Exploring a Carbon Strategy for a Public Forest Products Company in Canada

by

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Abstract

As forest companies in Canada are struggling to come through a period of record low commodity prices, US exchange rate challenges, and worldwide recession, it is unlikely that a carbon strategy would be a top priority. This paper explores the reality that even as a company operates in a harsh business environment, a carbon strategy is helpful in moving to a more sustainable and financially competitive future. In the context of stakeholder theory and competitive forces both inside and outside the company’s industry, there is evidence to show that moving toward a low carbon future is in their best interest over the long term. Considering this, the study looks at the possibility of direct investment in forestry carbon projects from a financial perspective. Specifically, the analysis is based on hypothetical afforestation, fertilization, and select seed projects with harvesting treatments based in the interior of British Columbia. The results indicate that due to the substantial uncertainty and poor expected returns, forest carbon projects may not be a wise investment for forest companies at this time. However, there are various steps that companies can make to transition themselves to a low carbon future. These include carbon footprinting and the development of green programs, targets, and goals within the company’s operations. These actions can lead to first mover advantages within the forest industry and prepare the firm for more onerous demands in the future. These demands would include regulatory emission constraints or preparing for the implementation of a cap and trade system.
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Introduction

A Harris-Decima poll held in 2009 suggests that nearly two thirds of Canadians agreed that, “Climate change is mankind’s defining crisis, and demands a commensurate response.”

Global warming is widely believed to be accelerated by the emission of greenhouse gases (GHG). While several types of gaseous compounds contribute to the greenhouse effect, the most predominant of these gases in our atmosphere is carbon dioxide (CO₂). Between 1970 and 2004 the annual emissions of CO₂ into the atmosphere grew by about 80% which far exceeds the variations in historical CO₂ cycles (IPCC 2007). In an effort to combat the human contribution to this problem, nations around the world are acknowledging the problem and taking steps to ensure that present and future emissions of CO₂ will decline. As forest companies have access to a renewable energy source in the form of wood fibre and the capabilities to sow, plant, and tend trees cost effectively, there may be inherent competitive advantages and the potential to profit from climate change policy through carbon markets or avoiding administrative penalties for carbon emissions.

In terms of public policy, one method to curb emissions is through taxation. However, a more popular approach is to move toward a market-based system commonly known as “cap and trade”. The premise of this system is that targets for future emission reductions are scaled down from a baseline year. For example, under the 1992 United Nations Framework Convention on Climate Change, the Kyoto Accord brought an agreement

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among developed signatory countries to reduce greenhouse gas emissions by 5% from a 1990 baseline level, and is effective from 2008 through 2012².

The basic premise is that the total emissions for each country are capped to meet the overall target. To accomplish this goal, these nations would then require industries and/or specific companies meet emission reduction targets. A given company then has a number of options to meet these targets depending on the specific design of the regulatory system:

1) **Reduce their emissions** to fall under their allowable amounts. This is typically either done through a change to cleaner technology and/or by reducing output.

2) **Develop “offsetting” projects** that either sequester carbon or replace energy produced by burning fossil fuels with a renewable energy source in order to balance emissions that go beyond their cap.

3) **Purchase carbon credits** in order to balance emissions that go beyond their cap. These credits are established from carbon offset projects.

4) **Purchase carbon permits** from other companies that are below their allowable thresholds.

5) **Exceed their cap and pay administrative penalties.**

In order to continue to address climate change beyond 2012, the UNFCCC Conference of Parties (COP 15) was held in Copenhagen, Denmark in December 2009. While some had hoped for a more inclusive agreement with enforceable targets, the result was a non-

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enforceable agreement, the Copenhagen Accord\(^3\), which was a disappointment to many observers. In fact, based on a survey of 4767 respondents, 70\% were either “dissatisfied” or “very dissatisfied” with the outcome of the event (Tvinnereim and Roine 2010). As the conference was held against the backdrop of a lingering world recession, some of the major sticking points continued to be the transfer of wealth from richer to poorer countries and a lack of consensus on what the pace of emission reduction should be. One of the successes of the conference was an official recognition of “reduced emissions from deforestation and degradation” (REDD). Perhaps even more significant was the agreement by developing countries to submit detailed and reviewable inventories to the same standard as developed countries\(^4\). The significance of the latter is the establishment of a common platform from which to build a future comprehensive international cap and trade system. The final result was an agreement signed by several nations as a commitment to work toward emission reductions, but with no firm reduction targets (Hamilton et al. 2010).

