Carbon Pollution Tax: 
*Implications for Vermont Agriculture*

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Abstract

This project assessed the potential impacts of a proposed carbon pollution tax (CPT) in Vermont on the agricultural community. Agriculture represents an essential political and cultural sector within the state, and its stance on the CPT will likely influence the outcome of the proposed bill. In order for the tax to be fair and equitable for all Vermonters, it is important to keep the needs of farmers in mind. Hence, understanding farmers’ views regarding the CPT is critical to shaping an effective policy. We worked closely with our community partner, the Vermont Natural Resources Council (VNRC), in the development of this research. Through interviewing sixteen farmers and three professionals, we gathered a variety of perspectives from across the state that represent a spectrum of agricultural sectors and farm sizes. Within this document, we synthesize our interview findings and distill the major themes that emerged from our conversations. In the final section, we make several policy recommendations and note key areas for further research. The primary goal of this report is to inform policymakers on how to best shape the policy to address the concerns of Vermont's farmers.

Our primary interview findings are: 1) the carbon pollution tax will impact different agricultural sectors and scales differently; 2) farmers expressed support for environmental initiatives and have already taken steps to promote energy efficiency on farms; and 3) farmers conveyed varying levels of skepticism about the state government and environmental advocates. Within this report, we elaborate on these key findings and their implications for shaping policy moving forward. Overall, we found that farmers recognized the importance of addressing climate change and want to take steps to reduce their footprints on the environment, however, they want to do so in a way that acknowledges the complexities of running a farm. In order for policymakers to gain the support of the agricultural community for the CPT, they will have to include farmers at the policymaking table and consider ways to recognize farmers for the environmental initiatives that they have already pursued before implementing what some would interpret as another punitive measure.
Acknowledgements

We would like to thank our community partners, Johanna Miller with VNRC and Lauren Hierl with Energy Independent Vermont (EIV), for their support and guidance throughout this process.

Thank you to all of the farmers and professionals that we interviewed for being generous with their time during a busy harvest season.

Thank you to our ES 401 professors, Chris Klyza and Mez Baker-Medard, for supporting us this semester as well as our class coordinator, Diane Munroe. Finally, thank you to all of our ES 401 classmates for their thoughts and suggestions in the development of this project.
Guide to Acronyms

BC: British Columbia
CPT: Carbon Pollution Tax
EIV: Energy Independent Vermont
GHG: Greenhouse Gas
NAICS: North American Industry Classification System
PICS: Pacific Institute for Climate Solutions
RAPs: Required Agricultural Practices
RGGI: Regional Greenhouse Gas Initiative
USDA: United States Department of Agriculture
VNRC: Vermont Natural Resources Council
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1. Overview

1.1 Why a Carbon Pollution Tax

Global climate change is one of the most significant environmental issues facing our planet. One of its leading causes is high levels of carbon dioxide emissions. To reduce these emissions, a carbon tax is often considered to be an efficient and effective market-based approach. This is because: 1) It incorporates the costs of carbon dioxide emissions into the market and thereby promotes emission reductions through behavioral change; 2) It is feasible to implement and simple to administer because taxes are familiar to policymakers; and 3) It produces revenue that could be used to fund energy efficiency research and tax credits to offset any regressive effects of the carbon tax (Reuven).

1.2 Vermont’s Proposed Carbon Pollution Tax

In the Spring 2015 legislative session, legislators in Vermont introduced bills H.395 and H.412, which would establish a carbon pollution tax (CPT) in the state. H.412 has emerged as the more viable bill, due to its more moderate goals compared to H.395. H.412 aims to reduce Vermont’s carbon emissions at a rate that helps to meet the state’s greenhouse gas (GHG) reduction goal: a 75% reduction of 1990 GHG emissions level by 2050. If passed, the carbon pollution tax would be applied to fossil fuels sold in Vermont, exempting electricity, which is already covered by the Regional Greenhouse Gas Initiative (RGGI). The carbon pollution tax will eventually reach $100/ton, starting at $10/ton in 2018 and ramping up $10/year for 10 years. The tax will be levied on fossil fuel distributors—companies that bring oil and gas to those who sell it, such as gas stations. It is likely that these distributors will pass along the cost of the tax to consumers by raising their prices. Additionally, H.412 proposes that 90% of the tax revenue will be returned to Vermonters in the form of rebates and other tax relief and that 10% of the revenue will be used to create a Vermont Energy Independence Fund dedicated to helping Vermonters cut their fossil fuel use and fuel bills through efficiency and clean energy investments (EIV 2015).

1.3 Why Agriculture Matters

Our community partner, the Vermont Natural Resources Council (VNRC), is working with Energy Independent Vermont (EIV), a coalition of businesses, low-income advocates, and environmental and faith-based groups. VNRC and EIV are interested in a carbon pollution tax for Vermont, but are also committed to understanding the implications, concerns, and realities of how a carbon pollution tax will affect Vermonters. In this vein, VNRC seeks to better understand the potential impacts of the tax on the agricultural community, which is a crucial component of Vermont’s culture, society, and economy.
There are over 7,000 farms in Vermont, with an average size of about 170 acres, combining to a total of about 1.2 million acres of farmland (Vermont Agriculture Classroom). Agriculture also makes up a significant portion of Vermont’s contribution to the national economy. For example, in the dairy industry, Vermont produces more than 1% of the U.S.’s dairy products, even though Vermont’s total economy makes up only 0.2% of the nation’s total. This fact highlights the disproportionately large economic impact of Vermont’s dairy industry relative to Vermont’s total national economic share (Jones). The agricultural sector also holds cultural importance for Vermont, as farming has long contributed to Vermont’s pastoral image. Therefore, in passing a carbon pollution tax through the legislature it is important to both understand its effects on—and hopefully gain support from—the agricultural sector.

Currently, the agricultural community is already facing various challenges. Some farmers perceive that they lack a strong political voice, which may be evidenced by the current regulations on the agriculture industry. For example, Vermont recently implemented new water quality regulations as part of Act 64 and developed Required Agricultural Practices (RAPs) to reduce phosphorus runoff into Lake Champlain and other waterways. This change has resulted in expensive reparative measures for many small farms. With these obstacles in mind, the proposed carbon pollution tax may also make it more challenging for Vermonters to make a living in agriculture. Certain sectors of the agricultural community rely on fossil fuels for tasks such as driving tractors, transporting produce, and operating machinery. Given the diversity of the agriculture industry, which ranges from small-scale vegetable farms to large-scale dairy farms, a carbon pollution tax will affect farms in different ways.

The goal of our research is to gain an understanding of the range of perspectives and issues within Vermont’s agricultural community and outline potential strategies for how a price on carbon pollution might be structured to mitigate impacts on the industry. Input from farmers and leaders in Vermont’s agricultural sector will be crucial to forming a complete understanding of how farmers use energy and how much and where there might be opportunities to support investments in on-farm efficiency and renewable energy solutions for farmers. We hope that our findings are useful to VNRC, EIV, and others supporting the tax, and we hope that this report serves as an introduction to the agricultural community’s stake in the policy’s development.

1.4 Summary of Major Findings

We conducted nineteen interviews with Vermonters who represent a range of farm types from maple to large dairy to organic vegetable, as well as professionals from government agencies to farm advocacy groups. The interviews showed that a carbon pollution tax would be felt in many different ways depending upon the type and size of farm operation. Conventional dairy farmers (and particularly small to medium scale dairy farmers) will likely be the most impacted by a tax because their operations are both fuel-intensive and they are often unable to pass along the cost by raising their prices. Another finding from our interviews is that many farmers believe the state government is out of touch with their needs, and that government programs aimed at helping agriculture are often difficult to access and work with. Other farmers,
however, noted that there are active government initiatives to aid farmers, and that these combined with innovation by individual farmers and support from nonprofits and private companies have been effective in reducing farm energy costs.

Research on other states and countries considering or implementing carbon taxes shows that agriculture has generally been exempt from carbon taxes. While there are reports suggesting that agriculture may not be significantly impacted by increased energy prices, empirical studies conducted specifically on Vermont farms could inform exactly how H.412 will impact farmers’ profit margins. Additionally, there are significant innovation measures already occurring within the agriculture sector, which can provide insight into how the government can support the sharing and development of this innovation.

Section 1: Conclusion

As a state, Vermont has made a commitment to reducing its greenhouse gas emissions, and is currently considering a carbon pollution tax as a means through which to do so. However, if this tax is to be effective, it must be designed in a way that supports the people and values of Vermont, including Vermont’s agricultural community. Therefore, the structure of this pollution tax must consider both the special concerns of various sectors of Vermont agriculture and the economic impact of such a tax. The following pages aim to build a foundation for this type of research, both by studying previous carbon taxes and by speaking with Vermont farmers.
2. Research Process and Methods

We started this project by gathering background information using previous studies, data, and literature. This research initially informed our interviews and later our recommendations on how to structure the tax in order to mitigate negative impacts on the agricultural community. Next, we prepared for the interviews. We treated our interviews as case studies and set out to compare the information we received from each farm, making these in-person interviews our primary research method for assessing the impact of the carbon pollution tax. Included in the preparation for interviews was the creation of a short overview of the carbon pollution tax and how it relates to our project, which we then gave to our interviewees. We worked on this document with our community partners (see Appendix A). The next step in the process involved conducting the interviews, which will be described in further detail below. The final part of composing our project was synthesizing the information we obtained from the interviews, combining and comparing it with the research we did, and creating policy recommendations based on these findings.

In order to determine who to interview for this project, we initially relied on our social network within the Middlebury College community. We used primarily a snowball sampling methodology to obtain interviews. We began by consulting our professors and other Middlebury faculty for recommendations on farmers to interview. Our community partner, VNRC, also recommended several people for us to interview. Following the interviews themselves, our interviewees recommended additional Vermont farmers to contact. Once we determined gaps in our interview pool, we conducted research using the internet to identify additional interviewees.

We compiled a master list of all of our potential interviewees, and reached out to each person via phone, email, or Facebook depending on the communication method best suited to each person. Before each interview, we reviewed and customized our interview questions and conducted preliminary research about each farm, advocacy group, or government representative. Our interviews were conducted in-person on farms, or through Skype, phone, or email exchanges. We presented our one-page overview of the tax to each interviewee to provide the necessary framework for our discussions. At least two members of our group were present at each interview, allowing for the division of asking questions and taking notes. Additionally, three interviews were conducted over email to better meet farmers’ needs and availability. Our outline of interview questions served as a guide for our conversations, but we also created the space for additional, site-specific questions. Our prepared interview questions are listed in Appendix B.

We began the interview process by piloting our questions with Jay Leshinsky, the manager of Middlebury College's Organic Farm. His feedback directed the format of our interviews moving forward. We contacted a wide range of farms in Addison County and some beyond the county's boundaries. We did our best to capture the diversity of the farm community in our interview pool. Of our nineteen interviews, sixteen were conducted with farmers, and the
remaining three were conducted with agricultural experts. Table 1 lists our interviewees by farm type, Table 2 lists our non-farmer interviewees, and Table 3 summarizes our interviews quantitatively. Our interviews represent a wide cross-section of the players in Vermont's agricultural community.

Table 1. Farm Interviews.

