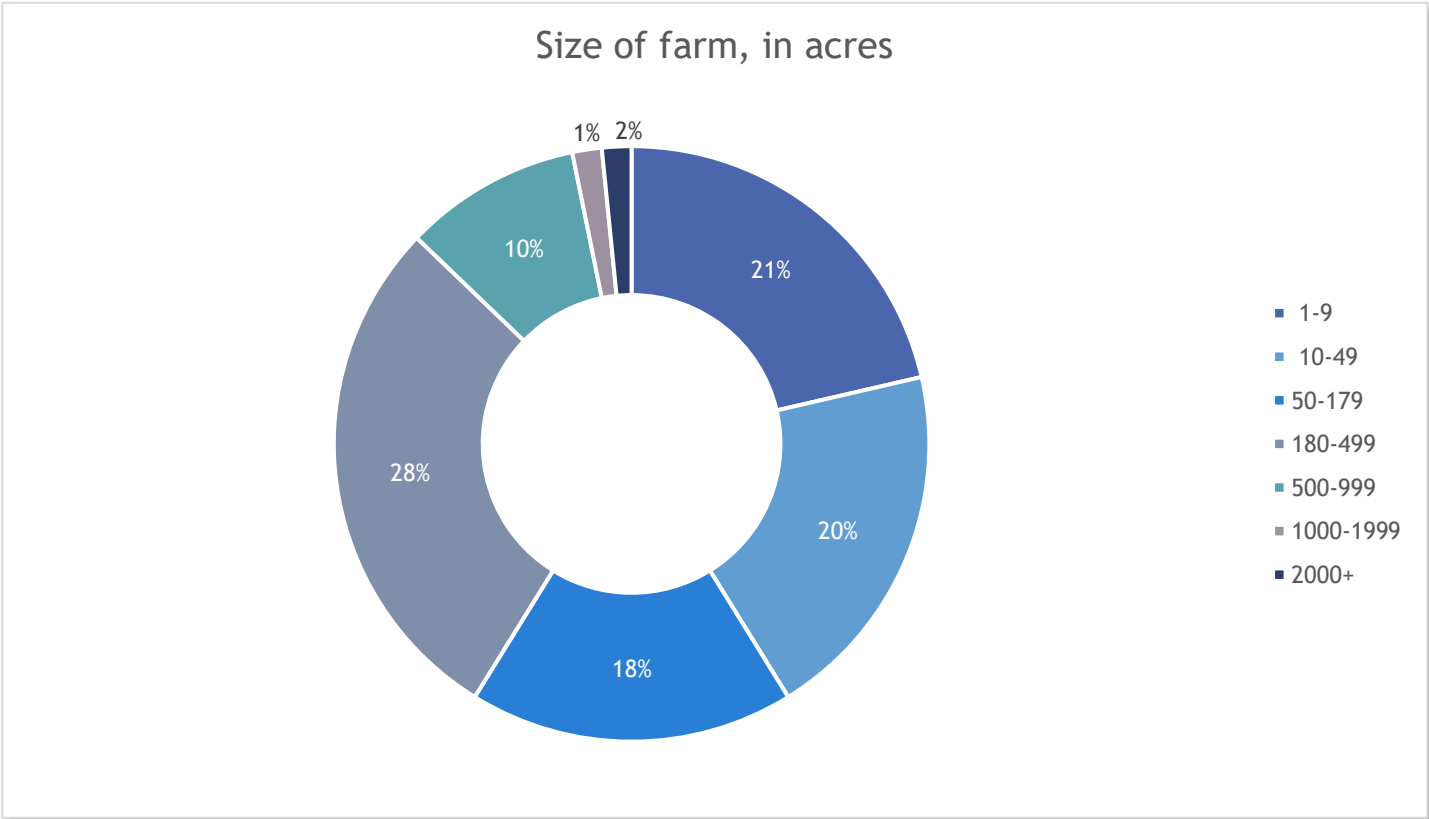


Figure 3. Size of respondent's farm in acres.

Q2. What are the main agricultural goods produced and sold from your farming operation?

Table 2. Agricultural good produced and sold from respondent's farm.

Agricultural products	% of respondents	# of respondents
Milk from cows	32.62%	61
Cattle and calves (beef, heifers, etc.)	19.79%	37
Poultry and eggs	21.39%	40
Hay	31.02%	58
Vegetables and/or berries	46.52%	87
Sheep/goats	13.37%	25
Hogs and pigs	10.70%	20
Maple	17.65%	33
Tree fruits/nuts	17.65%	33
Milk from sheep/goats	1.60%	3
Value-added products	30.48%	57

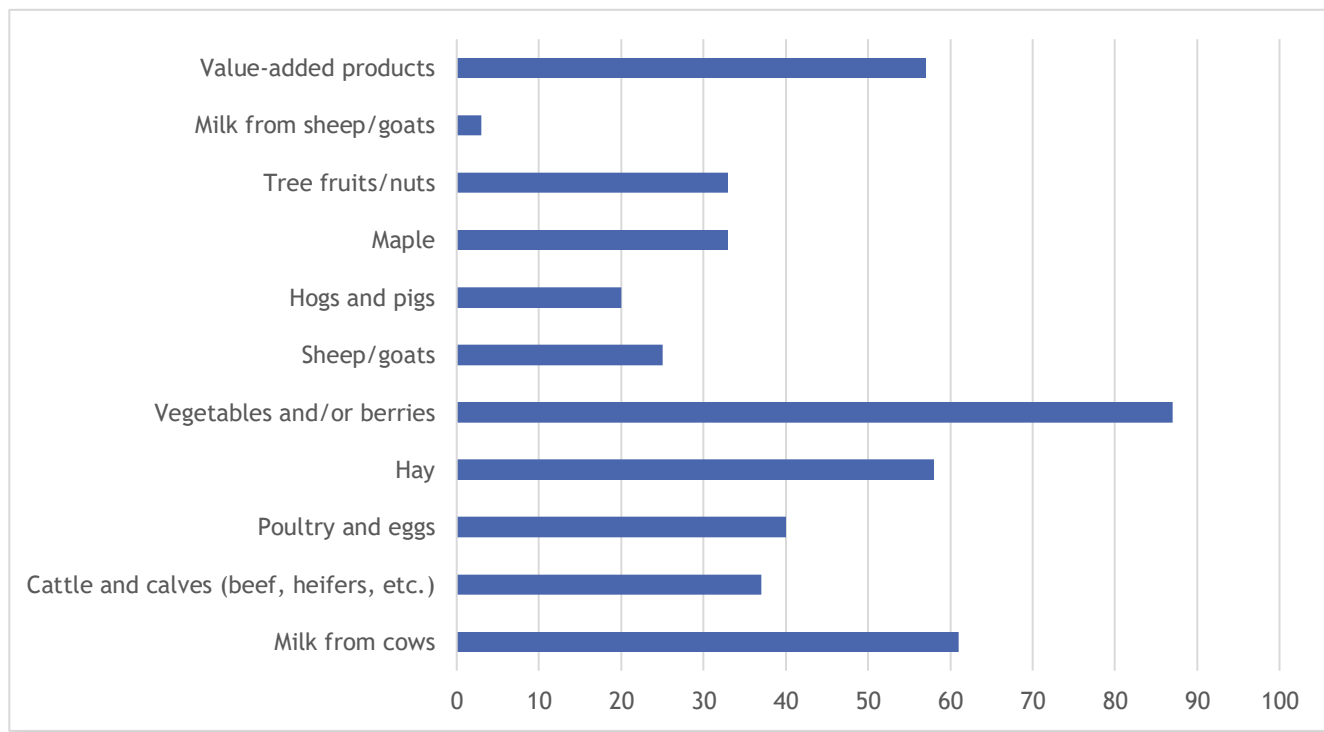


Figure 4. Agricultural good produced and sold from respondent's farm.

Q3. What is your gross annual farm income?

Table 3. Gross annual farm income among respondents.

Gross annual farm income	% of respondents
Less than \$1,000	7.19%
\$1,001 to \$49,000	34.64%
\$50,000 to \$149,000	15.03%
\$150,000 to \$349,000	16.34%
\$350,000- \$999,999	14.38%
\$1,000,000-\$4,999,999	11.76%
More than \$5,000,000	0.65%

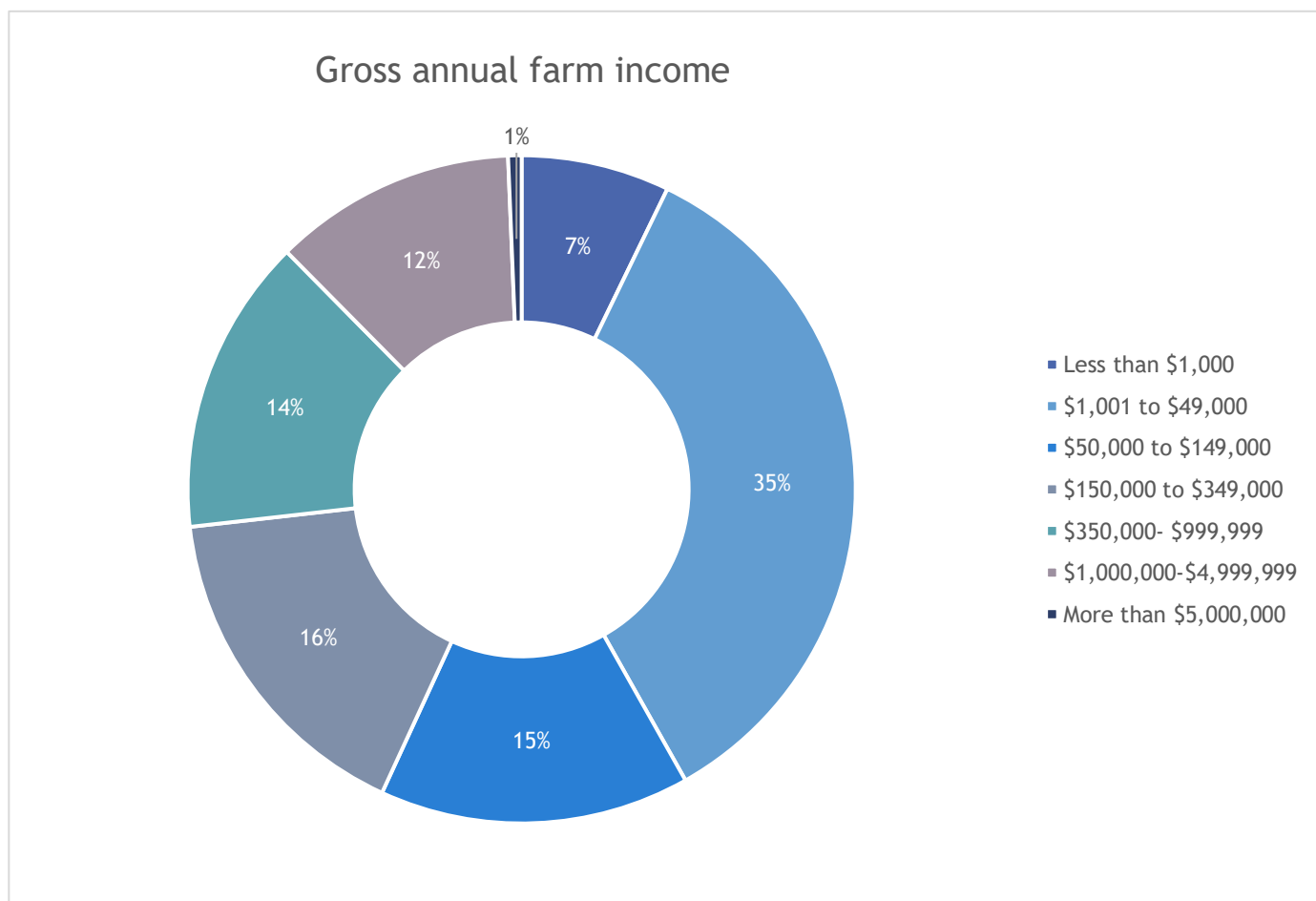


Figure 5. Gross annual farm income among respondents.

Q4. What is your farm ownership model?

Table 4. Farm ownership models of respondents.

Answer	% of respondents
Family	63.40%
Individual	22.22%
Community	1.31%
Collective/collaborative	2.61%
Other (please specify):	10.46%

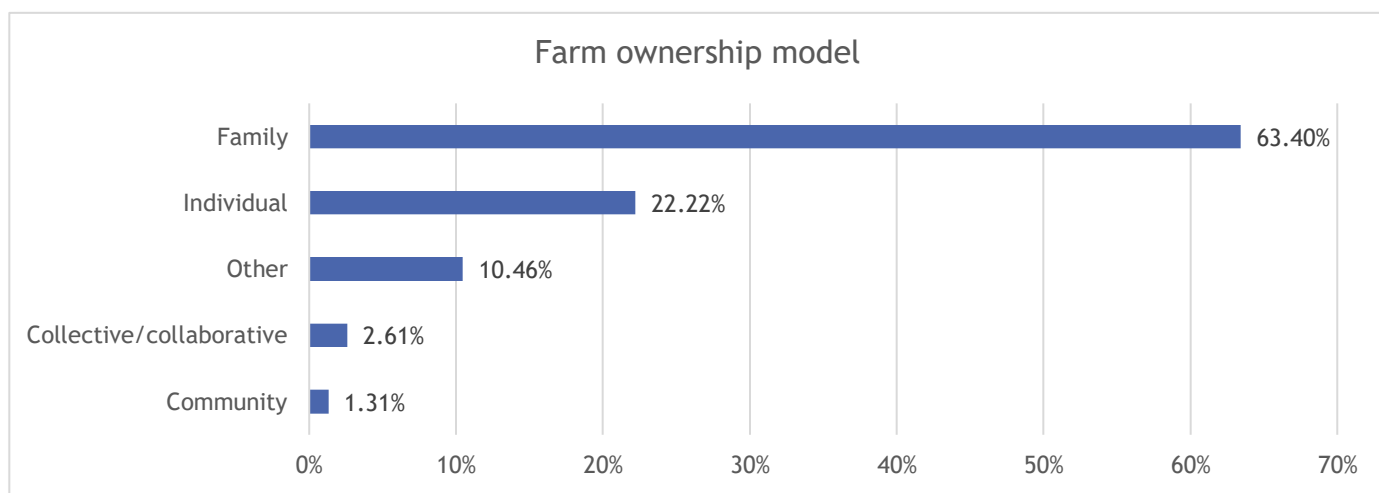


Figure 6. Farm ownership models of respondents.

Q5. Is any part of your farm under organic certification?

Table 5. Percent of respondents who have organic certification.

Organic certification	% of respondents
Yes	45.16%
No	54.84%



Q6. How would you describe the most common soil texture on your farm?

Table 6. Dominant soil texture on respondent's farm.

Dominant soil texture	% of respondents
Sand	3.76%
Silt	3.23%
Loam	23.66%
Clay	17.20%
Clay-loam	18.82%
Silty-loam	16.67%
Sandy-loam	16.67%

Q7. What bodies of water do you have on your property?

Table 7. Bodies of water on respondent's property.

Bodies of water	% of respondents
No bodies of water on property	10%
Rivers	22%
Streams	53%
Intermittent streams	48%
Vernal pools	25%
Ponds	44%

Section 2. Ecosystem Services

Survey respondents were given the following introductory language for this section of the survey on ecosystem services:

The following sections will gauge your opinions on ecosystem services and associated management scenarios. Agriculture is a fundamental part of our culture and landscapes. Here, natural functions and cycles play an important role. Human life and well-being depend, for example, on the availability and occurrence of fertile soils, clean water and stable natural cycles that offer protection from natural hazards or space for recreation in nature. These natural services are also referred to as "ecosystem services" and are a central topic of current nature conservation measures and agri-environment programs. The ecosystem services we are focusing on in this study can be changed for better or worse based on farming practices. Some ecosystem services like fertile soils may directly benefit you as a farmer as well as the surrounding environment. Others like downstream water quality for drinking and swimming may benefit your community members but not as directly benefit your farm. Others still like climate regulation may benefit society on a global scale.

In this study, we are interested in your perspective on ecosystem services specifically related to soil health. Some measurable qualities of soil are useful indicators of ecosystem services, and can be changed by the way farmland is managed. The following section will gauge your opinions about ecosystem services and the soil health indicators associated with ecosystem services.

Q8. Prior to this survey, were you familiar with the term ecosystem services?

Table 8. Familiarity with the term 'ecosystem services' prior to the survey.

Familiarity with ecosystem services	% of respondents	Count
Yes	58.89%	106
No	15.56%	28
Somewhat	25.56%	46

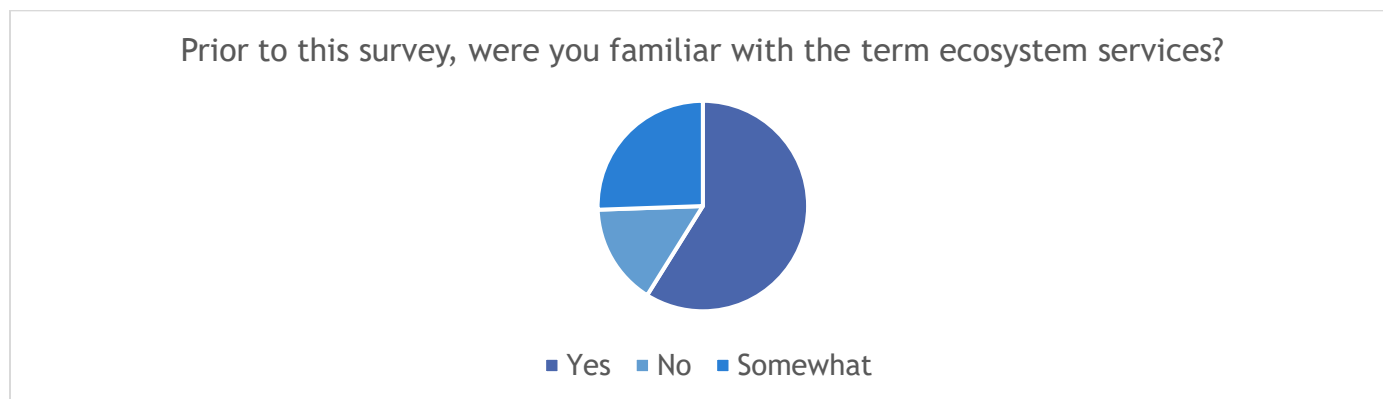


Figure 7. Percent of respondents familiarity with the term 'ecosystem services' prior to the survey.

