

COMPARATIVE ANALYSIS OF COVER CROP
INCENTIVE PROGRAMS IN THE NORTHEAST

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ABSTRACT

Farmers are increasingly interested in planting cover crops to improve soil health, reduce nutrient losses, and enhance pest suppression, and government agencies support the use of cover crops by offering cost-share programs. This research – which is the first of its kind – cataloged data on 12 cover crop incentive programs in Maryland, Pennsylvania, New York, and Vermont to understand how payments to farmers translated to acres cover cropped. We also conducted an online survey reaching 367 farmers to better understand the strengths and weaknesses of each program. Results show that cover crop incentive programs should expand outreach about their programs. Additionally, programs should be more flexible and better able to serve smaller farm operations. Future research should focus on reducing the economic burden of cover cropping by reducing seeding rates, seed costs, and time required to establish the crops.

BIOGRAPHICAL SKETCH

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After finishing her degree, Barbara will reengage with the Bay Area's sustainable food movement and hopes to help build the regions appetite for regional grains.

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LIST OF ABBREVIATIONS

AgNPS	Agricultural Nonpoint Source Abatement and Control Grant Program
CRF	Climate Resilient Farming Program
CSP	Conservation Stewardship Program
EQIP	Environmental Quality Incentive Program
FAP	Farm Agronomic Practices program
MACS	Maryland Agricultural Water Quality Cost-Share
MD	Maryland
NRCS	Natural Resources Conservation Service
NY	New York
NYDAM	New York Department of Agriculture and Markets
PA	Pennsylvania
SWCC	Soil and Water Conservation Committee
USDA	United States Department of Agriculture
VT	Vermont

INTRODUCTION

A cover crop is a plant that is used primarily to reduce soil erosion, fix nitrogen, improve soil health, enhance water quality, suppress weeds, increase biodiversity, help control pests and diseases, and can provide various other on-farm benefits (CTIC, SARE, ASTA, 2017; Dowd, Press, & Los Huertos, 2008; Napier, 2009; Reimer, Gramig, & Prokopy, 2013, Schipanski et al., 2014). Cover cropping provides a sustainable way to adapt to and mitigate climate change (Kaye et al. 2017) and can help farmers to increase production while regenerating existing farmland (Foley et al., 2011). A meta-analysis of data from 1965-2015 showed a neutral to positive correlation of corn yields following a winter cover crop and higher corn yields by 30% when terminated early (Marcillo and Miguez, 2017). In the 2016-2017 Annual Cover Crop Survey, farmers reported a 1.3% and 3.8% increase corn and soybean yields, respectively, with cover crops (CTIC, SARE, ASTA, 2017).

Farmers who use cover crops recognize the benefits noted above; however, other farmers are reluctant to integrate cover crops into their cropping systems (CTIC, SARE, ASTA, 2017). Concerns about cover crops include the cost of cover crop seed, reliability of performance of cover crop, negative effects on cash crop yield, and cover crop suitability for different regions, and access to necessary equipment (Carlson & Stockwell, 2013). Such concerns in addition to the time, money, and energy required to establish a new practice prevent some farmers from trying cover crops.

The various ways that cover crops are used on different types of farms can make designing incentive programs challenging. For example, grain crop farmers might use a cereal rye (*Secale cereale*) cover crop to cycle nutrients and prevent erosion after cash crops are harvested in the fall (Clark 2007), whereas vegetable farmers might use a buckwheat (*Fagopyrum esculentum*) cover crop to suppress weeds for short periods throughout the summer (Bjorkman and Shail 2013). Additionally, conventional and organic farmers differ in their motivations, limitations, and amount that they are willing to spend on cover crops (Wayman et al., 2017). Organic farmers rely more heavily on cover crops for ecosystem services (e.g., nitrogen fixing, increased soil organic matter) and as a management tool because they are restricted in their use of inputs including synthetic fertilizers and pesticides. Furthermore, organic and vegetable farmers are willing to pay more for seeds than conventional and grain crop farmers (Wayman et al., 2017)

As concerns increase about the negative impact of agriculture on the environment and the degradation of soil, water, and air quality in the United States, public and private agencies are increasingly using voluntary incentive programs to encourage farmers to embrace conservation efforts (Dowd et al. 2008, Napier 2009, Reimer et al. 2013). The federal government has increased conservation spending from \$1.8 billion in 2002 to \$5.6 billion in 2018 (USDA OBPA., 2003; USDA OBPA., 2018). Nationwide, cover crop acreage expanded from 10.3 million acres in 2012 to 15.4 million acres in 2017, a

50% increase (Census of Agriculture, 2017; LaRose & Myers, 2019). Additionally, in the United States, at least 29 states support cover crop education, technical assistance, or financial incentive programs (Myers, 2019).

Conservation programs are administered through federal agencies, state agricultural agencies, regional agricultural districts, and local organizations. The United States Department of Agriculture (USDA), for example, offers cover crop incentive programs through the Environmental Quality Incentive Program and the Conservation Stewardship Program. These programs provide technical and financial assistance to agricultural producers to confront farming challenges and conserve resources. While these are federal programs, they are implemented and operated by states, which are able to adapt the program to individual landscapes.

States and agricultural districts have also developed cost-share programs to supplement federal programs, which are often uniquely designed. Incentive program design may be influenced by geographies including, majority farm type (e.g., grain, vegetable), water resources, land ownership, and farm size (Bergtold et al., 2012, Franks, 2003; Kraft et al., 1996; Lambert et al., 2007; Reimer et al., 2013). Assessing the effectiveness of these programs is complicated for many reasons including factors related to participation, implementation, and monitoring. Evaluating cost-effectiveness of programs is also complex. Evaluators need to consider non-participation (i.e., when

a farmer does not participate in conservation programs), non-additionality (i.e., when farmers receive payments for practices they would adopt without payments), and dis-adoption (i.e., when farmers stop practices after payments end) (Claasen & Ribaudó, 2016).

A number of factors influence farmer willingness to participate in government programs and to adopt conservation practices (Franks, 2003; Kraft, Lant, & Gillman, 1996; Maybery, Crase, & Gullifer, 2005; Dupont, 2010; Reimer, Thompson, & Prokopy, 2012). Farmers with larger operations or higher education levels are more likely to try conservation practices (McCann & Claassen, 2016; Prokopy, Floress, Klotthor-Weinkauf, & Baumgart-Getz, 2008). Opinions about government, contact with NRCS staff, land ownership, and crops all influence farmer participation in programs (Kraft et al., 1996; Reimer et al., 2012). In one study, nearly a third of farmers that did not apply for programs agreed that pre-identified transaction costs such as application requirements and documenting compliance were barriers; however, farmers that have previously applied for programs were less likely to identify transaction costs as a barrier (McCann & Claassen, 2016). Lambert et al. (2007) noted that farm operators concerned with maximizing profits, younger farmers, and farmers with access to expert advice are most likely to adopt conservation practices. Moreover, payments for one practice may further incentivize adoption of complementary practices or disincentive adoption of substitute practices (Secchi et al., 2007; Wainger et al., 2013). While these studies reveal the

nuances of farmer decision making, relatively little research has compared farmer satisfaction of specific agri-environmental programs.

Our research compared and contrasted federal and state cover crop incentive programs in Maryland, Pennsylvania, New York, and Vermont. All four states participate in the Natural Resources Conservation Services (NRCS) programs which offers a 3-year and a 5-year program for cover crop use. Additionally, Maryland and Vermont have voluntary state-based programs that offer indefinite annual funding for farmers who plant cover crops. New York has a 3-year state-based cover crop program that is more flexible and distributes funding through local county offices. Pennsylvania does not have a state-based program. The area of land covered by these four states is representative of the Northeastern United States, and the results have the opportunity to benefit those in neighboring states with similar climate and soil type.