<table>
<thead>
<tr>
<th>Farm Type</th>
<th>Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming as a hobby/secondary source of income</td>
<td>Jay Leshinsky (Middlebury College Organic Farm)</td>
</tr>
<tr>
<td>Small and medium organic vegetable farms</td>
<td>Golden Russet Farm; small diversified vegetable farmer; Pete's Greens</td>
</tr>
<tr>
<td>Small dairy (&lt;200 cows)</td>
<td>Mike Eastman</td>
</tr>
<tr>
<td>Medium dairy (200-700 cows)</td>
<td>Monument Farms</td>
</tr>
<tr>
<td>Large dairy (&gt;700 cows)</td>
<td>Blue Spruce Farm; Four Hills Farm</td>
</tr>
<tr>
<td>Small beef</td>
<td>Meeting Place Pastures</td>
</tr>
<tr>
<td>Small maple (&lt;10,000 taps)</td>
<td>Baird Farm</td>
</tr>
<tr>
<td>Medium maple (10,000-20,000 taps)</td>
<td>Hillsboro Sugarworks</td>
</tr>
<tr>
<td>Fruit, Value-added</td>
<td>Lincoln Peak (vineyard and winery); Champlain Orchards (apple orchard)</td>
</tr>
<tr>
<td>Poultry</td>
<td>Misty Knoll</td>
</tr>
<tr>
<td>Vegetable, Pig, and Chicken</td>
<td>mid-sized diversified farm</td>
</tr>
</tbody>
</table>
Table 2. Other Interviews.

<table>
<thead>
<tr>
<th>Interviewee Profession</th>
<th>Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonprofit organizations</td>
<td>Andrea Stander, Rural Vermont; Jane Clifford, Green Mountain Dairy Farmers Cooperative Federation</td>
</tr>
<tr>
<td>Vermont Agency of Agriculture</td>
<td>Alex Depillis, Senior Agricultural Development Coordinator</td>
</tr>
<tr>
<td>Middlebury College</td>
<td>Steve Pecsok, Visiting Assistant Professor of Economics</td>
</tr>
</tbody>
</table>

Table 3. Breakdown of Interviewees.

<table>
<thead>
<tr>
<th>Farmers</th>
<th>Previous or Current Legislators</th>
<th>Nonprofits</th>
<th>Agency of Agriculture</th>
<th>Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>2 (both are also farmers)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Our methods for synthesizing the information gathered from the interviews involved transcribing interview notes, discussing each interview transcript as a group, and then categorizing interviewee responses into overarching themes. We ultimately created recommendations for how the carbon pollution policy should be shaped, utilizing the research and input from Vermont farmers and professionals. These policy recommendations come from farmers’ indications of elements of the tax that will impact them and from farmers’ ideas about how the government can support them in order to reduce negative impacts from this tax. Overall, a variety of methods were utilized to support the process of carrying out this project.
3. Background Research, Studies and Data

We begin our assessment of the potential impact of a carbon pollution tax on Vermont’s agricultural community with information from several different areas of study. These include: 1) preliminary information regarding the predicted effect of climate change on agriculture in Vermont; 2) an analysis of how carbon pollution taxes implemented or proposed in other locations accommodate agriculture; 3) how to define and categorize agriculture in Vermont; 4) the role of the dairy industry in Vermont; 5) current energy use on farms; and 6) examples of and opportunities for energy efficiency innovations in agriculture. This information provides context for the field research we conducted and provides a basis of knowledge for answering the question of how a carbon pollution tax might affect agriculture in Vermont.

3.1 Climate Change and Vermont Agriculture

The potential for climate change to disturb agricultural patterns provides a justification for the importance of considering a carbon pollution tax in Vermont. According to Joshua Faulkner, the Farming and Climate Change Coordinator at the University of Vermont’s Center for Sustainable Agriculture, the effects of climate change on Vermont’s agricultural community vary depending on the “degree of climate change that occurs” and the “extent of adaptations and resilience measures adopted by [agricultural] producers.” Some specific changes that have already occurred include greater and heavier rainfall, especially for northern Vermont, and an approximate 2.5°F increase in average temperature over the past century, which has increased the growing season by approximately three and a half days per decade. Projections for the Lake Champlain Basin, between the years 2040 and 2069, include continued increases in annual precipitation (by almost another three inches), increases in annual mean temperature (by 5.6°F), and an elongation of the growing season (by four weeks). Maple sap production will likely drop by seven days per year. Also, Vermonter can expect eighteen more days per summer to be over 90°F and thirty-two fewer days per winter in which the average temperature will be below freezing. These projections translate into potential impacts such as increases in erosion (and thus loss of nutrients from fields), likelihood of damaging floods, risk of heat stress, risk of spring frost damage, pest and weed pressure, need for irrigation, and excessive soil wetness. An additional, positive impact would be: “new opportunities and crops with extended growing seasons” (Faulkner 2015). Climate change will play a significant role in shaping Vermont’s agriculture future, well beyond paying next year’s bills, and so agriculture’s close tie to the negative impacts of climate change provides a greater incentive for passing a carbon pollution tax.

Vern Grubinger, a University of Vermont Extension Professor specializing in vegetables and berries, adds additional insight to some of the impacts listed by Faulkner. He claims the impact of a longer growing season may be helpful for many farmers in Vermont, but not, for
instance, for those producing apples and maple syrup or those in the dairy industry, as “milk production drops off when cows are exposed to hot, humid weather.” He adds that farmers can take steps to mitigate the impacts of these changes by sequestering carbon in plant biomass via “cover crops, permanent pastures and reduced tillage systems,” increasing the production of bioenergy (e.g., through anaerobic digesters) and reducing the consumption of fossil fuel energy e.g., increasing the efficiency of fuel, fertilizers, and pesticides, and switching to wind and solar energy). Also, “many agricultural actions that reduce GHG emissions can also enhance farm profitability” (Grubinger). This kind of information is an important resource for our understanding of the relationship between agriculture and carbon emissions in the long term and for farmers’ understanding of the need for and benefit of energy innovation in the shorter term.

3.2 Agriculture’s Contribution to Vermont’s GHG Emissions

Figure 1 shows Vermont’s GHG emissions by sector. In 2011, agriculture made up 10.4% of Vermont’s total GHG emissions, which is the third largest contributor. Figure 2 breaks down emissions within the U.S.’s agricultural sector, and shows that, across the country, the majority of agriculture's GHG emissions come from livestock and crop cultivation, including the emissions from enteric fermentation, manure management, and agricultural soils. A minimal amount of agriculture’s emissions come from fuel combustion. Of the factors contributing to agriculture’s emissions, fuel combustion would be most affected by a carbon pollution tax. However, since fuel combustion is such a small portion of agriculture’s overall emissions, a carbon pollution tax may not have a significant effect on reducing agricultural GHG emissions in Vermont. In other sectors, such as transportation, a carbon pollution tax would be much more effective.

Figure 1. Vermont GHG Emissions by Sector, 2011. Source: Vermont Greenhouse Gas Emissions Inventory Update 1990-2011.

Beyond reducing fossil fuel use, there are various other ways to think about reducing farm GHG emissions. For example, sixty percent of GHG emissions from the agricultural sector come from nitrous oxide. A primary source of these emissions is nitrogen based fertilizer, and so practicing more efficient fertilizer applications could lead to a significant decrease in total farm GHG emissions. Another significant GHG emission from agriculture is methane. Much of this methane comes from the digestive processes of cows themselves. Therefore, the more cows that a farm has, the larger their overall methane emissions will be. One way to decrease these emissions is to reduce the number of unproductive cows on a farm. This can be done by increasing feed quality, and improving breeding and animal health. Finally, methane is also released through the decomposition of manure. One of the most effective ways to reduce these emissions is through the installation of a methane digester, although digesters are not completely free of emissions, and so this technology still has room to improve. It’s important to recognize that none of the GHG emissions mentioned in the previous paragraph would be targeted by a tax on fossil fuel distributors, and therefore, none of the aforementioned steps to reduce these emissions would be incentivized or rewarded by a CPT (Takle and Hofstrand 2008).
3.3 Learning from Carbon Pollution Taxes Elsewhere

3.3.1 British Columbia

The carbon tax introduced by British Columbia (BC) in July of 2008 has proven largely successful for reducing greenhouse gas emissions while maintaining the lowest possible social cost in this province of Canada (PICS 4). This case is of particular interest to our project because the government granted greenhouse vegetable and horticulture growers a reprieve in 2012 which then extended to the entire agricultural sector, essentially exempting them from the tax on gasoline and diesel purchases. An influential study done by Nicholas Rivers and Brandon Schaufele for the Pacific Institute for Climate Solutions (PICS), “The Effect of British Columbia’s Carbon Tax on Agricultural Trade,” suggests that this relief is largely unnecessary.

The PICS study states that BC’s agricultural sector's major problem with the carbon tax was the “perceived difficulty in decreasing fuel use in the short-run in order to adapt to the tax.” The perceived danger lay primarily in decreased profits, decline in net exports, and potentially “farms leaving the BC industry all together.” The sector was considered “at-risk” by the government likely as a result of pre-budget consultation, in which representatives from the industry claimed the tax to be “devastating” agricultural producers. Consequently, the BC government granted exemptions without empirical evidence to justify these or qualify other exemptions for the agricultural sector. The main objective stated was to “enable BC growers to compete better with producers in the USA and Mexico” (PICS 6). The PICS paper uses data from Statistics Canada and Industry Canada to estimate whether there is a relationship between the introduction of the BC carbon tax and international agricultural trade patterns, as trade patterns can represent the economic success of the agricultural industry. The report’s findings ultimately do not reveal any changes in the pattern of agricultural trade that can be conclusively linked to the carbon tax (PICS 8-9).

The PICS paper expresses that BC’s carbon tax is currently attempting to achieve different policy goals with one single policy—a carbon tax with exemptions—and that this “compromises efficiency across all goals.” It thus offers alternatives, such as the idea of implementing sector exemptions to mitigate the potential impact on farm profits or performance (PICS 14). Other alternatives listed take the form of rebates, specifically lump-sum rebates (which are not tied to a company’s emissions or fuel use) or output-based rebates (which depend on a company’s performance and incentivize reduced emissions).

It is important to understand the differences between the BC carbon tax and Vermont’s proposed carbon pollution tax when considering PICS’s finding that the BC tax might not have impacted agriculture in the ways the sector feared it might. The most important difference is that BC’s maximum tax rate is $30/ton of fossil fuels over the course of four years, while Vermont’s maximum tax rate is $100/ton of fossil fuels over the course of 10 years. This difference is helpful to understand, as there may be a threshold level of taxation that would impact farmers in Vermont.
3.3.2 Ireland and Australia

Ireland and Australia are two other countries that have addressed the notion of a carbon pollution tax, and particularly its relationship to agriculture. While these countries may not serve as ideal models for how to implement a carbon pollution tax and consider agriculture, some insight on their processes can be helpful to mention. In Ireland’s case, “Emissions from agriculture were excluded on the basis of measurement difficulties” (Convery, Dunne, Joyce 136). Australia’s carbon tax was repealed by the senate in 2014, partially in response to the negative reaction it received from “many farmers, and particularly big rural businesses” (Barbour). Overall, the literature pertaining to carbon taxes in these countries focuses on the resistance by agriculture to support the tax according to potential negative consequences for international trade. This finding, while not particularly illuminating for Vermont, reinforces the importance of making sure the agricultural community’s opinions of the carbon pollution tax are addressed when developing the policy.