Q9. Prior to this survey, were you familiar with the connection between your farming practices and ecosystem services?

Table 9. Familiarity with the connection between farming practices and ecosystem services.

Familiar with the connection between farming practices and ecosystem services	% of respondents	Count
Yes	62.78%	113
No	7.78%	14
Somewhat	29.44%	53

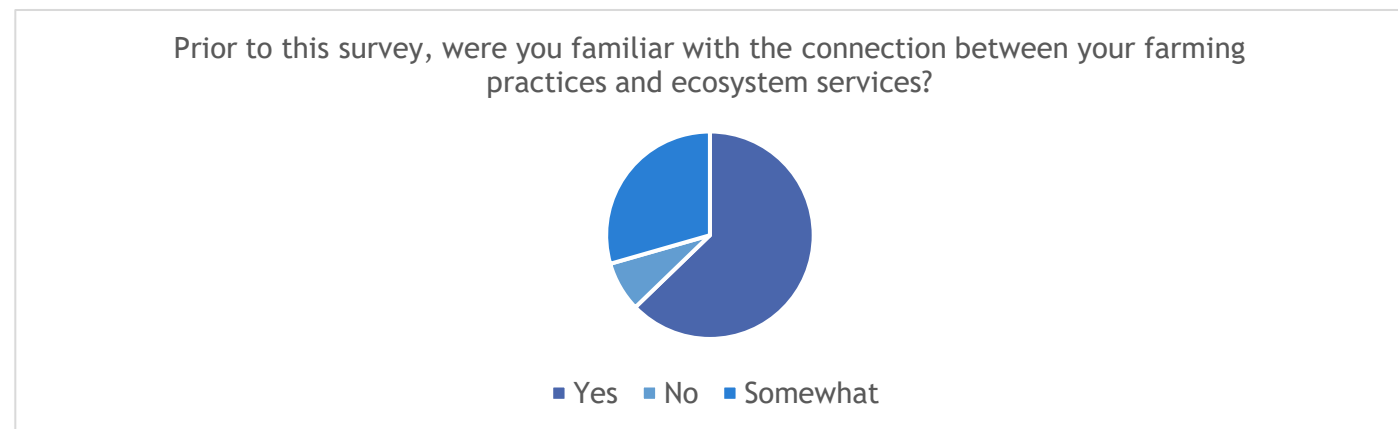


Figure 8. Percent of respondents familiar with the connection between farming practices and ecosystem services.

Q10. Please rank these five ecosystem services based on which are most important to you, with 1 being the most important and 5 being the least important.

Table 10. Ranked importance of selected ecosystem services to farmers.

Ecosystem Service	Rank				
	1 <i>Most important</i>	2	3	4	5 <i>Least important</i>
Climate regulation <i>Ecosystems regulate the global climate by storing greenhouse gases, preventing their release into the atmosphere.</i>	17.88%	11.17%	13.97%	23.46%	33.52%
Soil conservation <i>Ecosystems protect the topmost layer of soil from erosion and prevent reduced fertility caused by over usage, acidification, and salinization.</i>	39.44%	24.44%	18.33%	13.89%	3.89%
Downstream flood risk mitigation <i>Ecosystems slow down and store rainwater while protecting land from erosion, preventing floods.</i>	6.74%	11.80%	14.61%	22.47%	44.38%
Soil biodiversity <i>Ecosystems provide a biologically diverse mix of microscopic organisms, promoting fertile soil and enhanced plant growth.</i>	29.44%	31.67%	24.44%	11.11%	3.33%
Climate resilience <i>Ecosystems absorb stresses and maintain function in the face of external pressures, and adapt for future climate change impacts.</i>	25.70%	20.11%	24.02%	20.11%	10.06%

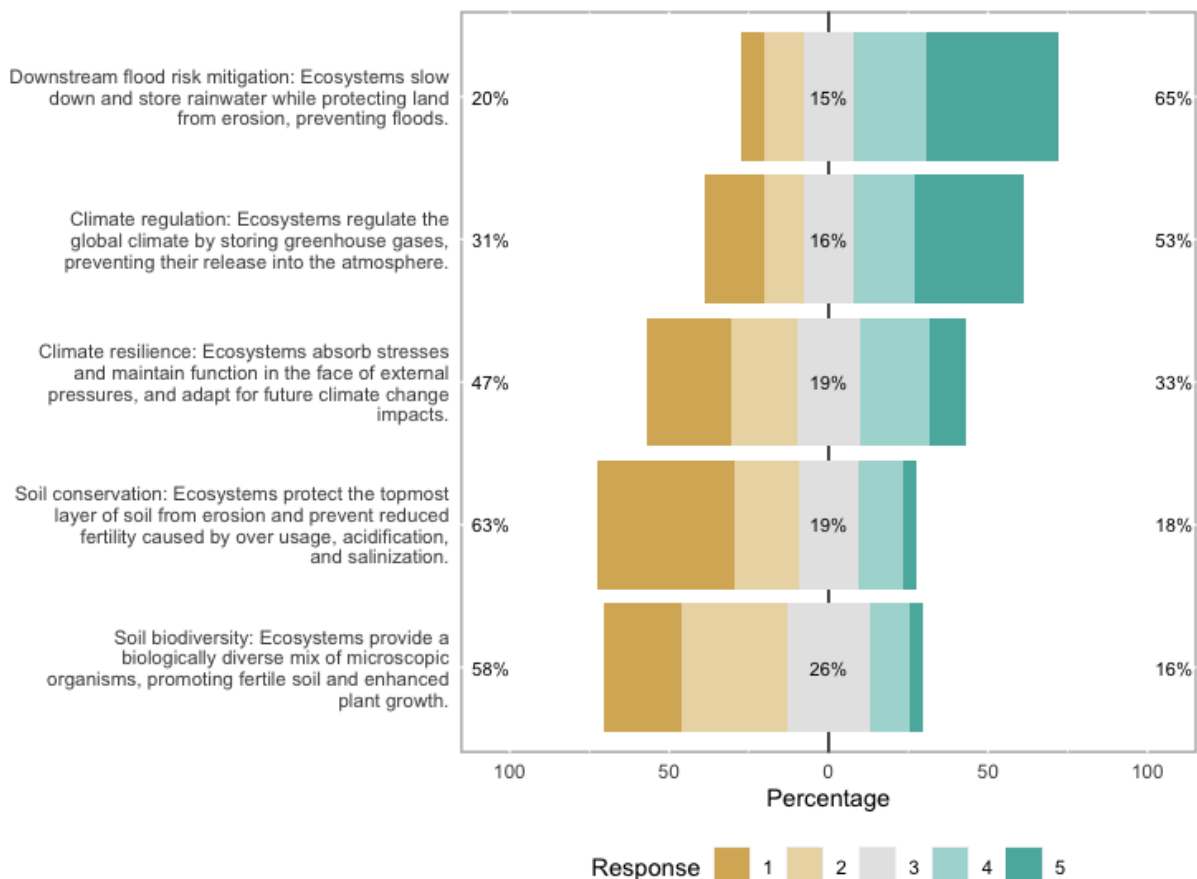


Figure 9. Ranked importance of selected ecosystem services to farmers.

Rationale for ranking of ecosystem services importance

Soil biodiversity and Soil conservation were ranked as most the important ecosystem services to farmers who took the survey. Downstream flood risk mitigation ranked lowest. Survey respondents were invited to describe their ranking in an open-ended question. Many farmers described the ranking process as being challenging because they are all important. For example, “It's hard to rank since they're all so vital to our community. “

Many farmers described their rationale through the relationships that these ecosystem services have with each other. Soil biodiversity and conservation were described as foundation that would allow, “the rest to fall into place.” Soil is considered the basis to climate regulation provisioning, and as having a strong influence on water. For example, one farmer stated, “*they are all important, but it starts with living soil,*” and another said, “*Can't have any of the other functions if you don't have soil.*”

Many farmers also highlighted their perceptions of relative risk, control and resilience capacity, as driving their ranking. For example, one farmer concerned with on-farm resilience said, “*my choice to rank climate resilience as the most important reflects the concern I have for the effects of extreme weather events and the external pressures associated with a changing climate on both our ability to continue successfully cropping land and making a living as well the quality of life and work of everyone in our community.*” In some cases the perception of risks and impacts being less direct or immediate, or more diffuse, were the reason that some ecosystem services were ranked lower. As one farmer put it, “*My ranking prioritized the biggest risks to our farm's ability to sustain our quality of life, placing lesser priority on negative effects that are more diffuse, such as downstream flood risk mitigation and climate regulation. Still, I care very much about those ecosystem services that have a more diffuse effect on the broader community.*”

Q11. Which of the following ecosystem services do you already consider when making management decisions on your farm?

Table 11. Percent of farmers who consider select ecosystem services when making management decisions.

Answer	% of respondents	Count
None of the above	2%	4
Climate regulation	43%	71
Flood mitigation	50%	84
Climate resilience	62%	104
Soil biodiversity	95%	159
Soil conservation	99%	165

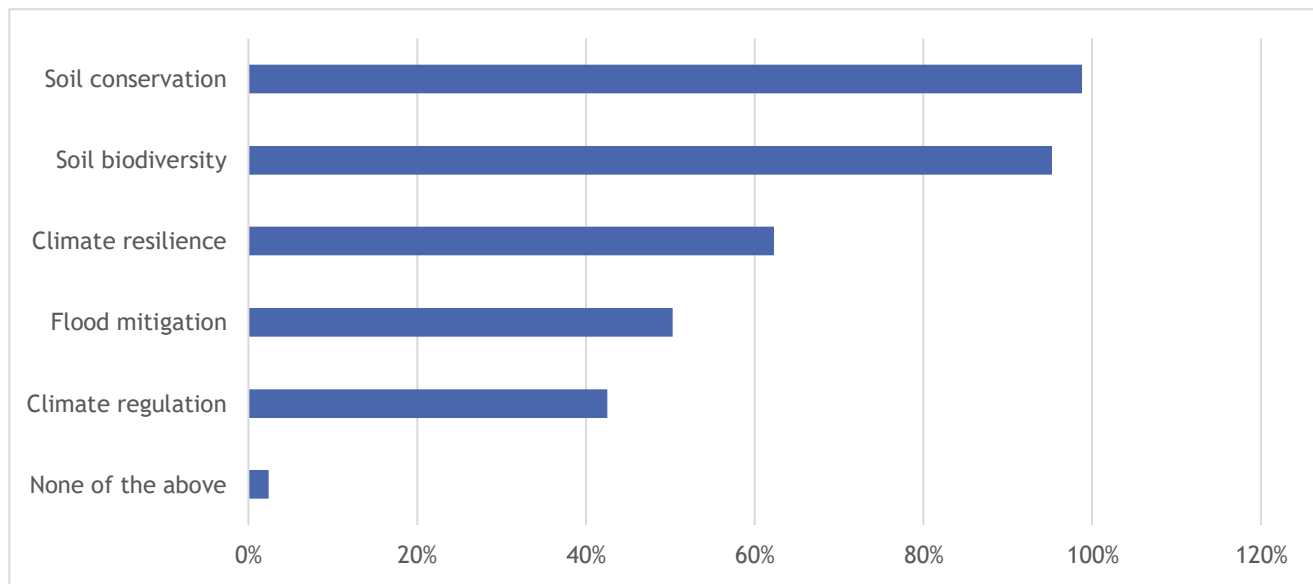


Figure 10. Ecosystem services considered by farmers when making management decisions.

Q12. Are there any other ecosystem services that you believe should be prioritized by agricultural programs and policy for Vermont farms?

Table 12. Additional ecosystem services that farmers believe should be prioritized by agricultural programs & policy for Vermont farms.

Answer	% of respondents	Count
Water quality	90%	150
Food production	77%	128
Pollination	75%	125
Wildlife biodiversity	73%	122
Timber production	40%	66
Recreation	29%	49
Tourism	28%	46
Spiritual wellbeing	21%	35
Other	10%	17
None	2%	4

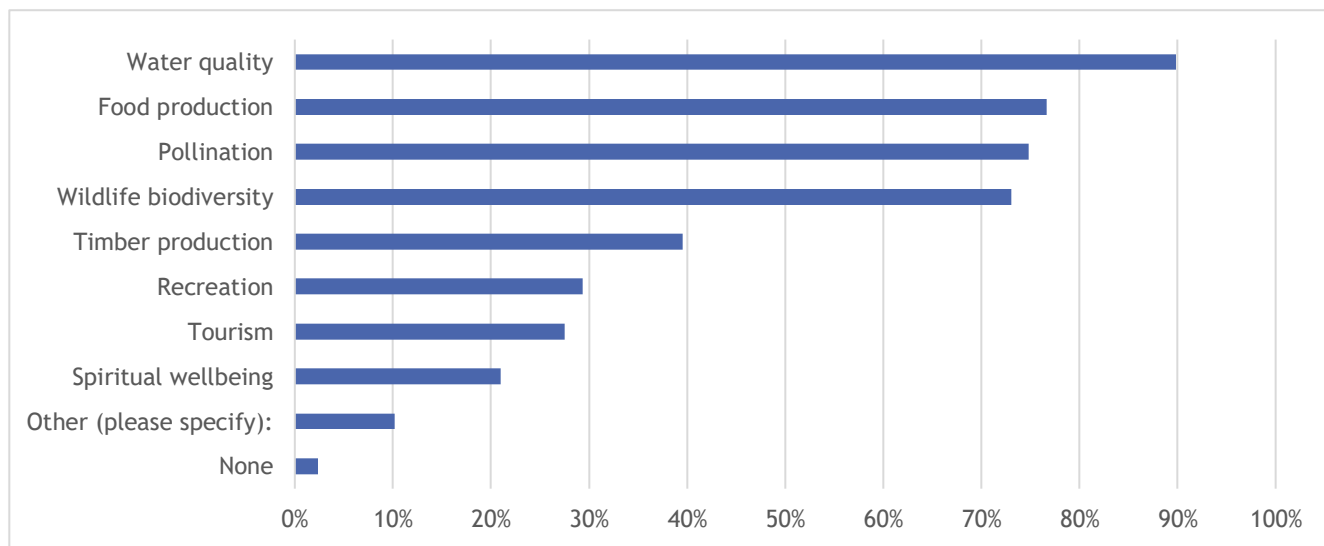


Figure 11. Additional ecosystem services that farmers believe should be prioritized by agricultural programs & policy for Vermont farms.

Section 3. Compensation & program elements

In this section of the survey, farmers were asked questions that could be used to inform the design and compensation structure of a performance-based soil health incentive program. Topics explored in this section include:

- preferred forms of compensation
- experience and knowledge of soil health testing & indicators
- preferred spatial basis for payment structure (field or farm scale)
- program elements that should be considered in setting compensation levels
- the amount of time farmers may spend on data reporting and soil sampling in a soil health PES
- hourly rates to use as a basis for setting compensation levels
- open-ended questions about preferred compensation and concerns

Survey respondents were given the following introductory language for this section of the survey on compensation:

“ The state of Vermont is interested in trying to compensate farmers for the ecosystem services that their farms provide. Again, the ecosystem services of particular interest are climate regulation, climate resilience, soil conservation, soil biodiversity, and flood risk mitigation. These ecosystem services can be influenced by the health, quality, and processes of soil, also known as soil health indicators. Soil health indicators are a key tool in measuring levels of ecosystem services. A few examples of soil health indicators are organic matter, bulk density, aggregate stability, and emission levels of carbon dioxide (CO₂) and nitrous oxide (N₂O).

The goal of this program is ultimately to compensate farmers for managing their land in such a way that enhances these measurable soil health indicators, and as a result positively influences the related ecosystem services. Our hope is that this payment strategy, which would pay for results, will complement existing conservation programs such as the Environmental Quality Incentives Program (EQIP), which pays for practices like cover cropping and conservation tillage. One method we are exploring for measuring the soil health indicators and determining payment for ecosystem services would be based on more advanced soil testing and reporting, as well as other information about your farm. Within the following section, some of the questions will try to gauge the time and effort required by you to perform these tasks, what a fair rate of pay would be to perform these tasks, and whether or not you would prefer someone else (i.e. a trusted 3rd party) to perform these tasks. “

Forms of compensation

Survey respondents were asked to rank the top three forms of payment or compensation they would accept for increasing or sustaining soil health. 159 respondents answered this question.

The most popular forms of compensation were direct monetary payment and tax incentives. 92% of farmers ranked direct monetary payment among their preferred form of compensation and 66% of farmers ranks tax incentives as their preferred form of compensation. Debt forgiveness, technical assistance, crop insurance, health insurance, lower interest loans and retirement funds were ranked in the top three by 20% to 28% of respondents. 9% of respondents ranked ‘other’ as an option and their responses identified grants for equipment and supplies such as seeds and fencing such as irrigation, as well as soil and water testing as preferred forms of compensation. One response questioned the need for compensation, and one response identified that being left alone by AAFM and Extension unless requested by the farmer would be a preferred form of compensation.

Q15. Please rank the top three forms of payment or compensation you would accept for increasing or sustaining soil health.

