APPENDIX M: POLICY ANALYSIS

RENEWABLE FUELS ROADMAP AND SUSTAINABLE BIOMASS FEEDSTOCK SUPPLY FOR NEW YORK
Final Report

Submitted to
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NEW YORK DEPARTMENT OF AGRICULTURE AND MARKETS
and
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1 INTRODUCTION – POLICY DEVELOPMENT PROCESS

The policies described in this report are a synthesis of many activities. Specific efforts of this task included: interviews with industry experts from both in and outside of New York State, interviews with people operating in all aspects of the biofuels industry's seven different identified sectors (feedstock producers, feedstock distributors, biorefinery operators, blenders, distributors, retailers, finance professionals, and other [not-for-profit, government, academia, etc.]), modeling that has been conducted as part of this task, and reviews of both federal and other states' policies. In addition, the sub-appendices to this chapter provide greater detail on the impacts of incentives and local laws. Specifically, Appendix M-A performs an economic analysis modeling the development of a willow plantation with various economic incentives, and Appendix M-B catalogues local ordinances governing timber harvesting and analyzes how they affect the ability of landowners to harvest biomass.

The goal of this report is to identify policies that, if implemented, would lead to the development and expansion of a significant, sustainable biofuels industry within New York State. The policies consider biofuels used for both transport and heat, but biomass used for generation of electricity is considered outside the main scope of this study. See Appendices O and P for more information on biomass used for purposes other than biofuels production.

2 MARKET CONDITIONS

As various policies are considered, it is important to understand the state of the biofuels market so that the policies actually adopted are effective in achieving their goals. Our interviews with professionals in the finance arena reveal that the biofuels markets - particularly those for liquid transportation fuels - are currently under severe financial distress (see Appendix M-C). Many corn grain ethanol refineries across the U.S. are in, on the verge of, or recovering from bankruptcy. These adverse market conditions have been caused by a confluence of factors, including the credit and financial crunch affecting all aspects of the economy (which limits the amount of working capital available for plant operation); the comparatively low price of oil and ethanol compared to the intense growth period from late 2005 to mid 2008; and the lower demand for liquid motor fuels compared to 2008 and previous periods. On the positive side, however, most ethanol producers are using corn as a feedstock and are helped somewhat financially by the lower prices of corn compared to 2008. Market conditions are in a state of constant flux, and ethanol production generally is moving towards becoming a low-margin activity where cost control and operating efficiency are important attributes for survival.

Given the tight credit markets, there is a reluctance to finance new ventures in all sectors of the economy. With the turmoil in the biofuels markets in particular, potential investors in this field are concentrating their attention on buying existing assets at much discounted prices rather than investing in new ones. There are currently 184 ethanol plants operating in the United States (one in New York with a capacity of 55 million gallons) with a national production capacity of 11.7 billion gallons. There are 23 idled plants with a capacity of 1.2 billion gallons (one in New York with an idled capacity of 100 million gallons) and 10 plants under construction with a capacity of 1.1 billion gallons (Ethanol Producer Magazine).

The price forecasts for oil vary considerably, with some projections showing stable prices and others showing slightly rising ones. Of significant note are the projections that forecast a continued increase in the world-wide demand for oil, with almost all of the increase attributable to developing countries. Due to new auto fuel efficiency CAFE[1] requirements in the U.S, projected increases in auto efficiency and new technologies such as plug-in hybrids, there are some who believe that the demand for oil in developed countries has peaked or will approach a peak very soon. This could mean that some of the growth in demand for biofuels may be driven by regulatory initiatives rather than growth in market demand.

The current outlook for corn-based ethanol is that the demand will continue to grow consistent with federal requirements, but that it is very unlikely that the federal requirement for new cellulosic ethanol will be met in the timetable established by the Energy Independence and Security Act of 2007 (EISA). There are two important caveats to this, however. The first caveat is that corn ethanol's viability is very dependent on the overall price of corn relative to ethanol in the market. The second caveat is that the determination of the eligibility of biofuels under EISA (and the related production incentives) is quite dependent on the results of the ongoing regulatory process to determine the carbon intensity of biofuels at the U.S. Environmental Protection Agency (EPA). This activity itself is affected by proposed Congressional amendments to EISA, removing the requirement that the carbon intensity of biofuels include an analysis of the indirect land use impacts of producing the feedstocks.[2] As discussed in Appendix O, EPA has made a determination in implementing the second renewable fuel standard, or RFS2,[3] regarding greenhouse gas (GHG) emissions limits of the various categories of biofuels and how it will ascertain the role of indirect land use change in that determination. Congress has not yet made a final decision on how the issues of indirect land use changes and their impact on GHG emissions will be addressed in the context of corn-based ethanol. This uncertainty, in addition to other currently unresolved market-creating policy decisions, (e.g., the extension of the volumetric ethanol excise tax credit and the expansion of the blend percentage of ethanol in gasoline to 15%) makes investors wary of the permanence of mandated corn ethanol incentives. These uncertainties have in turn exacerbated the stagnation of investment in biofuels and corn ethanol development in particular.

[1] Corporate Average Fuel Economy (CAFE) is the required average fuel economy for light duty vehicles manufactured for sale in the United States.

[2] See Appendices E and O, both of which discuss indirect land use change in greater detail.

[3] The EPA released its rules implementing RFS2 in early February 2010. This standard creates four categories of renewable fuels that must be blended into transportation fuel in the U.S. By 2022, it requires that 36 billion gallons must be blended. In addition, as mentioned above, each category of fuel must meet pre-determined life cycle GHG emission thresholds.

The "next generation" of biofuels production is focused on various conversion technologies for cellulosic ethanol and other advanced biofuels, as well as potential feedstocks like municipal solid waste and algae. While there are some pilot and demonstration-scale cellulosic ethanol plants recently completed (see Appendix H) with significant government financial support, none is yet at commercial scale or able to be financed in the marketplace without substantial government assistance. Research and development is continuing on conversion technologies, supported by both state and federal governments, and by the private sector.

Additional market developments include research, and policy strategies under discussion for "third generation" biofuels - beyond cellulosic ethanol- that are not linked to ethanol but could be a drop-in fuel that could be used directly as a substitute for petroleum without infrastructure or engine modification. Recent comments made by the Secretaries of Energy and Agriculture suggest that this emphasis on third-generation biofuels is a shift in policy focus. Other developments include a focus on crops grown specifically for fuel use. There is also continuing research and discussion of biofuels use in aviation, for which there are special needs regarding particular operating requirements for fuels and engines at high altitudes. New York, with its large dependence on airline travel, may be uniquely suited to position itself to take advantage of these developments.

In the current economic climate, the intensity of State competition for the limited number of new job-creating enterprises is increasing. States are being evaluated by potential biofuels producers to determine those that offer the best incentives to attract investment and technology for this new industry. New York was an early participant in the offering of lucrative incentives to locate advanced biofuels demonstration facilities and has since been surpassed by efforts of the U.S. Department of Energy (DOE) and other states to offer incentives for siting commercial-scale facilities.

3 OVERARCHING POLICY CONSIDERATIONS

As policies are developed by State leaders, there are several overarching themes that emerge.

<u>Integrated Approach:</u> An *integrated approach* considers the whole value chain including all segments of the industry. For example, policies could provide incentives for construction of a biofuels production facility, but also include the biomass production potential of the surrounding supply shed, or offer an incentive program to produce biomass for the facility.

<u>Time Frame:</u> Policies enacted for *mid- (minimum five years) to longer- term* could bolster investor confidence in the New York market as a location for biofuels facility development. Longer-term policies allow project developers to produce financial projections that support the developing industry as it gets off the ground, eventually able to compete without continuing subsidies.

<u>Regional Coordination:</u> The biofuels market is a regional one; promoting biofuels in the region would benefit all regional states and provide greater market certainty, demand and ability to support infrastructure.

The Midwestern Governors Association has undertaken a regional biofuels initiative. A regional program in the Northeast could potentially leverage relations and shared objectives established through the Regional Greenhouse Gas Initiative (RGGI) program and the Northeast Mid Atlantic Low Carbon Fuel Standard (LCFS) initiative.

Training and Education: The need for training and education of workers across all segments of the biofuels industry was raised many times in the course of interviews. The current agriculture and forestry workforce in New York is aging. Programs are needed to both train the current and future workforce in all aspects of the biofuels business as well as to educate the public. Courses are needed in biofuels feedstock production, existing crop and silviculture production, and comprehensive business model development for feedstock producers. Partnerships are also needed that lead to joint ownership of biorefineries and biomass production systems by landowners, biomass producers and project developers. Existing training programs could be deployed to create a skilled workforce for aggregation, biorefinery, distribution and retail job opportunities.

A single core resource center through which all training materials flow could attract biorefinery developers. Additionally, a cooperative network of education and research entities or a clearinghouse for training materials is also needed.

Focus on Non-Feed/Food Biomass: Given the direction of federal and regional programs encouraging the development of low carbon biofuels and concerns expressed in stakeholder meetings and commentary regarding potential competition for land between feed/food production and biofuels feedstock production, incentives could be focused on dedicated energy crops, wood waste and crop residues. Energy crops grown on the estimated 1.5 million acres of readily available underused and idle crop land highlighted in Appendix E are of particular importance.

Costs of Incentives: As a policy package is developed for biofuels in New York State, the costs to the State will be evaluated by considering the benefits produced. This could include programs such as taxes or fees on the use of traditional fuels, as well as self-financing of insurance, or other mechanisms.

4 POLICY FRAMEWORK

In addition to the general overarching themes above, the policies remaining are organized around the different segments of the industry and identified needs. The organizational structure is:

- Policies to increase demand for biofuels;
- Policies for the distributor of biofuels;
- Policies for the refiner of biofuels; and
- Policies for the feedstock producer and harvester of biofuels feedstocks.

The above list of policies is a blend of both regulatory requirements and financial incentives. They are designed to create both a "market push" for biofuels and a "demand pull."

4.1 POLICIES TO INCREASE DEMAND FOR BIOFUELS

Although some of the policies below may be redundant, the full suite is set forth as a complete menu of options.

Increase Requirements Beyond E10: While gasoline with a 10% ethanol blend (E10) is now commonly accepted, the current discussion at the federal level includes higher blends of E13, E15, and even E20. To achieve higher ethanol blends and to require that they be made available at retail stations, however, it is necessary to garner the acceptance of auto manufacturers that engine and auto warranties would be valid with this higher blend. Active participation in the national discussions is needed.

Low Carbon Fuel Standard: As California has done, New York State is considering adopting an LCFS for transportation fuels, as discussed in Appendix O. Such a standard would require that transportation fuels meet a low carbon standard when evaluated on a life-cycle basis. This could apply to both gasoline and diesel fuels and could become a significant incentive to use biofuels as part of the fuel mix

State-based Renewable Fuel Standard: Pennsylvania and other states have recently adopted an RFS that provides that all petroleum fuels – both gasoline and diesel – sold in the state contain a certain percentage of biofuels. These incentives are often tied to the growth of production of biofuels in the state, such that the standard would not be triggered until specific in-state production thresholds have been met, and the minimum standard would increase over time as in-state production of biofuels increases. Iowa's RFS increases to 20% by 2020. Massachusetts is also adopting a provision that all diesel and heating fuel be a certain percentage biodiesel (Cape Cod Today). Some of the issues noted above occur when the increase goes beyond E10.

