Tax Policy Structures for Incentivizing Reforestation of Abandoned Agricultural Lands in New York State

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Abstract

We examine the potential for incentivizing reforestation of abandoned agricultural lands in New York State through two tax policies: a property tax exemption and an income tax credit. We compare the incentivization structures of both policies by simulating net benefits to landowners and total costs per county. Ultimately, we find that the income tax credit incentivizes landowners more efficiently than the property tax exemption. The motivation for exploring property tax exemptions follows the New York State Climate Action Council's 2021 Draft Scoping Plan, which considers creating Real Property Tax Law 480c to incentive landowners to pursue carbon sequestering land management practices. The Draft Scoping Plan also considers the revisioning of the 480a Forest Tax Law program for forest management carbon sequestration. In this paper, we simulate Real Property Tax Law 480c with an incentivization structure mirrored on the active 480a Forest Tax Law program.

1 Executive Summary

The reforestation of abandoned, unmanaged, or inactive agricultural lands in New York State is a viable natural-and-working-lands carbon sequestration strategy for emissions reductions under the Climate Leadership and Community Protection Act. The New York State Climate Action Council identifies afforestation, reforestation, and other forest management strategies as essential measures to developing a stronger carbon bank on the State's lands ("New York State," 2021). The Climate Action Council's Agriculture and Forestry Advisory Panel outlines several strategies for increasing in-state reforestation programs, with a particular focus on selective location prioritization and larger grant program funding ("New York State," 2021). Through state tax records, we identified 317,563 acres of abandoned agricultural land in New York State, which through reforestation has a 10-year carbon sequestration potential of over 11.6 million tons of CO_2e. In the Draft Scoping Plan, the Climate Action Council identifies 1.6 million acres of marginal cropland and pastureland with a potential for reforestation and afforestation – a sum which is over 5 times the size of our calculation ("New York State," 2021). We consider two tax policies for incentivizing the reforestation of abandoned agricultural land: Real Property Tax Law 480c and an income tax credit.

Using county-level tax parcel data from the NYS GIS Clearinghouse, this paper simulates Real Property Tax Law 480c with an incentivization structure modeled on the 480a Forest Tax Law program. The 480a Forest Tax Law program provides property tax exemptions for large forest plot landowners through formulas which use the plot's tax assessment per acre and municipal equalization rate. Our analysis focuses on the top four counties with the largest individual sum of abandoned agricultural land: Clinton, Otsego, Delaware, and St Lawrence County. We identified positive and negative net benefit landowners by subtracting the tax exemption from reforestation costs per plot. Our results show that property tax exemptions under 480a Forest Tax Law program, however, provide a perverse incentive against larger plots of abandoned agricultural land; we attribute this to the larger original property tax assessment per acre of landowners with larger plots.

The paper also developed an income tax credit as an alternative tax policy to incentivizing landowners. The Climate Action Council's Draft Scoping Plan did not consider an income

tax credit as an alternative policy tool to the property tax law for afforestation and reforestation incentivization ("New York State," 2021). We structured the income tax credit to mirror reforestation costs to ensure that landowners maintained a positive net benefit across all years of a reforestation project.

By simulating annual total costs for the two policies over 40 years, we found that the income tax credit was significantly more cost-efficient than the 480a Forest Tax Law program. *Ultimately, we recommend utilizing an income tax credit to incentivize reforestation of abandoned agricultural lands over the use of a property tax exemption.* Using the property tax exemption structures of 480a Forest Tax Law program provides a perverse incentive against larger plots of abandoned agricultural land and does not effectively incentive landowners to a positive net benefit during all years of a reforestation project. Additional analysis is necessary to understand the existing tax burden of landowners, particularly for income taxes.

2 Introduction

As the impacts of climate change become increasingly apparent and severe, the need for climate action is more urgent now than ever before. According to the National Climate Assessment Northeast Chapter, New York State has experienced sea level rise and more frequent and extreme storms and flooding events ("National Climate Assessment, 2018). These impacts are disproportionately felt by low-income communities and communities of color across the state.

In 2019, New York State passed the Climate Leadership and Community Protection Act (CLCPA). The CLCPA requires New York State to achieve net-zero statewide greenhouse gas emissions by 2050. The law mandates an 85% reduction in greenhouse gas emissions by 2050 from a 1990 emissions level baseline. The law also mandates 100% zero-emission electricity by 2040. Some sectors in New York State are hard to decarbonize due to underdeveloped, high-cost technologies. Therefore, the CLCPA relies on in-state carbon sequestration opportunities to account for remaining emissions. The CLCPA created the Climate Advisory Council to prepare a Scoping Plan to achieve the state's decarbonization goals. The Climate Advisory Council consists of seven Advisory Panels, each of which specialize their discussion on sector-specific

decarbonization strategies. The Advisory Panels ultimately offer recommendations to the Climate Advisory Council to inform their development of the Scoping Plan.

Natural and working lands (NWLs) are a significant avenue for in-state carbon sequestration under the CLCPA. NWL carbon sequestration projects mainly consist of improved forest management, afforestation of previously unforested lands, and reforestation of previously forested lands. Depending on technology development and management practices, New York State's NWLs sink is expected to sequester between 25.4 to 36.4 million tons of CO_2e (Pathways, 2020). The largest potential gains for NWL carbon sequestration exist through afforestation and reforestation. There is a large potential for the carbon sequestration that can be stored in rapidly growing forests. New York State has a wide abundance of unforested land that is prime for forestation. In particular, abandoned agricultural land offers the state a significant quantity of underutilized land that can be used for carbon sequestration. In this paper, we identify 317,563 acres of abandoned agricultural land available for reforestation through our county-level GIS dataset, which has a carbon sequestration potential of 11.6 million tons of CO_2e over 10 years. This is equivalent to removing the greenhouse gas emissions of 2.2 million cars over 10 years. Other studies have estimated the state's sum of abandoned agricultural land to be over 4.3 million acres, leading to a total estimated greenhouse gas mitigation potential between 3.8 to 4.9 teragrams of carbon dioxide equivalent per year (Pathways, 2020). These disparities are likely due to different methodologies and assumptions (i.e. using property tax data in tax maps versus using satellite based approaches, etc.). Our estimates, thus, are conservative relative to the overall potential. As evident by the disparity between the two estimates, it is hard to calculate the total sum of the state's non-active agricultural land available for reforestation.

NWL carbon sequestration strategies face several challenges. First, reforestation costs can vary significantly between regions and even plots (Winsten et al., 2011). This cost uncertainty may challenge the effectiveness of a reforestation policy's incentive structure (White et al., 2018). Second, NWL carbon sequestration projects can be challenging and expensive to verify, especially across many plots (Austin et al., 2020). Third, invasive species and more frequent extreme weather events may challenge the project's ability to maintain the sequestered carbon's storage in perpetuity (Fischer & Charnley, 2010). Adaptive management of forested lands can

address these concerns to ensure the strength of the carbon sink. Lastly, landowner and community preferences may not favor reforesting lands (Arano et al., 2004).

This paper assesses how to incentivize reforestation of abandoned agricultural lands in New York State. The paper mainly looks at two policy approaches: property tax exemptions and income tax credits. The motivation for exploring property tax exemptions follows the New York State Climate Action Council's 2022 Draft Scoping Plan, which considers creating Real Property Tax Law 480c to incentive landowners to pursue carbon sequestering land management practices. The Draft Scoping Plan also considers the revisioning of the 480a Forest Tax Law program for forest management carbon sequestration. In this paper, we simulate Real Property Tax Law 480c with an incentivization structure mirrored on the active 480a Forest Tax Law program. The paper also develops an income tax credit incentivization scheme that follows reforestation costs across a forty-year period. The Draft Scoping Plan does not consider an income tax credit as a potential incentivization scheme for afforestation and reforestation policies. Income tax credits are a popular model for incentivizing individual taxpayers (Batchelder et al., 2006). New York State utilizes income tax credits to further sustainability goals, such as through the clean heating fuel credit and solar energy system equipment credit. We consider a property tax exemption and income tax credit as the two most viable potential tax policy tools for incentivizing reforestation of abandoned agricultural land in New York State.