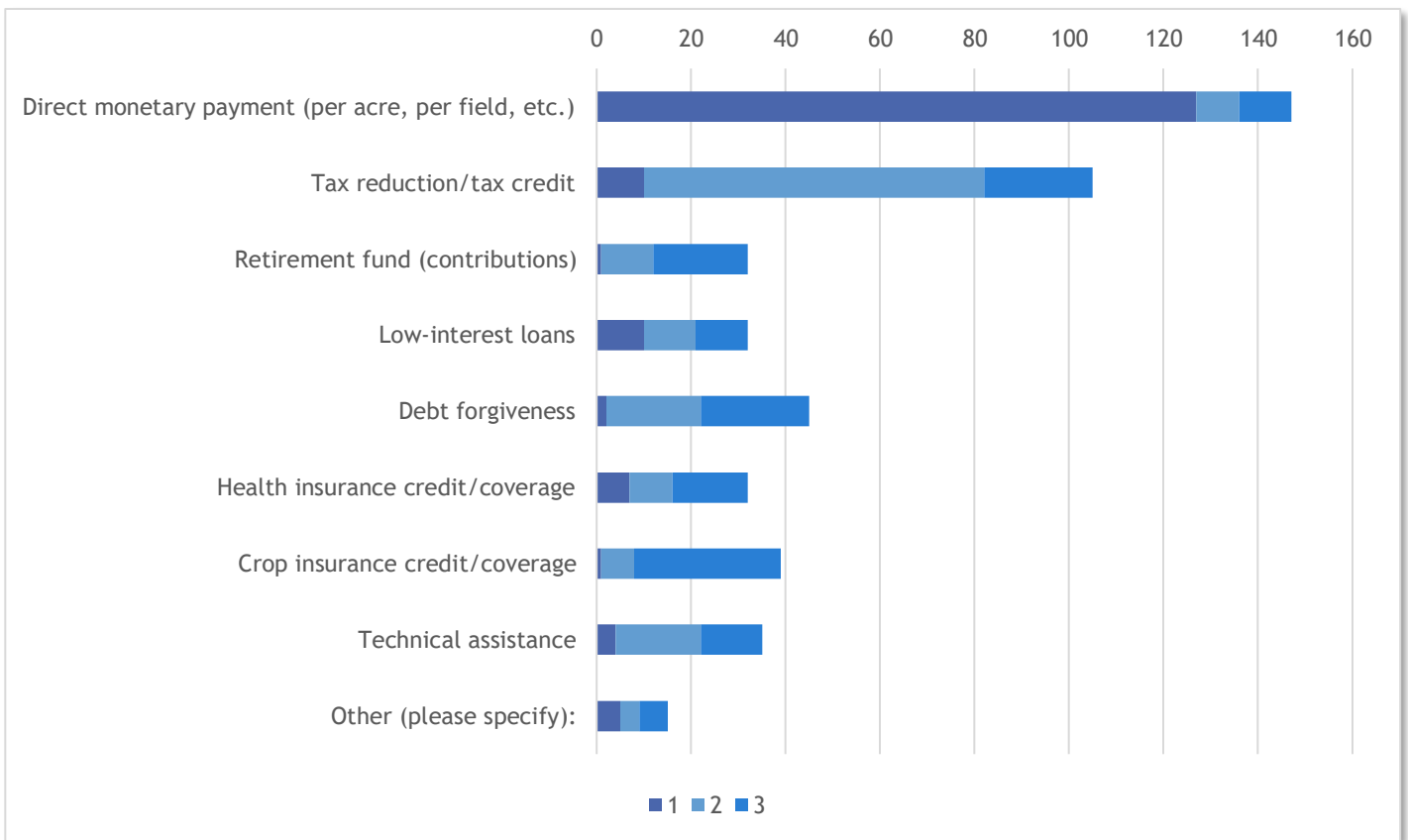


Figure 12. Top three preferred forms of compensation among Vermont farmers for a soil health payment for ecosystem services program, ranked 1 through 3.

Table 13. Preferred forms of compensation among Vermont farmers for a soil health payment for ecosystem services program, and their top three rankings.

Form of compensation	Total occurrences	Rank		
		1	2	3
Direct monetary payment (per acre, per field, etc.)	147	127	9	11
Tax reduction/tax credit	105	10	72	23
Retirement fund (contributions)	32	1	11	20
Low-interest loans	32	10	11	11
Debt forgiveness	45	2	20	23
Health insurance credit/coverage	32	7	9	16
Crop insurance credit/coverage	39	1	7	31
Technical assistance	35	4	18	13
Other	15	5	4	6

In addition to the multiple choice options, respondents were also give the opportunity to enter in additional ideas. These additional responses included:

- *Why do we have to be compensated to do the right thing?*
- *To be left alone by AAFM and AgEx unless involvement is requested.*
- *Special grant funding*
- *Equipment grants*
- *I feel direct monetary payment is primarily what I'm interested in. Farms already have tax incentives - some farms lease land and don't really directly benefit from that. different people and farms have different degrees of debt, not all farms have crop insurance, health insurance credit is not necessarily a benefit to everyone. Direct payments allow people to choose how best to spend the value they are creating.*
- *Grants for supplies, i.e. cover crop seed, fencing and water for rotational grazing. Testing, monitoring*
- *In kind payments: e.g. cover crop seed & seeding, conservation boundary and climate resilience plantings, energy conservation investments, etc.*
- *free soil and water testing.*
- *Direct payment to the vendor to repair/fix*
- *Compensation for soil testing (esp solvita/ woods end))*
- *Lower Property Taxes*
- *Marketing/sales assistance*
- *Someone come to farm to do the work*
- *Grants to improve*

Q13. Have you done soil health testing beyond your routine or required soil tests?

Table 14. Experience with advanced soil health testing among respondents.

Answer	% of respondents
Yes	45.51%
No	50.30%
Unsure	4.19%

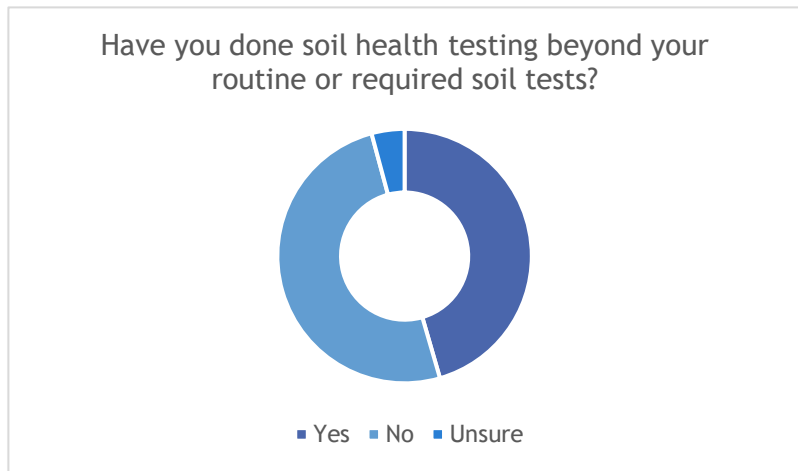


Figure 13. Experience with advanced soil health testing among respondents.

Q14. Are you familiar with any of these soil health indicators?

Table 15. Respondent’s familiarity with selected soil health indicators.

Soil health indicator	% of respondents	Count
Organic matter	95.21%	159
Bulk density	44.91%	75
Aggregate stability	43.71%	73
CO2/N2O emissions off soil	34.73%	58
None of the above	3.59%	6

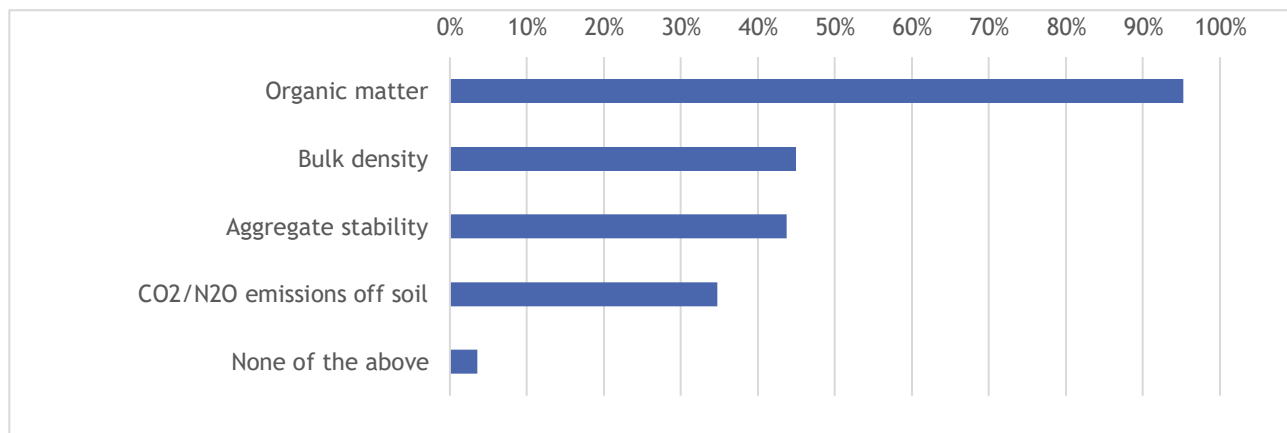


Figure 14. Percent of respondents familiar with selected soil health indicators.

Q16. If you were to be given a direct monetary payment for increasing or sustaining soil health, what form should this take?

Table 16. Preferred spatial basis for direct monetary payments.

Preferred spatial basis for payments	% of respondents
Per acre	46.11%
Whole farm payment	39.52%
Per field	2.99%
Other	11.38%

Comments about this question often suggested that a per acre payment rate be combined with different tiers. Many comments also suggested that payment be based on either the impact on ecosystem services, or the effort and cost of practice to the farm.

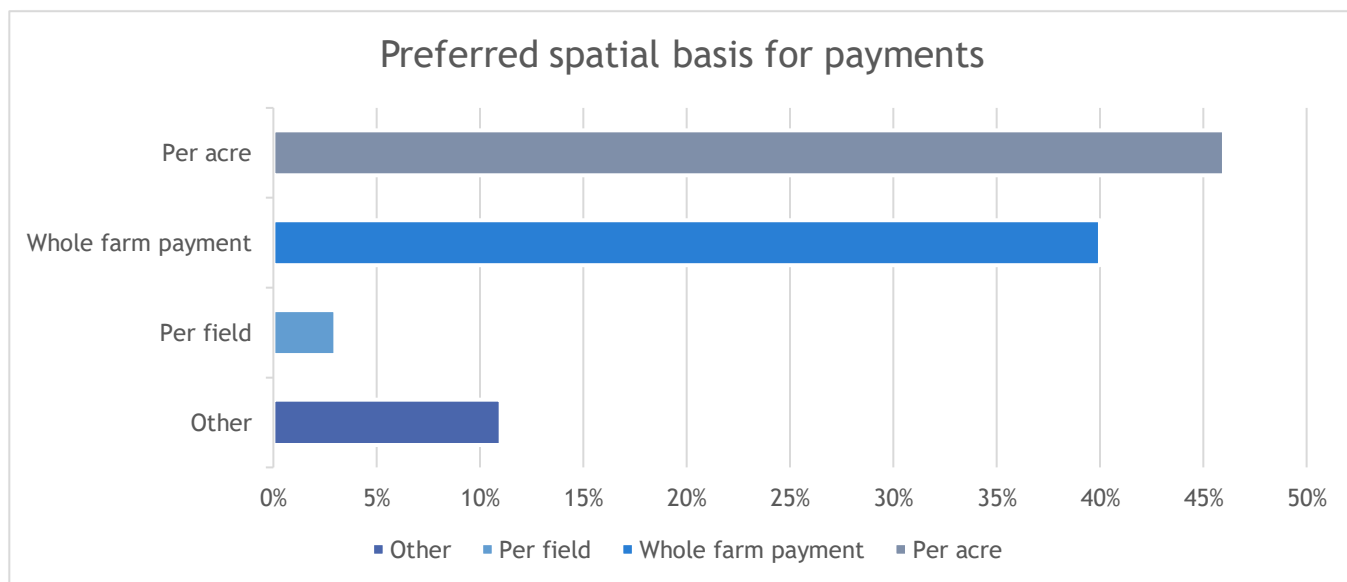


Figure 15. Percent of respondents who prefer selected spatial basis for direct monetary payments.

Q25. Privacy or efficiency. Which of the following is most important to you?

Table 17. Farmer preferences for either data privacy or reduced program paperwork through overlap with other programs.

Statement choices	% of respondents
The application for new conservation incentive programs should be combined with existing conservation incentive program paperwork as much as possible to save me time.	62.28%
My data privacy is important and enrollment paperwork should not be shared between programs.	14.97%
Neither is more important to me	22.75%

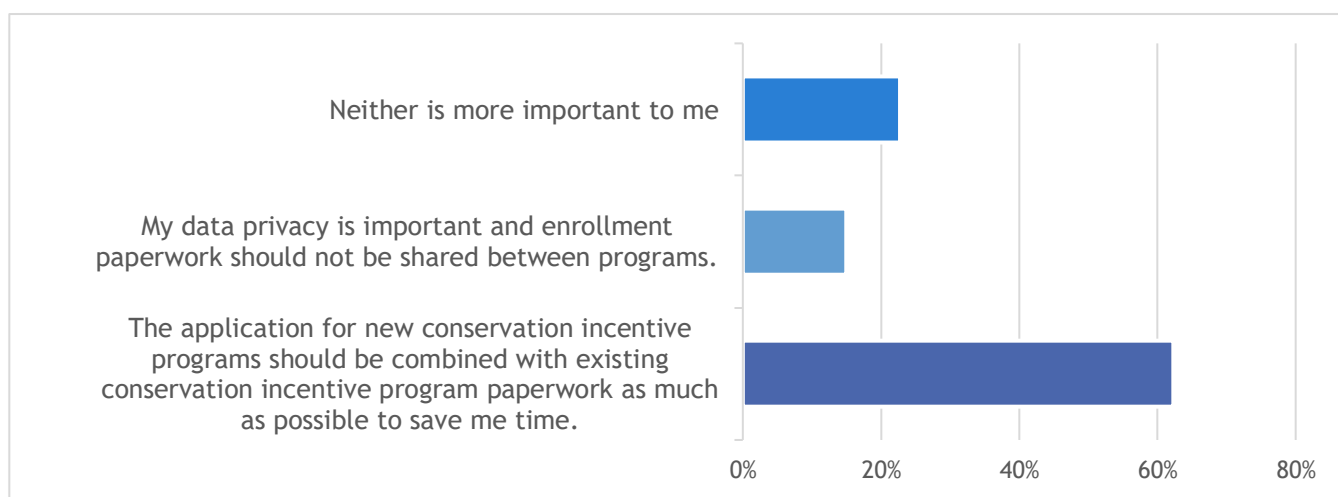


Figure 16. Farmer preferences for either data privacy or reduced program paperwork through overlap with other programs.

Q26. Do you think that technical assistance/education for farmers would be a necessary component of the program? (including application and other paperwork, soil testing, and data reporting)

Table 18. Need for technical assistance and education for farmers in a soil health PES program.

Answer	% of respondents	Count
Yes	78.44%	131
No	2.99%	5
Unsure	18.56%	31

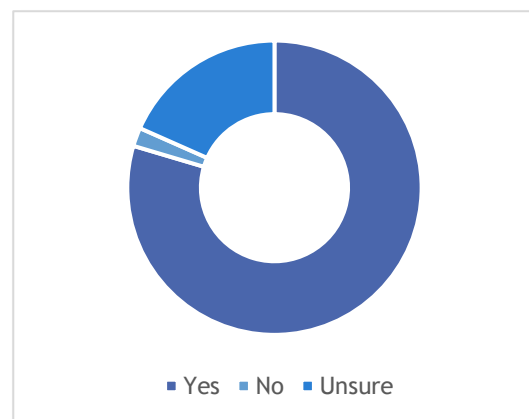


Figure 17. Need for technical assistance and education for farmers in a soil health PES program.

Q17. Would you allow a 3rd party to conduct the advanced soil measurements on your farm to participate in a program?

Table 19. Acceptance of third party organization to conduct advanced soil health tests on farms.

Answer	% of respondents
Yes	88.02%
No	1.20%
Unsure	10.78%

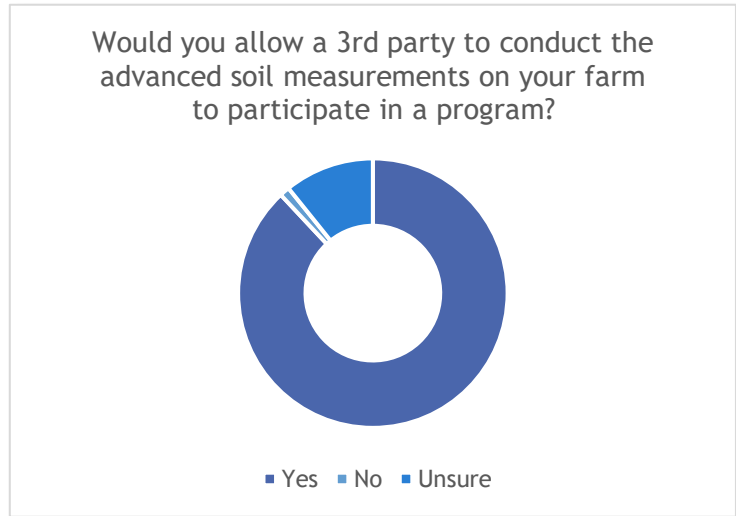


Figure 18. Acceptance of third party organization to conduct advanced soil health tests on farms.

Q18. Would you prefer to receive technical assistance so that you may eventually conduct these soil measurements yourself?

Table 20. Percent of farms who would prefer training in order to conduct measurements themselves.