Table 1. *Planted cover crop acres reported in the Census of Agriculture for 2017 and 2012, ranked by the 2017 acreage and showing percent increase for 2017 over 2012*

State	Amount of Cropland Cover Cropped (2012)	Amount of Cropland Cover Cropped (2017)	Percent Increase	Amount of Cropland in State	Farms	Percentage Cropland Cover Cropped
Maryland	327,689	410,849	25%	1,426,671	9,233	29%
Pennsylvania	446,295	595,309	33%	4,651,210	44,436	13%
New York	215,297	295,433	37%	4,291,388	27,676	7%
Vermont	20,120	40,555	102%	479,680	4,810	8%
Total	1,009,401	1,342,146	33%	10,848,949	86,155	12%

**Data from this table were sourced from LaRose & Myers, 2019 via the 2017 Census of Agriculture. The Census asked “how many for managing soil fertility, soil quality, and controlling acres were planted to a cover crop (cover crops are planted primarily weeds, pests, and diseases), excluding CRP acres.”*

Few assessments of cover crop incentive programs within states have been conducted and there is no known research that has compared programs across a geographic region. In Maryland, Pennsylvania, New York, and Vermont the amount of cropland planted with cover crops increased between 25% to over 100% from 2012 to 2017 (Table 1, Census of Agriculture, 2017). According the 2017 Agricultural Census, 29% of Maryland's cropland is cover cropped, followed by 13% in Pennsylvania, 8% in Vermont, and 7% in New York (Table 1). Given this range of adoption, we set out to investigate how incentive programs influence cover crop adoption. The goal was to contribute knowledge to improve the design of cover crop incentive programs and to enhance farm benefits. Most importantly, we wanted to understand how programs can be better adapted to suit the needs of farmers. By understanding the advantages and challenges for farmers, program administrators can adjust cover crop incentive programs to help increase adoption and effectiveness.

MATERIALS AND METHODS

Cover crop incentive programs were evaluated and compared using a mixed methods approach that included compiling information about programs and their implementation, as well as perspectives on programs from stakeholders. Data for this project were collected from cover crop program websites, through correspondence with cover crop incentive program administrators, from the 2017 Agricultural Census, and through an online survey.

Cover Crop Incentive Program Data

Data were first collected from websites and by email with program administrators from 12 cover crop programs in Maryland, Pennsylvania, New York, and Vermont. These data focused on program requirements, funding, and impact. We created a template of all the points needed for the analysis and requested 2011-2018 data from the program administrators. Since programs use different methods to collect and store data, some fields are incomplete. Smaller county or regionally based programs that provide short term or limited amount of funding exist in all four states and were excluded from this analysis.

Survey Design

After cover crop incentive program data were compiled, a transdisciplinary team designed an online survey instrument using Qualtrics XM (Qualtrics, LLC.; Provo, UT). The survey was deemed exempt by the Cornell University Institutional Review Board (protocol number 1906008869). A draft survey was circulated to program administrators for feedback to ensure that we represented the programs accurately. A pilot survey was then distributed to 10 farmers, with at least one farmer from each state. The final survey was anonymous and included demographic information, farm characteristics, use of cover crops, use of incentive programs for cover crops, and satisfaction with incentive programs. A combination of multiple choice, Likert Scale, and open-ended questions

were included. The survey used logic functions so farmers that had used cover crops and had participated in programs were asked additional questions (Appendix 1).

The survey began by asking questions about farm type and farming practices. Farmers that have used cover crops were asked additional questions about the practice. Farmers that did not use cover crops were asked one extra question about why they do not use cover crops. All farmers were then asked general questions about their opinions of cover crop incentive programs. Farmers that had participated in a cover crop incentive programs were asked to rate their satisfaction with each program they have participated in. Farmers that had not used a program moved on to the next section. All respondents finished with questions about their demographics.

Survey Distribution and Respondents

The survey targeted farmers in Maryland, Pennsylvania, New York, and Vermont that have the ability to use cover crops. Personalized emails were sent directly to farmers using online directories including the Organic Integrity Database and the USDA Community Supported Agriculture Directory. We used the “snowball” sampling method (Goodman, 1961) and asked for help in distribution from farmer organizations including Farm Bureau’s, the National Young Farmers Coalition, No-Till Alliance, and the Grain Growers Association. We also requested distribution from university extension agents and incentive program administrators in each state. We provided potential distributors

with email and social media templates so they could easily share our survey (Appendix 2). Our survey was likely distributed in ways that we are unaware, and the response rate cannot be estimated.

Categorizing Responses

The original answers to the questions about farm operation type “organic” and “mixed organic and conventional” were combined into the category “organic” for analysis. For the question about the use of cover crop incentive programs, farmers that answered “Yes, I use one whenever feasible” and “Yes, I used one in the past” were combined into one category, “has used an incentive program”; while, “No, but I would consider using one in the future” and “No, and I do not plan to use on in the future” were combined to another category of “never has used an incentive program”. Additionally, farmers ranked several questions on a Linkert scale, and for ease of analysis, we narrowed the original five categories into three. For example, “somewhat satisfied” and “extremely satisfied” were combined into one category as “satisfied”, and “strongly agree” and “somewhat agree” were combined as “agree”. Furthermore, consolidated “unsatisfied” and “disagree” responses. We also consolidated political affiliation categories: we combined “Democrat/ Liberal” and “Liberal Leaning Independent,” as well as “Republican/ Conservative” and “Conservative leaning Independent”. Neutral responses were not changed.

Statistical Analysis

We analyzed the data using Excel version 16.34., and data were either expressed using frequency, mean, or percent change and rounded to the nearest whole number.

RESULTS & DISCUSSION

Program Descriptions

The USDA offers a variety of financial incentive programs under Natural Resources Conservation Service (NRCS). Farmers can participate in cover crop incentive cost-shares through the Environmental Quality Incentive Program (EQIP) or the Conservation Stewardship Program (CSP). EQIP and CSP are federal programs but both are implemented and operated by states, which are able to adjust the program to individual landscapes. EQIP and CSP follow NRCS recommended guidelines for planting dates, which are determined by crop planting season and hardiness zone. Generally, in the northeast, early planting is before October 15 and the late planting deadline is November 5th; cover crops must be killed or suppressed by June 1st. In years with extreme weather planting or suppression dates may be adjusted. Both programs also follow NRCS cover crop species options which includes a variety of grains, legumes, brassicas, and grasses and have different seeding rates depending on the species and application method (e.g., aerial broadcast, drilling, etc.) EQIP and CSP offer increased and advance payments for historically underserved producers defined as

farmers that are beginning, limited resource, socially disadvantaged, and military veterans.

EQIP provides technical and financial assistance to agricultural producers to confront farming challenges and to conserve resources. Funding for EQIP's three-year cover crop contracts vary by practice; between 2011 and 2018 payments ranged between \$47 and \$77 in Maryland, Pennsylvania, New York, and Vermont depending on implementation (Table 2) (NRCS personnel. *Personal Communication*. 2018-2019). The application is typically due in June, so applicants needed to plan early. There is no minimum acreage to apply but growers needed to produce a minimum of \$1,000 of agricultural products to be eligible (EQIP 2019). Currently, farmers can receive a maximum of \$140,000 per year (EQIP 2019). Typically, farmers will enroll in EQIP to establish cover crops and later enroll in CSP to enhance or expand their existing systems.