3 Methods

To simulate each policy, we first collected county-level GIS data on the individual plots of abandoned agricultural land in New York State. We then simulated each policy's deployment by calculating 480a property tax exemptions and income tax credits on a plot-by-plot basis. Lastly, we simulated each policy's net benefits to landowners and total costs per county.

The paper uses data from the New York State GIS Clearinghouse on county-level tax parcel data (Winters, 2021). The paper considers the reforestation of abandoned agricultural land plots in all 62 counties of New York State, with a focus on the top 4 counties of abandoned agricultural land. The dataset consisted of information on tens of thousands of land plots in each

county. Relevant data included the land plot's county, municipality, acreage, ownership type, assessed land value, and property classification code. We used QGIS software (QGIS, Version 3.16.2) to select and extract the land plots identified as abandoned agricultural land under the New York State property classification code. New York State uses property classification codes in their tax assessments of land plots. New York State uses the code '321' to identify "abandoned agricultural land," which the State notes as "nonproductive; not part of an operating farm." To access the data, we first downloaded the county-level tax parcel dataset from the New York State GIS Clearinghouse. We individually downloaded and uploaded the datasets into QGIS county-by-county. We stored each county's tax parcel dataset as an individual layer in QGIS. Next, for each county, We opened the data layer's attribute table and selected the filter option utilizing control f. Next to "PROP_CLASS," We wrote '321' which is the property classification code to identify plots of abandoned agricultural land. We then chose "select features" to filter out only plots of abandoned agricultural land. Next, we created a new layer with these plots of abandoned agricultural land. We conducted the same procedure for each county. Once we had filtered out the plots of abandoned agricultural land for all 52 New York State counties, we then transferred the data to Excel by copying the attribute table of each county. Lastly, we deleted all plots of abandoned agricultural land below 10 acres due to their relatively higher anticipated reforestation costs per acre. This cutoff differs from the Draft Scoping Plan's proposed 15-acre eligibility requirement under Real Property Tax Law 480c.

As part of the initial analysis, we calculated county-level summary statistics on the abandoned agricultural land plots of all 52 New York State counties. We identified four counties with the greatest individual sum of abandoned agricultural land: Clinton, Otsego, St Lawrence, and Delaware County. The summary statistics included information on the total number of plots for each county, average plot size, median plot size, maximum plot size, and the number of landowners (Table 1).

The analysis then looked at the costs of reforestation. The paper considered two different costs approaches proposed by Walker et al. (2007) in their paper "Terrestrial Carbon Sequestration in the Northeast: Quantities and Costs" (Walker et al., 2007). The first cost approach looked at the more immediate costs of reforestation, specifically looking at the costs of conversion and maintenance. The costs included site preparation, labor, seedlings, and herbivore protection.

Walker et al. provide a min and max range for reforestation costs specifically for New York State. This cost approach focused on the immediate upfront costs one year into reforestation. The paper uses the average cost between the stated min and max. The second cost approach looked at the longer-term costs of reforestation, using area-weighted average total costs specific to New York State for the first 10, 20, and 40 years. The approach includes the upfront costs used in the first approach, but also incorporates maintenance costs over the following forty years. The approach also uses a 4% discount rate to account for the landowners' opportunity cost of agricultural production. The second approach was more widely encompassing of costs and offered a more comprehensive approach, for which this paper favors. The analysis calculated the 10-year, 20-year, and 40-year area-weighted average total costs for the top four counties with the greatest individual sum of abandoned agricultural lands, the sum of abandoned agricultural lands in all 62 counties, and the average NYS abandoned agricultural land plot size of approximately 34 acres (Appendix Table 2). The reforestation costs in Walker et al. closely follow the reforestation costs in a 2020 paper on potential carbon farming projects in New York State (Wightman & Woodbury, 2020).

The analysis also looked at the carbon sequestration potential of reforesting abandoned agricultural land in New York State. The paper uses a 10-year, 20-year, and 40-year county-area-weighted mean estimated potential CO_2e sequestration per area calculation specific to the State (Walker et al., 2007). Walker et al. present the calculation in tons of CO2e per hectare, for which this analysis converted to metric tons of CO_2e per acre. The 10-year, 20-year, and 40-year carbon sequestration potential of reforesting abandoned agricultural land in NYS is respectively 27.17, 52.13, and 95.09 metric tons of CO_2e per acre. Like the method for the costs of reforestation, the analysis calculated the 10-year, 20-year and 40-year county-area-weighted mean estimated potential CO_2e sequestration for the four counties with the greatest individual sums of abandoned agricultural land, the state-wide sum of abandoned agricultural land, and the average 34-acre plot size (Appendix Table 1). This calculation was done by multiplying acreage by the three different costs of reforestation to extrapolate a total value. This calculation is done for each county at an aggregate county-level extrapolation. For the top four counties, the calculation is done on a per-plot basis.

3.1 480a Forest Tax Law Program

The analysis next looked at the potential for applying the 480a Forest Tax Law to incentivizing the reforestation of abandoned agricultural land. 480a Forest Tax Law uses two methods to calculate its property tax exemptions. Both methods use the plot's assessment per acre, which is the plot's assessed land value divided by its acreage. The first method multiplies the plot's assessment per acre by 0.8. The second method multiplies the equalization rate for the plot's municipality by 0.4, and then subtracts that resulting value from the plot's assessment per acre. We found the equalization rates for each municipality from the New York State Department of Taxation and Finance. To determine the final exemption per acre, 480a Forest Tax Law program selects the maximum value of the two methods. The analysis includes summary statistics on the frequency and average exemption of the two 480a Forest Tax Law program methods among the top four counties (Appendix Table 3).

With 480a Forest Tax Law program exemptions now calculated, the paper examined the net benefit of landowners in the top four counties. The paper first calculated the new assessment per acre for landowners, which is the remaining property tax burden after accounting for the 480a exemption. The new assessment per acre was calculated by subtracting the assessment per acre by the 480a exemption per acre. The updated assessment and overall exemption per plots were both calculated by multiplying the new assessment and exemption per acre, respectively, by a given plot's acreage. Using the overall exemption per plot, the paper conducted a plot-by-plot analysis of the net benefit of reforestation under 480a after one year and after ten years. To conduct the one-year analysis, the paper used the initial upfront cost of reforestation from the Walker et al. paper, multiplying the cost per acre by each plot's acreage. This cost of reforestation was then subtracted from the overall exemption to get the net benefit of 480a enrollment after one year. To conduct the ten-year analysis, the paper used the 10-year area-weighted average total cost of reforestation by Walker et al (2007), multiplying this per acre value by the plot size. This cost of reforestation was then subtracted from the product of ten times the overall exemption, to account for the 480a's tax exemption over the first ten years. Ultimately, the analysis showed the net benefit of 480a for each landowner in the top four counties after one and ten years (Appendix Table 4). This net benefit was also reflected in per acre terms. To better understand the net benefits to participating landowners in the top four counties, the paper displays the

summary statistics of the positive 1-year, negative 1-year, positive 10-year, and negative 10-year net benefits to landowners for aggregate benefits and benefits per acre separately (Appendix Tables 5, 6). In this paper, "positive landowners" refers to landowners with a positive net benefit for a given period while "negative landowners" refers to landowners with a negative net benefit. The paper presents these summary statistics to reflect the magnitude of net benefits, helping policymakers better understand the efficiency of incentivization for positive landowners and the potential need for additional incentivization for negative landowners.