Answer	%
Yes	52.69%
No	9.58%
Unsure	37.72%

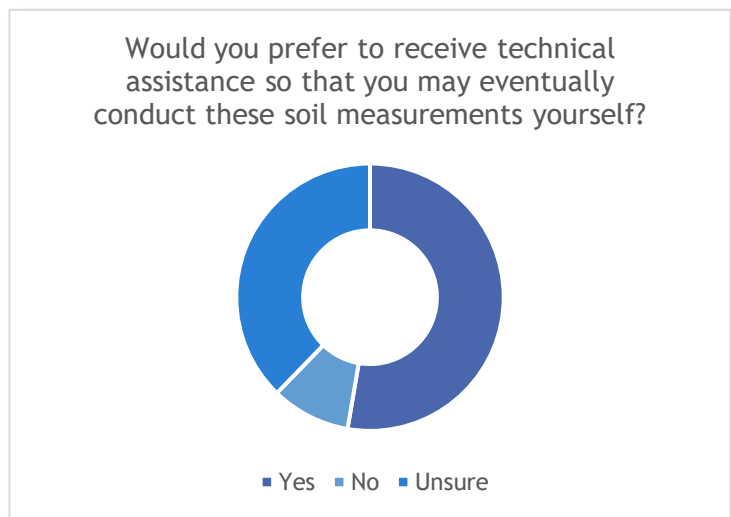


Figure 19. Percent of farms who would prefer training in order to conduct measurements themselves.

Q19. Which aspects of the program should you be compensated for?

Table 21. Aspects of program that farmers believe they should be compensated for.

Program element	% of respondents
Application and enrollment	40 %
Field sampling including basic and advanced soil measurements	82 %
Data collection, tracking, and sharing	80 %
Soil health outcomes/performance	80 %

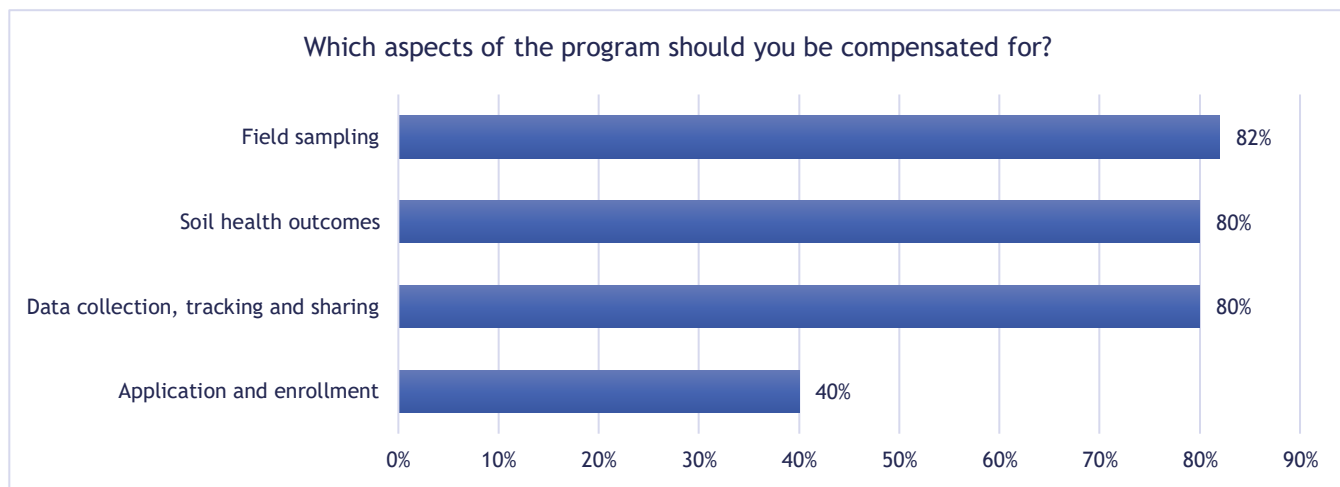


Figure 20. Aspects of program that farmers believe they should be compensated for.

Q20. Approximately how much time do you think it would take you to collect data on your management practices, conservation strategies, soil test results and other areas of your farm operation and report it to a new PES program?

Table 22. Estimated time farms would spend to collect and report management and soil data.

Data collection and reporting time	% of respondents	Count
Half a day or less	17.37%	29
A whole day	30.54%	51
A few days	40.12%	67
A week or more	11.98%	20

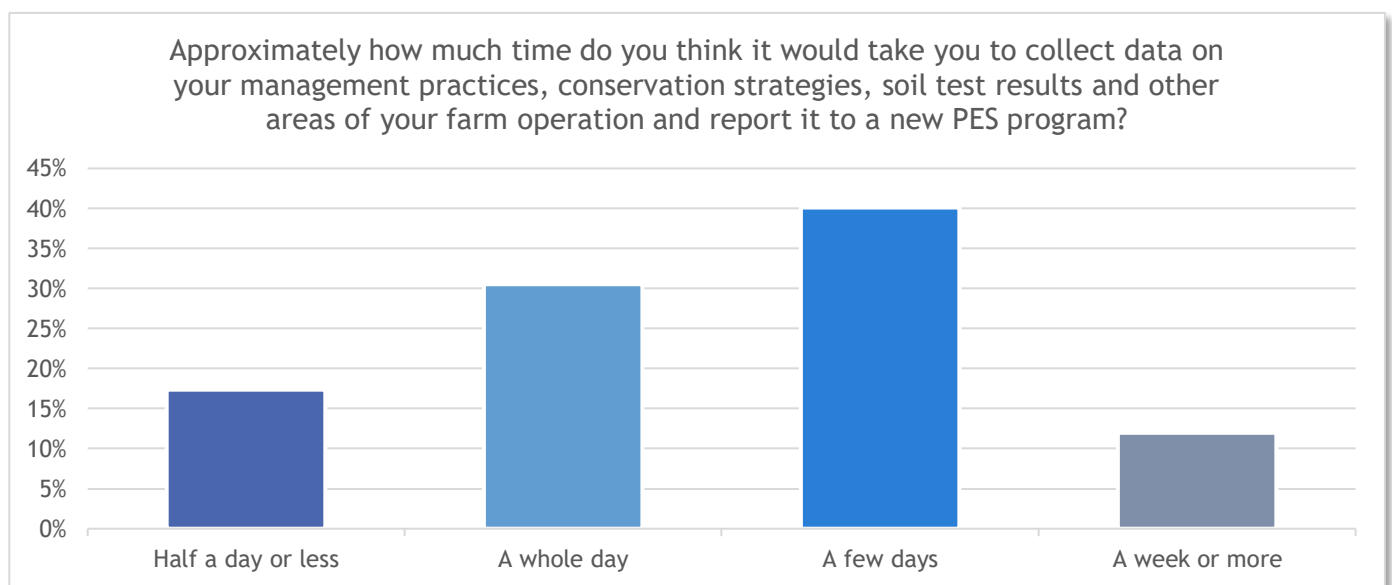


Figure 21. Estimated time farms would spend to collect and report management and soil data.

Q21. How many total hours do you think it would take you to collect a basic soil sample from each field on your farm?

Table 23. Estimated hours to collect basic soil samples from each field on the farm.

Acres	Min	Median	Mean	Max	Standard deviation
1-9	0.5	2	2.38	10	2
10-49	1	4	4.91	20	4.24
50-179	1	4	6.64	30	6.72
180-499	1	6	11.75	100	18.17
500-999	2	20	19.67	54	15.11
1000-1999	3	16	13	20	8.89
2000+	4	15	33.5	100	44.82
All farms	0.5	4	8.71	100	13.96

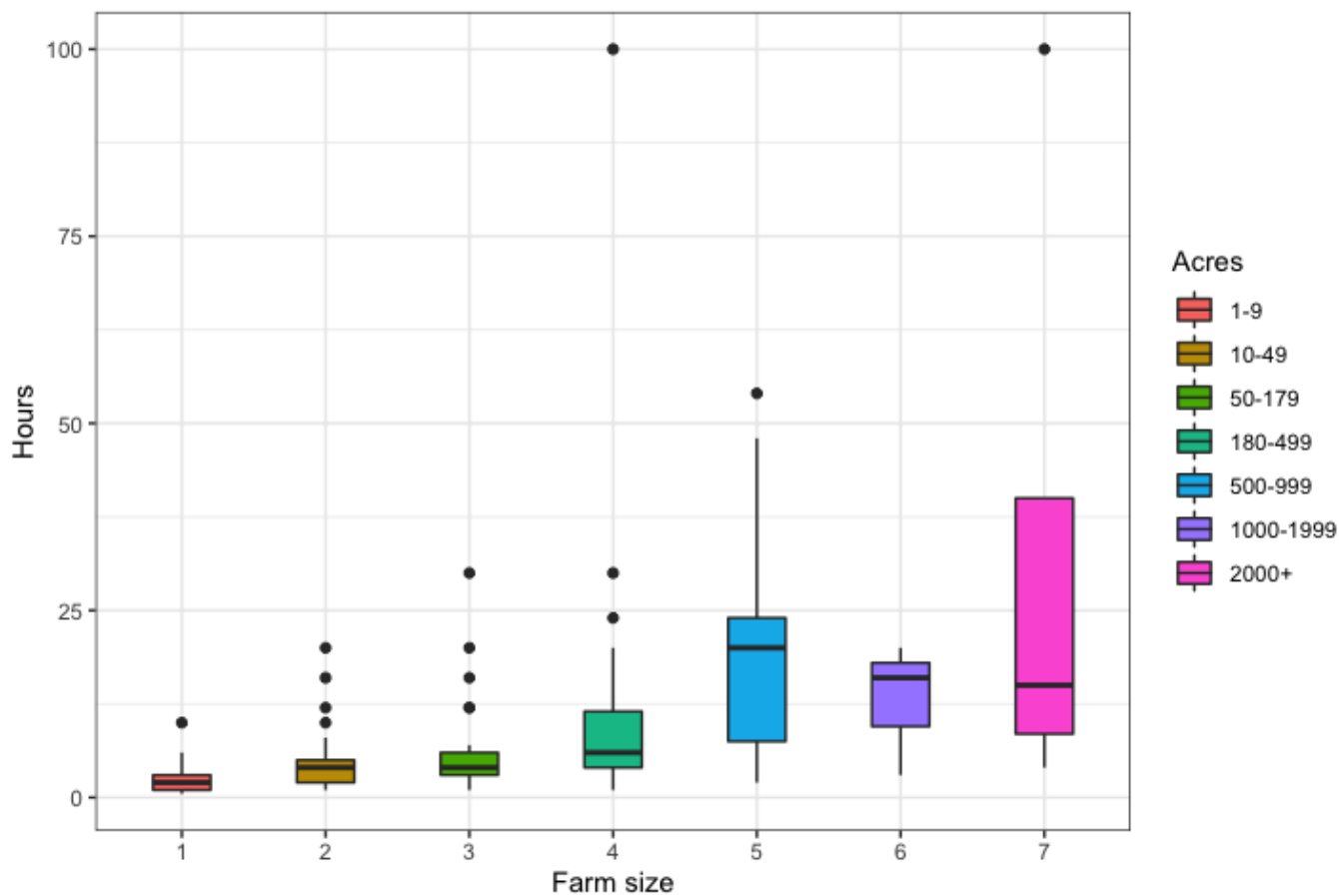


Figure 22. Estimated hours to collect basic soil samples on entire farm, by farm size.

Q22. If a program required you to share basic soil testing results and management practices for each field every year, what is the hourly rate you believe you should be paid for completing data entry? Please type your response in "per hour" format.

Table 24. Hourly compensation for reporting data on basic soil testing and management for each field.

Acres	Min	Median	Mean	Max	Standard deviation
1-9	10	25	33.09	100	23.22
10-49	0	25	32.14	100	20.42
50-179	2	25	37.78	250	45.04
180-499	2	25	41.88	300	51.44
500-999	0	25	26.94	60	16.38
1000-1999	20	25	40.00	75	30.41
2000+	20	40	47.50	90	30.96
All farms	0	25	35.42	300	34.64

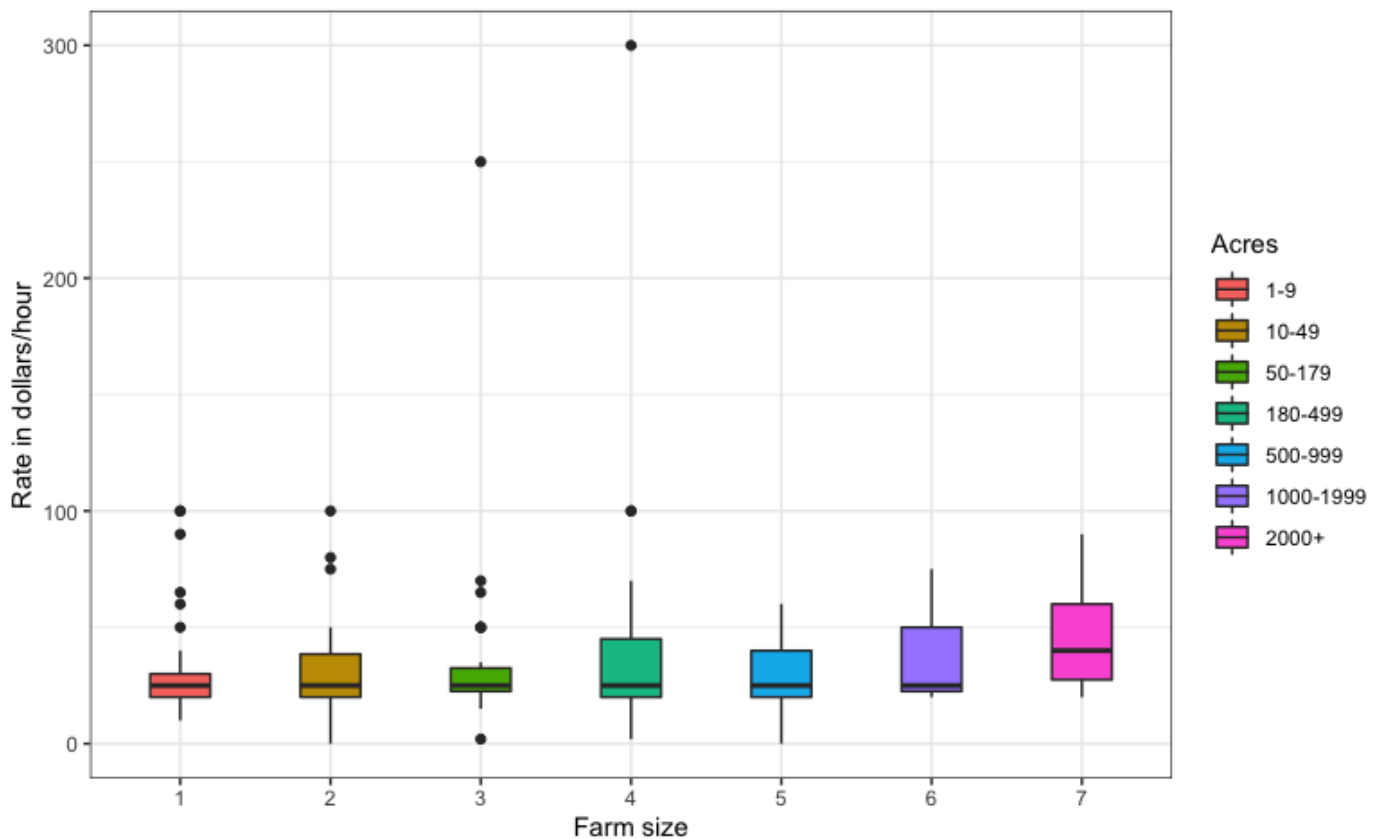


Figure 23. Hourly compensation for reporting data on basic soil testing and management for each field, by farm size.

Q23. If a program required you to conduct basic soil sampling on your farm, what is the hourly rate you should be paid for doing that work?

Table 25. Hourly compensation in dollars per hour for conducting **basic soil testing**, by farm size.