3.3.3 Other U.S. States

Several other states in the U.S. are currently considering a carbon pollution tax to mitigate the effects of climate change. Washington, Oregon, Massachusetts, and New York all have proposals for a tax on carbon pollution, and still other states have implemented a variety of policies to address greenhouse gas emissions. Although the details of the design of the tax differ from state to state, the proposals put forward a tax that returns most or all of the income from the tax back to taxpayers and use any remaining funds to increase energy efficiency alternatives to fossil fuel use (Carbon Tax Center).

Washington's proposal for a carbon pollution tax specifically cites improving energy efficiency in agriculture as a key goal of the policy (Carbon Washington). Washington's tax also includes an exemption for sequestered carbon and a 40-year phase-in for farm diesel. These considerations represent a gradual inclusion of the agricultural community over time, which may help farmers adjust to the tax, and provides recognition for the positive impacts that farms already have on carbon levels in the environment--crops, grass, and other plants on farms sequester significant amounts of carbon. Other state proposals have not addressed agriculture specifically in their tax designs.
Table 4. Proposed Carbon Pollution Taxes at the State Level.

<table>
<thead>
<tr>
<th>State</th>
<th>Tax Design</th>
<th>Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>$25/ton, phased in over 2 years and would increase each year after that by 3.5% plus the rate of inflation; reduction in the sales tax by 1%; rebate for low income families of up to $1,500</td>
<td>Exemption for sequestered carbon; 40-year phase-in for farm diesel</td>
</tr>
<tr>
<td>Oregon</td>
<td>Starting at $10/ton and rising by $10 per year to $60/ton</td>
<td>Not addressed</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Starting at $10/ton and rising $5/year to reach $30/ton in the fifth year</td>
<td>Not addressed</td>
</tr>
<tr>
<td>New York</td>
<td>$35/ton and increasing by $15/ton a year to a ceiling of $185/ton</td>
<td>Not addressed</td>
</tr>
</tbody>
</table>

Overall, studying carbon pollution taxes in other places emphasizes the importance of considering the needs of the agricultural community when creating this tax. While the cases of Ireland and Australia highlight the possibility of farmer resistance to a carbon pollution tax, the case of Washington shows that there are ways to address concerns of farmers. The BC case also shows the importance of considering agriculture, because an exemption of farmers may not have been necessary there. When these cases are taken together, it becomes clear that different places have different strategies for addressing farmers’ concerns, and in order to create the most effective policy, policymakers should incorporate farmers’ views into the formulation of the tax. See Section 5 for ways in which policymakers can shape the tax to address farmers’ concerns.

3.4 How to Define and Categorize “Agriculture” in Vermont

In order to get an accurate sense of the potential impact of a carbon pollution tax across the range of farms that function as part of Vermont’s diverse agricultural community, it was important for our group to determine in which sectors we most needed to establish interview contacts. To do this, we talked to several members of the Middlebury faculty, including Jay Leshinsky and Professor Marc Lapin, about how they suggested we define Vermont agriculture. We also looked at the Vermont Agency of Agriculture, the USDA 2012 Census of Agriculture—which includes the North American Industry Classification System (NAICS), and the Vermont Farm-to-Plate Atlas to determine the different sectors. The USDA 2012 Agriculture Census provides data on total number of farms by category of crop production. According to this census, the main farming sectors in Vermont are listed in Table 5 and shown in Figure 3. In terms of market value of agricultural products sold, dairy cattle and milk production had the highest values, as can be seen in Table 6 and Figure 4.
Table 5. Number of farms in Vermont by category.

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>All other crop farming</td>
<td>1401</td>
</tr>
<tr>
<td>Hay farming</td>
<td>1233</td>
</tr>
<tr>
<td>Dairy cattle and milk production</td>
<td>904</td>
</tr>
<tr>
<td>Beef cattle ranching and farming</td>
<td>862</td>
</tr>
<tr>
<td>Horse and other equine production</td>
<td>624</td>
</tr>
<tr>
<td>Greenhouse, nursery, and floriculture production</td>
<td>545</td>
</tr>
<tr>
<td>Vegetable and melon farming</td>
<td>351</td>
</tr>
</tbody>
</table>

Figure 3. Farms in Vermont by category, shown as a percentage of the total. Source: USDA 2012 Census of Agriculture.
Table 6. Market value of agricultural products sold ($).

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy cattle and milk production</td>
<td>593,146,000</td>
</tr>
<tr>
<td>All other crop farming</td>
<td>41,248,000</td>
</tr>
<tr>
<td>Hay farming</td>
<td>24,754,000</td>
</tr>
</tbody>
</table>

Figure 4. Market value of the three largest farm categories as a percentage of the total Vermont market value. Source: USDA 2012 Census of Agriculture.

Although all other crop farming and hay farming have the largest number of farms, clearly their market value is insignificant compared to dairy cattle and milk production. The discrepancy has two explanations: firstly, all other crop farming represents farmers who combine different types of farming, such as a farm that grows both fruits and vegetables. Secondly, hay farming includes both farmers who only grow hay and dairy farmers who grow hay in addition to their dairy or beef production.

Using the detailed classifications provided by these sources as a broad foundation, we consolidated categories based on our professors’ recommendations and our ideas of who we could feasibly talk to within our time frame. Additionally, through our interviews with farmers, we discovered that small and medium conventional dairy farms would be most affected by a carbon pollution tax and thus stand out in their importance for our findings. Therefore, it made the most sense to categorize first by production category and then by farm size. The sectors we selected are as follows: large dairy (700 or more cows), medium dairy (200-699 cows), small dairy (under 200 cows), beef/poultry, large vegetable, small vegetable, apple, small maple syrup (less than 10,000 taps), medium maple syrup (10,000-20,000 taps), and vineyard. Other
categories such as hay, oilseed and grains, and sheep, goat, and pigs would likely have been on a more extensive list had we had a longer timeframe and greater set of resources available for the project.

3.5 The Role of Dairy in Vermont

According to an economic assessment conducted by the Vermont Agency of Agriculture and the Agency of Commerce and Community Development, Vermont had 134,000 dairy cows in 2012, which is one fifth of its total population. There are 868 dairy farms in Vermont. 82% of them are small, with 200 or fewer cows. Only 2.8%, or 25 farms in Vermont, have herds of 700 or more. Mid-size farms that have 200 to 699 cows make up 15% of the total. The number of cows and dairy farms could reflect how important dairy is in Vermont (Jones 2014).

The overall value of dairy farming to the Vermont economy is $2.2 billion, which represents 70% of all agricultural sales in the state. Sixty-three percent of all milk produced in New England comes from Vermont (Jones 2014). Such economic revenue comes from a complex milk pricing system. According to Jane Clifford, who works as a farmer at The Clifford Farm as well as a dairy lobbyist, there are four classes of milk pricing: 1) fluid milk; 2) yogurt, ice cream, sour cream, etc.; 3) cheese; and 4) powdered products. She said, “farmers can charge a lot for cheese, but people will only pay so much for a gallon of milk,” which shows the challenge farmers have in adjusting to market forces that may affect milk prices.

The role of dairy in Vermont goes beyond the direct economic value of products that come from the farms. Between 6,000 and 7,000 jobs are tied to the dairy industry in Vermont. What’s more, dairy farms are often associated with Vermont's landscape and the state's "physical beauty" drives tourism and recreational sports like hunting, snowmobiling and skiing, which attract about 13.5 million tourists to Vermont every year (Jones 2014).

As the economic output of the dairy sector has increased over time, a number of issues have arisen as well. To ensure enough feed is available during the winter and that year-round levels of milk production remain high, a significant amount of corn is grown and put into silage for the winter feed. According to the USDA, in 1950, Vermont farmers harvested 620,000 tons of silage corn; in 2009 they harvested 1,634,000 tons (Krieg 2014). It also means that the state’s dairy herd is far more energy intensive than it was in 1950 when the herd numbered 257,000 (Krieg 2014). Today’s herd is milked year-round on a high-protein diet of silage produced from corn, a petrochemical intensive process that is highly dependent on the use of large machinery, fertilizers, and pesticides (Krieg 2014). For example, the nationwide average number of pounds of phosphate-based fertilizer applied to an acre of corn increased from 41 lbs. in 1964 to 58 lbs. in 2004 (Krieg 2014). Clearly, Vermont dairy plays an important role in the state both economically and environmentally, and therefore it is important to determine how a carbon pollution tax might impact the industry.
3.6 Current Farm Energy Use

A key indicator of the impact of a carbon pollution tax on agriculture is how much fossil fuel energy farms use. When assessing farm energy use it is necessary to consider both direct energy costs, such as fuels and electricity, as well as indirect energy-based expenses such as pesticide and fertilizer. Direct energy use accounts for the majority of total energy expenditures on farms. However, because electricity is exempt from the current carbon pollution tax policy (since it is already included in the RGGI program to reduce GHG emissions), it will not be considered in this report. Additionally, relative to fuel and fertilizer, pesticide costs make up a small component of farm energy expenditures. Therefore, the important farm energy related costs that need to be considered when assessing the implications of a carbon pollution tax in Vermont are fuel and fertilizer.

Figure 5 shows that fuel represents the greatest energy input on farms in the U.S., and therefore the carbon pollution tax will have an effect on farms. Even if a farmers’ overall energy costs are low, since fuel represents the majority of that cost for most farmers, that cost will be affected by the carbon pollution tax. Further research needs to be done to examine how a carbon pollution tax would affect fertilizer costs within Vermont. Natural gas represents around 70 percent of the cost to manufacture fertilizer, and thus its price is closely tied to fuel costs (Gellings and Parmenter, 2004). However, if fertilizer is produced out of state and shipped into the state, fertilizer costs may not change significantly due to a carbon pollution tax.

It is also important to recognize that energy expenditure as a percentage of operating cost varies a lot according to farm sector and size. Figure 6 illustrates these differences for the nation as a whole; however, when looking at these numbers it’s important to note that most dairy farms
in the state of Vermont are also growing corn, soy, hay and other silage crops, and so may not be well represented by the dairy bar in the graph below.

![Share of total operator expenses](image)

**Figure 6.** Share of operator expenses for energy-based purchases on U.S. farms.

Within the dairy sector, fuel costs can be further broken down into gasoline, propane, and diesel. Gasoline is likely used minimally and is often poorly accounted for. Propane is exclusively a heating fuel, and diesel is used for both transportation and heating. Determining the specific proportional expenses for each of these fuels is difficult as both diesel and propane often are a single entry in book keeping. Additionally, small and medium sized farms will likely be more affected by a CPT as energy expenses make up a larger share of their overall operator expenses, as shown in Figure 7.
Based on this information, a carbon pollution tax is likely to have an effect on farms in Vermont, but the impact will depend on factors such as 1) the percentage of a farm’s operating cost that is devoted to fuel and 2) farm size. Overall, the data show that large-scale farms will be less influenced by a CPT, while small- and medium-scale farms might be more negatively impacted. These data also show that farms growing corn, soy, hay, and other crops devote a larger percentage of their operating costs to energy, and many dairy farms in Vermont grow these crops in addition to raising livestock. This helps support our findings from interviews that small- and medium-scale dairy farmers will probably see the largest impact from a CPT (see section 4.1).