The paper determines the overall costs of implementing 480a Forest Tax Law program for the top four counties over one- and ten-year periods. To calculate this, the analysis sums all the individual exemptions for each county after 1 year, and then sums the four counties together. The same summing procedure is used to calculate the aggregate costs of reforestation after 1 year across the top four counties of abandoned agricultural land. The 10-year aggregate exemptions and reforestation costs are calculated the same way. The total cost of reforestation per metric ton of CO_2e sequestered over a 10-year period for the top four counties is calculated by dividing the aggregate 10-year total costs of reforestation by the 10-year aggregate sequestration potential. The exemptions per metric ton of CO_2e sequestered over a 10-year period for the top four counties is calculated by dividing the aggregate overall exemptions over 10 years by the 10-year aggregate sequestration potential.

Lastly, we simulated 480a Forest Tax Law program's annual total costs for the top four counties over a 40-year period, with a 5-year-lagged implementation. We used the aggregate overall exemptions from each county, which was the sum of the exemptions under 480a for each plot. We then divided the aggregate overall exemptions by 5 to create five equal groups of 20% of total exemptions per county. We then modeled out these fixed exemptions over a 40-year period. We did the same with each group, but we started each subsequent group in the following year. We conducted this lagging to represent realistic market conditions associated with reforestation. Thus, the first group started in year 1, the second group in year 2, the third group in year 3, the fourth group in year 4, and the fifth group in year 5. We then calculated the total costs of the 480a exemptions for each county by summing the five groups together for each year. Then, to calculate the total costs of 480a exemptions for each county over the program's 40-year period, we summed the total costs for each year together.

3.2 Income Tax Credit

The paper alternatively examines the potential for an income tax credit to incentivize the reforestation of abandoned agricultural land. The income tax credit, or ITC, follows the variable costs of reforestation through the project's lifetime, unlike 480a Forest Tax Law program's steady incentivization. Reforestation projects have the highest costs during the first year due to the upfront costs associated with conversion and tree planting. Costs significantly decrease in the following years, as the only remaining costs are associated with maintenance and monitoring. This paper models the ITC over a 40-year period. The ITC model follows the different costs of reforestation over four time periods: year 1, years 2-10, years 11-20, and years 21-40. The ITC's incentivization structure uses a combination of the two reforestation cost approaches used in the 480a Forest Tax Law program net benefit calculations. Using the Walker et al. 2007 paper, the ITC's incentivization structure uses the first approach for the year 1 costs, and then uses the second approach for the remaining years. This allows for a more precise modeling of the upfront costs in the first year, while also incorporating longer-term costs from the area-weighted average total costs in the second approach.

The year 1 cost of reforestation is $550 per acre (Walker et al., 2007). The 10-year area-weighted average total costs of reforestation is $1971 per acre (Walker et al., 2007). This value represents the costs of reforestation from years 1 to 10. Since we already incorporate year 1 costs through Walker et al.'s first cost approach, we subtracted $550 from $1971 to leave me with $1421, which represents the costs of reforestation from years 2 through 10. We then divided this sum by 9 to determine the annual base credit in the ITC from years 2 to 10. A base credit is the income tax credit before the margin of error or incentivization rate are considered. The 20-year area-weighted average total cost of reforestation is $2840. To get the costs of reforestation for only years 11 to 20, we subtracted the 10-year area-weighted average total cost of reforestation from the 20-year area-weighted average total cost, leaving me with $869. We again divided the multi-year total by 10, the number of years over the year 11 to 20 period, leaving me with the annual credit in the ITC from years 11 to 20. Lastly, the 40-year area-weighted average total cost of reforestation is $3824. To get the costs of reforestation for only year 21 to 40, we subtracted the 20-year area-weighted average total cost of reforestation from the 40-year area-weighted average total cost, leaving me with $984. We then divided the sum by 20. Under the ITC, the year 1 cost

of reforestation is $550. The base annual credit per acre is $158 during years 2 to 10, $87 during years 11 to 20, and $49 during years 21 to 40 (Table 4).

The ITC considers a margin of error and incentivization rate in calculating the total annual credit to landowners. To incorporate the margin of error, we multiple the base annual credit per acre by one plus the margin of error. We then multiply the new product by one plus the incentivization rate, resulting in the total annual credit. It is important to note that the incentivization rate is multiplied by the product of the base annual credit and the margin of error rate. The incentivization level is not calculated by multiplying incentivization rate by only the base annual credit. This would result in a lower incentivization level. The incentivization level and margin of error level do not have to be calculated in a particular sequential order. However, the second multiplication calculation needs to utilize the product of the first rate. We incorporate a margin of error into my calculation to account for the uncertainties associated with the costs of reforestation on abandoned agricultural land. The margin of error allows for more conservative estimation of reforestation costs. The incentivization rate functions as the tool to attract landowners to participate in the program. The base credit covers the costs of reforestation, while the incentivization rate attracts profit-seeking individuals who are looking to decrease their income tax burden. The ITC model in this paper is dynamic, meaning that the analysis can be conducted for any specific margin of error or incentivization rate. We considered margin of errors from 5% to 15% and incentivization rates from 5% to 40%. For my final calculations, we utilized an 10% margin of error and a 15% incentivization rate.

Lastly, we simulated the total costs associated with implementing the ITC model for the top four counties. We assumed that all landowners would participate in the program. We conducted a lagged simulation of the total costs over a five-year period. We took the sum of abandoned agricultural land in each county and divided it by 5. We then multiplied this value by the annual credit per acre, which included both the margin of error and incentivization rate. We had 20% of the plots of abandoned agricultural land in each county reforested in year 1, followed by another 20% in year 2, and another 20% in the following year until all the abandoned agricultural land was reforested by year 5. The reforestation that started in the fifth lagged year still follow the conventional payment scheme with annual credits starting at the year 1 level. Credits are based on the number of years in the program after an initial reforestation. We conducted this

lagging to represent realistic reforestation and market conditions. It is impractical for tens of thousands of acres of abandoned agricultural land to be reforested in one year. This lagging also spread out the upfront costs associated with the payments for landowners, allowing for a more accurate annual average total cost across all plots in a county. The total costs of the ITC cover years 1 through 44, even though the ITC credits landowners for a 40-year period. To calculate the total costs per county after each year, we summed the aggregate annual credits for each 20% component of acres. Then, we summed the total costs per county across years 1 through 44 to determine the program's overall costs to the county. We also summed the total costs across the four counties together after each year, and then calculated the sum of each of these annual costs to determine the total costs of the ITC over its 44-year simulation for the top four counties.

4 Results

Table 1: County-Level Summary Statistics on Plots of Abandoned Agricultural Land

County	Number of Plots	Total Sum (Acres)	Median Plot Size (Acres)	Maximum Plot Size (Acres)	Number of Landowners
Clinton	1,072	61,873	37.3	1,401.8	949
Otsego	816	29,588	20.6	359.1	734
St Lawrence	428	24,447	36.0	460.7	375
Delaware	583	23,673	20.4	692.2	451
Oneida	493	19,512	25.0	517.3	434
Chautauqua	499	17,911	25.0	336.0	416
Jefferson	292	16,899	39.6	475.2	251
Steuben	315	15,920	37.5	519.4	302
Cattaraugus	304	13,998	27.4	553.7	269
Chenango	338	10,960	20.5	177.3	303
Franklin	242	9,974	31.3	193.4	213
Onondaga	354	9,791	15.7	381.4	306
Herkimer	226	8,599	22.3	279.5	202
Madison	263	8,576	18.2	287.5	235
Oswego	165	7,314	28.3	381.1	150
Schoharie	175	6,983	20.0	429.0	154
Schuyler	199	6,963	24.8	195.1	190
Allegany	141	6,778	29.8	255.1	135
Lewis	172	6,561	24.1	200.6	138
Erie	165	6,189	24.3	310.0	163
Total	7,350	317,563			6,472

Note: table orders counties in descending order by total sum of acres. This table includes only counties that have a total sum of abandoned agricultural land above 6,000 acres.