Acres	Min	Median	Mean	Max	Standard deviation
1-9	5	25	30.09	100	20.36
10-49	0	25	32.20	100	21.06
50-179	2	25	32.78	100	20.19
180-499	1	25	34.27	120	23.91
500-999	0	25	26.00	60	15.00
1000-1999	20	25	40.00	75	30.41
2000+	20	40	47.50	90	30.96
All farms	0	25	32.14	120	21.16

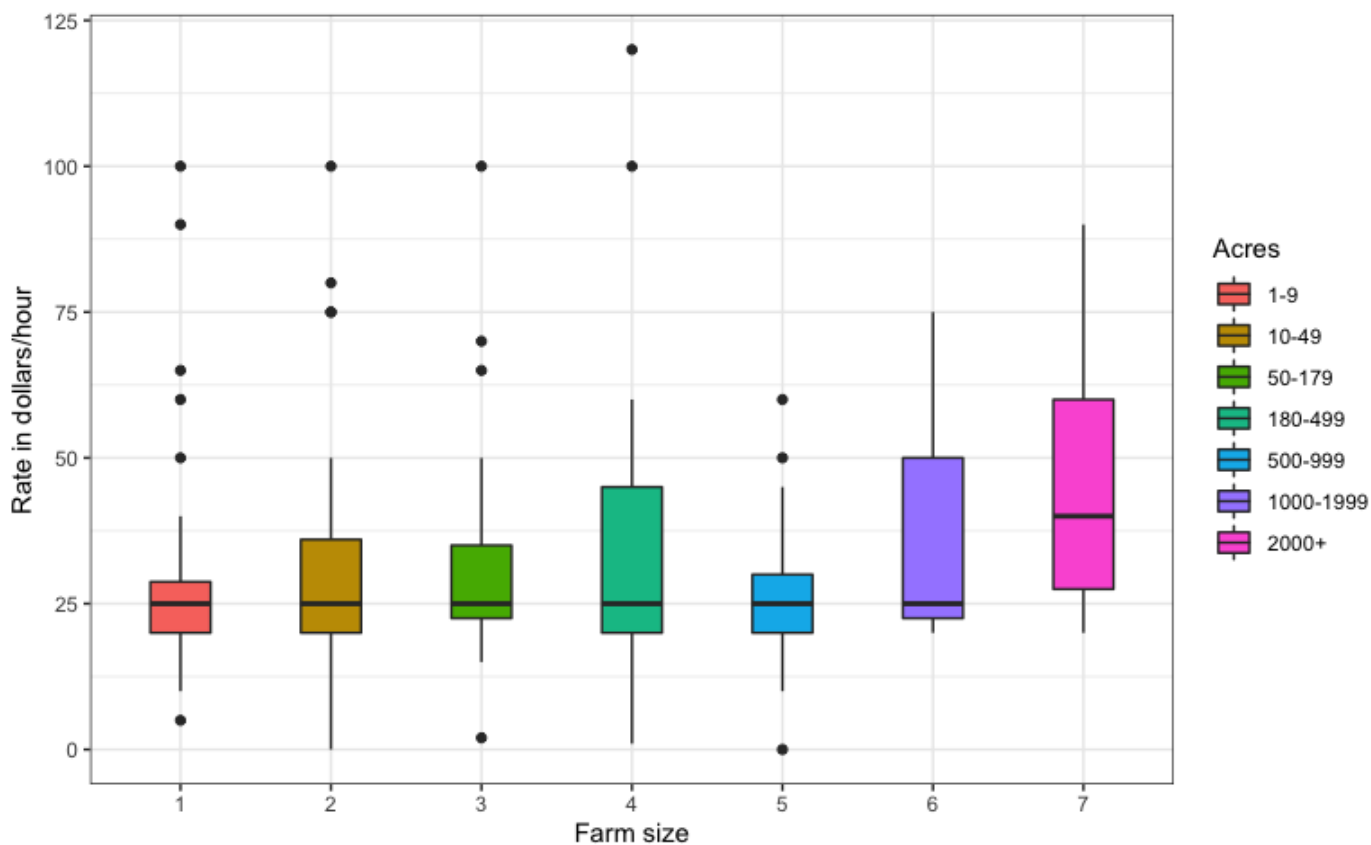


Figure 24. Hourly compensation in dollars per hour for conducting **basic soil testing**, by farm size.

Q24. If a program required you to conduct advanced soil testing (aggregate stability, bulk density, etc.) what is the hourly rate you should be paid for doing that work? Please type your response in "per hour" format.

Table 26. Hourly compensation in dollars per hour for conducting advanced soil testing, by farm size.

Acres	Min	Median	Mean	Max	Standard deviation
1-9	15	25	33.41	100	19.77
10-49	0	30	38.91	100	27.78
50-179	5	30	40.70	200	35.85
180-499	1	25	38.03	100	24.52
500-999	0	25	32.06	60	16.49
1000-1999	20	35	43.33	75	28.43
2000+	20	40	47.50	90	30.96
All farms	0	30	37.37	200	25.98

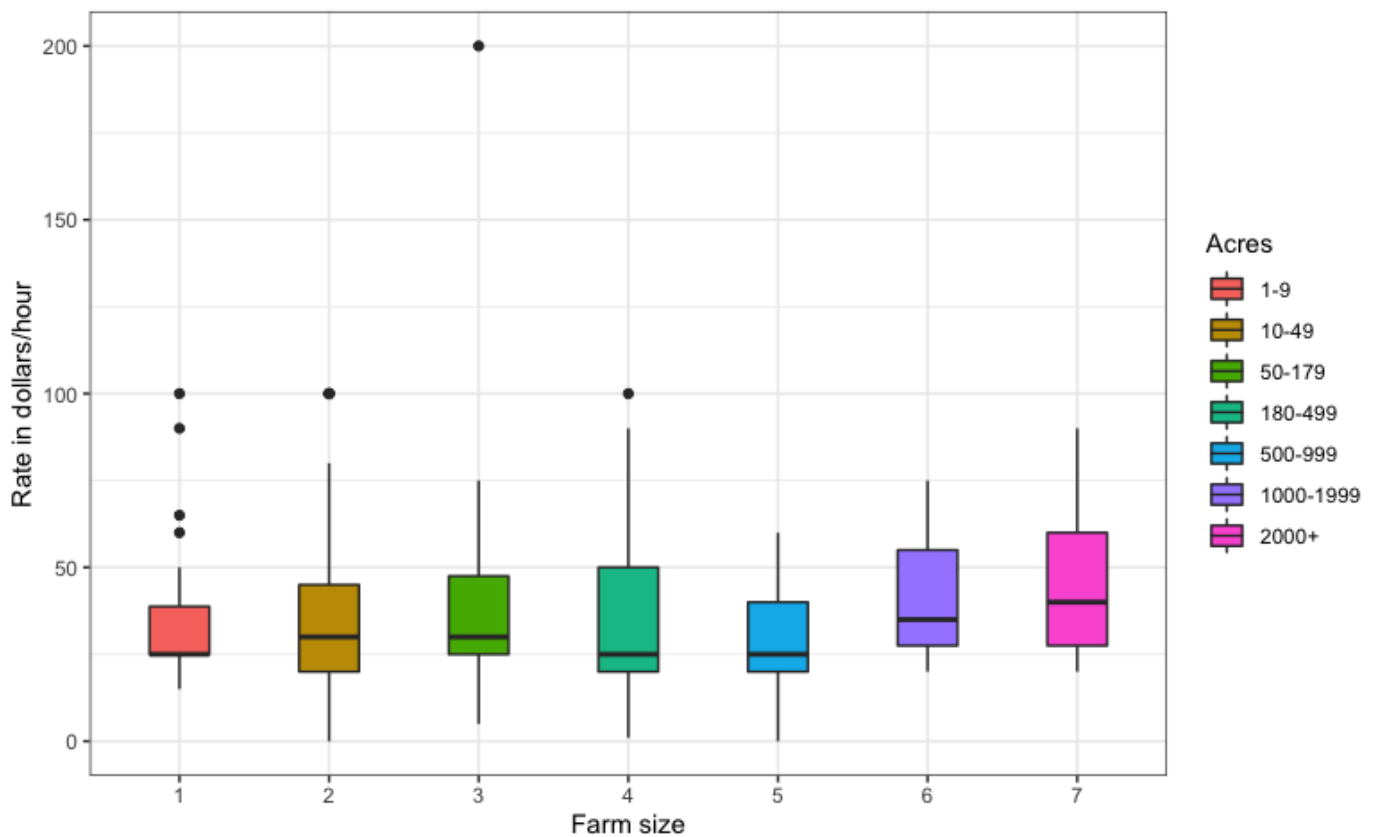


Figure 25. Hourly compensation in dollars per hour for conducting advanced soil testing, by farm size.

Q27. If a program compensated you based on how your soil test results compared to soil health threshold goals set by the program, how much do you believe you should be compensated for meeting those goals? Please type your answer in the box below and make sure to include units such as “per acre”, “per field”, etc. We understand this is a complex question with many factors.

Table 27. Suggested forms of fair compensation for meeting soil health threshold goals set by a soil health program.

Type of answer	Number of respondents
Per acre	48
Whole farm	12
Based on ecological outcome performance	14
Cost of practice	17
No payment	6
Per field	6
Based on cost of sampling	1

Among the 48 responses that suggested per acre compensation, the median rate was \$100/acre, and the mean rate was \$206/acre. The range of suggestions spanned from a minimum of \$2/acre to a maximum of \$3500/acre. Among the 12 respondents that suggested whole farm compensation levels, the median level was \$900 per farm, and the mean level was \$5,000 per farm. The range of suggestions spanned from a minimum of \$50 per farm to a maximum of \$50,000 per farm.

Q28. Please share your greatest concern(s) with entering a new conservation program

Farmers greatest concerns with entering a new conservation program were overwhelming that the burdens of paperwork and time not be worth it. Additional concerns include the following:

- complex paperwork and documentation
- the amount of time burden enrolling in new program would take away from crucial farm tasks
- data privacy & lack of confidentiality
- payments not being sufficient to justify participation
- the amount of time data collection would require
- reduced agency & loss of decision-making ability
- that the program actually result in meaningful benefits to environment, land, farmers and communities
- greenwashing & additionality
- commodification of data
- commodification of ecosystem services and subsequent undervaluation of them
- that the program would be too complex
- that the program would not be holistic, accurate or ambitious enough
- that wealthy landowners benefit more than farmers
- that agricultural land prices increase out of reach for farmers
- short term yield reductions
- new regulations or mandatory enrollment
- land use restrictions & red tape
- inconsistent funding for the program
- changes after enrollment
- inadequate technical assistance
- that previous stewardship be rewarded
- incompatibility or redundancy with emerging carbon market & existing programs
- consistent interpretation of measures by different audiences
- usability of information
- fairness
- long term nature of good management & soil health outcomes



Figure 26. Word cloud of farmers’ concerns with a new conservation incentive program.

Section 4. Conservation Practices and Current Incentive Programs

Q32. What conservation practices do you implement on your farm?

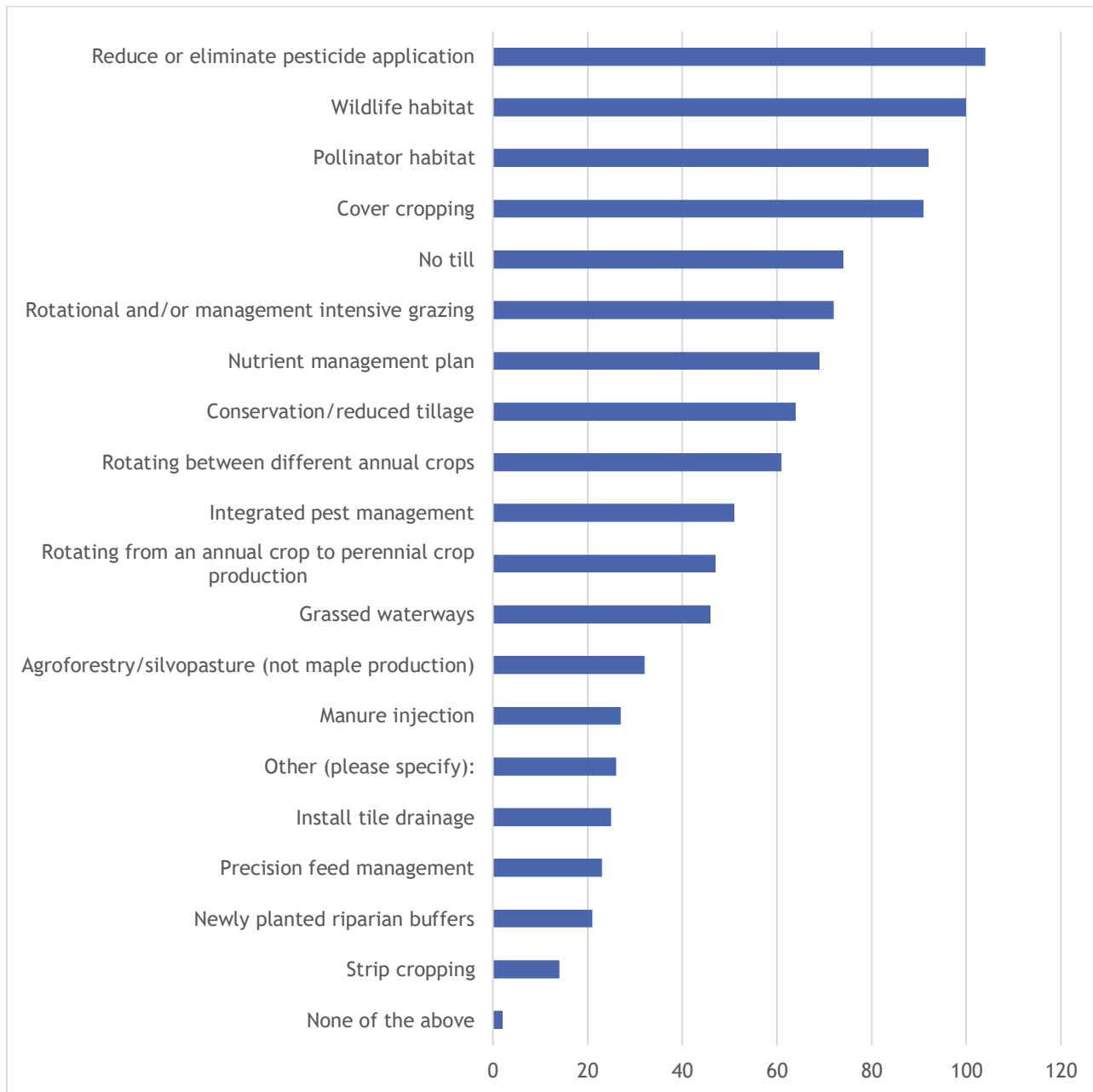


Figure 27. Conservation practices implemented by survey respondents.

Table 28. Conservation practices implemented by survey respondents.

Conservation practice	% of respondents who implement
Reduce or eliminate pesticide application	58%
Wildlife habitat	56%
Pollinator habitat	51%
Cover cropping	51%
No till	41%
Rotational and/or management intensive grazing	40%
Nutrient management plan	39%
Conservation/reduced tillage	36%
Rotating between different annual crops	34%
Integrated pest management	28%
Rotating from an annual crop to perennial crop production	26%
Grassed waterways	26%
Agroforestry/silvopasture (not maple production)	18%
Manure injection	15%
Other (please specify):	15%
Install tile drainage	14%
Precision feed management	13%
Newly planted riparian buffers	12%
Strip cropping	8%
None of the above	1%

In addition to the multiple choice options, respondents were also give the opportunity to identify other conservation practices. These additional responses included:

- Riparian and wetland buffers
- Bio-swales
- Using draft animals to reduce soil compaction and minimize erosion when working in fields
- Timed clipping behind grazing of invasive species
- Movement of mobile poultry housing
- Bale grazing to improve fertility
- Terraced to prevent erosion and flooding
- Soil augmentation through controlled burns and adding of charcoal
- Stockpile grazing
- Cut and drop syntropic practices

- Bedded pack
- Hugelkulture
- Swale permaculture
- Permanent perennial plantings
- Long term productive tree plantings and buffers
- On site compost production and applications
- Limits on # taps per tree in sugarbush
- Erosion elimination
- 50' forested buffer zone
- Regular mulching
- Spread cow manure on hay fields
- Beekeeping
- Diversion ditches
- Dedicated livestock lanes & farm roads
- Seasonal considerations for land use
- Buffers
- Organic certification
- Crop diversity in cover crops
- Reduced mowing
- Invasive removal
- Water ram-pump for irrigation
- Drip irrigation
- Organic fertilizers for slow release and minimizing runoff
- On farm plastic reduction
- Spader instead or rototiller for tillage
- Mixed annuals and perennials
- No spray
- Rotate between grazing and hay cutting
- Grass buffers
- Gras-legume mixes
- Research and innovation on farm
- Buffer maintenance

Extent of incentive program support for conservation implementation

Survey respondents were asked to identify how many acres they implement for each conservation practice, and how many acres of that implementation was supported by incentive programs.

Table 29. Extent of field scale conservation practice implementation among adopters, and percent of implementation supported by incentive programs.

Practice	Percent of respondents who implement this practice	Among adopters, percent of field acreage with practice (mean) *	Percent of acres implemented without incentive support (mean)	Percent of implemented acres supported by incentive (mean)
Cover cropping	51%	97%	71%	29%
Rotating from an annual crop to perennial crop production	26%	53%	86%	14%
Rotating between different annual crops	34%	87%	97%	3%
Strip cropping	8%	49%	89%	11%
No till	41%	72%	89%	11%
Conservation/reduced tillage	36%	72%	97%	3%
Manure injection	15%	42%	58%	42%
Rotational and/or management intensive grazing	40%	65%	82%	18%
*To calculate the percent of field acreage with the practice implemented, the cover cropping, rotations, strip cropping, no-till, and reduced tillage rows use the equation ‘acres in practice /total acres in annual crops on the farm’. For the manure injection row, we use the equation: ‘acres in practice /total acres in annual crops, hay and pasture on the farm’. For the rotational and/or management intensive grazing row, we use the equation: ‘acres in practice /total acres in hay and pasture on the farm’.				

Table 30. Edge-of-field and whole farm conservation practice implementation among adopters, and percent of implementation supported by incentive programs.