3.7 Energy Innovation for Vermont Agriculture

3.7.1 Examples of How Vermont Farmers Have Increased Energy Efficiency

“Innovation is trying something new, or taking a piece of equipment and using it in a different way,” notes Rick Marsh, president of Vermont Maple Sugar Makers Association (Delhagen 2008, 13). Vermont farms have embedded innovation into their existence as businesses under ever-changing circumstances, including economic uncertainty. Energy efficiency developments are one way farmers use innovation to survive fluctuating markets. In response to “powerful changes affecting Vermont’s economy over the past ten years,” energy
innovation across a range of production options has engaged groups of farmers and advocates. Ed Delhagen, the Clean Energy Program Specialist at Vermont’s Public Service Department, produced a report on farm energy innovation in Vermont. The report details research done around “innovation networks or hubs,” as ideal venues for energy innovation action. These hubs, which include “farmers, advocates, researchers, utilities, state agencies, community groups, non-profits, etc.” develop energy solutions scalable by farm so that they may be adopted by interested farmers over time. This research identifies existing innovation networks in order to inform and recommend further energy innovation for farmers in Vermont. These networks have existed predominantly in the dairy and maple sugaring sectors, and have demonstrated success in developing anaerobic digester projects (for example, Blue Spruce Farm) and “oilseed crop and farm biodiesel production” (for example, State Line Farm and Borderview Farm). These farms represent the introduction of Vermont agriculture to biogas and biofuel production and demonstrated ways that farmers have been able to learn from one another and create pathways for others to follow (Delhagen 2008, 4). Table 7 demonstrates the farms in Vermont with methane digesters in 2008.

Table 7. Vermont Farm Methane Digesters.

<table>
<thead>
<tr>
<th>Name &amp; Location</th>
<th>Year</th>
<th>Size &amp; Estimated Power Production</th>
<th>System</th>
<th>Cow Population</th>
<th>VT. Ag. Of Agric.</th>
<th>Dept. of Public Service</th>
<th>DOE or USDA</th>
<th>Utility</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foster Brothers Farm</td>
<td>1982</td>
<td>85 kW; 360,000 kWh</td>
<td>Hadley and Bennett</td>
<td>340</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Operational</td>
<td></td>
</tr>
<tr>
<td>Middlebury (1,4,8,10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Spruce Farm</td>
<td>2005</td>
<td>250 kW; 1.3 million kWh</td>
<td>GHD, Inc.</td>
<td>1,100</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>CVPS</td>
<td>Operational</td>
</tr>
<tr>
<td>Bridport (2,3,8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Farm</td>
<td>2006</td>
<td>65 kW; unknown</td>
<td>Designed by Agency of Agric. &amp; Stan Weeks</td>
<td>250</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Operational</td>
<td></td>
</tr>
<tr>
<td>Charlotte (9,10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berkshire Cow Power LLC</td>
<td>2006</td>
<td>600 kW; 3.5 million kWh</td>
<td>GHD, Inc.</td>
<td>1,500</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>VT. Electric Coop &amp; CVPS</td>
<td>Operational</td>
</tr>
<tr>
<td>Richmond (3,8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Mountain Dairy LLC</td>
<td>2007</td>
<td>300 kW; 1.8 million kWh</td>
<td>GHD, Inc.</td>
<td>1,050</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>CVPS</td>
<td>Operational</td>
</tr>
<tr>
<td>Sheldon (3,8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montagne Farm St. Albans</td>
<td>2007</td>
<td>300 kW; 1.0 million kWh</td>
<td>GHD, Inc.</td>
<td>660</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>CVPS</td>
<td>Operational</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foote Farm</td>
<td>2008</td>
<td>20kW; unknown</td>
<td>Avatari</td>
<td>160</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>GMP</td>
<td>Operational</td>
</tr>
<tr>
<td>Charlotte (9,12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhood Energy LLC</td>
<td>2008</td>
<td>225 kW; 1.4 million kWh</td>
<td>GHD, Inc.</td>
<td>–</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>VT. Electric Coop &amp; CVPS</td>
<td>Operational</td>
</tr>
<tr>
<td>Coventry (5,7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geneva Family Farm Bakersfield</td>
<td>2009</td>
<td>200 kW; 1.4 million kWh</td>
<td>GHD, Inc.</td>
<td>1,000</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Eversburg Village Electric Co. &amp; CVPS</td>
<td>Start-up</td>
</tr>
<tr>
<td>Westminster Farms</td>
<td>2009</td>
<td>225 kW; 1.6 million kWh</td>
<td>GHD, Inc.</td>
<td>1,200</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>GMP</td>
<td>Under Construction</td>
</tr>
<tr>
<td>Westminster</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5, 11,13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

This table details biomethane production on these innovative Vermont farms. Being able to visualize what kinds of farms are choosing to take these measures (by cow population) alongside the types of systems selected and the sources of financing and technical assistance is useful in envisioning what kinds of information the state would need to support energy.
innovation projects on farms. In terms of challenges, upfront cost is a major obstacle, and often a prohibitive factor. Particularly for “early adopters,” costs are felt to be especially high given the expensive nature of commercial offerings and prototypes (Delhagen 2008, 19). Additionally, of the fewer than 1,000 dairy farms currently operating in Vermont, many are considered too small (less than 200 cows) to really benefit from digester technology as it currently stands (Delhagen 2008, 20).

Delhagen (2008, 5) writes, “The farm biogas and biodiesel examples provide tangible evidence in support of this paper’s hypothesis that through innovation networks, groups of Vermonters can develop and implement scalable on-farm energy solutions through concept-to-market processes.” The paper further reveals the ways that farmers have, largely independently of state support or regulation, innovated in energy efficiency and begun to impact other farmers’ behavior, through the “pivotal role” played by communication among peers (Delhagen 2008, 5). It provides straightforward recommendations for the state in regard to the Vermont 25 by ‘25 initiative, a “statewide initiative aiming to increase production of renewable energy in the state” (Delhagen 2008, 4). These recommendations are:

1) Focus on peer learning for farm energy; 2) Improve farmers’ access to good information about farm energy production; 3) Provide two or more farm energy technical assistants; 4) Help farmers get to nearby demonstrations hubs; 5) Identify potential user groups for adoption of new energy technologies; 6) Fill out each farm energy sub-sector with key innovation components; 7) Focus on continuous development in a few farm energy sub-sectors; and finally 8) Monitor and communicate regarding strategic innovation across sub-sectors.

This information can be helpful to VNRC, EIV and legislators working with the proposed carbon pollution tax as it shows that there is opportunity for farmers to decrease their energy costs. Perhaps using part of the Energy Efficiency Fund to finance some of these initiatives on farms could help farmers shoulder the burden of the tax, which is a point we will return to in the policy recommendations section.

3.7.2 Government and Nonprofit Support for Energy Innovation

Currently, the state provides certain avenues of support for farmers to innovate in their energy use. The Vermont 25 x ‘25 Initiative represents an important part of the state’s current attempts to reduce its dependence on fossil fuels, and specifically involve and develop the farm energy sub-sector to do so (Delhagen 2008, 4). In its preliminary findings and goals, the initiative showed that “the state can produce 25% of its energy from renewable resources by 2025 if near-term priority is placed on supporting the most promising renewable energy and energy efficiency sectors and technologies” (Delhagen 2008, 10). In addition to this initiative, other projects and activities relating to farm energy include: the Clean Energy Dependent Fund (which provides $2.65 million in grants per year to applicants like Fillmore Farms and the Dubois Farm for anaerobic digesters), the Vermont Agency of Agriculture REAP Grants ($1.8
million in 2008 for projects such as methane digesters, biofuels, and biomass pellets), and Renewable Energy Funding for Farms by the USDA Rural Development program (Delhagen 2008, 11).

Section 3: Conclusion

The research in this section aims to provide context to our interviews with farmers, in order to support and clarify the issues they raised. It also aims to provide policymakers with a basis for understanding some of the information that exists about a CPT’s relationship to agriculture and a starting point for answering some of the questions that may arise as they attempt to address the agricultural community’s concerns regarding the CPT. Some of the major takeaways from this research are that small- and medium-scale farmers will feel greater impacts from a CPT, and that there are various avenues for energy innovation already being followed, such as the example of methane digesters referenced above. These findings were supported by our interviews which are discussed in detail in Section 4.
4. What Do Farmers Think?: Interview Findings

Our interview findings represent a broad spectrum of perspectives within the agricultural community. We identified three major themes that our interviewees repeatedly touched on, although, farmers offered differing perspectives on each these themes, which are highlighted below. The three overarching findings from our interviews are:

1) The carbon pollution tax will impact different agricultural sectors and sizes differently.
2) Farmers expressed support for environmental initiatives and have already taken steps to implement energy efficiency on farms.
3) Farmers conveyed varying levels of skepticism about the state government and environmental advocates.

4.1 CPT will Impact Different Agricultural Sectors and Scales Differently

1. Small and medium dairy farms are often hit harder by regulations than larger dairy farms as they do not have as large a revenue to absorb additional costs. They are particularly vulnerable now, as they have been asked to change their practices to comply with new water quality standards that fall under Required Agricultural Practices (RAPs). The Agency of Agriculture estimates that 2,500 small farms which have not previously been required to comply with RAPs will now have to do so, including farms with as few as 20 dairy cows (Doyle-Burr 2015).

2. Dairy farms largely cannot set their own prices and must accept milk prices set by the National Milk Federation. As prices takers, they are unable to pass along increases in operating costs to consumers. One exception to this situation is Monument Farms, which sets its own milk prices. As a produce-handler, it is not subject to National Milk Federation Producers Milk Prices.

3. Small vegetable farms and small value-added operations expressed the view that the carbon pollution tax would have a minimal impact on their operations. At Lincoln Peak Vineyard and a small diversified vegetable farmer, fossil fuel use accounts for less than five percent of their total operating costs, indicating that their carbon emissions are already minimal and the carbon pollution tax would not have a significant impact on their financial health. Both of these operations expressed general support of the bill, citing the need to address climate change as a society.

4. Chris Granstrom at Lincoln Peak Vineyard noted the difference between being able to pass along additional costs from the tax to consumers by raising the prices of their products, and the inability of commodity farmers to increase their prices when selling within a commodity market.

5. There is currently a lot of technology that can help maple farmers produce maple syrup more efficiently, however, for maple farms that need to haul their syrup (as opposed to just pumping it through tubes) a carbon pollution tax will have an impact.
6. Among the sixteen farmers that we interviewed, six believed that they would be negatively impacted by the tax, two were unsure, and eight believed that they would see little effect (Figure 8). Those who believed that they would be negatively impacted by the tax included Blue Spruce Farm, Four Hills Farm, Misty Knoll Farm, Hillsboro Sugarworks, Monument Farms, and Clifford Farm. These farms represent large and medium dairy, maple, and poultry farms.

![Figure 8. Perceived Future Effects of CPT on Farmers' Operations.](image)

4.2 Farmers Expressed Support for Environmental Initiatives and Have Already Taken Steps to Promote Energy Efficiency on farms

4.2.1 General Desire to Help the Environment

All of the farmers expressed sympathy with environmental causes. Bill Suhr from Champlain Orchards mentioned that he “would love to see short term pain for long term benefit,” and that he “very much would like to see us slow global warming and slow fossil fuel consumption so future generations can have access when necessary.” Other farmers, although somewhat less emphatically, demonstrated an understanding of the importance of protecting the environment, but definitely kept in mind the realities of farming and the expenses that come with making progressive environmental changes. For example, Jon Rooney at Monument Farms mentioned that he would like to see better environmental protection, but does not know of alternative solutions to the environmental struggles (such as dependence on fossil fuel energy) that farmers face.
4.2.2 Different Perspectives on What Makes Effective Environmental Change

All of the farmers we spoke to devote a lot of attention towards thinking about how to run their farms as efficiently as possible; however, the way farmers and policymakers view energy efficiency is often different. Many farmers think about their energy efficiency in terms of the productivity of their cows, gardens, maple taps, etc. Therefore, the way they approach efficiency may include things like feeding their cows healthier feed so that they produce more milk.