Table 1 displays the summary statistics on the plots of abandoned agricultural land in each county. There are a total of 7,350 plots of abandoned agricultural land in the top 21 counties across 6,472 landowners. The total sum of abandoned agricultural land across the top 21 counties is 317,563 acres. Clinton County has the greatest number of plots at 1,072, followed by Otsego County at 816 plots and Delaware County at 583 plots. Clinton County has the greatest total sum of abandoned agricultural land at 61,873 acres. Otsego, St Lawrence, and Delaware County all have a total sum of abandoned agricultural land between 23,000 and 30,000 acres. Jefferson County has the largest median plot size of abandoned agricultural land at 39.6 acres, followed by Steuben County at 37.5 acres and Clinton County at 37.3 acres. Clinton County has the largest maximum plot size of abandoned agricultural land at 1,401.8 acres. Delaware County has the second largest maximum plot size at 692.2 acres and Cattaraugus County has the third largest maximum plot size at 553.7 acres. Lastly, the number of landowners across counties is roughly 88% of the total number of plots. Overall, Clinton, Otsego, St Lawrence, and Delaware County all stand out with their leading individual total sums of abandoned agricultural land.

Table 2: The Number and Average Plot Size of Net Positive and Negative Landowners

	1 Year				10 Years			
	Number of Land-owners		Average Plot Size (acres)		Number of Land-owners		Average Plot Size (acres)	
County	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
Clinton	475	546	29.2	87.1	974	49	53.3	196.6
Delaware	206	193	61.8	52.4	313	86	53.5	71.1
Otsego	431	270	32.4	55.6	682	19	40.4	76.1
St Lawrence	51	326	32.7	69.2	291	86	60.6	76.7
Total	1,163	1,335			2,260	240		

Table 2 shows the number and average plot size of net positive and negative landowners in the top 4 counties under the 480a Forest Tax Law program after 1 year and 10 years. After 1 year, Otsego County has the largest number of positive landowners and smallest number of negative landowners as a percentage of all landowners. Meanwhile, St Lawrence County has the lowest number of positive landowners and greatest number of negative landowners as a percentage of all landowners. After 1 year, there are more net negative than net positive landowners. Otsego and Delaware County have more positive than negative landowners, while Clinton and St Lawrence County have more negative than positive landowners. The average plot size of negative

landowners is greater than that of positive landowners in Clinton, Otsego, and St Lawrence County. Only Delaware County has a larger average plot size among positive landowners. In Clinton County, the average plot size among negative landowners is nearly triple that of positive landowners. After 10 years, 90.4% of landowners are net positive, compared to only 46.6% after 1 year. Among the remaining negative landowners, the average plot size is significantly larger than that of positive landowners. All four counties have a larger average plot size among negative landowners. The difference is most visible in Clinton County, where the average plot size of negative landowners is 196.6 acres, nearly four times as larger as that of positive landowners.

Table 3: Net Positive and Negative Landowner Assessments After 1 and 10 Year(s) (Averages Per Acre)

		Old Assessment		480a Exemption		New Assessment		Net Benefit	
		Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
1 Year	Clinton	$1,197	$446	$957	$357	$239	$89	$407	-$193
	Delaware	$1,307	$297	$1,046	$233	$261	$64	$496	-$317
	Otsego	$1,603	$454	$1,283	$363	$321	$91	$733	-$187
	St Lawrence	$1,008	$351	$806	$278	$202	$74	$256	-$272
10 Years	Clinton	$825	$201	$660	$158	$165	$43	$4,629	-$388
	Delaware	$1,014	$108	$811	$75	$203	$32	$6,139	-$1,216
	Otsego	$1,187	$193	$950	$152	$237	$40	$7,529	-$447
	St Lawrence	$534	$122	$427	$85	$107	$37	$2,303	-$1,122

Table 3 shows net positive and negative landowner assessments, exemptions, and net benefits under the 480a Forest Tax Law program in the top 4 counties after 1 year and 10 years. Across both periods, net positive landowners have a greater average old assessment, 480a exemption, and new assessment per acre than net negative landowners. The difference between positive and negative landowners of average old assessment, 480a exemption, and new assessment per acre is more pronounced after 10 years than after 1 year. There is variability in this difference by County across the two time periods. After both 1 and 10 years, Otsego County has the largest average old assessment, 480a exemption, and new assessment per acre while St Lawrence has the lowest. Between 1 year and 10 years, the average old assessment, 480a exemption, and new assessment per acre decreased by nearly 50% for both positive and negative landowners. The difference between 1 year and 10 year for average old assessment, 480a exemption, and new assessment per acre in Delaware County was only slightly pronounced for positive landowners, with roughly a 25% decrease, while the difference for negative landowners was significantly

stronger, with approximately a 65% decrease. After 1 year, Otsego County had the largest average net benefit per acre among both positive and negative landowners. St Lawrence County had the smallest average net benefit per acre among positive landowners while Delaware County had the smallest average net benefit per acre among negative landowners. After 10 years, Otsego County had the largest average net benefit per acre among positive landowners and St Lawrence County had the smallest average net benefit per acre among positive landowners. Clinton County had the largest average net benefit per acre among negative landowners while Delaware County had the smallest average net benefit per acre among negative landowners.

Table 4: Annual Income Tax Credits Per Acre

Year(s)	Base Annual Credit	Margin of Error	Incentivization Level	Total Annual Credit	Aggregate Credits Per Period
1	$550	$55	$91	$696	$696
2-10	$158	$16	$26	$200	$1,798
11-20	$87	$9	$14	$110	$1,099
21-40	$49	$5	$8	$62	$1,245
					$4,837

Table 4 shows the annual income tax credit per acre under a 10% margin of error and 15% incentivization rate. The table is divided into four periods that follow reforestation costs: year 1, years 2 to 10, years 11 to 20, and years 21 to 40. The base annual credit are the reforestation costs under the Walker et al. 2007 paper. The margin of error and incentivization level decrease by each period as the base annual credit decreases. The total annual credit consists of the sum of the base annual credit, margin of error, and incentivization level. The total annual credit is highest in year 1 and decreases by each period. The greatest decrease is between the periods year 1 and years 2 to 10. The aggregate credits per period are the highest during years 2 to 10, despite being the second shortest period. The second largest aggregate credits per period is years 21 to 40. The lowest aggregate credits per period is year 1. The incentivization level is the landowners' net benefit, if the margin of error fully covers unforeseen costs associated with reforestation. Some of the margin of error may spill over into the incentivization level, affording landowners a greater net benefit.

Appendix Table 1 displays the carbon sequestration potential of reforesting abandoned agricultural lands in NYS. The table measures carbon sequestration potential in tons of carbon dioxide equivalent. The table shows the carbon sequestration potential of reforesting an average individual plot of abandoned agricultural land, the abandoned agricultural lands in the top four counties, and lastly the abandoned agricultural land in all NYS counties. The carbon sequestration potential of reforesting the top four counties of abandoned agricultural land is 4.2 million tons of CO_2e after 10 years, 8.0 million tons of CO_2e after 20 years, and 14.7 million tons of CO_2e after 40 years. The 40-year carbon sequestration potential of reforesting the abandoned agricultural land in all NYS counties is 40.6 million tons of CO_2e.

Appendix Table 2 shows the average total costs of reforesting abandoned agricultural lands in NYS per acre. The table presents reforestation costs for the average individual plot size, the top four counties, and all counties in NYS. The average total costs of reforesting the average individual plot size is $67,000 after 10 years, $97,000 after 20 years, and $130,000 after 40 years. The average total costs of reforesting abandoned agricultural land in the top four counties is $275.1 million after 10 years, $396.4 million after 20 years, and $533.8 million after 40 years. The average total costs of reforesting abandoned agricultural land in all counties of NYS is $762.5 million after 10 years, $1.1 billion after 20 years, and $1.5 billion after 40 years.

Appendix Table 3 reveals the frequency and average exemption of 480a Forest Tax Law program methods among the top four counties. Method 2 is a more frequent method than Method 1 by over 20 times. Method 1 has a frequency of 117 plots while Method 2 has a frequency of 2375 plots across the four counties. 480a used Method 2 on 95.3% of eligible plots in the top four counties. Method 1 had a lower average exemption than Method 2 in all four of the top four counties. The average exemption of Method 1 across the top four counties, at $537, was 20.6% lower than the average exemption of Method 2, at $648. The difference in average exemption between the two methods was largest in Otsego County, with a difference of 21.6%, and was smallest in St Lawrence County, with a difference of 15.8%.