Practice	Percent of respondents who implement this practice	Percent of implementation* without incentive support (mean)	Percent of implementation* supported by incentive (mean)
Nutrient management plan	39%	90%	10%
Integrated pest management	28%	93%	7%
Reduce or eliminate pesticide application	58%	96%	4%
Pollinator habitat	51%	95%	5%
Wildlife habitat	56%	91%	9%
Agroforestry/silvopasture (not maple production)	18%	93%	7%
Newly planted riparian buffers	12%	55%	45%
Grassed waterways	26%	92%	8%

Percent of conservation practice implementation supported by incentive programs on Vermont farms

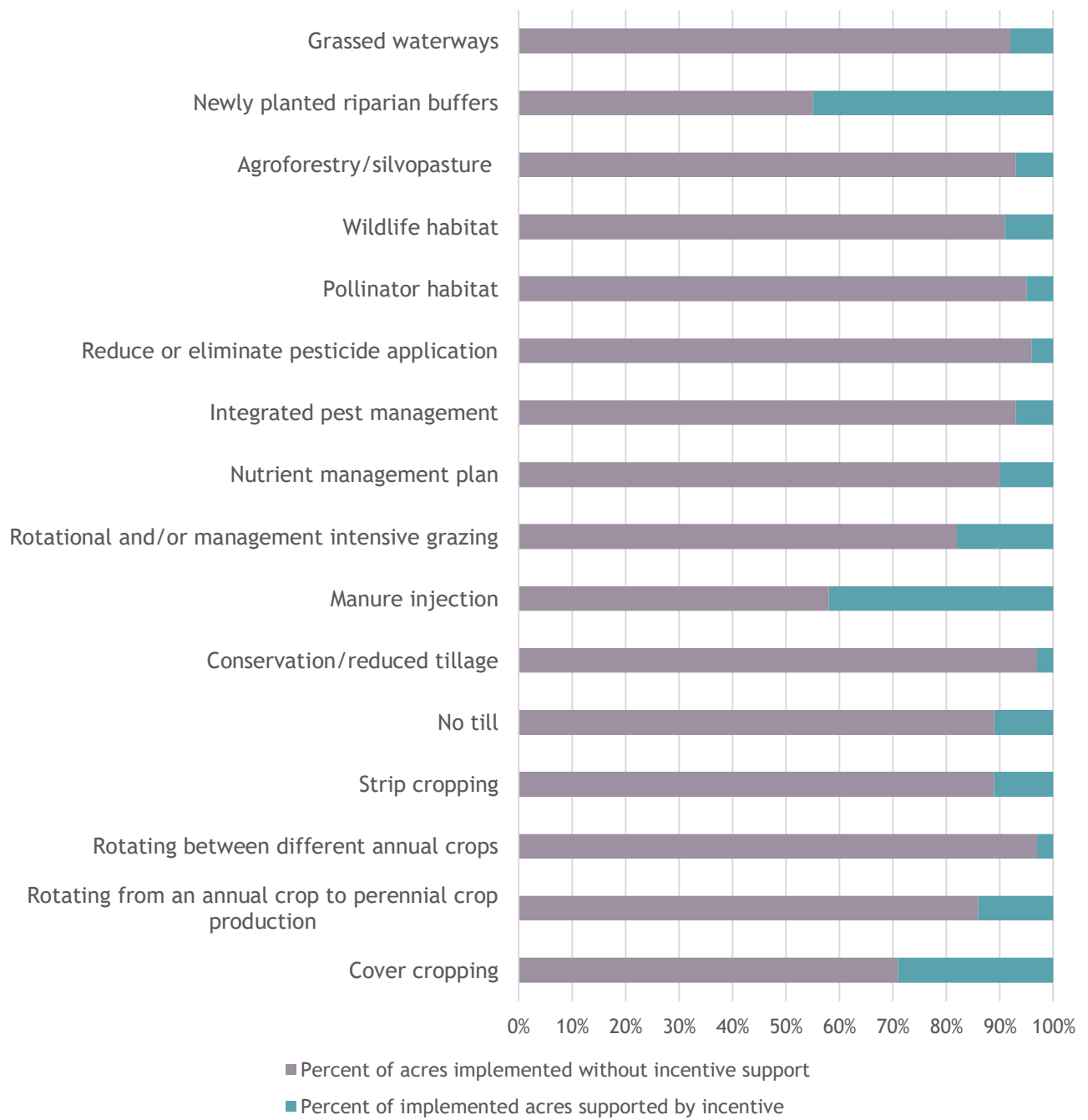


Figure 28. Funding for conservation practice implementation.

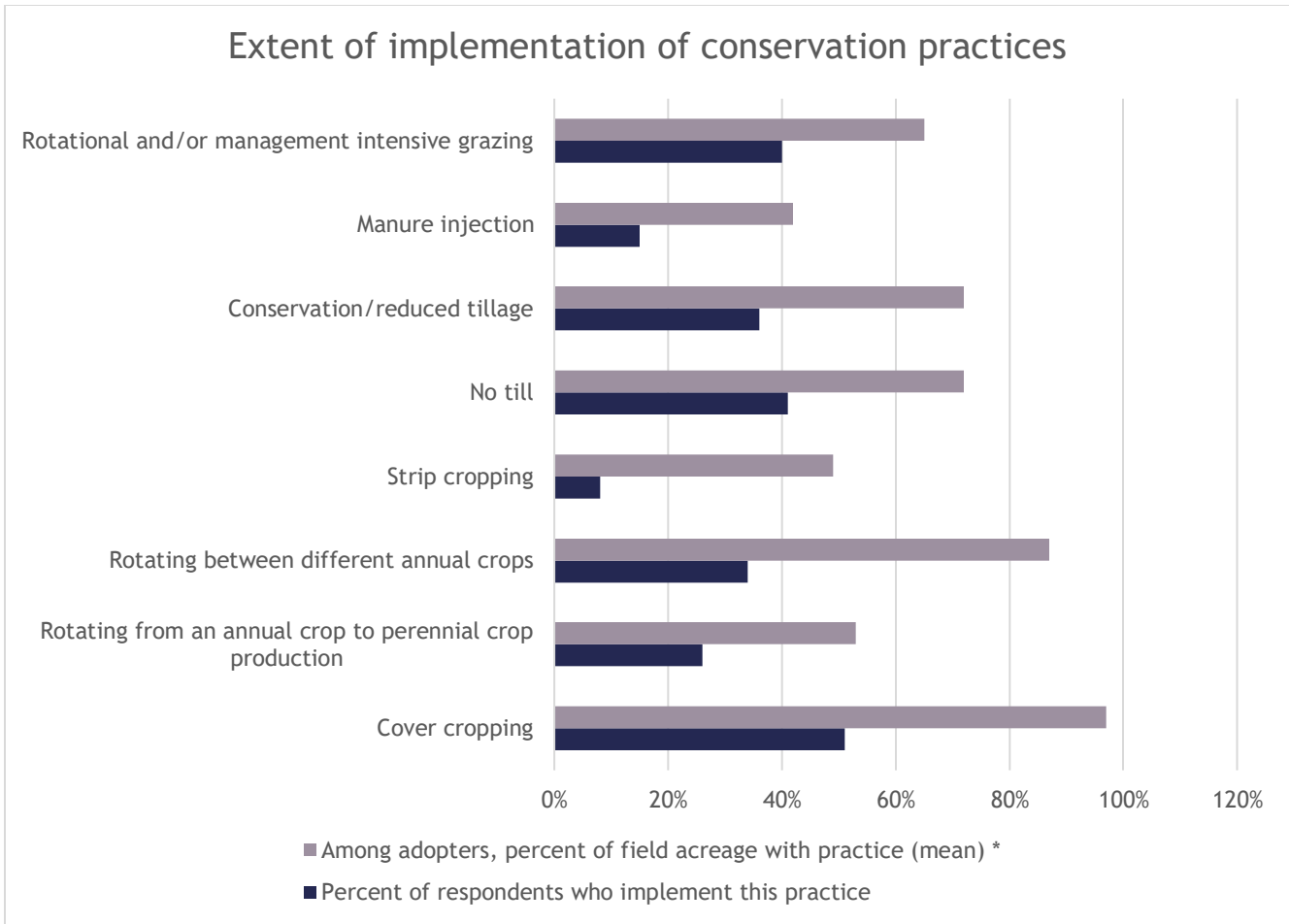


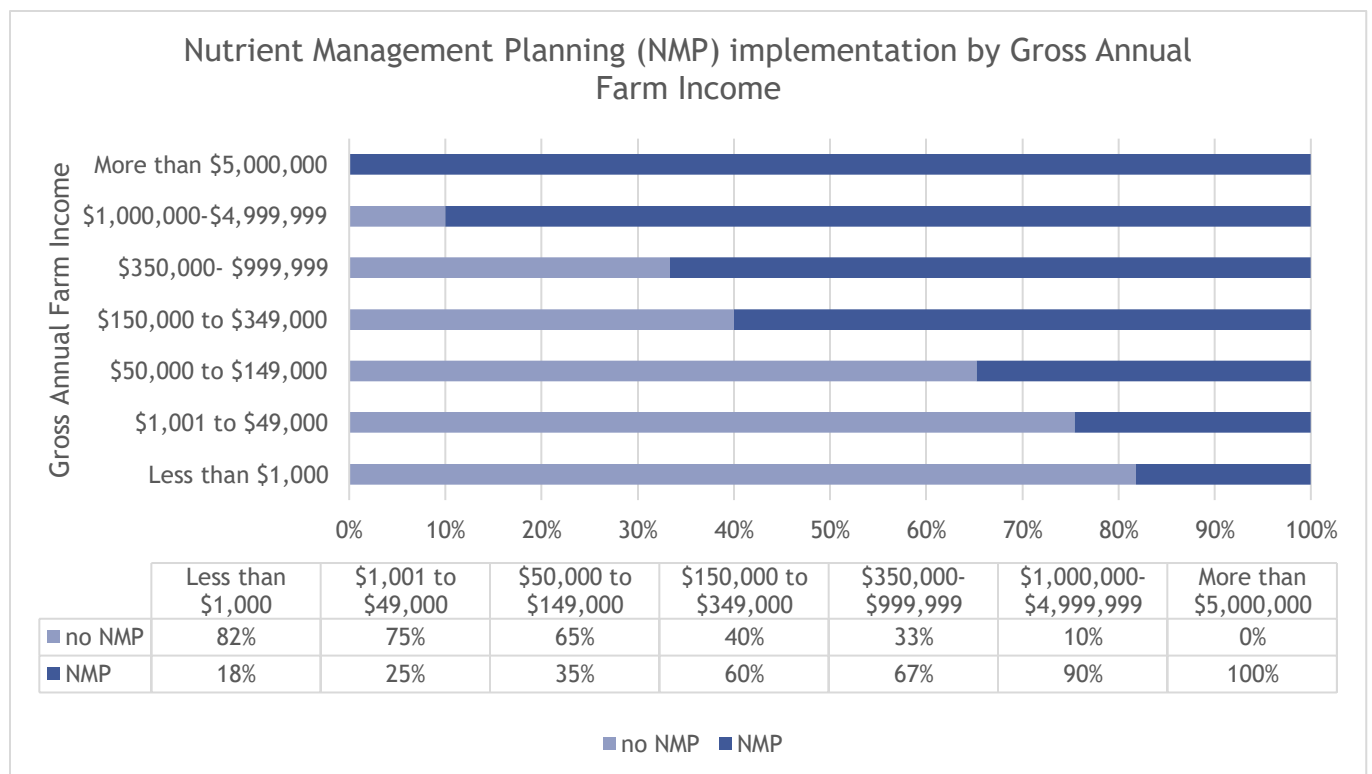
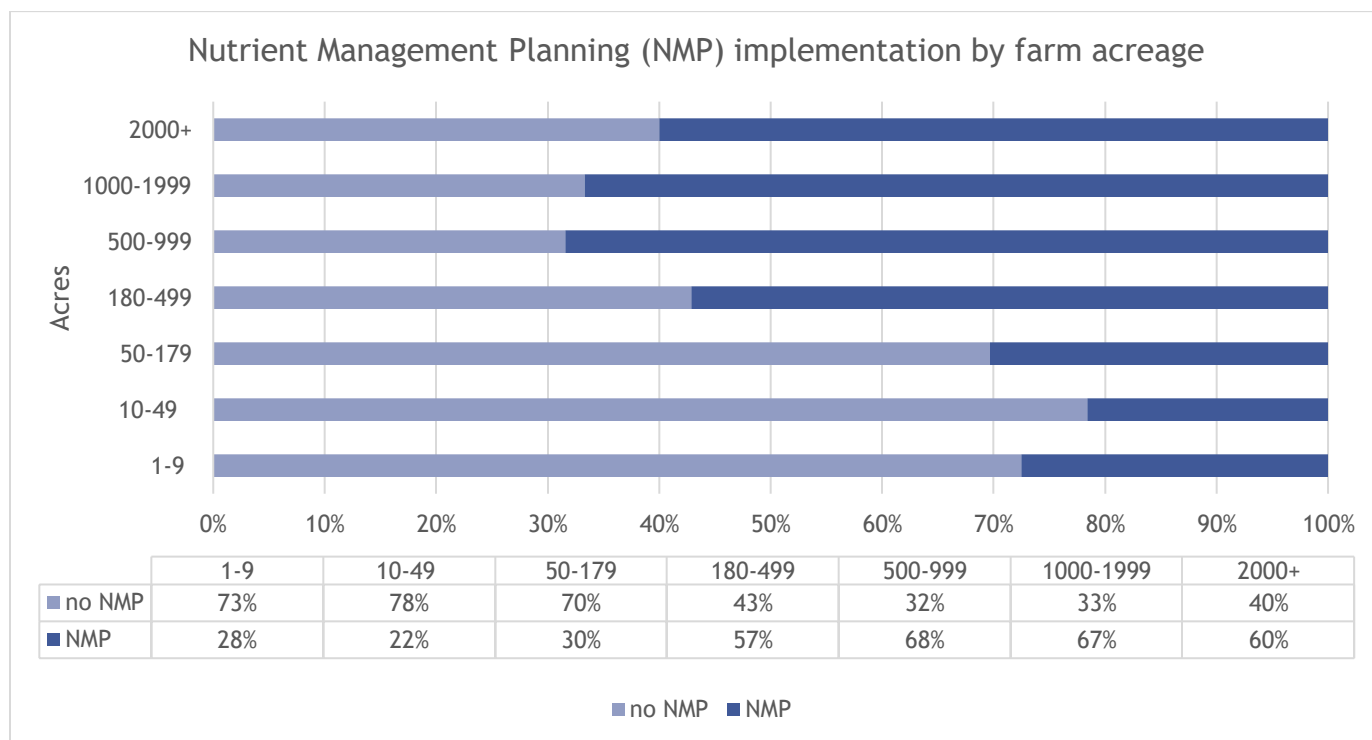
Figure 29. Percent of respondents who implement field scale practices, and the percent of their field acreage they implement these practice on. The figure provides a sense of the extent of adoption across farming community, and the extent of implementation on farms.

Precision feed management

Table 31. Heard sizes and extent of precision feed management among survey respondents.

Statistic	Number
Range of herd sizes among survey respondents (min-max number of cows)	10-1600
Average number of cows on farm	429
Percent of respondents who implement this practice	13%
Among adopters, percent of heard fed with precision feed management	89%

Nutrient Management Planning by farm size



Q33. Please rank your top three reasons for implementing conservation practices.

Table 32. Primary motivations for implementing conservation practices, as ranked by farmers.

Motivation	Total mentions	Rank		
		1	2	3
Stewardship of your farmland	145	77	39	29
Stewardship of the environment off your farm (water quality, soil health, ecosystem health, wildlife/plant biodiversity)	121	41	52	28
Benefitting your community and landscape	74	3	17	54
Financial (farm viability, economics, long-term cost savings)	64	25	17	22
Compliance with agricultural laws (ex. VT RAPs)	33	5	18	10
Help with farm management issues (ex. Nutrient management)	30	3	15	12
Other	7	4	0	3

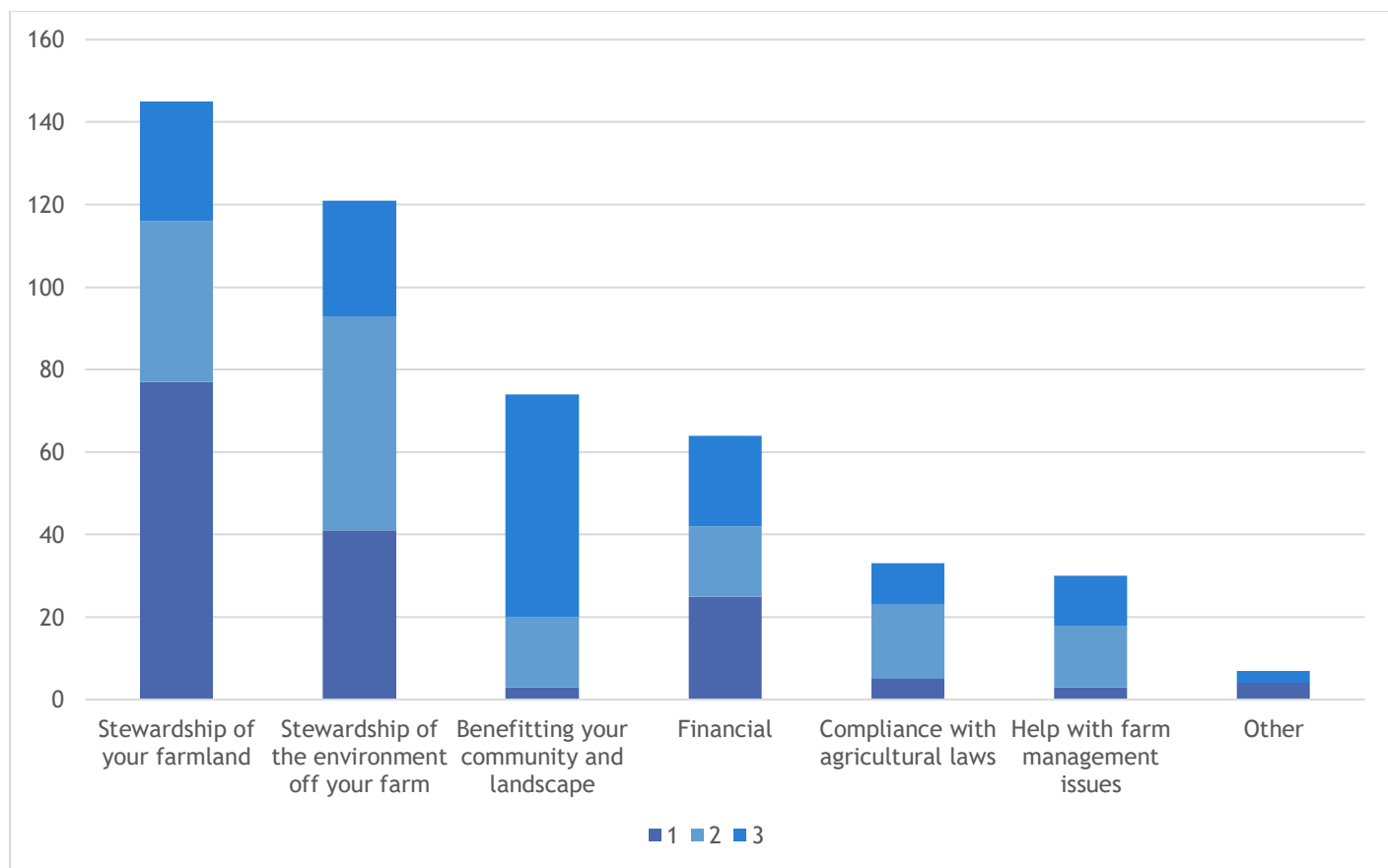


Figure 30. Primary motivations for implementing conservation practices, as ranked by farmers.