4.2.3 Progress Has Already Been Made in Making Farms More Energy Effective

Certain farms have made great strides in implementing energy efficient innovations. Farming as a business depends on being able to adapt and innovate, and more recently there has been progress specifically in the arena of renewable energy projects on farms. For example, compared to its establishment 67 years ago, Blue Spruce Farm is producing one gallon of milk by using 90% less cropland and 60% less water. Bob Baird, a maple farmer, has eliminated 90% of the fuel he uses to produce maple syrup over the time he has been a maple farmer. These examples showcase some of the important strides farmers have already made in becoming more efficient.

4.2.4 Interest in Developing More Environmental Initiatives, but Hesitation as to the Government’s Role

Many farmers are already looking into energy efficiency solutions that make good economic sense for their business operations. A small diversified vegetable farmer, who wished to remain anonymous, commented on the untapped potential of farmer-to-farmer knowledge exchange regarding innovations in farm-specific energy efficiency initiatives. He cautioned against the government's involvement in facilitating this forum for knowledge exchange, and instead suggested that a non-profit organization coordinate the efforts. Non-profits related to agricultural advocacy could schedule workshops devoted to reducing greenhouse gas emissions on farms in a way that promotes a horizontal exchange of information between farmers.

Bob Baird, a maple farmer, also strongly believes in making his farm more efficient; however, he is discouraged by the role the government has already had, and could have in that effort. While he has found the government to be characterized by unnecessary bureaucracy, he does speak highly of a private company, Same Sun, which effectively helped him install and receive grants for solar panels for his farm. He explained how as a middleman, Same Sun could help him effectively access government subsidies and eliminate the bureaucracy he encountered when working directly with the government. Furthermore, as a private company, Same Sun can be held more accountable to consumer demands.

Many dairy farms in Vermont have already been leaders in rethinking the way agriculture uses energy, by fronting the costs and seeking additional grants for digesters in order to run more efficient farms. Both economic efficiency and environmental values serve as motivations for
installing these digesters. For example, Blue Spruce Farm installed the first manure digester in the state of Vermont, closing many energy loops on the farm. Jay Leshinsky suggested drawing upon the expertise of farm leaders like these as the state considers shaping a CPT. For more examples of energy efficiency projects on farm, refer to Appendix C.

4.3 Farmers Conveyed Varying Levels of Skepticism about the State Government and Environmental Advocates

Overall, the farmers that we interviewed expressed varying perspectives on the effectiveness of government. Although many farmers expressed frustration with government officials, some farmers argued that farmers needed to take more initiative in accessing government resources that are available to them. Figure 9 clearly demonstrates the divide among farmers in terms of their views on their relationship to the government. The overarching themes from our interviews are as follows:

4.3.1 Miscommunication and Inefficiency in Government Programs

One major theme from our interviews was the lack of communication between farmers and government officials. Seven out of sixteen farmers were frustrated by their current and past interactions with the government (Figure 9). While all of the farmers we spoke to strongly supported taking efforts to reduce their ecological footprint, they had various complaints about the inefficiencies in existing government structures that are supposed to help with such types of efforts.

![Figure 9. Views of the Relationship between Farmers and State Government.](image)

a. Air pollution “taxes” on digesters

Four Hills Farm and Blue Spruce Farm both expressed frustration with the fact that, because they have installed digesters (which breakdown manure to use for fuel and thus reduces methane gas emissions), they now have to pay an extra cost on the emissions from those
digesters. Monument Farms also touched on having to pay this fee. This extra cost comes from the Air Pollution Control Annual Registration Program, which requires that all stationary sources of emissions pay a fee in order for the government to gather information about total state emissions. If it is the government’s goal to incentivize action on climate change, it seems counterintuitive that the government would have farmers pay extra for digester emissions, when the net impact of a digester is a significant reduction in GHG emissions compared to not using a digester.

b. Government bureaucracy leads to ineffective management

Bob Baird expressed doubt over the government's ability to support farmers in a transition to more ecological practices. In working to upgrade to new water quality standards, Baird has worked with many different government agencies over several years, and has still been unable to build a fence to keep his cows out of waterways. On the other hand, Baird mentioned that he worked to install his solar panels with a company called Same Sun. This company managed all interactions with government officials in order to help Baird install the panels, which he claimed worked well because Same Sun knew how to positively interact with the government, and Baird did not have to deal with disorganized government officials. His view was that having this type of “middleman” could be useful for other farmers in the future, because many farmers want support in installing new technologies and infrastructure, but do not want to deal directly with the government. Additionally, several farmers expressed concerns that funds from the proposed carbon pollution tax may not be effectively returned to citizens or energy efficiency technologies because too much of the money will likely be wasted due to government bureaucracy.

c. Perceived lack of support by the government for existing environmental initiatives

Of the steps farms have already taken to reduce their greenhouse gas emissions, the state government has played a small role. Instead, farmers themselves have fronted most of the costs of pursuing these projects, which include installing digesters and solar panels or purchasing more efficient technology. Additionally, many have sought grants from private organizations and loans from the federal government. Many of the grants and loans that farmers did receive from the government for these initiatives reflect the bureaucratic problems of governmental structures. For example, most of the funding for Monument Farms’ digester came in the form of a grant from the Clean Energy Development Fund (a government initiative), a USDA guaranteed loan, and a U.S. Department of Treasury grant. Working with so many different agencies and departments shows the inefficiency of governmental structures for helping farmers transition to cleaner energy. Blue Spruce Farm has taken many steps to improve energy efficiency, such as implementing a biomethane digester, a wind turbine, more efficient milk pumps, and LED light bulbs. Marie Audet stated that the farm paid for the majority of these investments on its own,
which reflects the sentiment that farmers do not feel supported by the government in their efforts to reduce their ecological footprints.

Although some farmers expressed frustration with current government funding sources, other farmers noted positive experiences with government officials. Dave Folino, a maple farmer, expressed the view that he felt adequately supported by the government and information on energy efficiency technology is readily accessible for farmers. Jane Clifford, a lobbyist for the dairy industry, believed that part of the disconnect between farmers and government stemmed from some farmers' sense of entitlement and isolated lifestyle. Clifford expressed the view that some farmers needed to assume more responsibility in their relationship with the government. Government funds for many energy efficiency technologies, including solar panels and digesters, already exist. Both government officials and farmers need to work more closely together in order to implement greater energy efficiency technologies.

4.3.2 Perceived Under-Representation in Vermont Politics

Many farmers' frustration with the government stemmed from the belief that they felt underrepresented in Vermont politics. Mike Eastman, who has been milking pasture-raised cows for 25 years in Vermont, expressed suspicion toward a government that values the opinions of legislators and environmental advocates over the experience of farmers. According to Will Stevens, a former representative in the Vermont legislature, there were only two other farmers in the legislature when he was serving. He explained that this lack of representation has become more common recently, correlating to the fact that the same amount of land is being farmed by fewer and fewer farmers. Marie Audet of Blue Spruce Farm echoed this sentiment. She explained that because of advances in technology, production on farms has increased while the number of farmers and acreage has decreased. Therefore, farmers have become proportionally less represented in government because their numbers have diminished. This lack of representation has led to the perception among farmers that Vermont politicians do not fully appreciate the importance of agriculture in the state. Farmers (and particularly dairy farmers) expressed concerns that Montpelier is “totally out of touch with how important agriculture is, not just to the state, but to the nation as a whole” (Chanin Hill).

4.3.3 Concern Over New Government Standards and Regulations

Vermont is an environmental leader in numerous realms, which has resulted in pressure higher than the national average on farmers in the state. Pressure from Vermont’s environmental ambitions correlates to our finding that many farmers expressed concern over new government environmental standards and regulations. Under the Vermont Clean Water Act passed in June 2015, farm operations not previously inspected by the Agency of Agriculture are now required to meet new certification standards. The new Required Agricultural Practices (RAPs) will significantly change the manner in which the state regulates farms of all sizes, with new certification requirements and mandatory inspections. Small farms, in particular, will come under
new regulations for the first time. The Act includes regular farm inspections, annual registration fees that vary by farm size, and imposes fees on farm inputs ($30/ton fee on non-agricultural fertilizer and an annual registration fee of $125 on pesticide products) ("Agricultural Water Quality"). Farmers that we interviewed felt that these new water quality standards placed an additional burden on their operations that is exceedingly difficult to comply with. Within the maple sector, Bob Baird mentioned that currently he is able to produce maple syrup in a cost effective way, however, if the government were to develop more regulations for maple syrup quality and additional health standards he would incur a lot of additional costs that would detrimentally affect his business.

4.3.4 Skepticism Concerning Advocacy and Activism

Several farmers also expressed skepticism of environmental advocacy groups and non-profit organizations. Will Stevens pointed out that advocacy groups increase their revenues by raising awareness for and promoting initiatives such as the carbon pollution tax, and that the tax may be perceived as simply a fundraising technique. This observation is especially relevant as the Energy Independent Vermont coalition could be classified as an advocacy group, which may bias farmers and others in the state against the tax. Marie Audet also mentioned a distrust and skepticism of “activists” because she thought most people who fit into this category attempt to solve issues that they do not truly understand. She pointed out that farmers are the ones who are most experienced when it comes to solving energy issues related to farming, and she does not have faith in those who participate in activism because they often have little to no real connection to the issues they are supposedly fighting for. Although farmers generally expressed skepticism of environmental non-profits, many spoke highly of other organizations, including the Vermont Farm Bureau, which is a grassroots organization that has “policies and priorities set at the county level by individual farmer members” and that tends to support larger agricultural operations in the state (Vermont Farm Bureau). Another organization, Rural Vermont, works to support and advocate for the many smaller farms in the state. If policymakers can garner support from organizations like the Farm Bureau and Rural Vermont they may gain support from farmers in the state.

4.4 Farmers' Positions on the CPT

In terms of farmers' views on the CPT, our interviewees expressed a range of opinions (Figure 10). Four farmers expressed support for the CPT, all citing the need to address climate change as a primary reason for pursuing the tax. However, several of those in support expressed a desire to see more work done on the policy to ensure that the needs of various constituencies are taken into consideration. Nine out of the sixteen farmers we interviewed were either strongly against the tax (namely large dairy and poultry) or skeptical of its ability to work in an effective manner. Those who were strongly against the tax felt that it would place an undue burden on their business and was not an effective means of reducing farm greenhouse gas emissions. They
also mentioned the tax might represent a purely punitive measure that would not incentivize behavioral change since affordable alternatives to fossil fuels do not exist for many farm operations. Some farmers expressed neutral views on the tax since they believed that the policy would have minimal impacts on their operations. Given that the majority of our interviewees were critical of the tax, including some of those in support of it, policymakers should include farmers in the shaping of this policy in order to assuage their concerns.