Appendix Table 4 presents the average net benefit for net positive and negative landowners under 480a Forest Tax Law program in the top four counties after 1 and 10 years. Among net positive landowners, for both 1 and 10 years, Delaware County has the largest average net benefit, followed by Otsego County, then Clinton County, and lastly St Lawrence County. Among net

negative landowners, for both 1 and 10 years, Otsego County has the largest average net benefit, followed by Delaware County, then St Lawrence County, and lastly Clinton County. Net positive landowners in Delaware County have an average net benefit of $24,290 after 1 year and $322,675 after 10 years. Meanwhile, net positive landowners in St Lawrence County have an average net benefit of $6,278 after 1 year and $107,678 after 10 years. Net negative landowners in Otsego County have an average net benefit of -$12,351 after 1 year and -$31,649 after 10 years. Net negative landowners in Clinton County have an average net benefit of -$20,894 after 1 year and -$79,169 after 10 years.

Appendix Tables 5 and 6 display the data in Appendix Table 4 in greater detail. Tables 5 and 6 present the summary statistics of the average net benefit for net positive and negative landowners under 480a in the top four counties after 1 and 10 years. Appendix Table 5 shows Clinton and Delaware County while Appendix Table 6 shows Otsego and St Lawrence County. Appendix Tables 5 and 6 display the average net benefit in both aggregate, or per plot, and per acre terms.

Among net positive landowners, Otsego County had the largest median aggregate net benefit at $15,192 after 1 year and $134,634 after 10 years. Delaware County had the second largest median aggregate net benefit at $14,452 after 1 year and $190,238 after 10 years, followed by Clinton County at $4,615 after 1 year and $120,076. St Lawrence had the smallest median aggregate net benefit at $2,720 after 1 year and $67,167 after 10 years.

Among net negative landowners, Otsego County had the largest median aggregate net benefit at -$6,977 after 1 year and -$27,465 after 10 years. Delaware County had the second largest median aggregate net benefit at -$9,682 after 1 year and -$38,259 after 10 years, followed by Clinton County at -$10,060 after 1 year and -$23,744 after 10 years. St Lawrence County had the smallest median aggregate net benefit at -$11,243 after 1 year and -$43,433 after 10 years.

Among net positive landowners, Otsego County had the largest median net benefit per acre at $588 after 1 year and $5,212 after 10 years. Delaware County had the second largest median net benefit per acre at $489 after 1 year and $4,561 after 10 years. Clinton County had the third largest median net benefit per acre at $238 after 1 year and $3,453 after 10 years. Lastly, St Lawrence County had the smallest median net benefit per acre at $118 after 1 year and $1,704 after 10 years.

Among net negative landowners, Otsego County had the largest median net benefit per acre at -$172 after 1 year and -$363 after 10 years. Clinton County had the second largest median net benefit per acre at -$190 after 1 year and -$293 after 10 years. St Lawrence had the third largest median net benefit per acre at -$267 after 1 year and -$1,260 after 10 years. Delaware County had the smallest median net benefit per acre at -$306 after 1 year and -$1,591 after 10 years.

Across the four counties, there are outliers that skew the average net benefits above the median net benefits for both aggregate and per acre net benefits. The outliers are visible by looking at the maximum net benefit. While the summary statistics do not display the frequency of such outliers, their difference from the third quartile suggests that there are outliers present. Clinton County had the largest outlier, with a maximum aggregate net benefit of $333,650 after 1 year and $3,771,979 after 10 years among net positive landowners.

Appendix Table 7 shows the annual income tax credits for a 50-acre plot. The credits are broken down by their four structured periods: year 1, years 2 to 10, years 11 to 20, and years 20 to 40. The annual credit per acre includes the 10% margin of error and 15% incentivization rate. The annual credit per acre is $696 in year 1, $200 in years 2 to 10, $110 in years 11 to 20, and $62 in years 21 to 40. The aggregate credit per period is $34,788 in year 1, $89,878 from years 2 to 10, $54,964 from years 11 to 20, and $62,238 from years 21 to 40. The period of years 2 to 10 has the largest aggregate credit, followed by years 21 to 40. Years 11 to 20 is the period with the third largest aggregate credit. Year 1 is the period with the smallest aggregate credit. For a 50-acre plot, the aggregate credits across all periods for the income tax credit's 40-year lifespan is $241,868.

Appendix Tables 8, 9, 10, and 11 display incentivization matrixes for the annual income tax credit. Each credit period has its own table. These four tables reflect the effect of different margin of error and incentivization rates on the annual credit per acre.

Figure 1 displays the annual total cost of the 480a Forest Tax Law program and an income tax credit for reforesting abandoned agricultural land in Clinton County. The annual total costs follow a 5-year-lagged 40-year simulation for each policy over 44 years. The 480a Forest Tax Law program consists of fixed annual exemptions. It follows a linear shape, increasing at a

rate of $5.6 million per year during the lagged implementation until year 5, when it hits a peak of $27.8 million. After year 5, the total cost remains constant at its peak until year 40, when it decreases by $5.6 million per year until it reaches year 44. Meanwhile, the income tax credit follows the same 5-year lag, but with decreasing credits over four periods. The ITC's annual total cost steadily increase from years 1 to 5, peaking at $17.9 million in year 5. From years 6 to 44, the ITC's annual total cost steadily decreases. From years 25 to 40, the ITC's annual total cost is constant at $3.7 million. Across the 40-year simulation, the annual total cost of 480a is higher than the ITC in all but two years. The annual total costs of 480a range from two to six times the size of the ITC's annual total costs. All in all, the income tax credit has a significantly lower total cost over the 40-year simulation than 480a Forest Tax Law program.

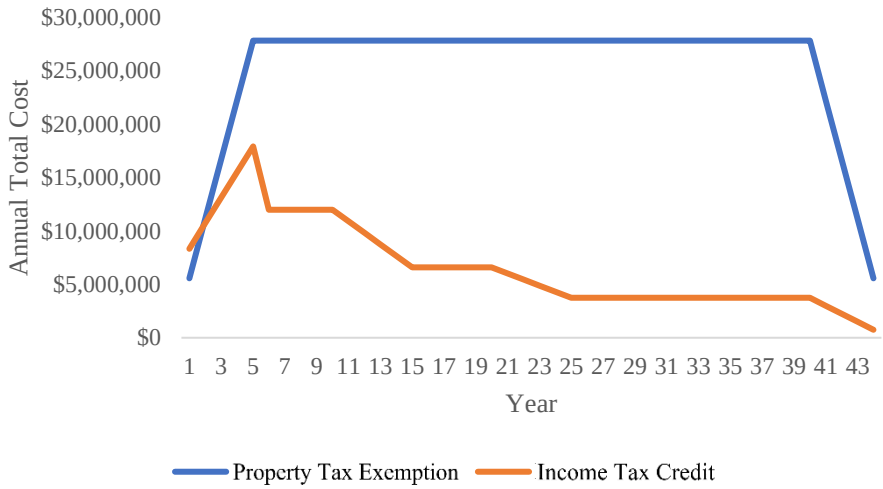


Figure 1: Annual total cost of 480a Forest Tax Law program vs. ITC for Clinton County. The ITC has lower annual total costs than 480a for nearly every year. The difference between the ITC and 480a is greatest between years 25 to 40, when 480a's annual total cost is over seven times that of the ITC. 480a follows an inverted horseshoe cost curve due to the 5-year lagged implementation during the first and last 5 years. 480a's incentives are constant at $27.8 million.

Figure 2 presents the annual total cost of the 480a Forest Tax Law program and an income tax credit for reforesting abandoned agricultural land in St Lawrence County. The annual total costs of 480a increase by $1.5 million per year during its 5-year-lagged implementation. From years 5 to 40, 480a's annual total costs maintain a peak of $7.3 million. During 480a's 5-year-lagged phasing out from years 40 to 44, annual total costs decrease by $1.5 million per year.