Q34. Please rank your top three reasons for enrolling in conservation programs.

Table 33. Primary motivations for enrolling in conservation practices, as ranked by farmers.

Motivation	Total mentions	Rank		
		1	2	3
Stewardship of your farmland	113	38	60	15
Stewardship of the environment off your farm	100	26	36	38
Financial	98	67	12	19
Help with farm management issues	40	9	15	16
Benefitting your community and landscape	37	4	8	25
Compliance with agricultural laws	31	1	7	23
Other	17	13	3	1

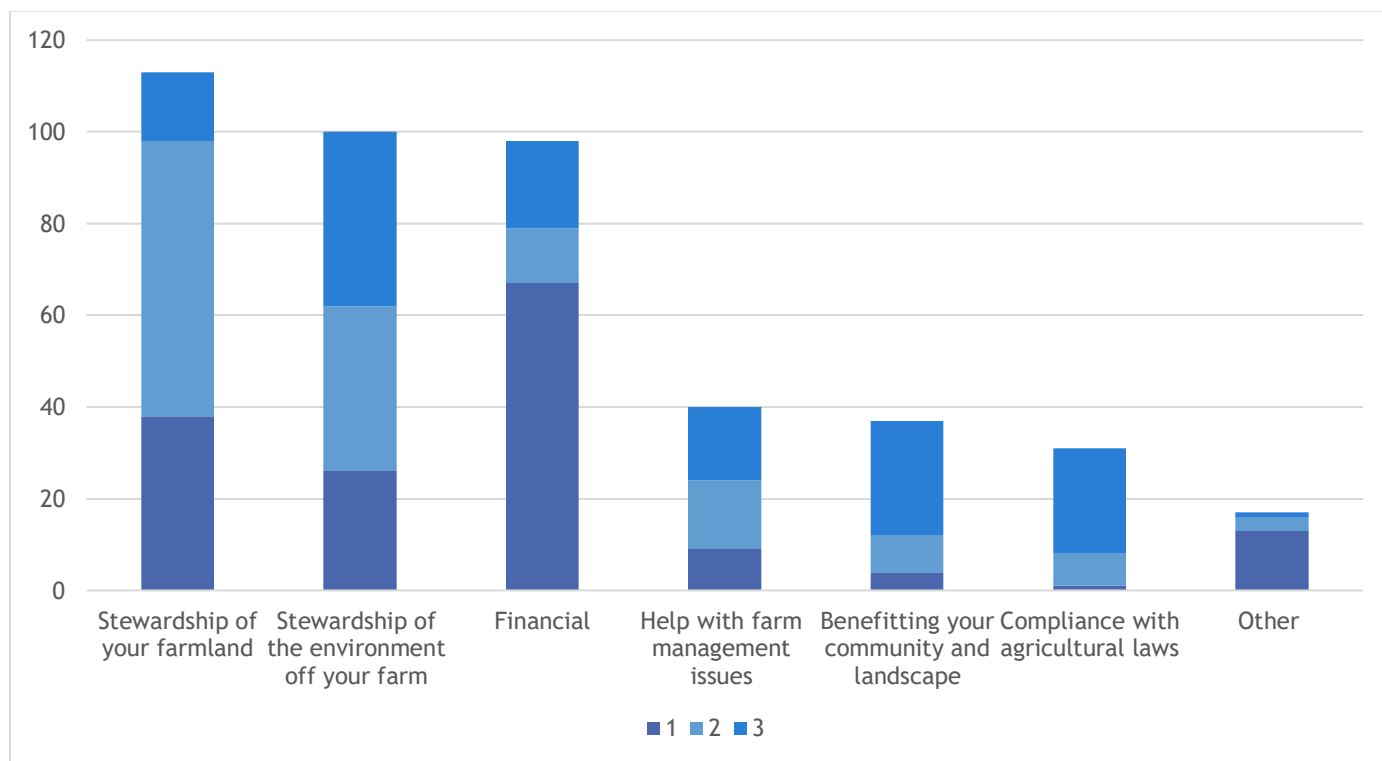


Figure 31. Primary motivations for enrolling in conservation practices, as ranked by farmers.

Q35. What state or federal conservation programs have you enrolled in? (including currently enrolled) (check all that apply)

Table 34. Programs respondents have enrolled in.

Answer	# of respondents enrolled
I am not enrolled in any state or federal conservation programs	56
NRCS Environmental Quality Incentive Program (EQIP)	70
FSA Conservation Reserve Enhancement Program (CREP)	17
NRCS Conservation Stewardship Program (CSP)	27
VAAFM Vermont Pay for Phosphorus (VPFP)	9
VAAFM Farm Agronomic Practice (FAP)	31
VAAFM Best Management Practices (BMP)	25
VAAFM Pasture and Surface Water Fencing (PSWF)	8
Other	11

Other programs identified by respondents:

- NRCS forestry CAP
- Federal Grasslands conservation Program
- Use Value
- VESP
- Ben & Jerry’s Caring Dairy
- NRCS/WRE program

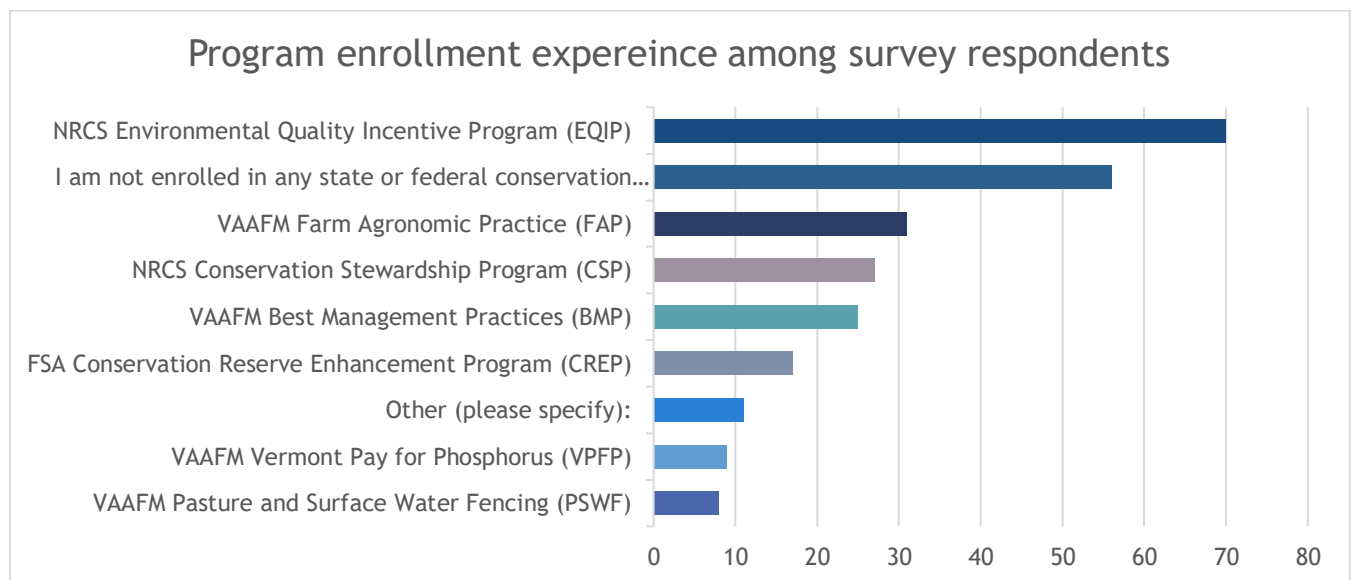


Figure 32. Programs respondents have enrolled in.

Q36. Do you grow corn, soybeans, or other row crops that are subsidized by the government?

Table 35. Percent of respondents who grow subsidized crops.

Answer	%	Count
Yes	16.22%	30
No	83.78%	155

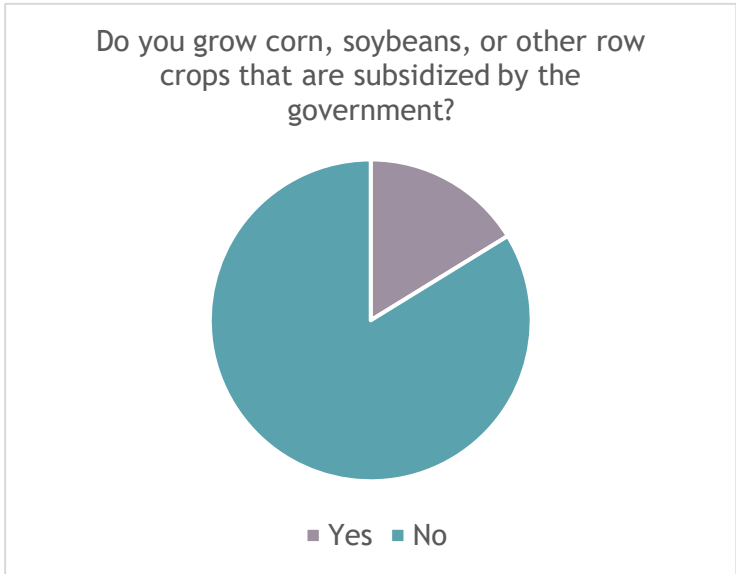


Table 36. Type of subsidy programs enrolled in, for the farms who participate in subsidy programs.

Answer	%	Count
USDA Market Facilitation Program (MFP)	20.69%	6
USDA Agricultural Risk Coverage- Price Loss Program (ARC-PLP)	75.86%	22
Other	3.45%	1

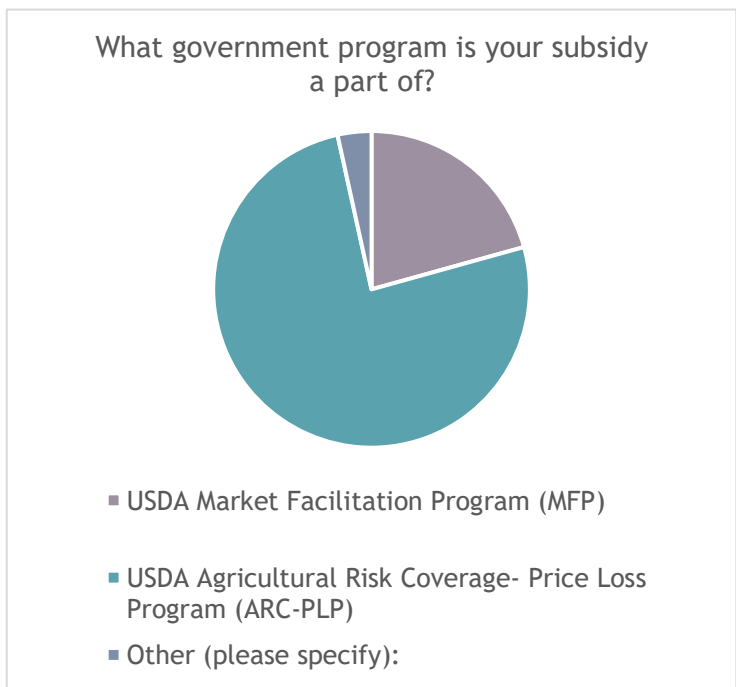


Table 37. Percent of annual farm income that is from subsidy, for farms that participate in those programs.

Answer	%	Count
0-25%	79.31%	23
25-50%	13.79%	4
50-75%	6.90%	2
75-100%	0.00%	0

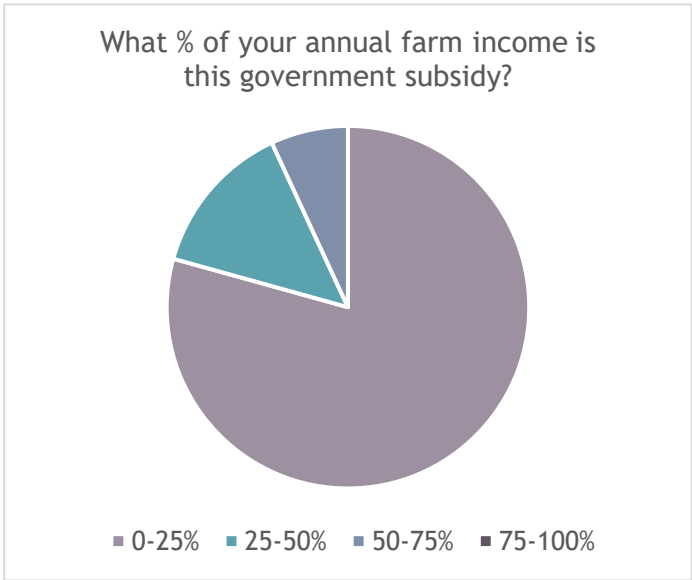
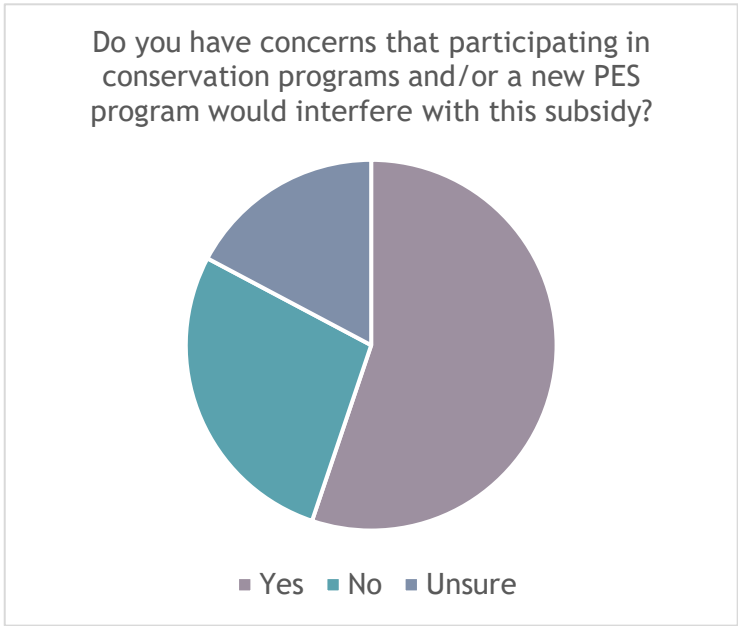


Table 38. Percent of farmers who are concerned about interactions between a new PES program and subsidy.

Answer	%	Count
Yes	55.17%	16
No	27.59%	8
Unsure	17.24%	5

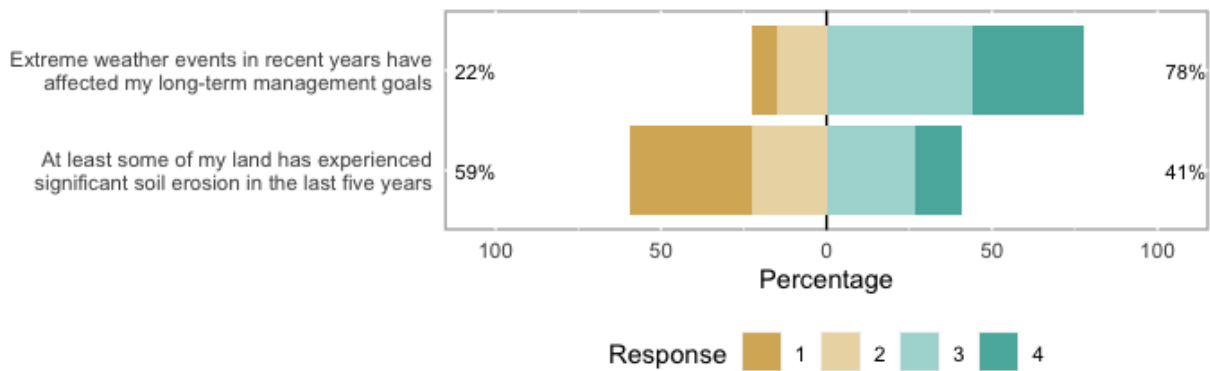


Section 5. Motivations, capability & beliefs

Survey respondents were asked to provide their opinions and level of agreement with a series of statements about perceived responsibility, capacity, vulnerability, and beliefs on a level of 1 to 4, where 1 was disagree and 4 was agree.