Figure 10. Farmers' Positions on the CPT/

Section 4: Conclusion

Our three major interview findings offer important insights into how farmers will be impacted by the tax and how they can be a resource in shaping a policy that works toward reducing overall GHG emissions. Farmers and policymakers are working to achieve similar goals, although they sometimes disagree over the best methods for achieving these goals. A detailed overview of each interview can be found in Appendix C. From our interview findings, we developed the following policy recommendations, which work to bridge the divide between farmers' environmental efforts and the state's goal to mitigate climate change.
5. Policy Recommendations and Looking Forward

In order to successfully implement a carbon pollution tax in the state of Vermont, policy makers must consider the potential economic and political implications that this tax poses for the agricultural sector. While more research is still needed to determine and advise policy on a potential carbon pollution tax, we hope that suggestions from this research will inform both future research and how the state addresses agriculture under a carbon pollution tax. We have identified several key recommendations for consideration, but have not endorsed one option above the others. Additional research is necessary to determine the best policy solutions moving forward.

5.1 Key Considerations

1. Under the carbon pollution tax, agriculture should be addressed using a multi-pronged approach, as there are large differences in energy use according to farm type and size.
2. Farmers should be continually engaged in the process of designing a carbon pollution tax, as they feel generally underrepresented in Vermont’s government, and because they are a knowledge base for innovative ways to reduce farm energy use.
3. Policy makers should realize that while a carbon pollution tax may be an effective tool for driving consumer behavior change, it by itself is not a mechanism for making farms more energy efficient. Many farms will most likely require additional financial investment if they are to become more energy efficient, because the upfront costs of energy efficiency may be too great for them to handle and thus may push them out of business. Therefore, changes in these farms’ infrastructure (and the money required to implement them) will be required if Vermont farms are to transition to a more energy efficient future.
4. Finally, while agriculture is a large contributor to Vermont’s overall greenhouse gas emissions, the majority of these emissions come from enteric fermentation (methane production due to cow digestion), manure management (which produces methane and nitrous oxide emissions) and agricultural soils (which can produce nitrous oxide depending on fertilizers used and methods of irrigation and tillage). Therefore, the behavior change encouraged by a carbon pollution tax may not significantly decrease agriculture’s overall carbon footprint.

5.2 Specific Recommendations

We have identified several potential policy recommendations based on our conversations with Vermont farmers. These recommendations reflect our initial findings in regard to potential solutions to mitigate the effects of the proposed carbon pollution tax on the agricultural community while also reducing greenhouse gas emissions on farms.
5.2.1 Special Considerations

Explore the option of including special considerations for certain agricultural sectors that will likely feel greater impact on their operations from the tax. These sectors include:

1. Small-Medium Scale Dairy
   a. Consider developing a longer timeline for phasing in the carbon pollution tax or consider exemption for Small- and Medium-Scale Dairy farms, which:
      i. Have recently been required to comply with Required Agricultural Practices, which has placed a large financial burden on them.
      ii. Have a smaller profit base than large dairy, which will make paying for new energy efficient technologies difficult.
      iii. Spend greater proportions of their total operation costs on fuel (relative to larger farms).
      iv. May not benefit from energy efficiency technology like digesters.
   b. Given these factors, a sudden new cost for these farmers could be disproportionately detrimental, which without a chance to develop more efficient technologies, might drive them out of the market.

2. Large Scale Dairy
   a. Large Scale Dairy will likely be impacted by the CPT, however, by implementing technologies such as digesters and biogas, they will be able to close more loops on their farms, which will increase their energy efficiency.
      i. Currently a large energy expenditure on dairy farms is diesel fuel for running trucks, tractors and machinery. However, with support, farms could switch from diesel to biogas (methane) produced from their digesters. This would greatly reduce the impact a CPT would have on their operations.

3. Maple Syrup Production
   a. Consider the impacts of hauling syrup (which uses gasoline intensively) on maple farmers in the state.

5.2.2 Alternative Options

Understand and Support Alternative Options for Creating Energy Efficiency on Vermont Farms.

1. Consider allocating a portion of the Energy Independence Fund towards agriculture, focusing on the following technologies:
   a. Digesters
      i. Consider ways digester technology can be made available to smaller farms.
ii. One option is to consider supporting digester cooperatives in which a few small farms within a small radius of a central site may co-run a digester.

b. Biogas
   i. Support technology and infrastructure that would help farmers with digesters transition to biogas (produced from their digesters) to run their tractors.

2. Consider rewarding farmers who have already reduced their GHG emissions. For example, a significant portion of farmer's GHG emissions comes from manure, which would not be covered under the CPT. A potential solution could include a tax break for farmers who have already installed digesters on their farms or who have pursued alternate energy efficiency technologies. This policy would still address the same issue of climate change, but in a way that rewards farmers for their positive actions instead of penalizing them through a tax.
   a. Pursuing this recommendation will be key to gaining support from the agricultural community. Farmers generally view financial support and further technological advances as requisite for their ability to increase their use of renewable/efficient energy technology past their current levels of efficiency.

5.2.3 Include Farmers to the Conversation

Develop a more effective platform for farmers to voice their opinions and gain access to state support when transitioning to more efficient energy technologies.

1. Have farmers at the table. Continually request and listen to their perspective on how to best shape policy and allocate the Energy Independence Fund.
2. Establish a single effective intermediary coalition or agency that will help farmers understand and receive state funds as well as other grants and loans for new technologies, so that farmers spend less time caught up in government bureaucracy.
3. Develop an accountability mechanism for said agency or coalition, and require that farmers both participate in and review this organization.
4. Alternatively, the private sector has been shown to be very effective at efficiently helping farmers implement new technologies (such as solar panels); therefore, the role of private companies, which are held to high standards by a competitive market, should be considered as a potential intermediary between farmers and the government in this process.

5.2.4 Policy Should Be Clear and Specific

Upon reading the one page overview of the tax, several farmers (such as small organic dairy farmer Mike Eastman) wanted to know exact numbers for the flat rate “refundable tax credits for individuals” and the “per-employee rebate for all employers.” Thus:
1. Provide distinct numbers for credits and rebates.
2. Distinguish what counts as an “employee” for the per-employee rebate.

5.2.5 Further Considerations and Areas for Future Research

1. What does it mean that this tax might disproportionately negatively affect small-medium sized dairy farms?
   a. What would this impact really look like?
   b. What would it mean if many small and medium-sized dairy farms were pushed out of state or out of business? Consider the cultural, environmental, and economic costs for Vermont.
   c. Could this unintended consequence of the tax reduce Vermonters access to local food? If farming becomes less economically viable, a reduction in the number of smaller dairy farms could affect Vermont’s landscape, transforming the open fields into other land uses that are more economically viable than farming. About 50% of the milk sold from Vermont farms goes to the cheese industry, which Vermont is known for (Jones 2014). Fewer Vermont dairy farms could lead to a weakening of this culturally and economically valuable industry.

2. What is the role of agriculture in the state as an employer?
   a. In 2008, farm-related earnings (farm earnings combined with agriculture and forestry support activities) constituted approximately 1% of earnings by Vermonters (Jeffords). While this seems to be a small number, it represents a significant amount of people whose livelihoods would be impacted if the CPT disrupts the viability of the agricultural industry.

3. Consider a comparative analysis of state, regional and national approaches.
   a. Several farmers (4 out of 16, including some farmers who were generally frustrated with state government and others who were very supportive of government measures) preferred regional and/or national approaches to solve border leakage issues, and to avoid the challenge of Vermont being a pioneer and yet, because of its small size and uniqueness in the United States, not provide a really representative model of how such a tax could be carried out in other places. Thus, these farmers believed a federal or regional tax would be more effective and better capture the true cost of carbon.

4. Pursue a better understanding of where greenhouse gas emissions are coming from, and how this tax will really work toward reducing them.
   a. Farmers were skeptical about a Vermont-scale or fossil fuel-focused tax being effective in reducing overall emissions. Several farmers directly stated or implied that this would be a “feel good tax.”
   b. The major greenhouse gas emissions on farms come from enteric fermentation, manure management, and agricultural soils. If the primary goal of H.412 is to help
meet the state’s GHG emission goals, policies targeted specifically at reducing these more notable agricultural GHG emissions might be more effective.

c. Understanding whether the tax is best constructed toward achieving this goal will be essential in gaining both widespread and agriculture-specific support for the policy.
6. Conclusion

The agricultural community in Vermont as represented by the farmers we spoke to cares about the environment. They also care about reducing their costs wherever possible. With this in mind, Vermont legislators can move forward in efforts to facilitate farmers' transition to using fewer fossil fuels under a CPT. If a real shift in energy use is to occur it will be in large part on farmers’ terms, or at least after building mutual understanding by increasing communication between farmers and government. If government agencies and environmental nonprofits can communicate effectively with farmers and work toward understanding their perspectives, policymakers will create a buy-in for the tax before imposing a punishment. Incentives and credits for taking environmental initiatives on farms can also help balance out potential burdensome feelings and economic impacts of a tax. Some will feel the impact harder than others, and some will feel it as an added impact on top of preexisting concerns about low dairy prices, poor hay seasons, or “air pollution fees.” These sectors might benefit from specific rebates or more gradual phase-in cost increase for diesel. Not all farmers will talk to an environmental coalition or a legislator, or even a student, but with ones that will, these types of considerations come to light. The insights of Vermont’s agricultural community can aid the state in its process of pursuing holistic, effective policy. These conversations remind us of the importance of listening. They pave a way for potential support of a CPT that has been carefully thought through and creates maximally efficient programs translated to users by trustworthy agents. With more detailed research and creative thinking, such a policy may be possible for Vermont.
Appendix A: Overview of CPT

Carbon Pollution Tax and Agriculture in Vermont
Middlebury College Student Research

A group of Middlebury College Environmental Studies seniors is working with a community partner – the Vermont Natural Resources Council (VNRC) – to research, identify, and better understand what the potential costs and benefits would be for Vermont’s diverse and important agricultural economy if the state placed a tax on carbon pollution. VNRC is working with a coalition of businesses, low-income advocates, environmental and faith-based groups – called the Energy Independent Vermont coalition – that is interested in such a policy for Vermont but committed to understanding the implications, concerns and realities of how such a policy would affect Vermonters. A significant, driving motivation for exploring this policy is to shape and potentially implement a solution to help mitigate the negative consequences of climate change, which will have immense impacts on Vermont – and our agricultural community.

Specifically, Middlebury students are investigating how such a policy might impact Vermont’s diverse agricultural sector. This research will be shared with project partners and policy makers with the goal of informing and shaping any potential policy moving forward. The goal is to gain an understanding of the range of perspectives and issues within Vermont’s agricultural community and outline potential strategies for how a price on carbon pollution might be structured to mitigate impacts to the industry. Input from leaders in Vermont’s agricultural sector will be crucial to a complete understanding of how farmers use energy, how much they consume, where there might be opportunities to support investments in on-farm efficiency and renewable energy solutions for farmers and more.

Two bills were introduced in the last legislative session, and it’s likely this issue will be discussed in the 2016 legislative session. That’s why it’s so important to gather information on key issues from the agricultural sector to help inform the policy.