The income tax credit's annual total cost increases by $940,000 per year during its 5-year-lagged implementation. The ITC's annual total cost reaches a peak of $7.0 million in year 5 and then steadily decreases during the following thirty-five years. From years 1 to 4, the ITC's annual total costs are higher than 480a. The two cost curves intersect in between years 4 and 5. From years 5 to 44, 480a's annual total costs are higher than the ITC. 480a has a higher total cost than the ITC, as visible by the area under each cost curve. The difference in costs between the two policies from years 6 to 40 is significant. From years 25 to 40, the annual total cost of 480a is nearly five times greater than that of the ITC. While the cost curves of 480a and the ITC are the closest to each other in St Lawrence County than any other of the top four counties, 480a Forest Tax Law program maintains a higher total cost than the ITC across the 40-year simulation.

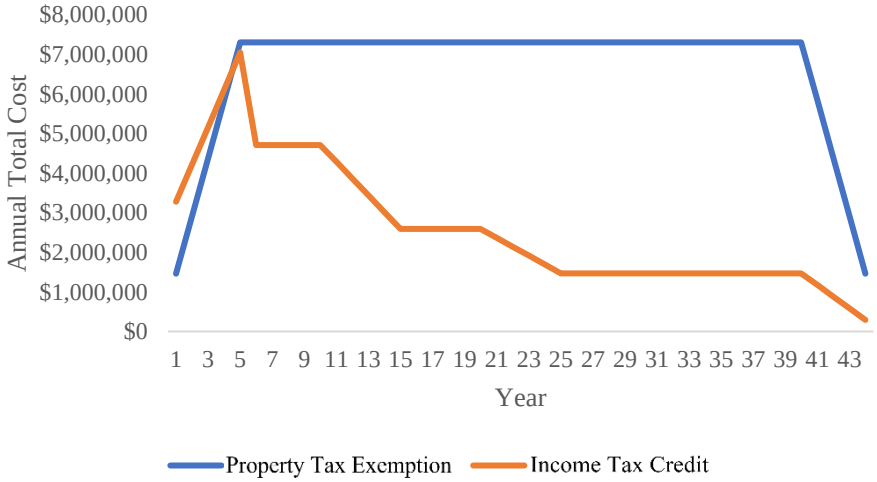


Figure 2: Annual total cost of 480a Forest Tax Law program vs. ITC for St Lawrence County. From years 1 to 5, the two cost curves follow each other at a similar level and rate of change. Afterwards, the ITC's annual total cost drops considerably while 480a's cost remains fixed at a higher level. The difference between the ITC and 480a is greatest between years 25 to 40, when 480a's annual total cost is nearly five time that of the ITC, a magnitude which is less than Clinton County. 480a follows an inverted horseshoe cost curve due to the 5-year lagged implementation during the first and last 5 years. 480a's incentives are constant at $7.3 million.

Appendix Figure 1 displays the annual total cost of 480a Forest Tax Law program and an income tax credit for Delaware County. 480a's annual total costs are $13.9 million from years 6 to 40. During 480a's 5-year-lagged implementation and phasing out, the annual total costs' rate of change is $2.8 million. The ITC's annual total costs steadily increase by $3.1 million per year

in the first five years. In year 5, the ITC's cost curve peaks at $6.6 million. Over the following forty years, the ITC's annual total costs steadily decrease. From years 25 to 40, the ITC's cost curve hovers below $1.4 million. 480a's annual total costs are higher than the ITC in every year except year 1. Similar to the other top 4 counties, the total costs of 480a in Delaware County are higher by a significant magnitude than the total costs of an income tax credit.

Appendix Figure 2 presents the annual total costs of 480a Forest Tax Law program and an income tax credit for Otsego County. During 480a's 5-year-lagged phase in and phase out, the annual total costs change by $4.1 million per year. 480a's annual total costs are $20.3 million from years 6 to 40. The ITC's annual total costs increase $3.9 million per year during the first five years, reaching a maximum of $8.4 million in year 5. From years 6 to 44, the ITC's annual total costs steadily decrease. The annual total costs of 480a are higher than the ITC for all 44 years of the 40-year simulation. The total costs of 480a are higher by a magnitude of two to ten times the total costs of the income tax credit.

Appendix Figure 3 displays the annual total costs of 480a Forest Tax Law program for the top four counties of abandoned agricultural land in NYS. Years 1 to 5 have a positive linear slope and years 40 to 44 have a negative linear slope. This reflects 480a's five-year-lagged implementation. Clinton County has the highest annual total cost at $27.8 million, followed by Otsego County at $20.3 million, then Delaware County at $13.9 million, and lastly St Lawrence County at $7.3 million.

Appendix Figure 4 exhibits the annual total costs of an income tax credit for the top four counties of abandoned agricultural land in NYS. The cost curves all follow a similar shape but with varying annual cost levels and slopes. All four counties have the highest annual total cost in year 5. The annual total costs rise linearly over the first five years. After the peak in year 5, the annual total cost of each county experiences three periods of a decreasing slope that eventually flattens. Clinton County has the highest maximum annual total cost at $17.9 million, followed by Otsego County at $8.4 million, then St Lawrence County at $7.0 million, and lastly Delaware County at $6.6 million. Clinton County has roughly double the annual total cost of Delaware, Otsego, and St Lawrence County.

5 Discussion

In our assessment of the two tax policies, we find that a property tax exemption modeled on the 480a Forest Tax Law program provides a perverse incentive against larger plots of abandoned agricultural land. 480a Forest Tax Law program incentivizes the landowners of each county differently depending on the county's municipal equalization rates and original land assessments. Counties with higher municipal equalization rates and higher land assessments experience the largest exemptions and incentives to landowners under 480a. Larger plots of abandoned agricultural land have lower average initial assessments per acre to start, as evident in Table 3; after 1 year, net negative landowners among the top four counties had an average original assessment per acre of $403, over a third the size of net positive landowners at $1,359. Thus, the 480a exemption alleviated an already low tax burden, in relative terms, to the assessment of net negative landowners. 480a still exempted a substantial portion of the tax burdens of net negative landowners, at nearly 80% of the original assessment after 1 year among the top four counties. However, this exemption did not offset the costs of reforestation. Therefore, net negative landowners under 480a owned larger plots. In Clinton County, after 1 year, the average plot size of net positive landowners is 29.2 acres while the average plot size of net negative landowners is 87.1 acres. The perverse incentive is more visible over a longer period. In Clinton County, after 10 years, the average plot size of net positive landowners is 53.3 acres while the average plot size of net negative landowners is 196.6 acres. While only 49 of 1023 landowners are net negative after 10 years, this perverse incentive still hurts 480a's effectiveness as larger plots of abandoned agricultural land can be most economically reforested per acre.

We have several recommendations for revising 480a Forest Tax Law program. First, 480a needs to lower its 50-acre minimum plot size requirement to 10 acres to encourage greater landowner participation. Second, 480a's first method needs to multiply the plot's assessment per acre by a larger fraction to result in higher exemptions levels. Currently, method 1 multiplies the assessment per acre by 0.8. Across the top four counties, method 1 consists of only 4.7% of all 480a exemptions while method 2 consists of the remaining 95.3% of exemptions. Method 1 should multiply the assessment per acre by a fraction such as 0.9 or 0.95. Third, 480a needs to offer stronger incentives to landowners of larger plots of abandoned agricultural land. 480a could offer additional nontax credit payments to bridge the incentivization gap, particularly for

landowners with lower assessment per acre levels to start. Fourth, 480a needs to move away from using municipal equalization rates in its calculation of method 2. Equalization rates can vary significantly by municipality, leading to incentivization disparities within and across counties that challenge the policy's deployment. 480a's method 2 formula could simply omit utilizing equalization rates.