CSP is the largest conservation program in the United States (CSP 2019). Agricultural producers can earn payments by actively managing, maintaining, and expanding cover crops and other conservation practices. CSP funding is much lower than EQIP and between 2011 and 2018 average funding for cover crops was between \$3 and \$10 per acre in Maryland, Pennsylvania, New York, and Vermont (NRCS personnel. *Personal Communication*. 2018-2019). Farmers can receive increased payments for complimentary practices. CSP applications are typically due in March. A

minimum payment of \$1,500 and maximum of \$40,000 is required (CSP 2019), which can prohibit small farms from participating. CSP has 5-year contracts that can be renewed if farmers expand their conservation efforts.

Pennsylvania does not have a statewide program, so this report solely examined EQIP and CSP's impact. However, based on conversations with extension agents and NRCS program administrators in the state, there seemed to be a widespread belief that farmers should not be paid to plant cover crops or to implement conservation practices. In 2017, Pennsylvania had 600,000 acres cover cropped – the greatest of all four states – and the second greatest percentage of cropland cover cropped with 13% compared to Maryland's 29% (Table 1).

States and agricultural districts have developed cost-share programs to supplement federal programs, often to address specific watershed or environmental concerns. The Maryland Agricultural Water Quality Cost-Share (MACS) provides funding to help farmers cover the cost to implement best management practices. The cover crop program within MACS will pay farmers for seed, labor, and equipment associated with planting cover crops. The impetus for the program was a 1984 study of water a nutrient transport processes in Maryland Coastal Plain cropland. In 2004, the state passed a “flush tax” to address septic runoff into the Chesapeake Bay Watershed and designated funds to the Chesapeake Bay Restoration Fund, specifically for farmers to plant winter cover crops

(Maryland Senate Bill 320). Today, the program is funded by the Chesapeake Bay Restoration Fund and the Chesapeake Bay and Atlantic Coastal Bay Trust Funds. In 2018, the program provided \$22.5 million designated to farmers to help improve soil quality and the health of the Chesapeake Bay (MACS 2019).

Farmers who are in compliance with the Maryland Nutrient Management Program and with MACS are eligible for annual funding. The application window is open for about a month between June and July. There is a 5-acre minimum to participate and no funding cap (MACS 2019). The program offered a base payment of \$45 and up to \$90 per acre depending on species planted, planting or kill down dates, and seeding method (e.g., aerial broadcast, drilling, etc.) (MACS 2019). The seeding rate varied by species ranging from eight pounds and up to 120 pounds per acre. Generally, cover crops needed to be planted before November 5th and killed down or suppressed between March 1st and June 1st.

In New York, the Department of Agriculture and Markets (NYDAM) and the Soil and Water Conservation Committee (SWCC) work on a broad range of issues in partnership with local, state, and federal agencies, as well as citizen interests and the private sector. Farmers seeking to adopt cover crops can enroll in cost-share programs through the Agricultural Nonpoint Source Abatement and Control Grant Program (AgNPS) or the Climate Resilient Farming Program (CRF). Both programs are funded

through the New York State Environmental Protection Fund and coordinated through New York State Soil and Water Conservation Committee and the Department of Agriculture and Markets. The programs are administered at the county level and funding varies by district. County level agents worked directly with growers to determine the best cover crop implementation method based off of NRCS guidelines. These programs are more flexible but also require farmers to have a personal relationship with agricultural service personnel.

AgNPS was established in 1994 to prevent water pollution from agricultural activities by providing technical and financial assistance to farmers. This grant incentivizes farmer by providing up to 75% cost-share of projects seeking to (1) conduct environmental planning, or (2) construct or apply conservation management practices (AEM Base Program Manual - Years 14: 2018-2019). On average, farmers receive \$70 per acre for planting cover crops for a maximum of three-years (G. Albrecht, *personal communication* February 8, 2019). CRF was created so New York farmers could either mitigate greenhouse gas emissions or adapt to climate-change related extreme weather events; cover crops fall into the latter category. The state will fund up to 75% of the costs for BMP implementation with average payments of \$60 per acre for three-years (AEM Base Program Manual - Years 14: 2018-2019).

In Vermont, the Farm Agronomic Practices program (FAP), is a statewide water quality grants program that provides farmers with funding to implement conservation practices to reduce agricultural runoff and improve water quality. In 2019, farmers could receive between \$30 and \$45 per acre and up to \$8,000 each year (FAP 2019). Applications for cover crops were due August 1st. Farmers were expected to plant 100 pounds of seed per acre. Broadcast seeding was expected by October 1st and drilled by October 15th. Farmers can receive extra funding for complimentary practices such as crop rotations, cross-slope tillage, and no-till pasture and hay renovation.

Table 2. Cover Crop Incentive Program Data Average over a Multi-Year Period

Program	Years	Payment per acre	Max Years	Applications (Average per year)	Accepted (Average per year)	Cover Crop Acres (Average per year)	Cover Crop Funding (Average per year)
Maryland - MACS ⁽¹⁾	2011-2018	\$30-\$90	None	1600 ⁽²⁾	1,520	353,879	\$20,300,000
Pennsylvania	No statewide program.						
New York - AgNPS ⁽³⁾	2011-2018	\$29-\$110	3	13	8	2,554	\$178,780
New York - CRF ⁽⁴⁾	2016-2018	\$55-\$70	3	7	7	2,026	\$121,560
Vermont - FAP ⁽⁵⁾	2011-2018	\$30-\$45	None	71	61	4,925	\$179,359
MD, PA, NY, VT - EQIP ⁽⁶⁾	2011-2018	\$47-\$77	3	-	-	11,406	\$583,778
MD, PA, NY, VT - CSP ⁽⁷⁾	2011-2018	\$3-\$10	5	-	-	-	\$1,414,534

(1) MACS (Maryland Agricultural Water Quality Cost-Share)

(2) Estimated. Personal communication Norman Astle, MACS Program Coordinator

(3) AgNPS (Agricultural Nonpoint Source Abatement and Control Grant Program)

(4) CRF (Climate Resilient Farming program)

(5) FAP (Farm Agronomics Practices program)

(6) EQIP (Environmental Quality Incentive Program)

(7) CSP (Conservation Stewardship Program)

Maryland’s cover crop program is the most widespread, has the greatest amount of funding, and allows for indefinite participation (Table 2). New York’s AgNPS and CRF programs were the most flexible but also the least consistent as funding and payment

levels varied greatly between districts and years. These programs also had the lowest amount of participation and were the least efficient in terms of cost per acre (Table 2). Vermont's FAP program is the most efficient in terms of cost per acre but it also offered the least amount of funding per acre (Table 2).

Demographics of Survey Respondents

A total of 367 farmers completed the survey: 78 from Maryland, 108 from Pennsylvania, 110 from New York, and 71 from Vermont (Table 3). Based on zip code, farmers were distributed across the states. Overall farmers were 51 years old or older, which is consistent with the national average of 59 years old (Census of Agriculture, 2017). However, it is important to note that the sample was not entirely representative of farmers in these states. Compared to average farm sizes in each state, respondents were predominately from larger farms: In 2017 the average farm size in Maryland was 161 acres compared to 507 acres reported in our survey; the average in Pennsylvania is 138 acres compared to 413 acres reported in our survey; New York's average is 207 acres compared to 492 acres reported in our survey; and Vermont's average is 176 acres compared to 210 acres reported in our survey (Table 3, USDA Farms and Land in Farms 2018). The majority of respondents (63%, n = 213/240) were organic or from a split organic and conventional operations. Over a quarter of the respondents (27%, n = 162/598) grew vegetables, and most respondents (89%, n = 326/367) had some experience with cover crops.