A concern has been raised in other states regarding state-based biofuels mandates that may lead to higher fuel prices than might otherwise have occurred. To address this issue, state-based biofuels mandates often include the requirement that they be conditioned upon meeting in-state production targets of the underlying fuels (as has been the case in states such as Minnesota). Researching the likelihood of increased cost to consumers and weighing that against the overall economic benefits to the state is another way to address the issue.

Tax Exemption: New York's alternative fuel sales tax exemption is scheduled to expire on September 1, 2011. Similar to the action in Massachusetts, any fuel produced from cellulosic ethanol could be made exempt from any state gasoline excise tax.

Report on State Use of Biofuels: There are several requirements to use biofuels in state vehicles, but no reporting currently exists regarding the status of compliance or the effectiveness of these provisions. It is unclear if these requirements are being met. The current requirement is that all state vehicles use 10% biodiesel by 2012. This threshold could be raised if auto manufactures agree to guarantee the engines at higher blends.

Heating Oil Incentives:

- Renewable Fuel Standard: There can be a requirement that a minimum percentage of all heating oil-based fuels sold in the state contain a minimum percentage of biofuels. This provision is described in detail in Appendix O. Massachusetts is adopting a similar provision (Cape Cod Today).
- Cash for Oil Burner Clunkers. A properly-structured incentive providing that the State will pay cash for turning in old inefficient heating oil burners to replace them with 100% biofuels heaters using wood pellets or other biofuels heating sources can have a significant market impact. [4] This could complement the existing federal program that provides a 30% tax credit for the purchase of this type of equipment.

4.2 DISTRIBUTOR INCENTIVES

Infrastructure Tax: The existing New York State fueling infrastructure tax credit is scheduled to expire on December 30, 2010.

Distributor Tax Credit: A tax credit to distributors that sell cellulosic ethanol blends or at the very least, E85 is somewhat similar to what Iowa has done for all ethanol blends. As third generation biofuels are adopted, this credit may be made applicable to them, and again may be triggered by and track in-State production of third generation biofuels.

4.3 REFINER INCENTIVES

First Mover Incentives: Grants and loan guarantees were identified in most of the interviews as the two highest priorities to achieve funding for any new biorefinery. State-based *grants and loan guarantees* would complement similar federal incentives. Particularly in times of financial stress, this type of equity assistance is needed to get new operations off the ground. To limit the overall cost, programs may be capped at a specified number of refineries.

Production Tax Credit or Subsidy. New York offers a production tax credit of 15 cents per gallon produced after the first 40,000 gallons, up to a maximum of 16.6 million gallons per year, which expires on January 1, 2013. This incentive is for ethanol and biodiesel, and is not currently specific to the production of federally defined advanced biofuels. The tax credit is a refundable credit. This direct subsidy may be more attractive to some potential investors since many of the producers are not able to take advantage of a

[4] Air quality impacts would need to be considered in such a program.

standard income tax credit if they are operating at a loss in the early years. Any income tax credit that can be carried over for a set number of years is also advantageous to the industry.

Research and Development (R&D): Additional R&D is needed on many of the conversion technologies to lower their costs and enable them to compete in the market. Such R&D programs may be coordinated with and build upon the successful State investments already made at various universities and biorefinery demonstration projects located in New York. These investments are successfully augmenting federal programs designed to spur research, development and deployment of biofuels.

Energy Economic Development Zones: Energy economic development zones have been used to create areas where there are no state or local taxes for refiners or others engaged in biofuels production or even clean energy businesses that locate within the zone and are either expanding existing businesses or starting new ones. Michigan has a program that has designated one such zone to date.

4.4 FEEDSTOCK PRODUCER/HARVESTER INCENTIVES

Feedstock Producer Insurance: Planting, growing and harvesting a feedstock that has no alternative uses other than biofuels or biomass combustion is a very risky business investment unless there is an assurance that a long-term market will exist for the biomass. A number of biomass producers interviewed highlighted this issue. They also raised the issue of the cost of establishing a perennial biomass crop such as hybrid willow, which can approach $1,000 per acre, meaning a $100 million investment in biomass alone to supply a 50-million gallon plant.

Policies to build advanced biofuels production facilities may also include incentives to plant the supporting biomass crops. This could be most effectively achieved if the biofuels facility investment was integrated with the investment in biomass production. This could be accomplished by the development of State policies that encourage joint incentive applications, the awarding of development grants only to projects where biomass producers are a direct part of the development team of the biofuels facility, or the requirement that the facility demonstrate, prior to eligibility for any financial incentive, that it has signed long-term contracts for its biomass supply. Additionally, to ensure that the feedstock producer has confidence in the market, an insurance program could be established that would guarantee that if the market price for the feedstock did not develop to a sustainable level, the fund would pay the feedstock producer an amount of money based upon the level of price insurance protection the feedstock producer purchased.

The U.S. Department of Agriculture (USDA) has established the Biomass Crop Assistance Program (BCAP) that was created by the 2008 Farm Bill.[5] This pilot program provides cash incentives for the production, harvest, transportation and storage of biomass for delivery to approved biomass conversion facilities (see Appendix M-A for economic analysis of the impacts of BCAP modeled in the study.)

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[5] BCAP provides financial assistance to producers or entities that deliver eligible biomass material to designated biomass conversion facilities for use as heat, power, biobased products or biofuels. (USDA Farm Service Agency).

Landowner Incentives: It is anticipated that most of the new land that will be made available to produce biomass for the biofuels industry will come from the large stock of idled farmland in the State previously mentioned in Appendix E. Some of this land is owned by nonfarm landowners who may need further incentives to engage this land in biomass production due to their lack of experience in this endeavor. In response to these concerns, a program that reduces the property tax burden on these landowners might be considered as a State-level incentive to biomass production. For example, using the facility registry program created by the BCAP, landowners who register as suppliers to these new biofuels facilities could become eligible for property tax relief from a refundable State income tax credit, similar to the farmers' school property tax relief measures implemented by New York State in 1996. (See also Appendix M-B for analysis of the impacts of timber harvesting ordinances on biomass harvesting by landowners).

5 CONCLUSION

The development of effective policies supporting the establishment of a biofuels production industry in New York State requires diligent analysis of options and consideration of the impact on existing environmental and social protections that exist in the State. In addition, many policy options are under consideration and in use at the federal level and in other states. Establishing a sustainable biofuels industry in New York will require the adoption of a judicious suite of policies that provide flexibility, balance and opportunity to the entire spectrum of stakeholders in this industry's development.

In response to these observations, future research needs have been developed. First, there is a need to establish an independent economic analysis team that interfaces with policy makers, interest groups and industry developers. This team could analyze economic impacts of differing policy options. In addition, another team could be established to analyze the environmental and rural sociological impacts of proposed policy options.

6 REFERENCES

Cape Cod Today. “Background on Massachusetts Biofuels Initiative: Q&A.” <http://www.capecodtoday.com/downloads/biofuels_qa.pdf> (accessed March 29, 2010).

Ethanol Producer Magazine. 2009. “Plants return to production after idle summer.” BBI International Media. November 2009 Edition. <http://www.ethanolproducer.com/article.jsp?article_id=6028> (accessed March 29, 2010).

USDA Farm Service Agency, Biomass Crop Assistance Program, http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ener&topic=bcap (accessed March 29, 2010).

APPENDIX M-A

ECONOMICS OF SHORT ROTATION WOODY CROPS (SRWC)

WILLOW PROJECTS

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BASIC ECONOMIC FACTS ON SRWC WILLOW BIOMASS PRODUCTION

Using a recently developed and publically available cash flow model, EcoWillow Beta v.1.4, for willow biomass crops, an economic analysis for a 20-acre short rotation woody crop (SRWC) willow field with a total plantation lifetime of 22 years was performed.[6] The time period includes two years of site preparation and decommissioning and seven three-year rotations of willow biomass crop growth. This baseline scenario assumes that the grower has sufficient capital to cover the initial site preparation and establishment costs through to the first harvest. Potential economic incentives are also not considered in the base line scenario. Profitability is measured by means of the project's Internal Rate of Return (IRR) over a 22-year period and – where applicable – for a 13-year period in case the project is ended prematurely. Input numbers and procedures for this scenario are based on a case study located in upstate New York in May 2007. For this scenario, custom farm rates for the central New York region were used as input data. Actual cultural and management practices were taken into consideration for this specific location at the time of preparation. Table M-A-1 shows a selection of key input variables on the case study.

[6] 23 years when including fall activities of the last non-SRWC planting season.

Table M-A-1. Selected input variables for the baseline scenario located in upstate New York.

	VARIABLE DESCRIPTION	UNIT	
GENERAL VARIABLES	Acreage	acre	20
	Biomass growth rate	odt[a]/acre/year	5
	Rotation length	years	3
	Biomass price incl. transport	$/odt	60
VARIABLES INFLUENCING LAND COSTS	Land costs including tax, lease, and insurance	$/acre/year	35
VARIABLES INFLUENCING ADMINISTRATION COSTS	Administration costs	$/acre/year	5
VARIABLES INFLUENCING ESTABLISHMENT COSTS	Planting stock costs	$/cutting	0.12
	Planting density	cuttings/acre	5,800
VARIABLES INFLUENCING FERTILIZER COSTS	Fertilizer cost (application after every harvest)	$/acre/application	70
VARIABLES INFLUENCING HARVEST COSTS	Average row length	ft	660[b]
	Agricultural diesel fuel costs	$/gallon	2.65[c]
VARIABLES INFLUENCING TRANSPORT COSTS	Hauling distance	mile	25
	Truck capacity	tons	35
	Trucking costs[b]	$/mile	0.5
	Road diesel fuel costs	$/gallon	3.03[c]
VARIABLES INFLUENCING STOCK REMOVAL COSTS	Stock removal	$/acre	300

[a] Oven-dried ton; containing 0 % moisture
[b] Excluding labor costs
[c] The difference in the two fuel costs is explained through a reduced tax for fuel used for agricultural production, and conventional fuel tax for road transport

As shown in Table M-A-2, the project's internal rate of return (IRR) over the project's lifetime of 22 years is 5.3%. Startup costs including land costs are $25,165 for the 20-acre baseline scenario. One commercial harvest costs $5,108 for the entire 20 acres and the payback is reached in the 12th year with the fourth harvest neutralizing the project's expenses.

Table M-A-2. Key output variables for the financial analysis of the baseline scenario.

OUTPUT VARIABLE DESCRIPTION	UNIT	RESULTS
Internal Rate of Return (IRR)	%	5.3 % (1.3 %)[b]
Average net earnings per acre	$/acre/year	40 (10)[b]
Production costs per ton	$	51 (58)
Earnings per ton	$	9 (2)[b]
Payback period	Years	12
Startup costs including land costs	$	25,165
Costs of one commercial harvest	$	5,108
Harvest costs	$/odt	17.0
Transport costs[c]	$/odt	5.5

[a] Against an interest rate of 6 %.
[b] Brackets indicate results after premature project closure at year 13.
[c] Assuming a 25 mi road transport.

Transport costs, establishment costs, harvest costs, and land costs combined account for 71% of the total project's costs (Figure M-A-1). The cost reduction potential for each of these key cost categories differs. Considering establishment costs, both cutting prices and planting density have a high impact on project profitability. For instance, subsidizing the costs of cuttings by $0.02 per cutting would decrease the cost of willow cuttings from $0.12 to $0.10, which in turn would decrease establishment costs by $115/acre and raise IRR by 1.1%. Results further indicate that planting speed, fuel, and labor costs only have a minimal effect on project profitability. Design of a SRWC willow project is an important economic factor because it has a direct effect on harvesting efficiency. Increases in field row lengths can improve overall profitability considerably by reducing the amount of unproductive time spent turning equipment around at the ends of the rows, which lowers costs associated with harvesting.