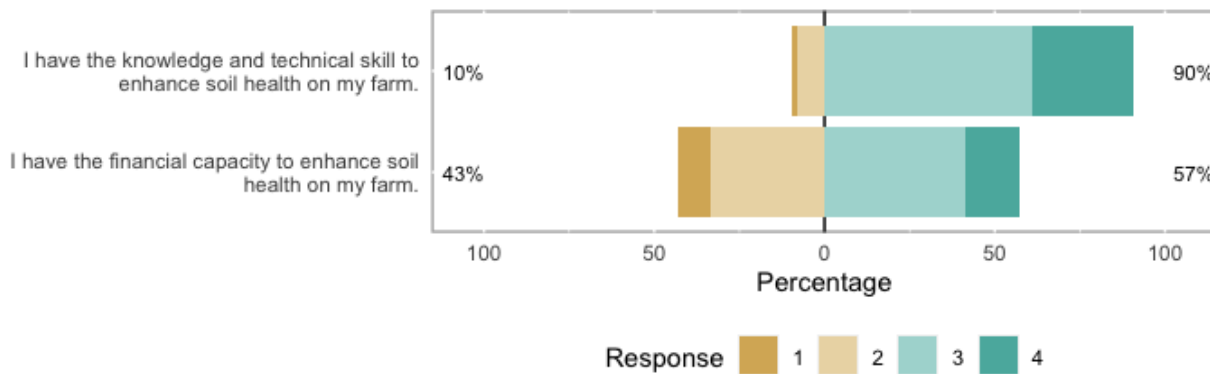
Perceived vulnerability

Statement	Disagree	Somewhat disagree	Somewhat agree	Agree
Extreme weather events in recent years have affected my long-term management goals	7.19%	20.92%	41.18%	30.72%
At least some of my land has experienced significant soil erosion in the last five years	34.64%	21.57%	32.03%	11.76%



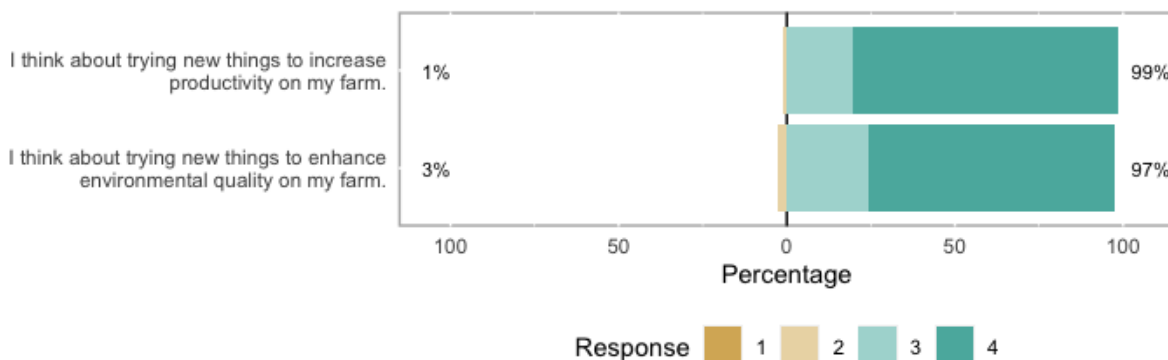
Perceived capability

Statement	Disagree	Somewhat disagree	Somewhat agree	Agree
I have the knowledge and technical skill to enhance soil health on my farm.	1.31%	7.19%	64.71%	26.80%
I have the financial capacity to enhance soil health on my farm.	9.15%	32.03%	45.10%	13.73%



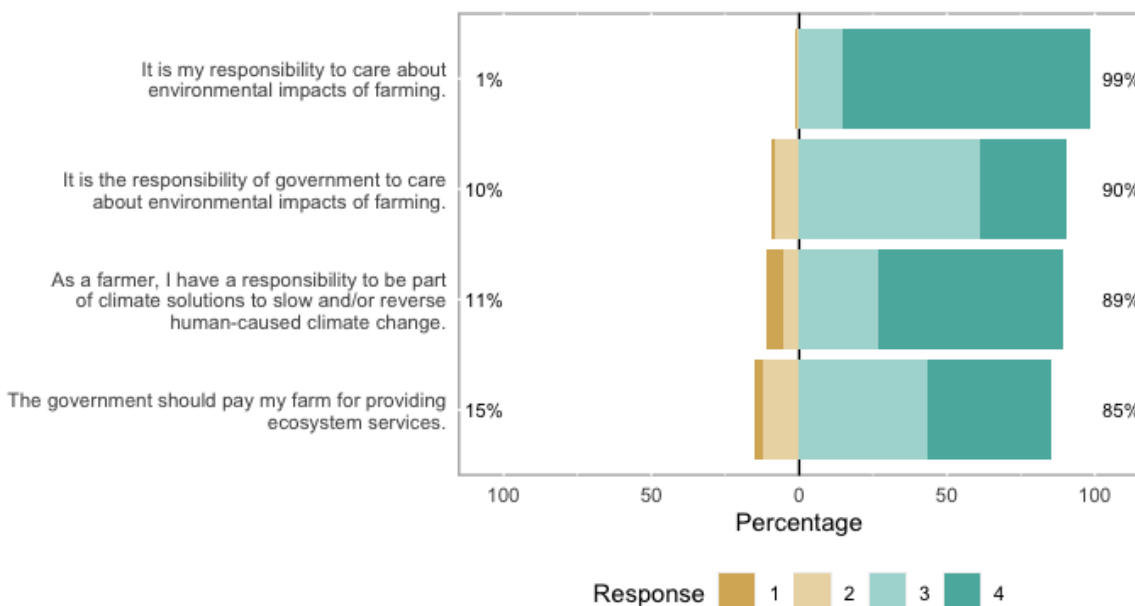
Innovative intent

Statement	Disagree	Somewhat disagree	Somewhat agree	Agree
I think about trying new things to enhance environmental quality on my farm.	0.00%	2.61%	23.53%	73.86%
I think about trying new things to increase productivity on my farm.	0.00%	0.65%	24.84%	74.51%



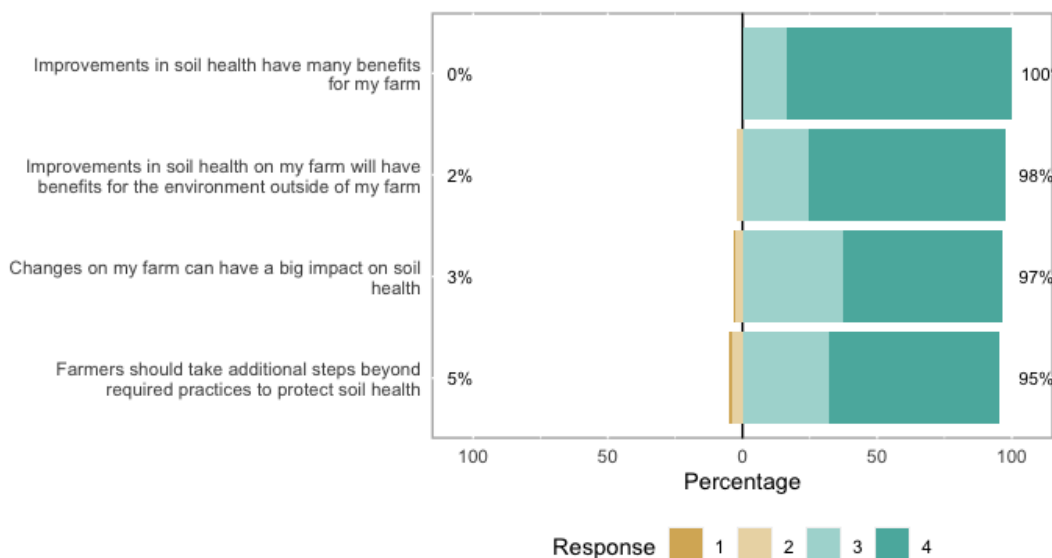
Responsibility

Statement	Disagree	Somewhat disagree	Somewhat agree	Agree
It is my responsibility to care about environmental impacts of farming.	0.00%	7.19%	13.07%	79.74%
It is the responsibility of government to care about environmental impacts of farming.	5.88%	9.15%	32.68%	52.29%
As a farmer, I have a responsibility to be part of climate solutions to slow and/or reverse human-caused climate change	4.58%	5.23%	32.03%	58.17%
The government should pay my farm for providing ecosystem services.	2.61%	11.11%	40.52%	45.75%



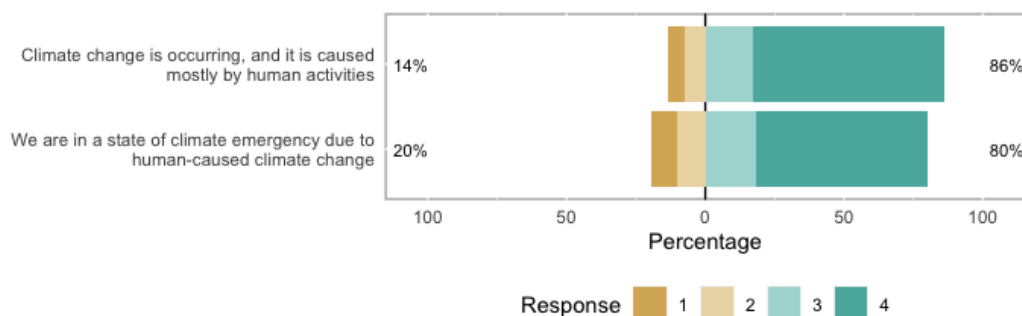
Soil health & farming

Statement	Disagree	Somewhat disagree	Somewhat agree	Agree
Improvements in soil health have many benefits for my farm	0.00%	0.00%	15.03%	84.97%
Improvements in soil health on my farm will have benefits for the environment outside of my farm	0.00%	1.31%	29.41%	69.28%
Changes on my farm can have a big impact on soil health	0.65%	2.61%	41.18%	55.56%
Farmers should take additional steps beyond required practices to protect soil health	0.65%	3.92%	35.95%	59.48%



Climate change belief

Statement	Disagree	Somewhat disagree	Somewhat agree	Agree
Climate change is occurring, and it is caused mostly by human activities	5.88%	6.54%	15.69%	71.90%
We are in a state of climate emergency due to human-caused climate change	8.50%	9.80%	23.53%	58.17%



Section 6. Information Sources

Survey respondents were asked to identify the top three sources of information they use when making farm management decisions.

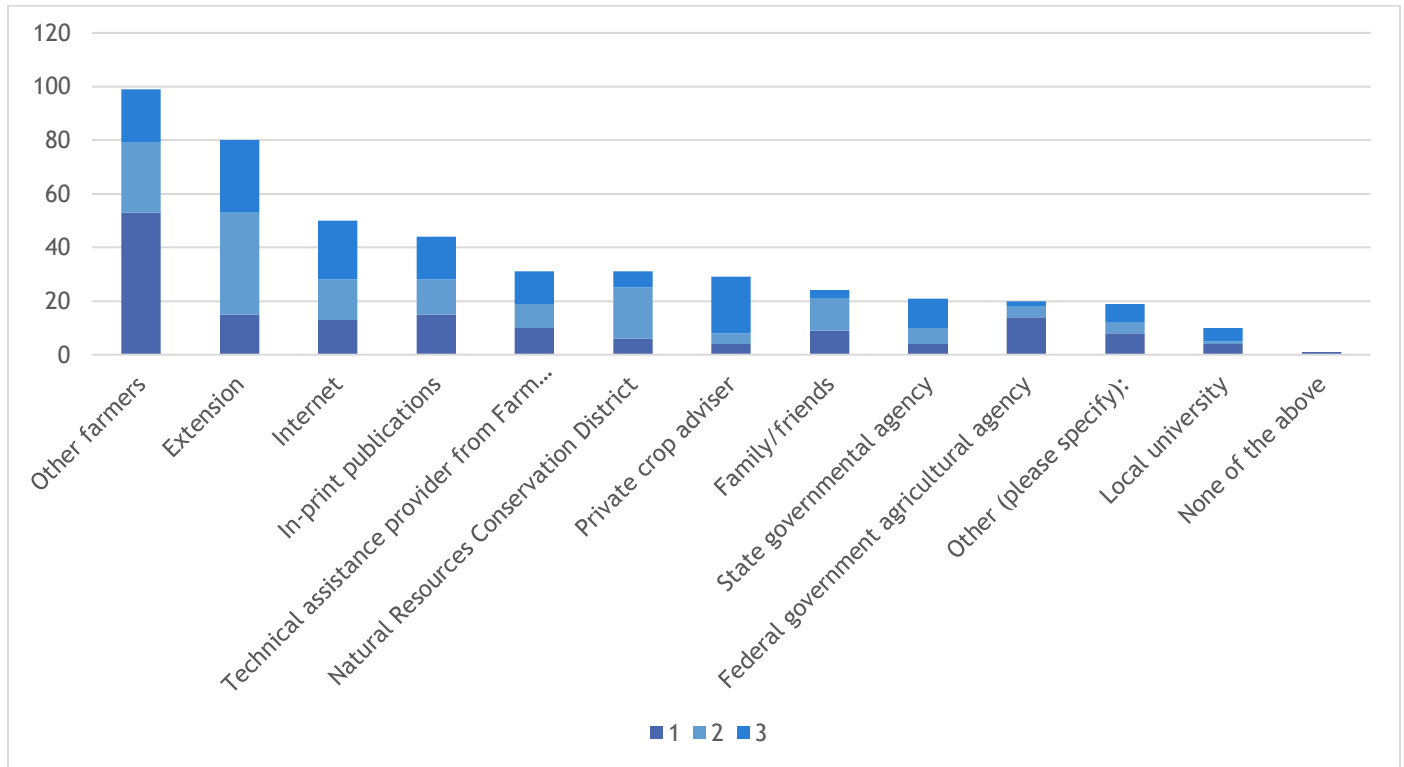


Table 39. Preferred sources of information by Vermont farmers.

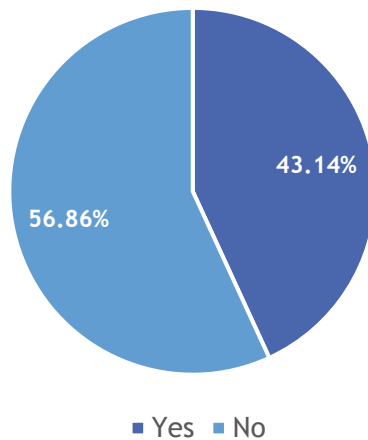
Preferred information source	Total mentions	Rank		
		#1	#2	#3
Other farmers	99	53	26	20
Extension	80	15	38	27
Internet	50	13	15	22
In-print publications	44	15	13	16
Technical assistance provider from Farm Viability Network (NOFA, Intervale, etc.)	31	10	9	12
Natural Resources Conservation District	31	6	19	6
Private crop adviser	29	4	4	21
Family/friends	24	9	12	3
State governmental agency	21	4	6	11
Federal government agricultural agency	20	14	4	2
Other	19	8	4	7
Local university	10	4	1	5
None of the above	1	1	0	0

Section 7. Respondent characteristics & demographics

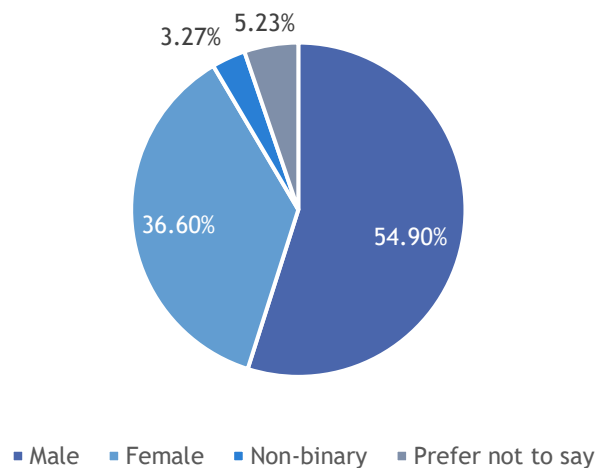
Table 40. Descriptive statistics of respondents' age, experience and intended years of farming in the future.

	Age	Years of farming experience	Intended years of future farming
Min	24	1.5	0
Mean	49	21	24
Median	46	15	20
Max	77	63	55

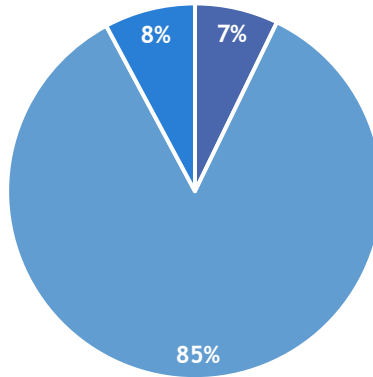
Percent of respondents who were raised on a farm



Gender

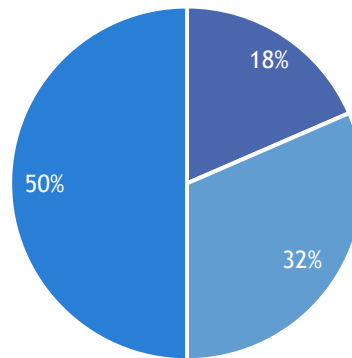


Do you identify as a Black, Indigenous, or other Person of Color?



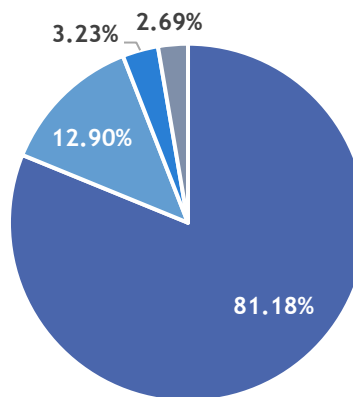
■ Yes ■ No ■ Prefer not to answer

Do you expect the farm to stay in your family/close network when you stop farming?



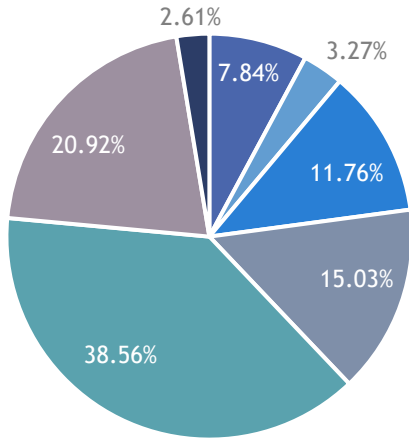
■ Maybe ■ No ■ Yes

What is your role on the farm?



■ Farm owner ■ Farm manager ■ Farm worker ■ Part-time farmer

Level of education



- High school or equivalent
- Associate degree
- Bachelor's degree
- Doctorate
- Technical or occupational certificate
- Some college coursework completed
- Master's degree

Answer	% of respondents
High school or equivalent	7.84%
Technical or occupational certificate	3.27%
Associate degree	11.76%
Some college coursework completed	15.03%
Bachelor's degree	38.56%
Master's degree	20.92%
Doctorate	2.61%