Table 3. Farmer Demographics and Farm Characteristics by State

	Maryland	Pennsylvania	New York	Vermont
N=	78	108	110	71
Age (median)	61+	51-60	51-60	51-60
Farm Size (acres)	507	413	492	210
Years Farming (median)	21-30	21-30	11-20	21-30
Gender:				
Female	14	27	42	21
Male	58	65	60	43
Political Views:				
Republican Leaning	38	52	28	12
Democrat Leaning	6	24	45	30
Prefer to Not Identify	23	11	18	15
Education:				
High School	20	21	14	13
Trade School or Associates	7	10	14	8
Bachelors	25	43	44	22
Masters or Doctorate	13	15	31	22
Land Tenure:				
Own	46	71	71	57
Rent	31	35	36	14
Farming Method:				
Conventional	42	53	16	13
Mixed	12	17	18	15
Organic	15	32	61	36
Crops:				
Forage	26	55	48	35
Grain	58	71	36	11
Vegetable	25	38	64	35
Fruit	12	26	29	23
Cover Crop Amount:				
Less than 33%	14	22	37	27
Between 33% and 67%	21	40	30	15
More than 67%	39	25	24	17

Across the four states, respondents varied in terms of demographic information and farm type (Table 3). Results are generally consistent with the literature, which says larger farms, farmers with higher education levels, and farmers that own their land are more likely to participate in conservation farming practices (Bergtold et al., 2012, Kraft

et al., 1996; Klotthor-Weinkauff, & Baumgart-Getz, 2008; McCann & Claassen, 2016; Prokopy, Floress, Reimer et al., 2012; SARE/CTIC, 2016). Interestingly, in Maryland a somewhat lower percentage of farmers own their land, but it is not surprising that tenant farmers would use cover crops because the MACS program offers indefinite funding and many landowners encourage their tenants to participate. Not surprisingly, 50% (n = 39/78) of Maryland respondents use cover crops on over 67% of their land, while in the other three states only about 20% cover crop that amount of land.

Cover Crop Usage

As noted above, 89% (n = 326/367) of farmers that took the survey have used cover crops on their farm. In response to the question, “*Why do you use cover crops? [check all that apply]*” 79% (n = 291/367) noted increased soil organic matter, 79% improved soil health, 73% (n = 268/367) reduced soil erosion, 69% (n = 253/367) weed suppression, 63% (n = 232/367) nutrient retention, 56% (n = 206/367) nitrogen fixation, and 51% (n = 188/376) improved water filtration and storage. Only 32% (n = 118/367) of farmers checked reduced insects or pests, pollinator resources, required by state, or wrote in a different reason for using cover crops. These results were consistent with literature, which shows that cover crops provide on-farm benefits (CTIC, SARE, ASTA, 2017; Dowd, Press, & Los Huertos, 2008; Napier, 2009; Reimer, Gramig, & Prokopy, 2013, Schipanski et al., 2014).

Barriers of Cover Crop Adoption

Of the 37 farmers who do not use cover crops and answered the question “*Why do you not use cover crops?*” 41% (n = 15/37) noted they do not have the right equipment, 35% (n = 13/37) not enough time to establish , 35% (n = 13/37) the high cost of cover crop seed, and 22% (n = 8/37) of the farmers that selected “other”. Many conservation districts offer discounted or free equipment rental for cover crops so incentive programs should share information about these local resources. Promoting equipment rental in tandem with the financial support of incentive programs could help resolve some of the barriers of adopting cover crops.

In contrast, of the 326 farmers that have used cover crops and answered the question “*What challenges, if any, have you encountered with cover crops?*” the challenges noted were: the cost of seed 50% (n = 162/326), not enough time to establish 48% (n = 157/326), bad weather 42% (n = 137/326), not having the right equipment 29% (n = 92/326), and difficulty killing or suppressing the cover crop 24% (n = 77/326). Interestingly, 9% had not experienced any challenges, whereas less than 5% of respondents noted other challenges including: increased weeds, reduced cash crop yield, increased pests or disease. Long term programs like MACS and FAP address the high cost of cover crop seed challenge. However, there should be more research and development to lower seed costs and to explore ways that cover crops can be established with limited time.

Barriers of Incentive Program Adoption

In response to the question, “*Are you familiar with any of the following incentive programs for cover crops [check all that apply]?*” Results were as follows: in Maryland 80% (n = 62/78), Pennsylvania 56% (n = 60/108), New York 61% (n = 67/110), and Vermont 67% (n = 46/69) of farmers were familiar with at least one program (Table 4). Of the 176 farmers who used cover crops but had not enrolled in an incentive program, 74% (n = 130/176) had no knowledge of cover crop incentive programs. Therefore, expanding awareness of these programs is critical to increasing participation. It is notable that Maryland had the greatest percentage of respondents that were knowledgeable of the MACS state program and fewest people that did not know of any program. New York on the other hand, had the least number of respondents familiar with their state-based programs. With the exception of Maryland, all state programs should expand outreach to inform farmers of their programs.

Table 4. Farmer Knowledge of Cover Crop Incentive Programs

EQIP ⁽¹⁾	n = 44	EQIP	n = 43	EQIP	n = 57	EQIP	n = 39
CSP ⁽²⁾	n = 37	CSP	n = 34	CSP	n = 40	CSP	n = 23
MACS ⁽³⁾	n = 56	-	-	AgNPS ⁽⁴⁾	n = 16	FAP ⁽⁶⁾	n = 31
-	-	-	-	CRF ⁽⁵⁾	n = 18	-	-
None	n = 16	None	n = 48	None	n = 43	None	n = 23
Total	n = 78	Total	n = 108	Total	n = 110	Total	n = 69

(1) EQIP (Environmental Quality Incentive Program, Federal Program)

(2) CSP (Conservation Stewardship Program, Federal Program)

(3) MACS (Maryland Agricultural Water Quality Cost-Share)

(4) AgNPS (Agricultural Nonpoint Source Abatement and Control Grant Program, New York)

(5) CRF (Climate Resilient Farming program, New York)

(6) FAP (Farm Agronomics Practices program, Vermont)

In response to the open-ended question “*Do you have any recommendations to improve cover crop incentive programs in your state?*”, 22 farmers mentioned making the programs more accessible to smaller operations by offering higher payment rates, flexibility with planting dates, and increased training and education. Large farms tend to have better financial outcomes and are able to make more intensive use of their labor and capital (MacDonald et al., 2013), so it is important to give small farms the opportunity to participate in incentive programs. Furthermore, the combined impact of small farms adopting cover crops can have a significant impact.

Farmers who knew about incentive programs were asked, “*How did you find out about the cover crop program(s)? [check all that apply]*” Of the 235 farmers who were familiar with cover crop incentive programs, 52% (n = 123/235) learned about the program at an NRCS office, 40% (n = 93/235) from a farmer, 40% (n = 93/235) from a local conservation district, and 30% (n = 70/235) from a university agricultural service provider. In districts with low rates of cover crop use NRCS offices and agricultural districts should emphasize training and outreach so more farmers can learn about their programs. Moreover, McCann & Claassen (2016) found that farmers have greater perceived transaction costs prior to participating in a program so expanded outreach should proactively address perceived transaction costs.

To gauge farmers willingness to participate in incentive programs, farmers were asked their opinion about different statements related to incentive programs: 96% (n = 317/331) agreed or strongly agreed that “*incentive programs help farmers to protect the environment*”; 82% (n = 256/313) agreed or strongly agreed that “*the government should pay farmers to plant cover crops*,” 61% (n = 179/293) agreed or strongly agreed that “*incentive programs are strict and participating is time consuming*”; and 32% (n = 96/300) agree that the “*government should stay out of agriculture*”. The literature suggests that farmer attitudes towards incentive program is largely tied to political affiliation and education levels however additional analysis would be needed to confirm these correlations.