Figure M-A-1. Undiscounted costs associated with the 20 acre willow biomass crops production system over the whole project life of 22 years. Land costs cover annual costs such as rent and taxes.

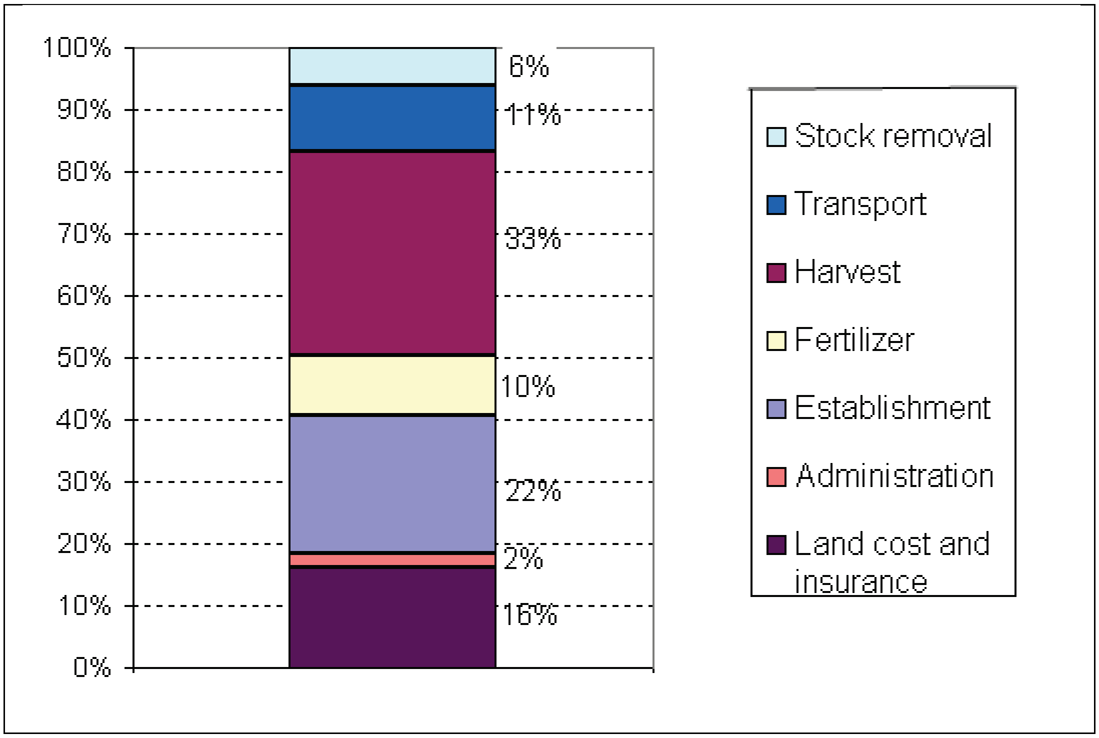


Figure M-A-2. Undiscounted accumulated cash flow as given in the budget model over the total project life for the 20 acre SRWC willow project scenario. In the worst case scenario assuming a 10% drop in revenues and 10% increase in expenses, the payback is not reached in the project's life time. In best case scenario, assuming 10% increase in revenues and 10% decrease in expenses, the payback is reached in the 9th year.

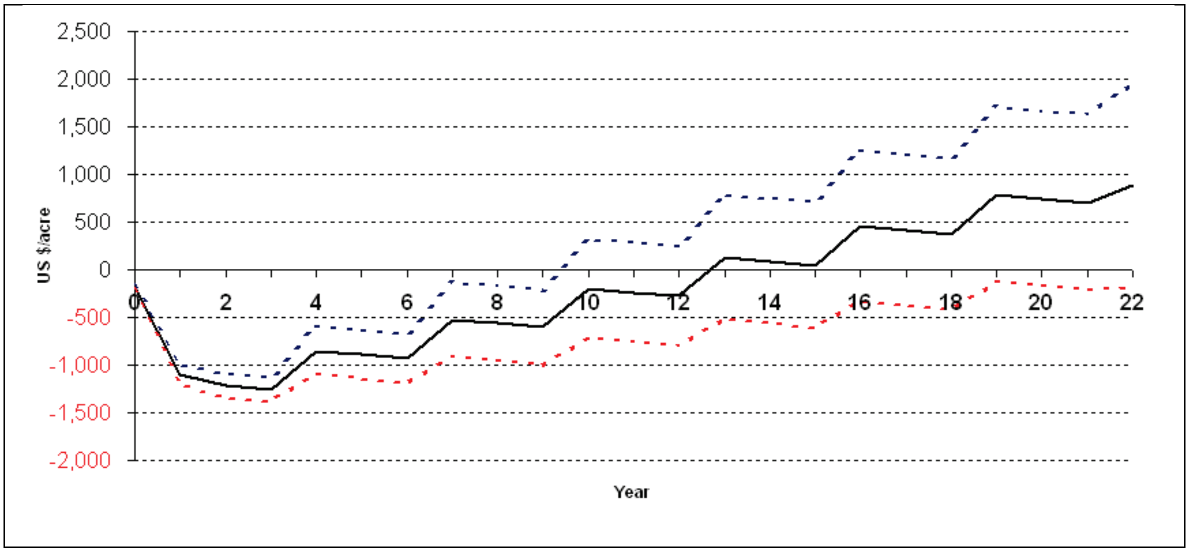
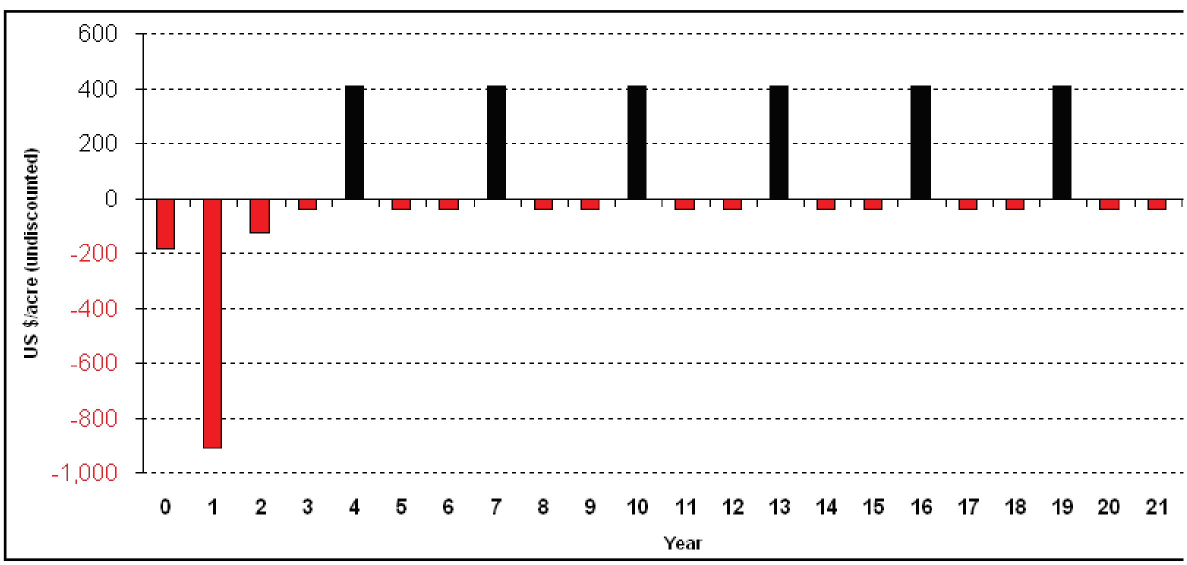


Figure M-A-3. Undiscounted annual cash flow in $/acre.



Land rent and biomass productivity, two interconnected variables, both have a significant effect on the project's profitability. In the absence of financial support schemes, a biomass production below six oven-dried tons (odt)/acre/yr (resulting in an IRR of 7.2 %) renders the project unprofitable. For the base case scenario with yields of five odt/acre/yr, a biomass price of at least $64/odt would need to be established to reach an IRR of more than 7%. There are also indications that for sites with low biomass productivity, a project's IRR over 13 years is considerably lower than the IRR over the total project life of 22 years. In other words, discontinuing a less productive project after 13 years would result in considerable profitability losses.

Table M-A-3. Relation productivity to land rate for upstate New York (source: Woodbury, personal communication).

SCENARIO	PRODUCTIVITY IN ODT/ACRE/YR	LAND RENT IN $/ACRE	IRR IN %*
1	3	13	-
2	4	19	1.5
3 (base case)	5	35	5.3
4	6	51	7.3
5	7	67	9.7
6	8	83	11.1

* All other variables being equal to the base case depicted in Scenario 3.

The results outlined above are based on the current conditions and state of technology for the production of willow biomass crops. However, this is a very new cropping system and there is considerable potential for increased in yield due to improved crop management and breeding and selection of new varieties.

Production costs can be reduced by improving crop management and developing new harvesting systems that are more efficient and effective. F or example, changing the rotation cycle from three to four years improves the IRR by 1% as more biomass is harvested in one harvest activity and the number of harvesting operations required over the life of the crop decreases. By increasing the row length, harvest speed and machine efficiencies can reduce harvest cost considerably. A further increase in projected future yields through improved planting material by 30% would further raise the IRR by 4.9%.

TRANSPORTATION COSTS OF WILLOW BIOMASS AND IMPACT OF FUEL COSTS ON SRWC WILLOW ECONOMICS

Figure M-A-4 shows that transport costs are a linear function of hauling distance and have a strong influence on the project's overall IRR. There is also a close to linear relationship between hauling distance and the project's IRR.

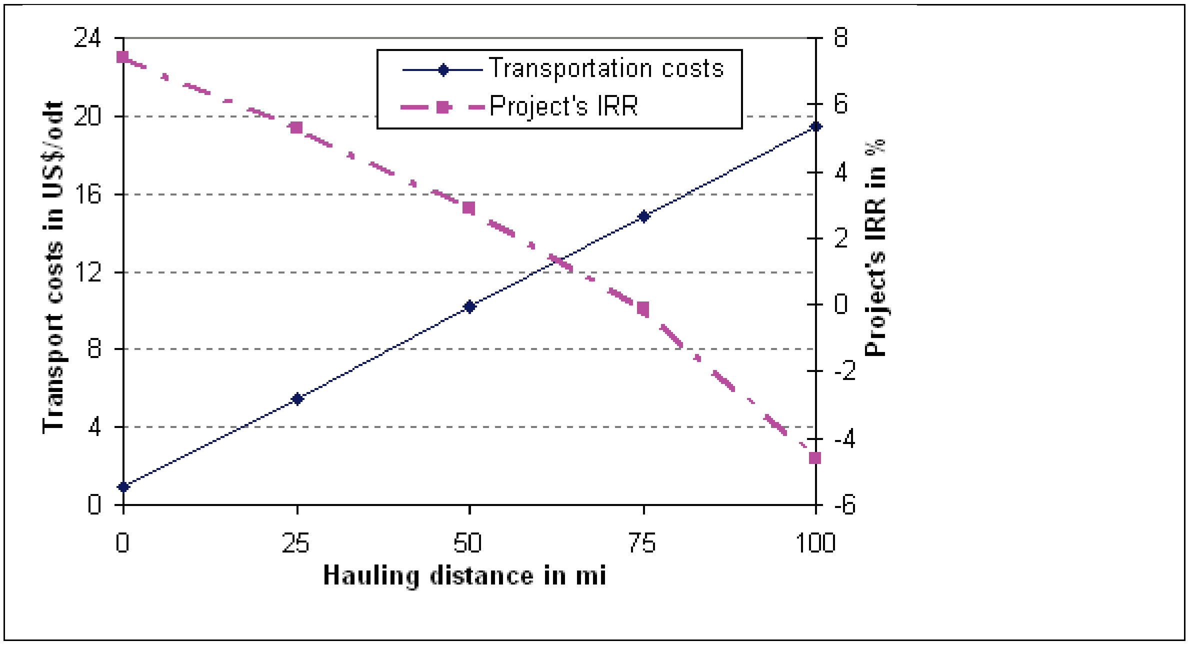


Figure M-A-4: Transport costs and IRR of a 20-acre willow biomass crop as a function of hauling distance. For a road hauling distance of 0 miles, transport costs are 0.9 $/odt because a field road distance of 2 miles is assumed for all scenarios but is not included in the distance on the x-axis of this graph.