The income tax credit incentivizes landowners more efficiently than 480a Forest Tax Law program. By mirroring the costs of reforestation, the income tax credit allows landowners to receive a positive net benefit for every participating year, unlike 480a. The income tax credit conducts this more effective incentivization with significantly lower total costs over the policy's 40-year lifespan, compared to 480a. An income tax credit has substantially lower costs than 480a particularly between 25 to 40 years into the policy's deployment. This difference among the top four counties ranged from a magnitude of five to ten times. Ultimately, an income tax credit is significantly more effective than 480a in terms of landowner incentivization and cost effectiveness.

There are several important factors to consider in my analysis. First, we consider a landowner under 480a Forest Tax Law program as net positive if they have a net benefit above zero. This suggests that because there is a positive net benefit, the landowner will participate in 480a. However, the net benefit may not be large enough. By calculating the average net benefit of each county, we are not accurately considering the propensity of lower positive net benefit landowners to participate in the program. Second, we do not know the existing tax burden of landowners under the ITC as we do under 480a. Thus, landowners may have a small tax burden to start and thus may not view additional tax credit incentivization as worthy of their time. Therefore, we do not know for certain that an ITC is more effective at incentivizing landowners than 480a. This may point to the strength of utilizing direct payments to landowners above any type of property tax exemptions or income tax credits. Third, we do not know if landowners pay their property or income taxes in full. Landowners may have existing property tax exemptions or income tax credits that lower their tax burden. Both policies would be less effective once these existing exemptions and credits are considered. Lastly, a sensitivity analysis on the income tax credit is necessary to determine landowner participation with various margin of error and incentivization rates.

There are several counties in NYS that have the vast majority of abandoned agricultural land. Eight counties have a total individual sum above 15,000 acres, allowing for greater efficiency in policy deployment and reforestation efforts. Those eight counties, from order of largest to smallest are: Clinton, Otsego, St Lawrence, Delaware, Oneida, Chautauqua, Jefferson, and Steuben County. This paper examines that top four counties, all of which have a total individual sum above 20,000 acres. The median plot sizes of Clinton, St Lawrence, Jefferson, and Steuben County are all above 30 acres, allowing for economies of scale associated with reforestation costs to be more easily realized. Policies on the reforestation of abandoned agricultural land should aim to provide the strongest incentive to the largest-sized plot owners. It is crucial for the largest plots in the top four counties to have positive net benefit resulting incentives to ensure landowner participation. For example, in Table 1, the maximum plot size of Clinton County is 1,401 acres, which is nearly 38 times the size of the county's median plot size. The policy should also target landowners who own more than one plot of abandoned agricultural land as this would improve the program's efficiency.

6 Conclusion

Looking at all these results together, we see that an income tax credit is a more efficient policy measure than the 480a Forest Tax Law program for incentivizing the reforestation of abandoned agricultural lands. The income tax credit incentives landowners to a positive net benefit every year by following reforestation costs. Meanwhile, 480a provides a fixed incentive that often leads to a negative net benefit during the early years of a project, when there are high upfront reforestation costs. Later on, 480a provides too strong of an incentive as reforestation costs decrease considerably after the first year. Thus, the income tax credit is also a more cost-efficient policy than 480a in terms of annual and overall total cost. Additionally, 480a provided a perverse incentive against larger plots of abandoned agricultural land. Larger plots often have lower average original assessments per acre to start, which limits the strength of 480a's incentivization. Policies on reforesting abandoned agricultural land need to incentive larger plots the strongest as larger plots have lower reforestation costs per acre due to economies of scale associated with land conversion and tree planting. Additionally, policies should focus on the top four or eight

counties with the highest individual sum of abandoned agricultural land to realize greater cost efficiencies associated with reforestation. Lastly, policymakers should consider direct payments to landowners to avoid the uncertainty of existing tax burdens due to additional property tax exemptions or income tax credits. By having lower tax burdens to start, the income tax credit and 480a would both be less effective at incentivizing landowners to participate in reforesting their lands as the policies would have less of a tax burden to offset. Direct payments to landowners avoid this uncertainty, in turn improving the policy's implementation due to greater landowner participation rates.

Acknowledgements

We would like to acknowledge the Levitt Center for Public Affairs at Hamilton College for funding and support for this project.

7 Appendix

Appendix Table 1: The Carbon Sequestration Potential of Reforesting Abandoned Agricultural Lands in NYS (Tons CO_2e)

	Acres	10 Years	20 Years	40 Years
Average Individual Plot Size	34.1	1021	1,959	3,573
Top Four Counties	139,582	4,180,014	8,021,108	14,630,051
All Counties in NYS	386,849	11,584,854	22,230,397	40,546,992

Appendix Table 2: The Average Total Costs of Reforesting Abandoned Farmland in NYS (Per Acre)

	Acres	10 Years	20 Years	40 Years
Average Individual Plot Size	34.1	$67,191	$96,816	$130,360
Top Four Counties	139,582	$275,115,314	$396,411,716	$533,760,000
All Counties in NYS	386,849	$762,478,453	$1,098,649,825	$1,479,308,779

Appendix Table 3: The Frequency and Average Exemption of 480a Methods in Top 4 Counties

	Frequency			Average Exemption (per acre)		
	Method 1	Method 2	Method 2 %	Method 1	Method 2	Difference
Clinton	17	1003	98.3%	$636	$755	18.7%
Delaware	48	348	87.9%	$655	$796	21.5%
Otsego	4	696	99.4%	$928	$1,129	21.6%
St Lawrence	48	329	87.3%	$352	$408	15.8%
Total	117	2376	95.3%	$537	$648	20.6%

Appendix Table 4: Average Net Benefit to Net Positive and Negative Landowners in Top 4 Counties

	1 Year		10 Years	
	Positive	Negative	Positive	Negative
Clinton	$11,304	-$20,894	$164,940	-$79,169
Delaware	$24,290	-$19,112	$322,675	-$83,950
Otsego	$17,971	-$12,351	$215,528	-$31,649
St Lawrence	$6,278	-$19,455	$107,678	-$70,392

Appendix Table 5: Summary Statistics of Aggregate and Per Acre 480a Exemptions for Clinton and Delaware County

		Clinton				Delaware			
		1 Year		10 Year		1 Year		10 Year	
		Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
Aggregate	Average	$11,304	-$20,894	$164,940	-$79,169	$24,290	-$19,112	$322,675	-$83,950
	Min	$35	-$45	$118	-$939	$198	-$22	$108	-$1,640
	Q1	$2,540	-$4,300	$81,507	-$10,736	$7,452	-$4,576	$38,195	-$18,884
	Median	$4,615	-$10,060	$120,076	-$23,744	$14,452	-$9,682	$190,238	-$38,259
	Q3	$9,838	-$23,538	$187,844	-$70,420	$31,356	-$22,332	$428,565	-$106,523
	Max	$333,650	-$602,462	$3,771,979	-$1,077,668	$163,639	-$288,653	$2,453,178	-$732,306
Per Acre	Average	$407	-$193	$4,629	-$388	$496	-$317	$6,139	-$1,216
	Min	$0.7	-$1.4	$0.8	-$9.7	$3.7	-$2.1	$0.9	-$35.0
	Q1	$97	-$98	$1,780	-$121	$117	-$198	$2,152	-$371
	Median	$238	-$190	$3,453	-$293	$489	-$306	$4,561	-$1,591
	Q3	$473	-$286	$5,783	-$561	$772	-$496	$10,274	-$1,885
	Max	$9,302	-$490	$96,546	-$1,371	$1,744	-$572	$20,969	-$2,192

Appendix Table 6: Summary Statistics of Aggregate and Per Acre 480a Exemptions for Otsego and St Law. County