Satisfaction with Incentive Programs

Farmers were asked to rate the importance of financial incentive (i.e. amount of money offered), ease of application (i.e. effort it takes to complete the application), flexibility of programs (e.g. planting dates, species options), and reimbursement process (e.g. proof of planting, reimbursement date). The most commonly selected as important or moderately important was flexibility of program with 89% (n = 316/355), followed by ease of application with 82% (n = 290/355), then financial incentive with 78% (n = 272/355), and finally reimbursement process with 72% (n = 256/355). This finding stands in contrast to popular belief that farmers are mostly concerned with the financial aspect of incentive programs (Charles, 2017).

Farmers were also asked to rate their satisfaction with various aspects of cover crop incentive programs. 92% of farmers were satisfied or extremely satisfied with cover crop incentive programs (Table 5). Across all programs, 91% (n = 169/185) were satisfied or extremely satisfied with application requirements and 88% (n = 162/184) with species options. Conversely, planting dates and amount of money offered ranked the lowest with 71% (n = 130/183) and 73% (n = 136/186), respectfully. Farmers criticism to the financial amount offered is distinct from it being the most important aspect of a program. In Maryland, each year a majority of farmers accepted lower payment rates to plant late which highlights that farmers willing to sacrifice payment amount for flexibility of a program.

Farmer satisfaction of attributes vary between programs which highlights the strengths and weaknesses of each (Table 5). For example, farmers participating in the MACS and FAP program were especially critical of planting dates. While the farmers participating in New York's CRF program were dissatisfied with a program administrator. With the exception of the MACS program, farmers were generally satisfied or extremely satisfied with the application process. The satisfaction with the amount of money offered is especially interesting. CSP and FAP offer the lowest rate per acre, however 93% (n = 13/14) participants are satisfied with FAP, while only 67% (n = 32/48) are satisfied with CSP. Additionally, 67% (n = 29/43) of farmers are satisfied

with the amount of money the MACS program offers, which has a range of \$30 to \$90.

It should be noted that our sample size for the AgNPS, CRF, and FAP program were small and might not be generalizable.

Table 5. Farmer Satisfaction with Cover Crop Incentive Programs

	Application Satisfaction	Submission Date	Species Options	Seed Requirement	Planting Dates	Money Offered	Reimbursement	Program Administrators	Overall Satisfaction
EQIP - Environmental Quality Incentive Program (MD, NY, PA, VT)									
Total	71	69	70	67	70	71	71	71	57
Satisfied	65	60	64	51	52	54	63	63	52
Dissatisfied	6	9	6	16	18	17	8	8	5
Percent Satisfied	92%	87%	91%	76%	74%	76%	89%	89%	91%
CSP - Conservation Stewardship Program (MD, NY, PA, VT)									
Total	47	47	47	46	47	48	47	48	34
Satisfied	45	44	42	35	38	32	40	44	32
Dissatisfied	2	3	5	11	9	16	7	4	2
Percent Satisfied	96%	94%	89%	76%	81%	67%	85%	92%	94%
MACS - Maryland Agricultural Water Quality Cost-Share Program									
Total	43	42	43	41	42	43	43	40	34
Satisfied	36	33	33	30	22	29	30	33	30
Dissatisfied	7	9	10	11	20	14	13	7	4
Percent Satisfied	84%	79%	77%	73%	52%	67%	70%	83%	88%
AgNPS - Agricultural Nonpoint Source Abatement and Control Grant Program, New York									
Total	6	5	6	5	6	6	6	6	3
Satisfied	6	5	5	4	5	5	5	6	3
Dissatisfied	0	0	1	1	1	1	1	0	0
Percent Satisfied	100%	100%	83%	80%	83%	83%	83%	100%	100%
CRF - Climate Resilient Farming Program, New York									
Total	4	4	4	4	4	4	4	3	2
Satisfied	4	4	4	3	3	3	3	2	2
Dissatisfied	0	0	0	1	1	1	1	1	0
Percent Satisfied	100%	100%	100%	75%	75%	75%	75%	67%	100%
FAP - Farm Agronomics Practices Program, Vermont									
Total	14	13	14	13	14	14	14	13	12
Satisfied	13	11	14	12	10	13	13	10	11
Dissatisfied	1	2	0	1	4	1	1	3	1
Percent Satisfied	93%	85%	100%	92%	71%	93%	93%	77%	92%
Combined Total									
Average	94%	91%	90%	79%	73%	77%	82%	84%	94%
Satisfied	169	157	162	135	130	136	154	158	130
Total	185	180	184	176	183	186	185	181	142
Percent Satisfied	91%	87%	88%	77%	71%	73%	83%	87%	92%

Incentive Program Impacts:

The survey revealed that incentive programs have a substantial impact on cover cropped acres (Table 6 and Table 7). Table 6 shows the number of acres cover cropped before and during incentive program enrollment. Table 6 has a higher n-value than Table 7 because a majority of farmers that took the survey were still enrolled in a cover crop

incentive program. Table 7 is interesting because it shows the impact offering financial assistance then taking it away. Farmers actively enrolled in an incentive program had the greatest increase in acres planted, however, after incentive programs conclude acreage decreases.

Table 6. *Cover Crop Impact – Farmers who reported cover crop acres before and during incentive program enrollment*

State	Average Acres Cover Cropped		Average Percent Change
	Before	During	
Maryland. (N=50)	100	308	207%
Pennsylvania (N=23)	127	171	35%
New York (N=31)	175	268	53%
Vermont (N=21)	109	150	37%
Total Averaged (N=125)	128	224	83%

Table 7. *Cover Crop Impact – Farmers who enrolled then stopped a cover crop program and reported cover crop acres before, during, and after incentive program enrollment*

State	Average Acres Cover Cropped			Average Percent Change		
	Before	During	After	Before-During	During-After	Before-After
Maryland (N=9)	25	83	48	227%	-42%	91%
Pennsylvania (N=9)	110	172	192	56%	12%	74%
New York (N=10)	176	261	231	49%	-11%	32%
Vermont (N=8)	25	35	18	40%	-48%	-27%
Total Averaged (N=36)	84	138	122	93%	-11%	42%

If the goal of an incentive program is to get farmers to plant the greatest number of cover crop acres then Maryland is succeeding. While enrolled in the program farmers planted over 200% more cover crops than prior to participating (Table 6). However, Maryland and Vermont farmers have the steepest dis-adoption rate planting 42% and 48% fewer acres, respectively (Table 7). This is logical because both of these states offer

indefinite annual funding for cover crops so farmers stopping the program are also likely stopping the practice. New York farmers plant the most cover crops prior to enrolling in a program and they have a modest increase comparably at 32% (Table 7).

Pennsylvania – which only has the EQIP and CSP programs – was the only state to have an increase in cover crop plantings after a program completed. Pennsylvania farmers plant 74% more cover crops than prior to enrolling in a program (Table 7). This program is the most successful in terms of adoptionality because farmers continued to expand the practice after the program completed (Claasen & Ribaud, 2016). It should be noted that in states with multiple programs specific program data cannot be gleaned from these results because all the states include EQIP and CSP data in addition to state-based programs.

CONCLUSIONS

The purpose of this research was to compare cover crop incentive programs in Maryland, Pennsylvania, New York, and Vermont. This research revealed that while complex, the cover crop incentive programs assessed were successful at increasing the amount cropland cover cropped. This research, however had some limitations: the survey included disproportionately more organic and vegetable farmers, drought and early winter may have impacted program data during the years assessed, and the factors between the states may have impacted the results in various ways. Further analysis of

this data is needed to better understand the relationship between program design and environmental effectiveness, as well as how farm type and demographic information play into the farmers decision to plant cover crops. Nonetheless, our results can be used to increase participation and effectiveness of cover crop incentive programs.