Changes in fuel costs impact transport costs in a linear fashion. Increasing fuel costs in the baseline scenario by 50% (see Table M-A-1) increases planting costs by $2.0/ha (change of > 1 %), harvesting costs by $0.90/odt (change of ~ 5 %), and transport costs by $0.70/odt (change of ~11 %). However, this drastic increase in fuel costs has comparatively little effect on the overall project's IRR, reducing it by only 0.8%. Considering the restricted impact of fuel costs on profitability, however, it has to be kept in mind that increased fuel costs affect not only fuel used on site and for transport, but also that a price increase would also have indirect impacts on production costs such as increased costs for fertilizer or machinery production, which were not modeled in this scenario.

THE ECONOMIC IMPACT OF INCENTIVE PROGRAMS

The Conservation Resource Program (CRP)

A collaborative effort by New York State Department of Agriculture and Markets, SUNY ESF, USDA Farm Service Agency and USDA Natural Resources Conservation Service resulted in approval of willow biomass crops as a type of perennial cover under the conservation reserve program (CRP). This makes willow biomass crops eligible for the incentive payments under CRP, which currently include an establishment grant that covers 50% of costs and an annual acreage incentive payment (AIP) of around $50 to $55 per acre for New York counties (Green, personal communication). For more information on CRP, see USDA FSA (2009a). We analyzed the impact of the CRP on the overall economics of willow biomass crops assuming the AIPs ranged from five to 22 years.

Changing the levels of the establishment grants (EG) or the length of AIPs under a program like CRP will have an effect on the returns associated with willow biomass crops. Results from a number of different scenarios indicate that there is very little difference in the IRR between AIP payments that are made for either 15 or 22 years (Figure M-A-5). Changing the AIP payment from $50 to $55 also has a limited impact on the overall IRR. The results of this analysis emphasize how important good yields from willow biomass crops are if the system is going to be viable. With yields in the 4 – 6 odt/acre-yr range willow biomass crops can be barely profitable without any incentive programs. Willow biomass crops with the lowest yields can only be made economically viable (i.e. an IRR > 7 %) with at least an EG of 50% and at least 10 years of AIP. Productivity of 2 odt/acre/yr would require either a 50% EG or 15 years of AIP. Yields of 3 dot/acre/year requires at least an AIP for five years.

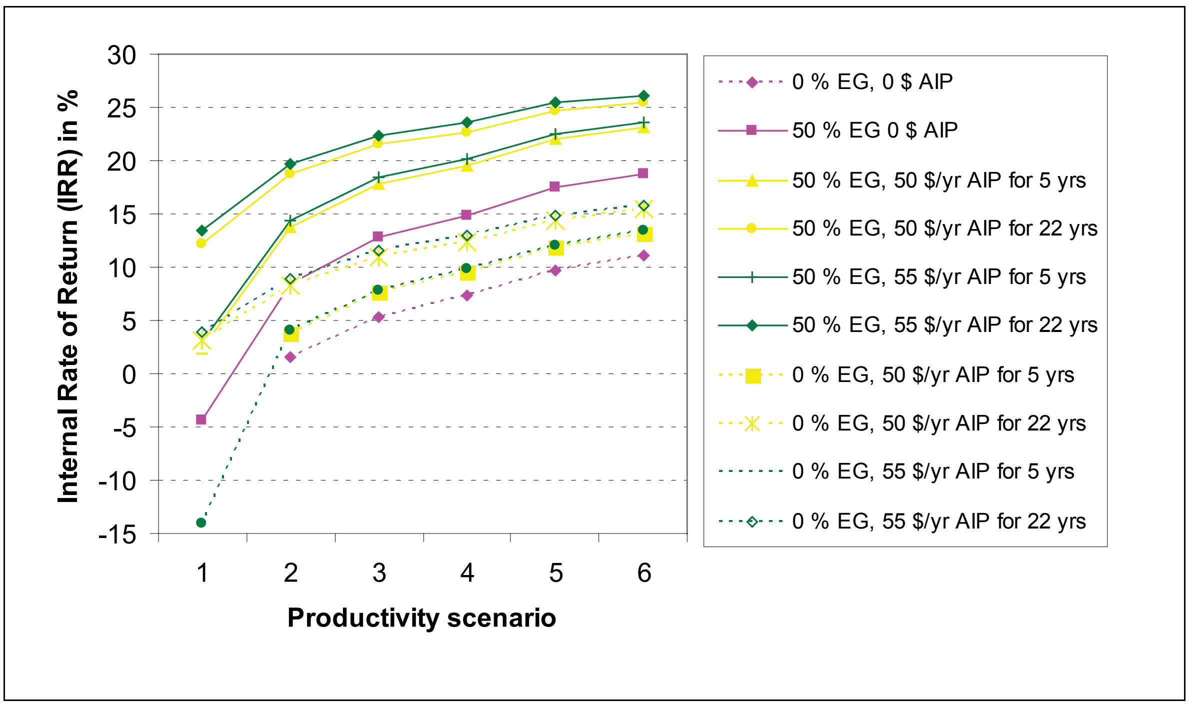


Figure M-A-5: Project IRR for willow with CRP incentives under various productivity (odt/acre/yr) and Establishment Grant (EG) and Annual Incentive Payment (AIP) scenarios. Scenarios without EG are described using dotted lines, scenarios using the same AIP are described in the same colors. For productivity scenario descriptions see Table M-A-3. Current establishment cost estimates for willow are around $ 1,100/acre.

Assuming a fixed amount of funding available to support the establishment of willow biomass crops, the overall effectiveness of the program will be influenced by how the program is designed and how the payments are structured. If payments are limited to $549/acre, which is equal to a 50% EG, the IRR is maximized under productivity Scenario 3 (equal to the baseline scenario, see Table M-A-3) and more productive sites are economically viable when grants are spread evenly over 22 years (resulting in an IRR of 8.2% and more); Scenario 1 (3 odt/acre/yr; $13/acre/yr land rent) is uneconomical with a subsidy of $549/acre in any case and Scenario 2 (4 odt/acre/yr; $19/acre/yr land rent) would need all the subsidies upfront, i.e. as an establishment grant, or at least have it spent in the first five years as AIP (resulting in an IRR of 7.2%). Despite these analyses, it is important to realize that large capital investments for farmers are one of the major hurdles for establishment of willow biomass crops. Therefore, it might be advisable for incentive programs to be based on establishment grants rather than as acreage incentive payments despite the fact that the AIPs may provide a slightly higher IRR.

Different combinations of AIP and EG incentives vary the cash flow associated with willow biomass crops over time (Figure M-A-6). The base case scenario (5 odt/acre/yr, $35/acre land rent per year) does not have positive cash flow until fourth harvest cycle in the 13th year. The break-even point can be shifted considerably with an incentive payment paid through an establishment grant: A 50% establishment grant alone will shift the payback period to the second harvest in year 5. In this example, incentives paid through an AIP do not have a substantial effect on shortening the payback period. Therefore, in order to address the barrier of the high up-front costs and long return time associated with willow biomass crops, EG or some other sort of up-front payment to producers would be effective in addressing this issue.

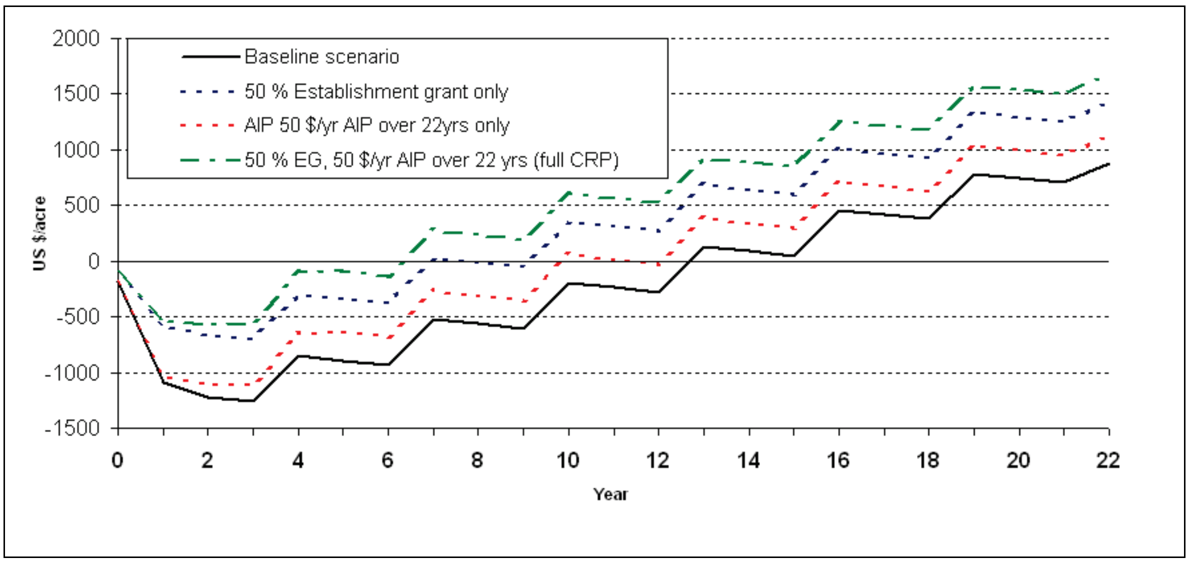


Figure M-A-6. Accumulated cash flow for willow biomass crops under different establishment grant (EG) and annual incentive payment (AIP) combinations based on current conservation reserve program (CRP) incentive payments.

This analysis suggests that it is essential to support research and development to increase yields of willow biomass crops. Investments in increasing yields may return more benefits to the overall development of willow biomass crops in the region than incentive payments that support poorly established crops. It also suggests that incentive payments should be tied to the successful establishment of willow biomass crops because poor establishment can result in depressed yields over the life of the crop and have a very negative impact on the returns from the system. This approach is already been partially adopted as part of the energy crops scheme in the United Kingdom where there is an expectation that survival should be >80% (Natural England 2009).

Biomass Crop Assistance Program (BCAP)

The recently established Biomass Crop Assistance Program (BCAP) is administered through the USDA (USDA FSA 2009b) and differs in the structure of incentives paid to farmers compared to the CRP program. Through the BCAP program, a biomass producer (1) is reimbursed for 75% of the establishment costs, (2) receives annual incentive payments based on acreage (these payments are reduced in years of biomass harvest) and (3) is paid a collection, harvest, storage, and transportation (CHST) match of one dollar for each dollar paid per ton for delivered biomass at the plant gate (measured on a oven-dry basis and capped at $45/odt).