		Otsego				St Lawrence			
		1 Year		10 Year		1 Year		10 Year	
		Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
Aggregate	Average	$17,971	-$12,351	$215,528	-$31,649	$6,278	-$19,455	$107,678	-$70,392
	Min	$22	-$21	$630	-$1,897	$20	-$359	$116	-$45
	Q1	$5,549	-$1,885	$58,508	-$10,749	$1,110	-$5,159	$32,145	-$16,167
	Median	$15,192	-$6,977	$134,634	-$27,465	$2,720	-$11,243	$67,167	-$43,433
	Q3	$25,065	-$16,471	$302,732	-$37,724	$9,588	-$26,860	$133,885	-$86,543
	Max	$115,216	-$109,191	$1,531,511	-$115,722	$41,290	-$170,687	$549,973	-$659,105
Per Acre	Average	$733	-$187	$7,529	-$447	$256	-$272	$2,303	-$1,122
	Min	$1.4	-$1.3	$12.6	-$77.9	$0.5	-$4.2	$3.5	-$0.8
	Q1	$214	-$79	$2,503	-$220	$57	-$159	$847	-$281
	Median	$588	-$172	$5,212	-$363	$118	-$267	$1,704	-$1,260
	Q3	$1,058	-$289	$11,477	-$512	$257	-$356	$3,022	-$1,959
	Max	$4,204	-$479	$45,565	-$1,266	$3,176	-$575	$35,291	-$2,220

Appendix Table 7: Annual Income Tax Credits for a 50-Acre Plot

Year(s)	Annual Credit Per Acre	Aggregate Annual Credit Per Plot	Aggregate Credit Per Period
1	$696	$34,788	$34,788
2-10	$200	$9,986	$89,878
11-20	$110	$5,496	$54,964
21-40	$62	$3,112	$62,238
			$241,868

Appendix Table 8: Annual Income Tax Credit During Year 1

		Margin of Error Rate				
		5%	7.5%	10%	12.5%	15%
Incentivization Rate	5%	$606	$621	$635	$650	$664
	10%	$635	$650	$666	$681	$696
	15%	$664	$680	$696	$712	$727
	20%	$693	$710	$726	$743	$759
	25%	$722	$739	$756	$773	$791
	30%	$751	$769	$787	$804	$822
	35%	$780	$798	$817	$835	$854
	40%	$809	$828	$847	$866	$886

Appendix Table 9: Annual Income Tax Credit During Years 2-10

		Margin of Error Rate				
		5%	7.5%	10%	12.5%	15%
Incentivization Rate	5%	$174	$178	$182	$186	$191
	10%	$182	$187	$191	$195	$200
	15%	$191	$195	$200	$204	$209
	20%	$199	$204	$208	$213	$218
	25%	$207	$212	$217	$222	$227
	30%	$215	$221	$226	$231	$236
	35%	$224	$229	$234	$240	$245
	40%	$232	$237	$243	$249	$254

Appendix Table 10: Annual Income Tax Credit During Years 11-20

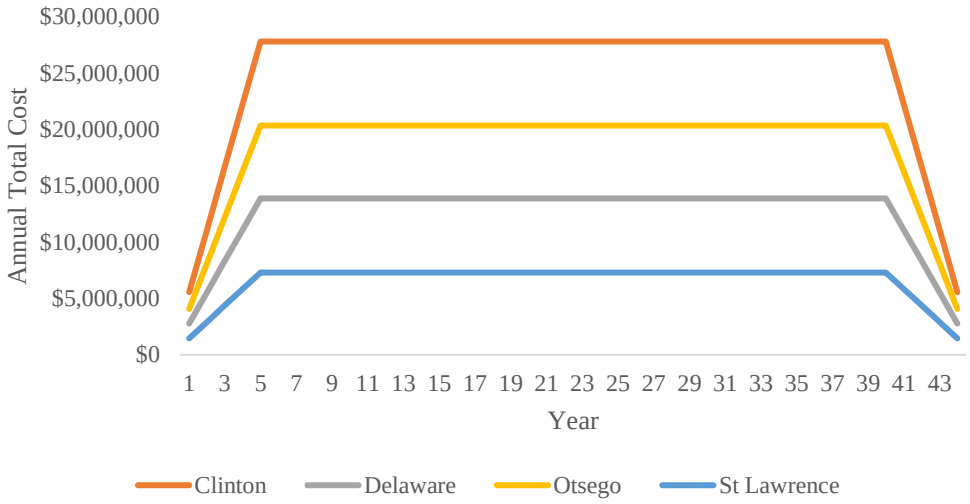
		Margin of Error Rate				
		5%	7.5%	10%	12.5%	15%
Incentivization Rate	5%	$96	$98	$100	$103	$105
	10%	$100	$103	$105	$108	$110
	15%	$105	$107	$110	$112	$115
	20%	$109	$112	$115	$117	$120
	25%	$114	$117	$119	$122	$125
	30%	$119	$121	$124	$127	$130
	35%	$123	$126	$129	$132	$135
	40%	$128	$131	$134	$137	$140

Appendix Table 11: Annual Income Tax Credit During Years 21-40

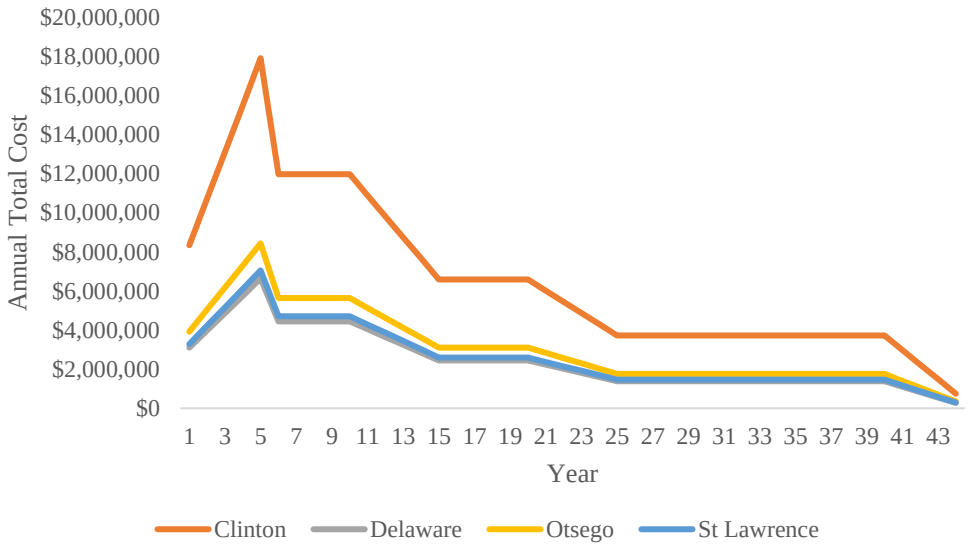
		Margin of Error Rate				
		5%	7.5%	10%	12.5%	15%
Incentivization Rate	5%	$54	$56	$57	$58	$59
	10%	$57	$58	$60	$61	$62
	15%	$59	$61	$62	$64	$65
	20%	$62	$63	$65	$66	$68
	25%	$65	$66	$68	$69	$71
	30%	$67	$69	$70	$72	$74
	35%	$70	$71	$73	$75	$76
	40%	$72	$74	$76	$77	$79

Appendix Figure 1: Annual total cost of 480a Forest Tax Law program vs. ITC for Delaware County. The ITC has lower annual total costs than 480a for every year except year 1. The difference between the ITC and 480a is greatest between years 25 to 40, when 480a's annual total cost is nearly ten times that of the ITC.

Appendix Figure 2: Annual total cost of 480a Forest Tax Law program vs. ITC for Otsego County. The ITC's annual total costs are lower than 480a's for all 44 years. The difference between the ITC and 480a is greatest between years 25 to 40, when 480a's annual total cost is ten times that of the ITC.



Appendix Figure 3: Annual total costs of 480a Forest Tax Law program for the top four counties. The annual total costs of the top four counties in order of largest to smallest: Clinton, Otsego, Delaware, and St Lawrence County.



Appendix Figure 4: Annual total costs of an income tax credit for the top four counties. The annual total costs of the top four counties in order of largest to smallest: Clinton, Otsego, St Lawrence, and Delaware County. Clinton County has roughly two times the annual total cost of the other three counties, individually.

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