The biggest challenge for farmers that have not used an incentive program is having knowledge of those programs. Of farmers that have used cover crops but have not enrolled in a cover crop incentive program, 74% of farmers did not know that these programs existed. Of farmers that have not enrolled in a cover crop program, 67% noted that *“incentive programs are strict and participating is time consuming.”* There was also a positive correlation with the number of years farming and likelihood of knowing about a program. These transaction costs are echoed in the literature by Claassen & Ribaudo (2016) so program administrators should focus on greater outreach and results-based education, proactively address concerns, and guide new applicants through the process to increase participation in cover crop programs.

Of farmers that had participated in a cover crop program, our research revealed that 92% were satisfied or extremely satisfied with the programs we examined. Contrary to popular belief (Charles, 2017), the farmers surveyed believed that ease of application (i.e. effort it takes to complete the application) and flexibility of programs (e.g. planting dates, species options) were the most important aspect of incentive programs – not the

amount of money offered. However, in ranking their satisfaction with specific aspects of each program, respondents were the most dissatisfied with planting dates, followed by money offered and seed requirements, which is echoed by Bergtold et al., (2019). Thus, programs should consider if they can ease restrictions on planting dates or seeding rate so they can encourage more farmers to participate. Moreover, research and development on cover crops should explore planting dates, effectiveness related to environmental factors, and ways to lower seed prices.

Cover crops can provide various on-farm and environmental benefits including enhanced ecosystem services. Therefore, it is important to understand how money invested in cover crop incentive programs can have the greatest impact. In terms of cost-effectiveness, all programs have their strengths and weaknesses. Pennsylvania, New York, and Vermont have significant potential to increase participation. Non-participation is detrimental because on and off farm benefits cannot be realized without participation. Maryland, on the other hand, struggles with non-additionality. Many of Maryland's farmers would likely plant cover crops without the annual payments so that money could be used instead to increase cover crop training or research. With the exception of Pennsylvania, all states should help ensure that farmers receive the full benefits of planting cover crops so as to prevent dis-adoption and non-participation. All of the programs should explore how they can become more inclusive to different types of farms, including small farms.

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APPENDIX 1 – SURVEY

Cover Crop Cost-Share Programs in the Northeast

The purpose of this project is to better understand farmer perspectives on cover crop incentive programs in Maryland, New York, Pennsylvania, or Vermont. This project is being conducted by Matthew Ryan and Barbara Chami at Cornell University. You are invited to participate in this research project because you are a farmer or because you have knowledge of these programs. Your participation in this project is voluntary. If you decide to participate in this survey, you may withdraw at any time.

The survey will take approximately 5-10 minutes. To protect your confidentiality, the survey will not contain information that will personally identify you. The results of this study will be used for scholarly purposes and your participation will help guide future research. If you have any questions about this project, please contact Barbara Chami bac267@cornell.edu.

Select an answer which best describes you:

- I work on a farm
- I do not work on a farm, but I have knowledge of cover crop incentive programs
- I do not work on a farm and have limited knowledge of cover crop incentive programs

Skip To: End of Block If Select an answer which best describes you: = I work on a farm

Skip To: End of Survey If Select an answer which best describes you: = I do not work on a farm and have limited knowledge of cover crop incentive programs

In which state do you farm?

- Maryland
- New York
- Pennsylvania
- Vermont
- Other. Please specify:

Skip To: End of Survey If In which state do you farm? = Other. Please specify:

What is the zip code where the farm is located?

How would you describe your farm operation?

- Conventional
- Organic
- Mixed conventional and organic
- Other. Please state:

For how many years have you been farming?

What is the size of your farm in terms of acres of cropland?

Do you own or rent the land you farm?

- Own all acres
- Own more than half of the acres and rent the rest
- Rent more than half the acres and own the rest
- Rent all of the land
- Unsure

What crops do you grow? [check all that apply]

- Grains
- Forages
- Vegetables
- Tree fruits or berries
- Other. Please specify: _____

Do you have livestock or poultry?

- Yes
- No

End of Block: Farm Operation

Start of Block: CC Intro Questions

Have you ever used cover crops on your farm?

- Yes
- No

Skip To: If Have you ever used cover crops on your farm? = No

For how many years have you used cover crops?

Display This Question:

If Have you ever used cover crops on your farm? = Yes

On average, how much of your cropland do you plant with cover crops?

- None, I stopped using cover crops on my farm
- Less than 33%
- Between 33-67%
- More than 67%

Why do you use cover crops? [check all that apply]

- Reduced soil erosion
- Increased soil organic matter
- Weed suppression
- Nutrient retention
- Nitrogen fixation
- Improved soil health
- Improved water infiltration and storage
- Reduced disease and insect pests
- Pollinator resources
- Required by the state
- Other. Please list: _____

What challenges, if any, have you encountered with cover crops? [check all that apply]

- Not enough time to fit into rotation
- High cost of cover crop seed
- I have not had time to establish the cover crop after cash crop harvest
- Bad weather
- Increased weeds
- Increased insect pests
- Increased disease
- Difficulty killing or suppressing cover crops
- Reduced cash crop yield
- I do not have the right equipment
- Other. Please specify: _____
- I have not experienced any challenges

What cover crops have you grown or would you like to grow? [select all that apply]

	Have previously grown	Would like to grow
Barley	<input type="radio"/>	<input type="radio"/>
Buckwheat	<input type="radio"/>	<input type="radio"/>
Cowpea	<input type="radio"/>	<input type="radio"/>
Crimson clover	<input type="radio"/>	<input type="radio"/>
Cereal rye/ winter rye	<input type="radio"/>	<input type="radio"/>
Hairy vetch	<input type="radio"/>	<input type="radio"/>
Field pea	<input type="radio"/>	<input type="radio"/>
Lupin	<input type="radio"/>	<input type="radio"/>
Mixtures	<input type="radio"/>	<input type="radio"/>
Mustard	<input type="radio"/>	<input type="radio"/>
Oats	<input type="radio"/>	<input type="radio"/>
Pearl millet	<input type="radio"/>	<input type="radio"/>
Radish	<input type="radio"/>	<input type="radio"/>
Red clover	<input type="radio"/>	<input type="radio"/>
Ryegrass (perennial or annual)	<input type="radio"/>	<input type="radio"/>
Sorghum sudangrass	<input type="radio"/>	<input type="radio"/>
Sunflower	<input type="radio"/>	<input type="radio"/>
Sunn hemp	<input type="radio"/>	<input type="radio"/>
Triticale	<input type="radio"/>	<input type="radio"/>
Turnip	<input type="radio"/>	<input type="radio"/>
Wheat	<input type="radio"/>	<input type="radio"/>
Winter pea	<input type="radio"/>	<input type="radio"/>

Other. Please specify: _____

Display This Question:

If Have you ever used cover crops on your farm? = No

Why do you not use cover crops? [check all that apply]

- Not enough time to fit into rotation
- High cost of cover crop seed
- Bad weather
- I have not had time to establish the cover crop after cash crop harvest
- Increased weeds
- Increased insect pests
- Increased disease
- Difficulty killing or suppressing cover crops
- Reduced cash crop yield
- I do not have the right equipment
- Other. Please specify: _____
- I have not experienced any challenges

End of Block: CC Intro Questions

Start of Block: CC Program Knowledge

Please rate the importance of the following aspects of cover crop incentive programs.