Various combinations of the BCAP incentive payments have different effects on the internal rate of return from willow biomass crops (Figure M-A-7), but for almost all productivity scenarios, the BCAP incentives make willow biomass crops highly profitable. The exceptions are when yields are only one odt/acre/yr and only a single incentive payment program is in place (i.e. either AIP, EG or a tonnage payment). For these scenarios, the IRR is still positive, but it is low in the range of 1 to 6%. At yields of only 2 odt/acre/yr, the IRR from willow biomass crops ranges from 6 to 56% depending on the combination of incentive programs. With high yields of 6 odt/acre/yr, the IRR ranges from 15 to 64%. While this may be seen as beneficial from a producer's perspective, it can result in serious problems for the industry. Many of the combinations as outlined in Figure M-A-7 have a very favorable IRR even when productivity of the willow crop is very low, in the one to two odt/acre/yr range. These yields will not provide the biomass needed to support end use facilities that are planning on production rates around 4 to 5 odt/acre/yr. However, the structure of these incentive payments does not promote an investment in good crop management activities such as proper weed control and nutrient management because the largest increase in IRR is associated with the land area in willow biomass crops not the yield of the crops on this acreage.

The inclusion of the incentive payment for delivered biomass modifies this since it creates a stronger positive relationship between yield and IRR. But even the scenario with no EG or AIP has a positive IRR for low yields about 6% and 15% for yields of 1 and 2 odt/acre/yr, respectively. A potential result of this type of incentive payment structure is that large acreages of low yielding crops will be established, which will discourage other producers from establishing the crop without incentive payments. A similar situation occurred in Sweden during the early expansion of willow biomass crops. Incentive payments were very high for establishing the crop, which resulted in large areas of low yielding crops. Once the incentive payments were phased out, the expansion of willow biomass crops essentially stopped (Helbya et al. 2006).

Timing the incentive payment to the yields of the crops will promote better crop management and long term productivity under this program. There is a fairly linear relationship of land productivity to IRR increase through the BCAP program for production sites with four odt/acre/yr and upwards. In other words, the BCAP program does not favor particular production potentials but improves the economics of SRWC plantations across different site production potentials by the same IRR percentage points, except for sites with productivity below 4 odt/acre/yr, in which case the economic incentive through the IRR is far less. Still, from a government/payee perspective, it is more economical to support highly productive sites through the BCAP program as only $35/odt are spent in subsidies for productivity Scenario 6 versus $45/odt spent for the low productivity Scenario 1.

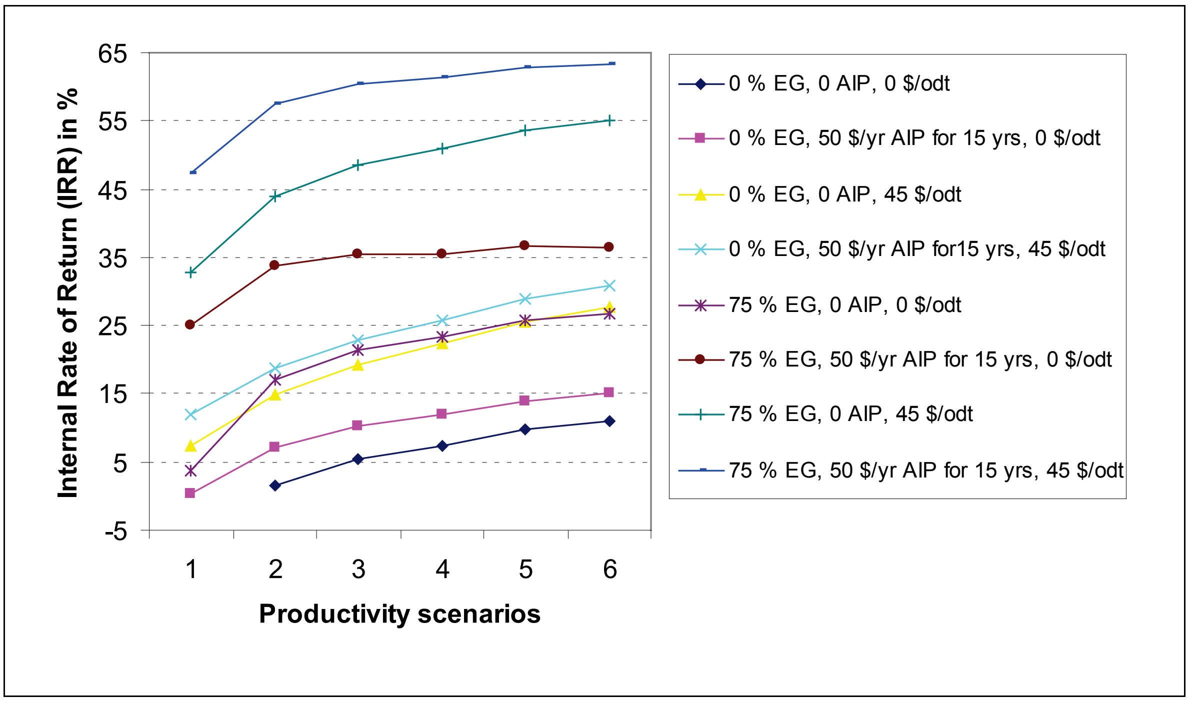


Figure M-A-7. Internal rate of return for willow biomass crops with different combinations of BCAP incentives (Establishment Grant (EG), Annual Incentive Payment (AIP), or collection, harvest, storage and transportation (CHST) match) under various productivity scenarios. See Table M-A-3 for scenario descriptions. Current establishment cost estimates for willow are around $1,100/acre.

The internal rates of return generated under the current structure BCAP program have the potential to be very high, but the cost of the program as it is currently structured also has the potential to be very high on a per acre or per ton basis. The 75% EG alone will cost $550/acre over the 22 years that the crop is in the ground, assuming that the crop is left in for that length of time. On an annual basis this is $25/acre-year or $5/odt if yields are 5 odt/acre/yr. If the crop is left in the ground for a shorter period of time or has lower returns, the cost per ton will be higher. Returns from the EG only scenario range from 16% to 26% for yields of 2 to 6 odt/acre/yr (Figure M-A-7). The AIP incentive alone costs $50/acre/yr or $10/adt if yields are 5 odt/acre/yr. The IRR under this incentive payment structure is the least responsive to improvements in yield in the 2 to 6 odt/acre/yr range. The CHST incentive alone has the highest cost per ton, about $22.50/odt assuming that the moisture content of willow biomass is 50% at the time of harvest. Returns from this program alone are very sensitive to the willow biomass crop yields. The combination of all three incentives together would generate IRR of 46 to 64%, but would cost about $37.50/odt. Lowering the incentive payments and spreading the available funds across a greater number of acres may be a more effective may to support the expansion of willow biomass crops.

Figure M-A-8 demonstrates how each dollar spent in different kinds of subsidies affects the project's IRR in a SRWC willow field. Except for productivity Scenario 1, the highest impact for each dollar spent is reached by the CHST match, i.e. matching the biomass price paid at the plant gate. Even so, it has to be kept in mind that a high IRR is not necessarily the ultimate goal for a farmer, who needs to be able to make the initial investment as well and therefore might value the establishment grant more.

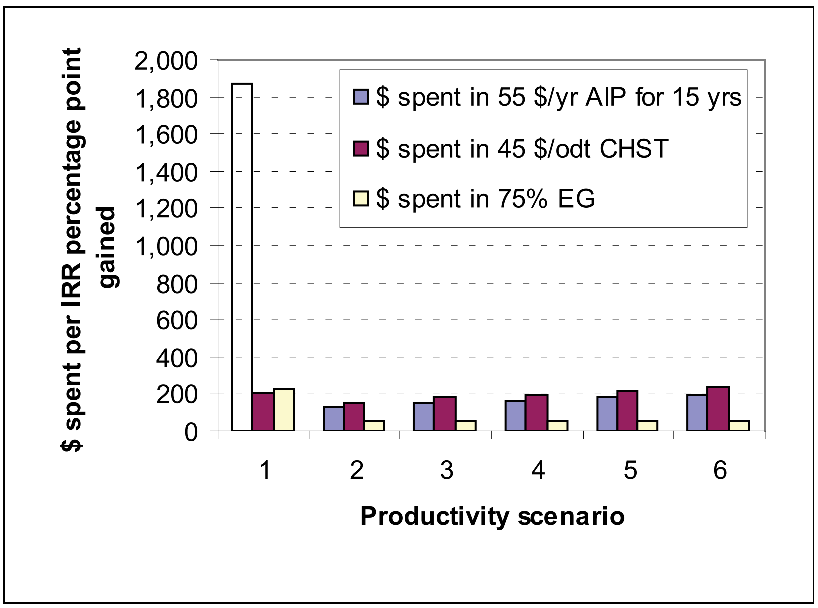


Figure M-A-8. Cost ($) to generate a 1% increase in IRR for different productivity scenarios (see Table M-A-3) and under different BCAP incentives payments including annual incentive payments (AIP), establishment grants (EG), or collection, harvest, storage and transportation (CHST).

The inclusion of the EG as part of the BCAP program has the most immediate effect on cash flow for willow biomass crop producers (Figure M-A-8). With the inclusion of the EG the payback period is met at the time of the first harvest and cash flow for the rest of the life of the crop is positive. The AIP alone results in positive cash flow at the time of the third harvest at about the 10th year of the willow crop's life.

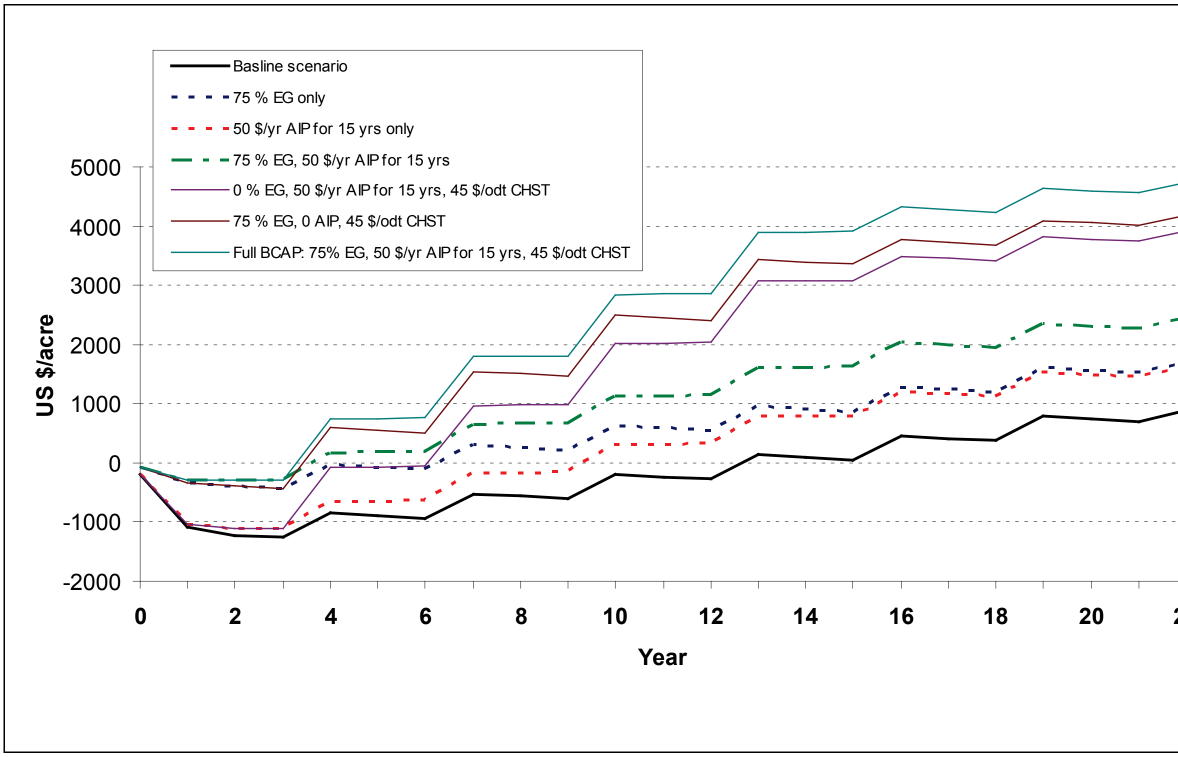


Figure M-A-2. Accumulated cash flow for willow biomass crops under different BCAP incentive payments.