The objectives of Energy Independent Vermont Coalition members and sponsors of the legislation are three-fold:

Policy Objectives:

- Significantly reduce Vermont’s greenhouse gas emissions
- Do so in a way that is a net economic benefit to Vermont
- Do so in a way that is equitable, including for low-income Vermonters
The framework of the policy as introduced (H.412) includes:

- Placing a fee on carbon pollution, applied to fossil fuel distributors in Vermont
- Apply that fee to heating and transportation fuels; electricity would be exempt
- Start the fee at $10/ton of CO2 in 2018 and increase it $10/year for 10 years (capped at $100/ton) – for reference, $10/ton is about $0.10/gallon of gas

How would the money be used in the currently proposed legislation (H.412)?

100% of the revenue would stay in Vermont:

- 90% of the revenue would return to Vermonters in tax rebates and other tax relief, including:
  - A 1% reduction in the Sales & Use Tax (a benefit coalition partners recognize sales and use tax-exempt entities would not enjoy, so other solutions are being explored).
  - Refundable tax credits for individuals (a flat per capita amount annually rebated to every adult resident)
  - Additional rebates for Vermonters at or below 200% of the federal poverty level
  - Per-employee rebate for all employers
- 10% of the revenue would be used to create a Vermont Energy Independence Fund which will support programs to help Vermonter cut their fossil fuel use and fuel bills through efficiency and clean energy investments.
  - The fund would support a range of programs, including a potential targeted program to help farmers cut their energy use/bills.

What are the benefits?

- According to an independent analysis conducted by Regional Economic Models, Inc. (REMI), in the next 10 years, the proposed tax will create 2,000 jobs and increase Vermont’s GDP by nearly $100 million.
- According to the same analysis, a carbon pollution tax is the single biggest step Vermont could take to dramatically reduce our greenhouse gas emissions.

As noted above, there is a conversation around this important topic and a growing, diverse coalition that is committed to the three goals of reducing Vermont’s contribution to climate change in a way that grows our economy and mitigates potential negative impacts to those who cannot afford to pay more for their energy. As this conversation evolves, and when the Legislature explores a carbon pollution tax, input from Vermont industries such as agriculture will be very important.

It’s clear that the legislation as introduced will change, and the specific policy will evolve as legislators explore the issues and opportunities that it creates. The goal is to ensure that any proposed policy works well for Vermonter and Vermont’s key industries (including agriculture).
Understanding how to mitigate any negative impact to Vermont’s agricultural community will be key. Again, the fact that farms do not pay sales tax is important to take into account, since the current draft of H.412 offers that tax relief as part of mitigating the cost impacts. What are other solutions the state could embrace to fill that incentive gap for the agricultural sector?

We thank you in advance for any help you can lend to deepen our understanding of the fossil fuel-based energy costs farmers are currently incurring, how a price on carbon pollution could impact Vermont farms, and how it might be shaped to mitigate those impacts and help farms transition off of expensive and unpredictably-priced fossil fuels.

Thank you,

Middlebury students Mara, Jess, Shaojin, Allie, and Jordan, and VNRC partners

If you have any questions, please contact:
Jordan Collins
jcollins@middlebury.edu
(609) 651-0363
Appendix B: Interview Questions

Questions for Farm Advocacy Groups:
1. What are the main sectors/categories of farms in Vermont that you think we should cover in order to get an accurate read of the impact of a carbon pollution tax?
2. How do you think the proposed Carbon Pollution Tax will impact the agricultural community?
3. What are your current concerns with the Carbon Pollution Tax, as they relate to agriculture in VT? Do you have any ideas that might alleviate those concerns?

Questions for Vermont Agency of Agriculture:
1. What are the main sectors/categories of farms in Vermont that you think we should cover in order to get an accurate read of the impact (positives or negatives) of a carbon pollution tax?
2. Can you give us an idea of the main processes on farms that require fossil fuels, and will thus factor into the impact of the tax on farms?

Questions for Farmers:
1. Tell us about your operations/business.
   a. What do you currently produce?
   b. Would you say that you have any main values or priorities that affect how you make decisions in your business/on your land?
   c. How many people does it take to run this farm?
   d. What percentage of your operating costs goes towards fossil fuels?
1. Have you heard of the proposed Carbon Pollution Tax? (send one-page overview)
   a. Clarify our position: students doing research for a class that involves working with community partners who are looking into such a tax for Vermont.
   b. If no, give time for them to process the bill using our overview.
1. How do you think the Carbon Pollution Tax would impact you and your farm? Keep in mind your energy usage, transportation needs, imports and exports, etc.
2. If a Carbon Pollution Tax were implemented, how could the State support your adjustment to this new policy?
3. Are you currently taking any steps to reduce your fossil fuel costs/use? What are some of the challenges in doing so?
4. What are some relevant challenges you currently face as a farmer?
   1. How does your energy use compare to other farms (in your sector and across sectors)?
   2. How do you think the proposed Carbon Pollution Tax would be received by / would impact the range of farmers in VT?
   3. How do you and/or other farmers perceive the role of the government as pertains to agriculture, generally and in terms of supporting energy innovation? If there is frustration or skepticism, where is it coming from?
Questions for Legislators:

1. Who do you generally see as being key players in the political process in the state? How does the agricultural sector get involved in politics in the state?

2. Can you describe your constituency for us? What role does the agricultural community play in your decision making process?

3. Would you say your constituency is representative of the rest of Vermont? How might other legislator’s constituencies be similar or different to yours, particularly on the issue of a Carbon Pollution Tax.

4. Do you have a general idea if your constituency (particularly if it includes farmers) would be in support of, against, or undecided/uninformed about a Carbon Pollution Tax? Why might that be?

5. Who are already large players for or against a Carbon Pollution Tax in the state?
## Appendix C: Findings from Interviews