	Extremely important	Moderately important	Slightly important	Not at all important
Financial incentive (i.e. amount of money offered)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of application (i.e. effort it takes to complete the application)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flexibility of program (e.g. planting dates, cover crop species options)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reimbursement process (e.g. proof of planting, reimbursement date)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display this question:
If In which state do you farm? = Maryland*

Are you familiar with any of the following incentive programs for cover crops? [check all that apply]

- NRCS, Environmental Quality Incentive Programs (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- The Maryland Agricultural Water Quality Cost-Share (MACS) Program
- Other. Please specify: _____
- Not familiar with any of these programs

Skip To: End of Block If Are you familiar with any of the following incentive programs for cover crops? [check all that ap... = Not familiar with any of these programs

*Display This Question:
If In which state do you farm? = New York*

Are you familiar with any of the following incentive programs for cover crops? [check all that apply]

- NRCS, Environmental Quality Incentive Programs (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- NYS, Agricultural Non-Point Source Abatement and Control Grants Program (AgNPS) offered through local Soil and Water Conservation Districts (SWCDs)
- NYS, Climate Resilient Farming Program (CRF) offered through SWCDs
- Other. Please specify: _____
- Not familiar with any of these programs

Skip To: End of Block If Are you familiar with any of the following incentive programs for cover crops? [check all that ap... = Not familiar with any of these programs

*Display This Question:
If In which state do you farm? = Pennsylvania*

Are you familiar with any of the following incentive programs for cover crops? [check all that apply]

- NRCS, Environmental Quality Incentive Programs (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- Other. Please specify: _____
- Not familiar with any of these programs

Skip To: End of Block If Are you familiar with any of the following incentive programs for cover crops? [check all that ap... = Not familiar with any of these programs

Display This Question:

If In which state do you farm? = Vermont

Are you familiar with any of the following incentive programs for cover crops? [check all that apply]

- NRCS, Environmental Quality Incentive Program (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- Vermont Agency of Agriculture, Food and Markets (VAAFMM) Farm Agronomic Practice (FAP)
- Other. Please specify: _____
- Not familiar with any of these programs

Skip To: End of Block If Are you familiar with any of the following incentive programs for cover crops? [check all that ap... = Not familiar with any of these programs

How did you find out about the cover crop program(s)? [check all that apply]

- Farmer
- Crop consultant
- University agricultural service provider
- Local conservation district
- At the NRCS office
- Government agricultural service provider
- Internet search
- Organization
- None of the above. Please specify: _____

End of Block: CC Program Knowledge

Start of Block: CC Participation

Display This Question:

If Have you ever used cover crops on your farm? = Yes

Have you ever used an incentive program for cover crops?

- Yes, I use a program whenever feasible
- Yes, I used one in the past
- No, but I would consider using one in the future
- No, and I do not plan to use one in the future

Skip To: If Have you ever used an incentive program for cover crops? = No, but I would consider using one in the future

Skip To: If Have you ever used an incentive program for cover crops? = No, and I do not plan to use one in the future

Display This Question:

If In which state do you farm? = Maryland

And Have you ever used an incentive program for cover crops? = Yes, I use a program whenever feasible

Or If

In which state do you farm? = Maryland

And Have you ever used an incentive program for cover crops? = Yes, I used one in the past

Which program(s) have you participated in? [check all that apply]

- NRCS, Environmental Quality Incentive Program (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- The Maryland Agricultural Water Quality Cost-Share (MACS) Program
- Other. If selected, what program? _____

Display This Question:

If In which state do you farm? = New York

And Have you ever used an incentive program for cover crops? = Yes, I use a program whenever feasible

Or If

In which state do you farm? = New York

And Have you ever used an incentive program for cover crops? = Yes, I used one in the past

Which program(s) have you participated in? [check all that apply]

- NRCS, Environmental Quality Incentive Program (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- NYS, Agricultural Non-Point Source Abatement and Control Grants Program (AgNPS) offered through local Soil and Water Conservation Districts (SWCDs)
- NYS, Climate Resilient Farming Program (CRF) offered through SWCDs
- Other. If selected, what program? _____

Display This Question:

If In which state do you farm? = Vermont

And Have you ever used an incentive program for cover crops? = Yes, I use a program whenever feasible

Or If

In which state do you farm? = Vermont

And Have you ever used an incentive program for cover crops? = Yes, I used one in the past

Which program(s) have you participated in? [check all that apply]

- NRCS, Environmental Quality Incentive Program (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- Vermont Agency of Agriculture, Food and Markets (VAAF) Farm Agronomic Practice (FAP) Program
- Other. If selected, what program? _____

Display this question:

If In which state do you farm? = Pennsylvania

And Have you ever used an incentive program for cover crops? = Yes, I use a program whenever feasible

Or If

In which state do you farm? = Pennsylvania

And Have you ever used an incentive program for cover crops? = Yes, I used one in the past

Which program(s) have you participated in? [check all that apply]

- NRCS, Environmental Quality Incentive Program (EQIP)
- NRCS, Conservation Stewardship Program (CSP)
- Other. If selected, what program? _____

Display This Question:

If Which program(s) have you participated in? [check all that apply] = NRCS, Environmental Quality Incentive Program (EQIP)

Or Which program(s) have you participated in? [check all that apply] = NRCS, Environmental Quality Incentive Program (EQIP)

Or Which program(s) have you participated in? [check all that apply] = NRCS, Environmental Quality Incentive Program (EQIP)

Or Which program(s) have you participated in? [check all that apply] = NRCS, Environmental Quality Incentive Program (EQIP)

Please rate your satisfaction with the following aspects of the EQIP cover crop incentive program.

	Extremely satisfied	Somewhat satisfied	Somewhat dissatisfied	Extremely dissatisfied
Application requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Submission date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cover crop species options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certified seed requirement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planting dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of money offered per acre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Payment reimbursement process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication with program administrators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall satisfaction with the program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Display This Question:

If Which program(s) have you participated in? [check all that apply] = NRCS, Conservation Stewardship Program (CSP)

Or Which program(s) have you participated in? [check all that apply] = NRCS, Conservation Stewardship Program (CSP)

Or Which program(s) have you participated in? [check all that apply] = NRCS, Conservation Stewardship Program (CSP)

Or Which program(s) have you participated in? [check all that apply] = NRCS, Conservation Stewardship Program (CSP)

Please rate your satisfaction with the following aspects of the NRCS CSP cover crop incentive program.

	Extremely satisfied	Somewhat satisfied	Somewhat dissatisfied	Extremely dissatisfied
Application requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Submission date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cover crop species options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certified seed requirement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planting dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of money offered per acre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Payment reimbursement process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication with program administrators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall satisfaction with the program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Which program(s) have you participated in? [check all that apply] = The Maryland Agricultural Water Quality Cost-Share (MACS) Program

Please rate your satisfaction with the following aspects of the MASC cover crop cost-share program.

	Extremely satisfied	Somewhat satisfied	Somewhat dissatisfied	Extremely dissatisfied
Application requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Submission date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cover crop species options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certified seed requirement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planting dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of money offered per acre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Payment reimbursement process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication with program administrators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall satisfaction with the program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Which program(s) have you participated in? [check all that apply] = NYS, Agricultural Non-Point Source Abatement and Control Grants Program (AgNPS) offered through local Soil and Water Conservation Districts (SWCDs)

Please rate your satisfaction with the following aspects of New York's AgNPS cover crop incentive program offered through local SWCDs.

	Extremely satisfied	Somewhat satisfied	Somewhat dissatisfied	Extremely dissatisfied
Application requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Submission date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cover crop species options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certified seed requirement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planting dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of money offered per acre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Payment reimbursement process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication with program administrators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall satisfaction with the program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Which program(s) have you participated in? [check all that apply] = NYS, Climate Resilient Farming Program (CRF) offered through SWCDs

Please rate your satisfaction with the following aspects of New York's CRF cover crop incentive program offered through local SWCDs.