ANTICIPATED COMMERCIAL DEVELOPMENTS

The development of advanced cellulosic biorefineries will require a reliable and economical supply of biomass over time. In addition to the development of biorefineries, woody biomass feedstocks are being examined for a number of other power and heating opportunities, which may have an effect on both the cost and long term reliability of feedstocks for biorefineries. As an example of the market challenges likely to be faced by biofuel producers, Figure M-A-9 illustrates known potential biomass energy projects under consideration in central New York. There are currently nine facilities that are or will very soon be using biomass for the production of bioenergy or bioproducts. These nine facilities (indicated by the red stars) are Curran Renewable Energy in Massena, New England Wood Pellet in Schuyler, Lyonsdale Biomass in Lyons Falls, U.S. Salt in Watkins Glen, AES Greenridge in Dresden, Mascoma in Rome, Boralex NY Inc. in Chateaugay, Empire Pellets in Lafargeville, and Colgate University in Hamilton,. There are also six proposed facilities that will use biomass as a feedstock for bioenergy. These six facilities (indicated by the purple stars) are the Catalyst Renewables facility in Solvay, NY, the Destiny and SUNY ESF projects in Syracuse, NY, the SUNY Morrisville project in Morrisville, New England Wood Pellets in the Deposit, NY, and AES in Kings Ferry. As shown in Figure M-A-9, facilities producing less than five MW of energy are estimated to require a 15-mile supply radius. The facilities producing 5-20 MW of energy are estimated to require a 35-mile supply radius and those facilities producing more than 20 MW of energy are estimated to require a 50-mile supply radius. With the exception of Curran Renewable Energy, all of the existing and proposed facilities will be competing for biomass feedstocks from similar supply sheds. From one perspective, this may be beneficial since it would provide reliable markets that would help to establish the infrastructure of suppliers and supply of biomass, and suppliers will have more than one buyer for their product, which reduces their risk. On the other hand, the amount of available feedstock could be decreased to the point where not enough supply is available for all users and consequently the price increases. However, assessments of the amount of woody biomass available from natural forests and willow biomass crops in a 50-mile radius around Syracuse indicates that over 830,000 odt of woody biomass are potentially available in this region. About 460,000 odt of woody biomass would come from natural forests and another 372,000 odt could be produced from woody biomass crops if about 10% of the available agricultural land was used to produce willow biomass crops.

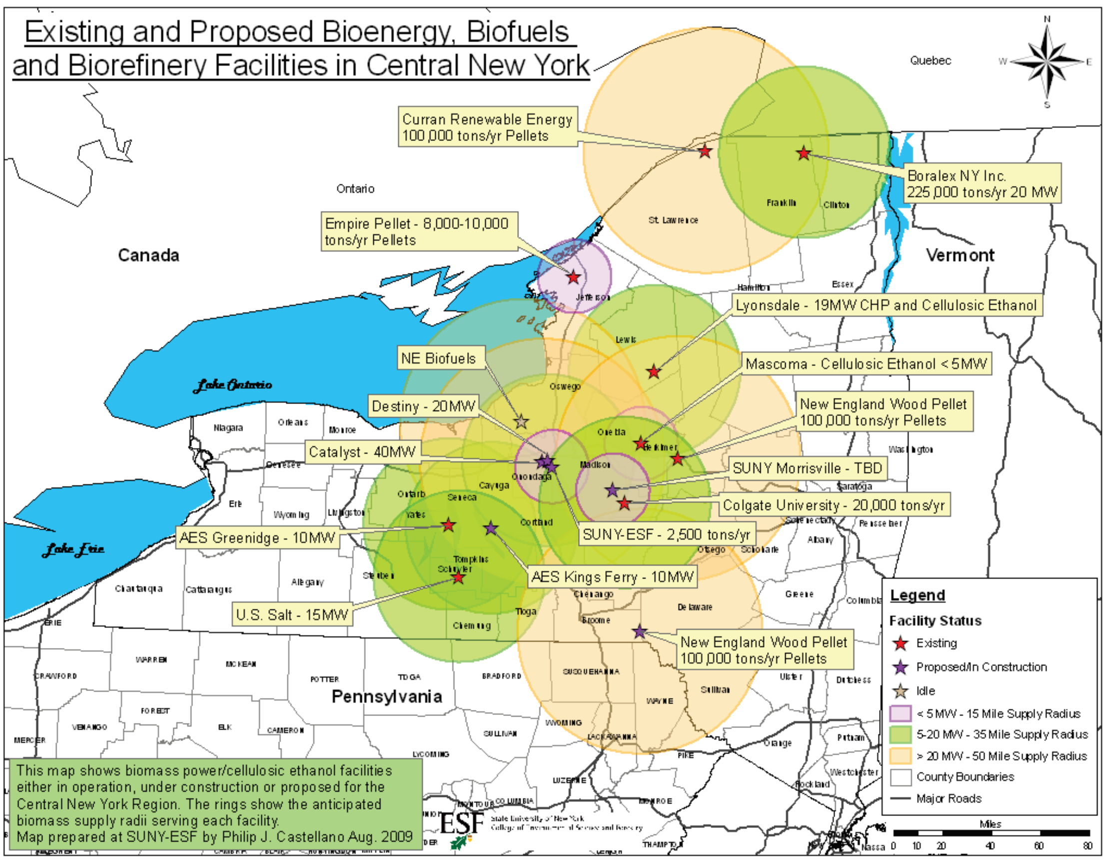


Figure M-A-9. Active and developing bioenergy projects in the central New York region.

The current markets for low grade woody biomass are currently not very efficient, with limited pricing visibility and liquidity. The markets are typically based on negotiated prices, with no common delivery points or standard contract provisions. The Empire State Forest Products Association and other entities in New York are working to develop better markets and support structures. However, until those markets develop, typical commodity hedging strategies that use financial and physical contracts are not likely to be significant. Thus, securing a wood supply for biomass energy projects will likely rely on three main tactics: (1) diversifying sources for procurement of wood supply, (2) exploring potential capital investment/financing to support low grade wood harvest, and (3) considering securing control of land through purchase of long term rental for the production of willow biomass crops.

Procuring wood from a variety of sources could include low grade forest residues, SRWC such as willow, and well sorted municipal biomass such as tree trimmings and yard waste. At this point in time, forest residues offer the most consistently available current source of commercially available biomass. However, supply has been somewhat correlated with saw log demand. Currently there are few loggers/producers targeting the market for low grade forest products suitable for biomass energy projects. This is likely caused by the combination of present prices for low grade forest products suitable for bioenergy (approximately $25-35 /wet ton or 50-70 $/odt) and the lack of robust long term markets for wood chips. Production of wood chips requires producers to make a significant investment in equipment, including harvesting equipment, chippers, and trailers. There are few producers who have made this investment because there is a lack of long term reliable markets and the initial investment required is high. The potential for multiple regional biomass projects, which would traditionally be viewed as competition for supply, may actually enhance available wood chip supply as more producers become convinced that there is a viable market for low grade forest products.

In addition to supporting potential government subsidies to spur bioenergy crop production, biomass energy project developers may need to consider finance or purchase of some equipment for loggers to support the long term production of low value wood from forests. Some existing biomass projects have used this as a tool to increase supply availability. Contractually linking biomass supply to equipment financing can result in more dedicated producers and reduced risks.

A final point of supply consideration is municipal tree harvesting associated with annual efforts and storm damage. Typically this material needs more handling and cleaning to make it a suitable fuel supply. However, removal of this material provides a reduced cost in tipping fees for the municipality. In addition, energy project developers may be able to include this as part of a package of benefits associated with the energy project when seeking community support or project approvals from municipalities.

The development of sufficient woody biomass as an input for commercial biofuels will likely need focused programs to improve market conditions rather than solely relying on price signals. While new biofuel plants will increase the demand for woody biomass, and hence the price, this may not be sufficient to provide efficient input feedstock markets. Other commodities have developed standard contracts, visible pricing and forward markets to ensure consistent supply. Properly-structured policy options may support the development of the information and liquidity needed for efficiently functioning markets. Subsidized financing for producers or market developers may be needed. The need to support different production technology from what loggers typically use is a potential market barrier for existing biomass producers and new entrants that could be solved with subsidized financing. Similarly, potential market makers will need access to liquidity to support trading operations. This liquidity has been difficult for established firms to maintain in other markets, and it will likely pose a similar challenge in the woody biomass commodity market.

CONCLUSIONS

Economics of SRWC depend on site productivity with low productivity sites (<6 odt/acre/yr) being economically unprofitable in the absence of incentive programs. High productivity sites producing 6 odt/acre/yr or more are economically viable without subsidies. Through the CRP, low productivity sites need at least a 50% establishment grant to become economically viable and several years of Annual Incentive Payments (AIP). AIPs currently paid through the CRP vary from $50 to 55/acre/yr in New York State. Results indicate that the $5 difference is negligible when it comes to boosting profitability of SRWC. The BCAP consists of a75% Establishment Grant (EG), an AIP paid through 15 years except in years of harvest, and a Cropping, Harvest, Storage, Transport (CSHT) match of $1/odt up to $45 total for each odt delivered to a bioenergy facility. For a site productivity of five odt/acre/yr, BCAP does not favor any given site productivity, as it increases the IRR by a similar percentage point across all site ranges. Lower productivity sites are disadvantaged through the program, but their profitability can increase (IRR>4 %) when BCAP is applied. From a payee's perspective of the BCAP program, it is better for the payee to support high productivity sites measured in how many tons are delivered per dollar spent. Experiences from Sweden have shown that a well designed incentive program can boost establishment of SRWC. However, results from these programs have also shown that the establishment grants need to be performance-based (e.g. survival rate >80% after the first year) as many of those plantations failed due to neglect in planting and best management practices.

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APPENDIX M-B

LOCAL GOVERNMENT REGULATIONS AFFECTING BIOFUEL SUPPLIES IN NEW YORK

Dr. Robert Malmsheimer, Department of Forest and Natural Resources Management, SUNY College of Environmental Science and Forestry, July 2009

EXECUTIVE SUMMARY

Local government timber harvesting ordinances are laws enacted by municipalities and regional governments that restrict commercial forestry in some way. These regulations seek to prevent damages caused by forest management activities, such as soil erosion, road damage, or water quality degradation. However, these laws also inhibit the harvesting of forest biomass for biofuels.

In New York State and the Northeast, these ordinances are generally enacted by townships. The most important New York State exceptions to town-adopted ordinances are the park-wide regulations administered by the Adirondack Park Agency in the Adirondack Park.