### Table 1. Main Findings from Farmer Interview

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Operation/ Organization Description</th>
<th>Fossil Fuel Use &amp; Potential Impact from CPT</th>
<th>Environmental Stance &amp; Efforts</th>
<th>Relationship to the Government</th>
<th>Views on CPT &amp; Solutions Ideas</th>
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<tbody>
<tr>
<td>Small Diversified Vegetable Farmer**</td>
<td>Organic (not certified) vegetables □ 4 acres tilled, 160 acres total □ Infrastructure: barn, 4 tractors, cold storage, 3 vans for deliveries □ High tunnel and plans to build a second next year □ 3.5 full-time employees</td>
<td>□ Less than 5% of operating costs □ CPT would not greatly impact his operation</td>
<td>□ Support for environmental initiatives that make economic sense</td>
<td>□ Skeptical of state government’s effectiveness □ Small government advocate</td>
<td>□ Had heard of tax? Yes* (*following columns will just have Y or N) □ CPT = &quot;benign tax&quot; for him and in general</td>
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<td>Chris Granstrom, Lincoln Peak Vineyard (New Haven)</td>
<td>Value-added vineyard, includes farm, processing, manufacturing, retail sales, some wholesale □ 12 acres of grapes (80,000 lbs a yr → 25,000 bottles of wine) □ 3 yr-round employees, 7-8 total during peak times</td>
<td>□ Fuel = less than 5% of operating costs □ Diesel tractor: $1200/year □ Propane for heating: $700-800/year □ CPT would not greatly impact his operation</td>
<td>□ Support for environmental initiatives</td>
<td>□ Generally neutral feelings toward the government, doesn't regularly interact with the government</td>
<td>□ N □ Neutral stance on CPT</td>
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<td>Jay Leshinsky, Middlebury College Organic Farm (Middlebury)</td>
<td>Small organic vegetable farm at Middlebury College □ 4 interns</td>
<td>□ Very small fossil fuel use, aim to emit as little carbon as possible □ Most energy use comes through transportation, farm</td>
<td>□ Environmentalism is a priority: aims to be a part of the “slow food” movement</td>
<td>□ Can achieve lower carbon footprint by using labor instead of machinery □ There are a lot of existing leaders within VTs agricultural community. If the state seeks out and works with those leaders they’ll be able to make more effective change; these leaders may also be role models</td>
<td>□ Y □ Supportive of CPT, but wants to see thoughtful policy development</td>
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<td>Marie Audet, Blue Spruce Farm (Bridport)</td>
<td>makes frequent short trips to deliver models</td>
<td>Farmers themselves are a huge resource for mechanisms of innovation on farms. State will need to support the transition to renewables by supporting shifts in technology, can be done with incentives and rebates (maybe provide subsidies for new energy efficient technologies). These shifts will take time. Fertilizer and transportation are likely some of the largest fossil fuel related costs for farmers. New water quality standards have recently been hitting farmers, may make policy difficult.</td>
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<td>Family farm (20 family members)</td>
<td>Diesel Fuel is one of their biggest fossil fuel expenditures. Would probably be able to absorb costs from a CPT (but that doesn’t mean they wouldn’t struggle). Farms under 500 cows are now required to comply with the same standards as bigger farms, but are much less able to absorb costs (RAPS, required Ag. Practices).</td>
<td>Frustrated with the “Air Pollution Control Annual Registration Fee” they have to pay on emissions from their digester, when the net effect of the digester is already a huge reduction in GHG emissions. Feel that Dairy is “not welcome in the state”. The government can help by using/supporting the infrastructure that is already helping farmers (e.g. FSA). Feel that farmers do not have a strong voice in VT politics. Farms play a big social community role, by providing compost, fertilizer, local food and jobs to surrounding communities- feel underappreciated by government for this service.</td>
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<td>30 people employed</td>
<td>1,500 cows 3,000 acre farm Grow hay grass and corn to feed cows</td>
<td>Y Against CPT. Believe they need to do something about climate change, but don’t think a CPT is the right way to do so. Farmers need capital if they are to update their technology to cope with a CPT. Would appreciate support to transition to biofuel, so that they can run tractors/machinery/trucks off of their digester. The research and technology are out there for farmers to become more energy efficient, but they need help to front the costs/transition. Helpful organizations in improving farm energy efficiency: UVM Extension Service, Champlain Valley Farmers Coalition, USDA FSA (Farm Loans).</td>
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<td>Since their founding (67 years ago), they use 90% less cropland and 60% less water to produce 1 gallon of milk. Their efforts to reduce GHG emissions are focused on their cows, by providing better nutrition, medicine, and environment for cows, they produce more milk = more efficient use of energy. Use cold water to cool milk → warm water used for cows to drink. Variable speed drive on milk pumps, expensive up front, but increases their energy efficiency. Energy efficient lighting Manure Digester (first in VT) Wind Power through</td>
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<td>Chanin Hill, Four Hills Farm (Bristol)</td>
<td>Large scale dairy</td>
<td>Raised concerns that small farms are being forced out by poor markets and govt. regulations.</td>
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<td>Their farm struggles as they’ve invested hundreds of thousands of dollars to upgrade facilities to comply with BMP, but haven’t been given permission to expand their operation to cover costs.</td>
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<td>Frustrated that they have to pay an “Air Pollution Control Annual Registration Fee” on their digester which eliminates thousands of tons of carbon.</td>
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<td>Believes Montpelier is out of touch with how important agriculture is to the state, nation, and world as a whole.</td>
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<td>States that rules and laws created by the legislature are not clearly defined.</td>
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<td>Against a CPT.</td>
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<td>States that in many ways they already are paying a CPT, as they are already taxed for their fossil fuels under an “all on-road diesel tax.”</td>
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<tr>
<th>Jon Rooney, Monument Farms (Weybridge)</th>
<th>High end of medium scale dairy</th>
<th>Fossil fuels are 5.22% of their total operating costs.</th>
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<td>Their largest expense is feed, which could also be driven by fuel prices.</td>
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<td>If the CPT is implemented they could pass on the additional cost.</td>
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<td>Methane digester (paid for by small grant from state, large CEDF grant, USDA backed loan and a treasury grant).</td>
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<td>Recently invested a lot of money to meet all the new clean water guidelines.</td>
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<td>Tough for small farmers who haven’t had to comply with water quality standards before; expressed concerns over how government supports small farmers (who are already struggling).</td>
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<td>Would like some way to give feedback and better transparency with the legislature.</td>
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<td>Skeptical, undecided view of tax: thinks too much of money could be wasted on government bureaucracy but not against measures for reducing emissions.</td>
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<td>Drivers</td>
<td>Cost to consumers, but it could hurt them competitively</td>
<td>Will be difficult for them to grow to cover new costs as they are not a conventional dairy farm</td>
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<tr>
<td>Rob Litch, Misty Knoll Farms (New Haven)</td>
<td>□ Free-range turkey and “naturally-raised” chickens</td>
<td>Uses a considerable amount of energy, particularly propane</td>
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<td></td>
<td></td>
<td>□ Has pursued all energy efficiency technologies that exist, cannot increase efficiency further</td>
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<td></td>
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<td>□ Truck that run on diesel fuel</td>
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<td></td>
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<td>□ Will support energy efficient technologies that make economic sense</td>
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<td></td>
<td></td>
<td>□ Has pursued all energy efficiency technologies that exist, cannot increase efficiency further</td>
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<td>□ Frustration with inefficiency of government; feels that many government officials are unqualified</td>
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<td>□ Efficiency VT is an example of using revenue to fund employees and budget, but employees are not usually held accountable, and often do not submit or follow up on reports</td>
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<td></td>
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<td>□ It is very important that the government support new technologies; implementation has been insufficient</td>
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<tr>
<td>Will Stevens, Golden Russet Farm</td>
<td>□ Organic vegetable, CSA, bedding plants and flowers, wholesale (City Market, Middlebury)</td>
<td>Does not use much fossil fuel (less than 5% operating costs)</td>
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<td>□ Gasoline- deliveries</td>
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<td>□ Diesel ($1,500/yr)</td>
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<td></td>
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<td>□ Skeptical of government after working in it</td>
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<td>□ Government encouraged dairy to grow in the Nixon era, and now dairy farmers are struggling (milk price already lower than</td>
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<td>□ Government encouraged dairy to grow in the Nixon era, and now dairy farmers are struggling (milk price already lower than</td>
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<tr>
<td>Name</td>
<td>Occupation</td>
<td>Vertical Integration</td>
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<td><strong>Co-op</strong></td>
<td>- Was in the legislature for 8 years</td>
<td>- Propane for greenhouse</td>
</tr>
<tr>
<td><strong>Dave Folino, Hillsboro Sugarworks (Starksboro)</strong></td>
<td>- Maple sugar operation</td>
<td>- Fossil fuel use accounts for 5-6% of operating costs</td>
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<td>- Produces 6,000 gallons a year</td>
<td>- Produces 6,000 gallons of syrup using 1,500 gallons of oil a year</td>
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<td>- Certified organic</td>
<td>- Delivers syrup</td>
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<td>- 2 full time employees and temporary labor for 2 months/year</td>
<td>- Would feel an impact but willing to absorb the cost</td>
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<tr>
<td><strong>Bill Suhr, Champlain Orchards (Shoreham)</strong></td>
<td>- Fresh apples, pears, plums, peaches, nectarines, cherries as well as sweet cider, hard cider, ice cider, pies, applesauce, apple butter, fresh apple slices</td>
<td>- 7% of operating costs go toward fossil fuels, includes electrical</td>
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<td>- Probably would not be detrimentally affected by carbon pollution tax</td>
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<tr>
<td>Name</td>
<td>Description</td>
<td>Trucks</td>
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<td>Bob Baird, Baird Farm (Chittenden)</td>
<td>Milked cows for 23 years then switched to dairy heifers, and now produces sugar maple 8,300 taps; small maple farmer  For maple farms: 10,000-20,000 taps = medium; 20,000+ taps = large</td>
<td>In the past 10-20 years he has eliminated 90% of his fossil fuel use  This was achieved through reverse osmosis, solar panels, and a mixed evaporator produces 4,000 gallons of syrup in an average year, with 8,300 taps, using 1,000 gallons of oil</td>
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<td>Mike Eastman, Small dairy (Addison)</td>
<td>Certified organic  Grass-fed dairy  Grows own hay, stores dry (no silage)  Milks less than 40 cows on 312 acres  Runs farm alone</td>
<td>Diesel for tractors (400 gallon/yr, which is 10 gallon/cow), used for hay baling and spreading manure to nearby fields  If diesel is $3/gallon, only spend $1,200/year on fuel  Fossil fuels account for only 1-1.5% of operating costs  Not very worried about CPT because fossil fuels make up a very small portion of their total operating costs</td>
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<tr>
<td>Jane Clifford, Green Mountain Farmers Cooperative Federation, The Clifford Farm (Starksboro)</td>
<td>Executive Director of Green Mountain Farmers Cooperative Federation, represents 90-95% of dairy farmers in VT</td>
<td>Spends $15-18,000/year on fossil fuels for heating (milking parlor, calf barn, houses), running machinery</td>
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<td>220 cows</td>
<td>Medium-scale dairy</td>
<td>Fossil fuels account for less than 5% of their operating costs</td>
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<td>Runs operation with her husband, they provide housing for 2 employees</td>
<td>Worried about the trickle down effects of the tax on farm inputs, such as animal feed ($750,000/yr)</td>
<td>Farmers in Vermont &quot;often have a sense of entitlement&quot;; government resources exist to help farmers</td>
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<tr>
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<td></td>
<td>Fossil fuels account for less than 5% of their operating costs</td>
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<td>Marc Cesario, Meeting Places Pastures (Cornwall)</td>
<td>Upper end of small scale, grass-fed beef (about 200 cows)</td>
<td>Would not blink an eye if tax was passed</td>
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<td>Very little fossil fuel consumption</td>
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<td>Does not use much electricity</td>
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<td>No tractor; feed and manure taken care of by pasture, which minimizes fuel use and mitigates a potential impact from the tax</td>
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<tr>
<td>Amy Skelton, Pete's Greens Farm (Craftsbury)</td>
<td>Organic vegetables, sustainable practices, profitable growth</td>
<td>Fossil fuels account for 4% of their operating costs</td>
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<td>Have 25 people year round, an additional 7 in summer</td>
<td>CPT will cause expenses to go up and will squeeze profitability</td>
<td>Considering installation of large wood chip system for heating facility.</td>
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<tr>
<td>CPT will also cause expenses to go up for their main competition: low-priced organics shipped in from other countries or California. Might help them to sell more of their food at a better price if prices for these &quot;imports&quot; are forced higher.</td>
<td>However, two major challenges:</td>
<td>1. <strong>COST.</strong> Lot of money that takes years to recoup in savings;</td>
</tr>
<tr>
<td><strong>Farmer and legislator</strong> <strong>(organic)</strong></td>
<td><strong>CPT</strong> would increase their costs, but not tremendously relative to other costs and the variation in their income.</td>
<td>Extension agents and farm groups are more trusted than the Agency of Agriculture or businesses that appear to be trying to help, but are also clearly operating in their own self-interest.</td>
</tr>
<tr>
<td>□ Mid-sized vegetable and livestock (organic)</td>
<td>□ Support for environmental initiatives</td>
<td>□ Thinks that the Energy Independence Fund is an excellent idea</td>
</tr>
<tr>
<td>□ 30 acres of diversified vegetables</td>
<td>□ They are renovating their existing equipment barn to install solar panels to cover about 60-75% of electricity usage</td>
<td>□ Converting other energy usage to solar and reducing that cost in order to offset increased fuel costs could be a way to go.</td>
</tr>
<tr>
<td>□ 50 pigs for slaughter and 70 additional piglets for sale</td>
<td>□ Uses fuel for vehicles (tractors and delivery/harvest trucks)</td>
<td>□ CPT would increase their costs, but not tremendously relative to other costs and the variation in their income.</td>
</tr>
<tr>
<td>□ 1200 meat chickens</td>
<td>□ Uses electricity for cooling and storing</td>
<td>□ They are renovating their existing equipment barn to install solar panels to cover about 60-75% of electricity usage</td>
</tr>
<tr>
<td>□ 4 employees in winter, 13 employees in summer</td>
<td>□ Uses some energy for water (pump from well) and heating (lights in chicken incubator, heat in warmer storage room in winter)</td>
<td>□ They are renovating their existing equipment barn to install solar panels to cover about 60-75% of electricity usage</td>
</tr>
<tr>
<td>□ Fossil fuels accounted for 2.5% of their operating costs in 2014 (⅓ of their total pay).</td>
<td>□ Support for environmental initiatives</td>
<td>□ They are renovating their existing equipment barn to install solar panels to cover about 60-75% of electricity usage</td>
</tr>
<tr>
<td>□ Extension agents and farm groups are more trusted than the Agency of Agriculture or businesses that appear to be trying to help, but are also clearly operating in their own self-interest.</td>
<td>□ Thinks that the Energy Independence Fund is an excellent idea</td>
<td>□ Converting other energy usage to solar and reducing that cost in order to offset increased fuel costs could be a way to go.</td>
</tr>
</tbody>
</table>
While it might look like a small percentage, any change in that (which changes their bottom line) is not insignificant.

* For the column “Views on CPT & Solutions Ideas”, “Y” means “have heard of the proposed carbon pollution tax” and “N” means “have not heard of the tax”.

**Interviewee wished to remain anonymous.
### Table 2. Other Interviews

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Takeaways</th>
</tr>
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</table>
| Professor Pecsok, (Middlebury)                                              | ☐ Consideration of Vermont's goal in agricultural production  
☐ Vermont wants to maintain a pastoral ideal; agriculture is extremely important to the state's image |
| Alex Depillis, VT Agency of Agriculture, (Montpelier)                        | ☐ Farm Sectors:  
○ Conventional dairy (no digester)  
○ Conventional dairy (with digester)  
○ Organic dairy  
○ Grain Farmer  
  ▪ Because of VT Sustainable Jobs Fund, they could produce biodiesel from grains- they could benefit from a carbon pollution tax  
○ Vegetable and Greenhouse Grower (operating a greenhouse through the winter)  
☐ Farms bringing in the Money: Dairy  
☐ Greenhouse Gas Emissions on farms come from:  
  ○ Manure = huge part of a farm's GHG emission, a CPT would not change or reduce this emission  
  ○ Potential Solution: GHG accounting to give CPT tax breaks to farms that reduce GHG emissions by installing digesters  
  ○ This would still address the same problem (climate change) in a potentially more effective way  
  ○ Transportation and Heating Costs  
☐ Other ways to reduce GHG emissions:  
  ○ Switch from propane to clean electricity  
  ○ Help farmers transition to biogas to put in vehicles (this could be produced in a digester) |
| Andrea Stander, Rural Vermont (Montpelier)                                  | ☐ Advocacy group for Vermont farmers  
☐ Promotes a local food system that is "self-reliant and based on reverence for the earth"  
☐ 900 members  
☐ Most members are small-scale farmers  
☐ Strong environmental ethic  
☐ Farmers are already exploring ways to reduce fossil fuel use  
☐ Farmers are under a lot of pressure  
☐ Need to continue to incentivize energy efficiency practices for farmers |
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