	Extremely satisfied	Somewhat satisfied	Somewhat dissatisfied	Extremely dissatisfied
Application requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Submission date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cover crop species options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certified seed requirement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planting dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of money offered per acre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Payment reimbursement process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication with program administrators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall satisfaction with the program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Which program(s) have you participated in? [check all that apply] = Vermont Agency of Agriculture, Food and Markets (VAAF) Farm Agronomic Practice (FAP) Program

Please rate your satisfaction with the following aspects of Vermont's FAP cover crop incentive program.

	Extremely satisfied	Somewhat satisfied	Somewhat dissatisfied	Extremely dissatisfied
Application requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Submission due date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cover crop species options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certified seed requirement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planting dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of money offered per acre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Payment reimbursement process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication with program administrators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall satisfaction with the program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

*If Have you ever used an incentive program for cover crops? = Yes, I use a program whenever feasible
Or Have you ever used an incentive program for cover crops? = Yes, I used one in the past*

Would your cover crops acreage change without financial compensation from an incentive program?

- Cover crop planting would increase
- Cover crop planting would stay the same
- Cover crop planting would decline
- I would not use cover crops

Display This Question:

*If Have you ever used an incentive program for cover crops? = Yes, I use a program whenever feasible
Or Have you ever used an incentive program for cover crops? = Yes, I used one in the past*

In an average year, how many of your acres are supported by a cover crop incentive program?

▼ 0-25 acres (1) ... More than 1,000 acres. Please specify: (6)

Display This Question:

*If Have you ever used an incentive program for cover crops? = Yes, I use a program whenever feasible
Or Have you ever used an incentive program for cover crops? = Yes, I used one in the past*

Roughly, how many acres did you cover crop in the years before, during, and after participating in financial incentive programs for cover crops?

- Before _____
- During _____
- After (leave blank if still enrolled) _____

Was your application for a cover crop incentive program ever denied?

- Yes
- No

Display This Question:

If Was your application for a cover crop incentive program ever denied? = Yes

Did you plant cover crops the season your application was denied?

- Yes. Please explain this decision: _____
- No. Please explain this decision: _____

Display This Question:

If Have you ever used an incentive program for cover crops? = No, but I would consider using one in the future

Or Have you ever used an incentive program for cover crops? = No, and I do not plan to use one in the future

Or If

Have you ever used cover crops on your farm? = No

What level of financial incentive would be needed in order to have you participate in a cover crop incentive program? Please enter a dollar amount per acre of land planted with cover crops. If you would not use cover crops regardless of amount offered select "None".

▼ None (22) ... More than \$200 (25)

In general, how do you feel about conservation incentive programs for agriculture?

	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	No opinion
The government should pay farmers to plant cover crops	<input type="radio"/>				
Incentive programs help farmers to protect the environment	<input type="radio"/>				
Incentive programs allow farmers to test practices with less financial risk	<input type="radio"/>				
Incentive programs are too strict and participating in them is time-consuming	<input type="radio"/>				
The government should stay out of agriculture	<input type="radio"/>				

Do you have any recommendations to improve cover crop incentive programs in your state?

End of Block: CC Participation

Start of Block: Demographic

What is your age?

- 20 years or younger
- 21-30 years old
- 31-40 years old
- 41-50 years old
- 51-60 years old
- 61+ years old

What is your gender?

- Male
- Female
- Unspecified/ other

What is the highest level degree attained?

- Did not graduate high school
- High school graduate
- Trade school
- Associates degree
- Bachelors degree
- Masters degree
- Doctorate degree

Which of the following best describes your political affiliation?

- Democrat/ Liberal
- Liberal leaning Independent
- Conservative leaning Independent
- Republican/ Conservative
- None of the above
- Prefer to not identify

Q57 Thank you for taking our survey. Is there anything else about cover crop incentive programs that you would like to share with us?

End of Block: Demographic

APPENDIX 2 – EMAIL TEMPLATES

1. Template for Farmers

Dear {{First Name}},

I am writing to request your participation in a 5-10 minute [survey](#) related to cover crop incentive programs. You do not need to have experience with cover crops to participate.

With support from Cornell University and Sustainable Agriculture Research and Education (SARE), I am conducting an external assessment of cover crop incentive programs in Maryland, New York, Pennsylvania, and Vermont. The goal is to identify how cover crop incentive programs can be improved to better suit farmer needs.

Key findings from the survey will be shared widely and communicated directly to local, state, and federal program administrators so that recommendations reflect what you identify as being the most helpful for your operation.

We need more feedback from {{State}} farmers so we hope {{Operation}} will participate! If you feel so inclined, feel free to share the survey with your fellow farmers.

Please click here to fill out the survey:

https://cornell.qualtrics.com/jfe/form/SV_41vvNzqOIAQTmyF

Thank you very much for your time,
Barbara Chami

2. Template for Potential Distributor

{{First}},

I am writing to request your assistance in distributing a survey to farmers in {{County}}. The purpose is to identify how cover crop incentive programs can better suit farmer needs. Farmers do not need to have experience with cover crops to participate. So far, only {{Number}} farmers from {{State}} have participated, but I would like to reach at least 100.

Survey details:

Cornell University, with support from Sustainable Agriculture Research and Education (SARE), is surveying all fruit, vegetable, field crop, grain, and mixed crop-livestock producers in New York, Pennsylvania, Maryland, and Vermont. The anonymous survey will take 5-10 minutes to complete.

Key findings from the survey will be shared widely and communicated directly to local, state, and federal program administrators so that recommendations reflect what farmers identify as being the most helpful to their operation.

Can you share the survey with 5-10 farmers?

If so, let me know, and I will forward you templates to ease the distribution process. Or, feel free to send me email addresses so I can reach out to farmers directly.

If you have knowledge of cover crop incentive programs and would like to participate, please click here to fill out the survey:

https://cornell.qualtrics.com/jfe/form/SV_41vvNzqOIAQTmyF

Thank you,
Barbara Chami

3. Template for Distribution

Facebook and LinkedIn distribution

Instructions:

Please copy and paste the text below, including the link.

Text:

Crop Farmers – help improve cover crop incentive programs!

Cornell University needs your input on a short survey assessing cover crop incentive programs in Maryland, New York, Pennsylvania, and Vermont. You do not need to have experience with cover crops to participate.

<http://cornell.justsharedthis.info/s6zKK>

Twitter distribution

Instructions:

Please copy and paste the text below, including the link. You can then select the attached photo to include with the tweet.

Text:

Crop Farmers – help improve cover crop incentive programs!

Cornell University needs your input on a short survey assessing cover crop incentive programs in Maryland, New York, Pennsylvania, and Vermont. You do not need to have experience with cover crops to participate.

Take the survey: https://cornell.qualtrics.com/jfe/form/SV_41vvNzqOIAQTmyF

E-mail distribution

Subject line:

Help Improve Cover Crop Incentive Programs!

Email body:

Cornell University, with support from Sustainable Agriculture Research and Education (SARE), is conducting an external assessment of cover crop incentive programs in Maryland, New York, Pennsylvania, and Vermont. The assessment is based on farmer feedback so they are seeking fruit, vegetable, field crop, grain, and mixed crop-livestock producers to take their 5-10 minute survey. You do not need to have experience with cover crops to participate.

The goal is to identify how cover crop incentive programs can be improved to better suit farmer needs. Key findings from the survey will be shared widely and communicated directly to local, state, and federal program administrators.

Please click here to fill out the survey:

https://cornell.qualtrics.com/jfe/form/SV_41vvNzqOIAQTmyF