The first municipal ordinance in New York restricting forestry activities was passed by the town of Big Flats in 1977. Since that time, scores of New York towns have passed ordinances. The most recent survey in 1996 located 57 town ordinances (and classified these ordinances into five categories based on their characteristics). Although there is no state-wide registry of these ordinances, trends in other jurisdictions and anecdotal evidence indicates that the number of New York towns adopting ordinances is increasing. Research has also found that the adoption of ordinances by New York towns is statistically associated with towns' experience with forest management controversies.

Since these restrictions limit forest management activities on private lands, they decrease the amount of biomass available for production of biofuels by: (1) reducing the amount of land that can be harvested; and (2) increasing harvesting costs for forest managers and landowners. For example, some ordinances require non-harvestable buffer strips along roads and streams, and other ordinances dictate the maximum basal area to be removed or the number of seed trees that must be retained per acre. These requirements decrease landowners' income from harvests and increase landowners' transaction costs for harvesting forest products and biomass by requiring landowners to pay permit fees or by increasing land management administration costs (e.g., marking boundaries, permit applications). Additional costs can make harvesting unprofitable for some landowners and on some lands. In addition, ordinances requiring buffers or other provisions can fragment forest lands and make them economically unviable to harvest, because small forest management units are less efficient for harvesting operations than large ones, and when fixed costs (such as road construction for access) are spread over a small area, some operations (generally 20 acres or less) become economically unfeasible.

In response to the proliferation of local government regulation of forest lands, states, including New York in 2003, have enacted “right-to-practice forestry laws that address local regulation of forest management. New York State’s “notification and comment” statute, establishes a mechanism for the DEC Commissioner to comment on proposed ordinances’ impact on the long-term viability of a municipality’s forests and to suggest modifications to minimize that impact. While there is anecdotal evidence that the law is causing some towns to reconsider proposed regulation of forest management practices, the law has several limitations. Thus, local government regulation of forest practices, including the harvesting of biomass for biofuels generation remains an important issue in New York State.

INTRODUCTION

Local government timber harvesting ordinances are laws, enacted by municipalities and regional governments, that restrict commercial forestry in some way. These laws also inhibit the harvesting of forest biomass for biofuels. In New York State and the Northeast, these ordinances are generally enacted by townships – in other parts of the country they are usually enacted by counties. The most important New York State exception are lands located in the Adirondack Park, which are subject to park-wide (i.e., regional) restrictions administered by the Adirondack Park Agency that limit some forest management activities.

Local ordinances and regulations seek to prevent damages caused by forest management activities, such as soil erosion, road damage, or water quality degradation. Restrictions can be in the form of a separate ordinance or as part of a larger zoning law or town code. Scores of New York State towns and other local governments have passed ordinances. Although there is no State-wide registry of these ordinances, researchers have documented increases in local government ordinances restricting forest management in every jurisdiction surveyed – including jurisdictions with State “right-to-practice forestry” laws – and anecdotal evidence indicates New York State towns are following that trend.

After discussing the prevalence of these regulations in New York State, this sub-appendix explores why municipalities adopt ordinances and their characteristics. It then discusses the effect of these regulations upon forest management and New York State’s right-to-practice forestry law. It should be noted that this sub-appendix relies heavily on Kaiser’s (1996) the “Local Regulation of Forest Practices in New York State.” Although dated, this comprehensive analysis provides the only scientific examination of local government ordinances in New York.

PREVALENCE OF REGULATIONS

Town Ordinances

Studies indicate that town timber harvesting ordinances are prevalent in New York and anecdotal evidence indicates that the number of towns enacting such ordinances is increasing. Hickman and Martus (1991) and Greene and Siegel (1994) found local ordinances particularly prevalent in the Northeast. In fact, Hickman and Martus (1991) found that two-thirds of all existing local ordinances in the Northeast (CT, ME, MD, MA, NH, NJ, NY, and PA) had been enacted in the ten years prior to their study and nearly half had been enacted between 1985 and 1990.

Researchers believe that the Town of Big Flats was the first New York State local government to regulate timber harvesting when it adopted an ordinance in 1977 (Hamilton 1977, Wolfgram 1984) although Fishkill may have done so in 1973 (Kaiser 1996). Since that time the number of ordinances in the State has continued to increase. Wolfgram (1984) found 24 ordinances; six years later Hickman and Martus (1991) found 38 ordinances. A New York State Department of Environmental Conservation (DEC) study in 1992 located 47 local ordinances. A few years later, Kaiser (1996) found the number had risen to 57 ordinances.

No one has documented the number of ordinances in New York State since Kaiser's study and there is no State registry for these ordinances. However, researchers have documented increases in local government ordinances restricting forest management in every jurisdiction surveyed – including jurisdictions with State "right-to-practice forestry" laws. For example, Granskog et al. (2002) found that the number ordinances in the South increased 141% from 1992 to 2000, with the number of ordinances in most Southern states doubling during that time. Mortimer et al. (2006) found that the number of ordinances in Virginia increased from 48 in 1992, to 78 in 2000, to 264 in 2005 (with increases since 1997 continuing to occur despite the fact that Virginia adopted a fairly strict Right-to-Practice Forestry law in 1997 (see below)). Anecdotal evidence indicates New York towns are following the same trend.

ADIRONDACK PARK AGENCY REGULATIONS

As described in Malmsheimer (2009), the Adirondack Park Agency (APA) was created in 1971 by the APA Act. The agency is charged with administering the APA Act (Executive Law Article 27); the Freshwater Wetlands Act (Environmental Conservation Law (ECL) Article 24) within the Park; and the Wild, Scenic, and Recreational Rivers System Act (ECL Article 15, Title 27) on the Park's private lands. In 1973, the agency developed a comprehensive land-use system for the park, the Adirondack Park Land Use and Development Plan (APLUDP), which governs the preservation, use, and development of the Park's private and public lands.

The APA Act primarily addresses the development and use of the Park's private lands. The APLUDP and its associated map classify the Park's private lands into six land-use areas: hamlet, moderate intensity use, low intensity use, rural, resource management, and industrial use. For each area, the APA specifies a character description; purposes, policies and objectives; guidelines for development intensity (except for industrial-use areas); and classifications of primary and secondary uses.

The APA regulates forest management activities in the Park. APA regulations, based on the statutes noted above, limit forest management activities though the use of buffer zones and other restrictions (such as clear-cut limitations), and require approval for many management activities. Although rarely used, townships within the Adirondack Park can adopt municipal restrictions that expand the APA's restrictions.

TOWNS ORDINANCE ADOPTION AND CHARACTERISTICS

<u>Why Towns Adopt Ordinances</u>

As Kaiser (1996) described, researchers and commentators have speculated on the reasons towns enact timber harvesting ordinances – the APA's enabling legislation required it to develop land use restrictions. These anecdotal-based factors include:

- *Changes in Public Attitudes towards Forestry.* A shift in public attitudes toward environmental protection regulation and perception that timber harvesting degrades the landscape cause the public to insist on ordinances.

- *Clash between Urban and Rural Values.* New politically active inhabitants unfamiliar with rural practices, such as forestry and agriculture, insist on regulation to preserve their pastoral perceptions of rural landscapes.

- *Concern over Increased Logging Activity.* Increases in prices for sawtimber, pulpwood, and firewood, and new markets for biomass and other products, increase logging and prompt the public to push for regulation.

- *Forest Management Controversies.* An irresponsible harvest or harvests cause noise pollution, or road, stream, or other damage that community members believe must be prevented in the future.

- *Lack of Knowledge of Forest Management Practices.* Members of the public and town officials push for ordinances because they do not understand acceptable and environmentally-sound forest management practices.

- *Regulation in Neighboring Towns.* Ordinances in adjacent or nearby towns cause towns to enact ordinances to provide their citizens with similar levels of protection.

Kasier (1996), in one of the only scientific studies of the topic, designed and administered a questionnaire to 815 town officials (59% response rate) that tested whether the aforesaid reasons were associated with towns adopting ordinances in New York. Kasier found that experience with "forest management controversies" was the only factor significantly associated with towns adopting regulations. None of the other suggested factors were statistically significant.

Types of Town Ordinances

In addition to locating ordinances, Kaiser (1996) categorized (and described the provisions of) ordinances. Kasier classified the ordinances found in the 57 towns she located into five mutually exclusive categories. The number of New York towns having such ordinances is in parentheses.

- *General Environmental Protection (28 towns).* Ordinances intended to protect environmental values associated with well-managed commercial forests, including natural beauty, water and air quality, diverse wildlife habitat, and soil productivity.

- *Public Property / Safety Protection (11 towns).* Ordinances intended to: (1) protect public investments in roads, bridges, drainage ditches, or rights-of-ways, or (2) limit interference with traffic flows and protect motorists from potentially hazardous driving conditions that might result from damaged road or bridge surfaces, mud or other logging debris on roadways or bridges.

- *Urban / Suburban Environmental (7 towns).* Ordinances intended to protect the environmental (aesthetics, reduce erosion and sedimentation, improve water and air quality, and reduce noise) and property values by retaining individual trees or wooded tracts in urban or suburban settings.

- *Special Feature / Habitat Protection (7 towns).* Ordinances intended to protect features or habitats (e.g., scenic river corridors, shoreline and coastal zones, wetlands, and threatened or endangered species' habitat) that are special because of their scenic value, environmental sensitivity, or the natural functions that they perform.

- *Forest land Preservation (4 towns).* Ordinances intended (usually through a stringent permit or license process) to perpetuate forests and to maintain a relatively undisturbed forest condition through land use controls (usually zoning restrictions).

PROBLEMS CREATED BY LOCAL REGULATIONS

Local regulations affect forest management and forest products harvesting, including harvesting for biomass. The most direct of these problems is increased costs for forest management, which affect forest lands subject to both town ordinances and the APA's regulations. Other problems are unique to town ordinances.

Increased Costs

Landowners incur costs when towns enact forest management restrictions. The most direct cost is the revenue landowners forgo from timber and other products when these products can no longer be harvested and sold because of regulations. Local regulations often dictate specific management practices, rather than a desired outcome (Kaiser 1996). For example, many regulations require buffer strips (where no, or only a portion of, trees can be harvested) along roads or other features. Other regulations dictate the maximum basal area that can be removed, the number of seed trees that must be left per acre, or the size of harvestable areas (Kaiser 1996). These types of regulations decrease the amount of biomass landowners can harvest. Also, overly-restrictive ordinances can indirectly prohibit harvesting within a town. For example, regulations requiring buffers or other provisions can fragment forest lands and make them economically unviable to harvest, because "small forest management units . . . are less efficient for operations than large ones, and when fixed costs (such as road construction for access) are spread over a small area, some operations [generally 20 acres or less] become economically unfeasible" (Prisley et al. 2006, 189).

Regulations increase harvesting and road construction costs (Prisley et al., 2006), and increase administration costs to comply with regulations. Kaiser (1996) found that many town ordinances contained similar requirements, such as: (1) permit and license requirements and fees, (2) posting of surety or performance bonds, (3) site plan review or approval, (4) harvest plans prepared by a professional forester, (5) non-harvestable buffer areas, (6) operating hour restrictions, (7) public hearings, and (8) review by a professional forester. These requirements were found among all categories of ordinances. APA regulations include many of these requirements. These costs can make harvesting biomass unprofitable for some landowners and on some lands.

Research on the impact of costs on New York landowners has not be conducted, but studies in other jurisdictions have demonstrated that private landowners incur addition costs when harvesting timber and biomass in localities with harvesting regulations. For example, Lickwar et al. (1992) examined 22 timber harvests in Alabama, Florida, and Georgia and found that local ordinances increased costs by an average of 3% of total timber sale revenue, or approximately $12.45 per acre harvested.

In the only non-case study estimating the forest land area affected by local regulations(Prisley et al. 2006) examined the effects of local forest management ordinances in four Virginia counties. They found that the direct effects (e.g., buffer zones and other restrictions) of the ordinances ranged from 9 to 33%(and averaged 21%) of the operable forest area in the county and that between 2 and 23% of the operable forest area in a county was impacted by the indirect effects of ordinances (i.e., how buffer zones fragment existing forest management units into smaller discontinuous blocks that make forestry commercially unviable). Importantly, for biofuel supply implications, Prisley et al. (2006, 188) found that of "the total forest area in these four counties, 13.6% lies in protected areas, 27.7% is inoperable small parcels (prior to ordinances), and 16.7% is affected directly or indirectly by ordinances, leaving only 42 percent of forest area potentially available for management.

Other Problems

Town ordinances present four unique problems. First, town ordinances can be very difficult to locate and recognize (Provencher and Lassoise 1982, Popovich 1984, Youell, 1985, Cubbage and Siegel 1988, Cubbage 1989). In some towns they are separate ordinances, in other towns they are part of another law, such as a zoning schedule, site plan review requirement, or a land clearing law.

Second, local ordinances vary considerably from town to town in: intent, severity, number of restrictions, and cost of compliance. This "crazy-quilt," "checkerboard," or "hodgepodge" of regulations frustrates and confuses timber harvesters that operate in multiple jurisdictions (Hamilton 1980, Provencher and Lassoie 1982, Smith 1984).

Third, town ordinances are often overly restrictive. Some laws limit the amount of tree cover that can be removed; others specify basal area or diameter limit restrictions, or require large buffer strips along property lines and roads. These restrictions limit foresters', landowners', and timber harvesters' ability to use new and innovative practices, and often do not protect the environmental integrity of the site (Kaiser 1996).

Fourth, compliance requirements can cause delays in forestry operations, which negatively impact environmental site quality when a forestry operation is delayed and forced to operate during less than ideal conditions, such as during the mud season (Kaiser 1996). In addition, the issuance and enforcement of permits is often left up to town officials who usually lack the expertise to accurately judge the quality of forestry operations (Provencher and Lassoie 1982).

RIGHT-TO-PRACTICE FORESTRY LAWS

In response to the proliferation of local government regulation of forest lands, states have enacted "right-to-practice forestry laws that limit local [and regional] governments' police powers and offer forest landowners varying degrees of protection from local ordinances regulating forestry activities" (Malmsheimer and Floyd 1996, 31). The last comprehensive national analysis of these laws in 1996 revealed that 20 states had such laws and that they varied considerably (Malmsheimer and Floyd 1996).

New York State enacted its right-to-practice forestry law in 2003 (NYS ECL 9-0815). The law is a "notification and comment" statute, which establishes a mechanism for the DEC Commissioner, on the Commissioner's own initiative or upon the written request of a municipality or a forest landowner within the municipality, to comment on proposed ordinances that may restrict the practice of forestry. The Commissioner [can] . . . comment on the impact of the proposed ordinance upon the long-term viability of the municipality's forests and suggest modifications to minimize the proposed ordinance's impacts on forest practices. The Commissioner has 45 days to make comments, during which time the municipality must defer adopting the proposed ordinance. The [law] . . . also requires towns developing a master plan to 'facilitate the practice of forestry' in ways similar to other agricultural uses (Malmsheimer 2003, 7).

While there is some anecdotal evidence that the law is causing some towns to reconsider proposed regulation of forest management practices, the law has several limitations. First, it is not retroactive, meaning it does not provide a mechanism for the Commissioner to comment on ordinances adopted before the law became effective. Second, the law requires towns to consider the DEC Commissioner's comments, meaning it does not require the town to amend its proposed ordinance in light of those comments in any way.

POLICY RESEARCH NEEDS

These suggested research needs attempt to address the problems that local over-regulation of timber harvesting creates in New York State for harvesting biomass for biofuels:

- Determine whether a Right-to-Practice Forestry law that prevents or limits local governments' ability to restrict forest management would improve Statewide consistency. According to the last survey of these laws ten years ago, twenty states had such laws, some of which were more restrictive than others (Malmsheimer and Floyd 1998). Consider whether such law should be retroactive (to address existing regulations).

- Review existing laws enacted by local governments that restrict harvesting and provide these governments with information on how overly-restrictive laws can be amended to minimize their impact on sustainable forest practices.

- Conduct a scientific study, similar to Kaiser's (1996) research, to document the number of towns (and other municipalities) with laws and understand how these laws are affecting forest management. The results of this study could inform policymakers whether, and to what extent, additional policy actions are required

CONCLUSION

Despite New York State's right-to-practice forestry law, local government regulation of forest practices, including the harvesting of biomass for biofuels generation, remains an important problem in New York. Much has changed since Kaiser's (1996) comprehensive analysis. New markets for forest products, including biomass (for use as biofuels) and carbon sequestration, have developed. We have only this dated study and anecdotal information about town ordinances and how they may affect these new markets. Yet, one thing is clear: local regulation of forest management, including biomass for biofuels, will have large impact on the feedstock required to produce those fuels.

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APPENDIX M-C

BIOMASS AND BIOFUELS STAKEHOLDER SURVEY

New York State Renewable Fuels Roadmap and Sustainable Feedstock Supply

Biomass and Biofuel Stakeholder Survey

Name: ____ (Optional)
Company ____ (Optional)

We value your knowledge as an expert in the biomass and biofuels marketplace and appreciate your willingness to participate in this survey. Results from this survey will be used to develop key insights and recommendations in support of New York's Renewable Fuels Roadmap. We estimate that this survey can be completed in 25 to 35 minutes.

Thank you!

Market Opportunities and Barriers for New York State Biofuels

Industry segment: _____________ (***required - choose number from below***)

1. Feedstock producer
2. Feedstock distributor
3. Biorefinery operator
4. Blender
5. Distributor
6. Retailer
7. Finance
8. Other (nonprofit organization, government, academia, interested citizen, etc.)

Please answer as many questions as you feel comfortable answering.

1. What are the top 3 biomass end-uses that you expect will drive demand for New York's biomass resources over the next 5 years?

   a. ____
   b. ____
   c. ____

2. What do you expect will be the largest source of *growth* in demand for New York’s biomass resources over the next 5 years?

a. ____
b. ____
c. ____

3. Do you expect that advanced biofuel technologies (e.g., cellulosic ethanol, gasification) will begin to compete substantially with existing technologies for New York's biomass resources? Choices: Yes or No

If yes, within what timeframe do you expect these technologies to compete for New York’s biomass resources?

Within the next 5 years;
Within 5-10 years;
More than 10 years

4. What new biomass feedstocks (e.g., algae), if any, do you think will become commercially significant in fuel production within the next 5 years?

a. ____
b. ____
c. ____

5. What, if any, segments do you think will become commercially significant in the biomass thermal production sector within the next 5 years?

a. ____
b. ____
c. ____

6a. List the top four leading barriers, in order of importance, facing the development of a sustainable, economic biofuels industry in New York State.

a. ____
b. ____
c. ____
d. ____

Other comments on this question:

6b. List the top four leading barriers, in order of importance, facing the development of a sustainable, economic thermal biomass industry in New York State.

a. ____
b. ____
c. ____
d. ____

Other comments on this question:

6c. List the top four opportunites, in order of importance, for thermal biomass industry in New York State.

a. ____
b. ____
c. ____
d. ____

Other comments on this question:

7. What are, in order of importance, the top four leading barriers facing the development of a sustainable, economic biofuels industry in New York State *in your segment of the industry*?

a. ____
b. ____
c. ____
d. ____

i. What are the top 2 technical barriers, if any, in your industry segment? Be specific
    1. ___________________________________
    2. ___________________________________
ii. What are the top 2 economic barriers, if any, in your industry? Be specific
    1. ___________________________________
    2. ___________________________________
iii. What are the top 2 social barriers, if any, in your industry segment? (such as concern over impact on food prices, water use, or others) Be specific.
    1. ___________________________________
    2. ___________________________________

Other comments on this question:

8. What are the top three issues or needs that must be addressed to develop your business segment?

a. In the next 1-5 years?
   i. ____
   ii. ____
   iii. ____
b. In the next 5 to10 years?
   i. ____
   ii. ____
   iii. ____
c. In the next 10+ years?
   i. ____
   ii. ____
   iii. ____

Other comments on this question:

9. Who are the top 3 industry leaders in your segment of the industry in New York State?

a. ______________
b. ______________
c. ______________

10. Who are the top 3 industry leaders in your segment of the industry outside of New York State?

a. _______________
b. _______________
c. _______________

11. Finance: What is your perception of both 1) the initial capital costs and 2) the annual operating costs to construct and run an at-scale commercial entity?

a. Feedstock producer
   i. Initial capital cost: $__________________
   ii. Annual operating cost: $_______________

b. Feedstock Distributor
   i. Initial capital cost: $__________________
   ii. Annual operating cost: $_______________

c. Biorefinery Operator
   i. Initial capital cost: $__________________
   ii. Annual operating cost: $_______________

d. Blender
   i. Initial capital cost: $__________________
   ii. Annual operating cost: $_______________

e. Distributor
   i. Initial capital cost: $__________________
   ii. Annual operating cost: $_______________

f. Retailer
   i. Initial capital cost: $__________________
   ii. Annual operating cost: $_______________

12. What is the main financing barrier currently in your segment of the industry?
____
____
____

Policies and Programs

13. What are your three highest policy or program priorities, in order of importance that you would like to see New York State undertake to promote a biofuels industry in New York State?

Choose your response from the following, if necessary, or choose your own: Tax incentives; Production incentives; Employment or wage incentives;
Production cost incentives; Mandates or incentives for biofuel use; GHG caps; Fuel performance standards

a. _________________________
b. _________________________
c. _________________________

Other comments on this question:

14. What are your three highest policy or program priorities, in order of importance that you would like to see New York State undertake to promote *your industry segment* of the biofuels industry in New York?

Choose your response from the following, if necessary, or choose your own: Tax Incentives; Production incentives; Employment or wage incentives;
Production cost incentives; Mandates or incentives for biofuel use; GHG caps; Fuel performance standards

a. ______________________________
b. ______________________________
c. ______________________________

Other comments on this question:

15. On a scale of 1-4, with 4 being very significant, and 1 being not at all significant, please rate the following:

a. Your view of the significance of the development of the biofuels industry on food prices over the next 5-10 years.
   i. 1-4: ________
b. Your view on the *perception of the public* of the impact of biofuels on food prices.
   ii. 1-4: ________
c. Your view on the significance of the development of the biofuels industry on land availability or prices in New York State over the next 5-10 years.
   iii. 1-4: ________

16. On a scale of 1-4, with 4 being very significant, and 1 being not at all significant, please rate the following:

a. Your view of the significance of the development of the biofuels industry on global land use change over the next 5-10 years.
   i. 1-4: _________
b. Your view on the *perception of the public* of the impact of biofuels on land use change at a global level.
   ii. 1-4: ________
c. Your view on the significance of the development of the biofuels industry on land use change NY over the next 5-10 years.
   iii. 1-4: __________

Vision for Success

17. Overall vision: Describe how you would define success within 5 years for the development of the biofuels industry in New York State.

18. Overall Vision: Describe how you would define success within 5 years for the development *of your segment* of the biofuels industry in New York State.

19. Any additional comments:

Thank you for your time!

If mailing or faxing your response, please send to the following address:

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