**Problem Definition**

Business leaders are beginning to consider climate change no longer as an environmental issue but rather a market transition (Hoffman 2008). As in every industry, the forest sector must also look to the future in this way. Companies that pursue a carbon strategy

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\(^3\) [Link](http://unfccc.int/meetings/cop_15/items/5257.php) accessed April 22, 2010

\(^4\) [Link](http://docs.google.com/viewer?a=v&q=cache:lp_RKkTW-EJ:unfccc.int/resource/docs/2009/cop15/eng/107.pdf+cop15+results+reporting&hl=en&gl=ca&pid=bl&srcid=ADGEESiZNwiaqKEdTaTUUCBGEqIt-azG3hOj95ofd7k8bcGcJkiLhxXWFqj3kb5R90RaS3X-e1Vs4nhXkqOWFzTIMEJL4Slo9NBQrYYMq9jXE7zePcvJf-fxqfn2DuokJ03eVmHZ2K&sig=AHIEtbTcaflT022zvJNv56LXJzw-zY3W2hMG) accessed April 23, 2010
will be faced with decisions regarding their methods and level of engagement which will have impacts on all aspects of their business.

While it is a given that forestry-based projects have the potential to sequester carbon, it is unclear whether this could be profitable in current or future carbon trade markets. Strategies to move toward carbon neutrality before a compliance regime is enacted in Canada could give a company an early advantage during this transition, but are there enough incentives for first movers and what are the risks? The lack of progress from the international community has been a cause of uncertainty (Pinske 2007). As forest companies struggle through a period of record low commodity prices and currency risk on exported goods, carbon trade in this sector is a possible revenue source that has not received a lot of research interest to date.

Several forest companies are currently active in moving from heavy reliance on fossil fuels to using residual wood fibre for energy required at processing facilities. In some instances, co-generation is allowing companies to use this as a revenue source by selling excess electricity that is being produced. These “green” projects are also incented by way of tax relief or other government stimuli in some jurisdictions. In other cases, they may be credited with verified emissions reductions (VERs) that would count as emission offsets. These government incentives are part of a broader movement to create what has been called a “low carbon” or “green” economy. Where this is occurring, there is a good foundation to establishing a complete strategy that moves a company toward the future expectation of carbon neutrality and possibly other revenue sources.
As part of the answer to stabilizing atmospheric carbon levels over the next 20 to 50 years, forests have been identified as a natural way to remove and secure carbon until technology provides a more effective alternative (Sedjo 2005). Through the process of photosynthesis, carbon is removed from the air and secured in woody fiber for long periods of time. Growing trees for carbon sequestration is considered as both legitimate and crucial, although there are some risks that need to be addressed such as damage due to disease, fire, or insect. One of the barriers to forest offsets is the lack of recognition for carbon retained in harvested wood products under international rules. In reality, about 40% of timber harvested is retained within long-lived products such as lumber and panels (Dymond and Spittlehouse 2009). This lack of acceptance, particularly in compliance markets, has prevented forest carbon initiatives from becoming a major component of the worldwide carbon project portfolio to date.

Around the world, the role of forests has become center stage in climate change issues in public policy, research, and investment (Hamilton et al. 2010). In fact, forestry could be the only industry sector that may be a net carbon sink (Ximenes and Cowie 2008). This means that more gaseous carbon is removed from the atmosphere than is released to it. While healthy growing forests are usually carbon sinks, since 2002 in British Columbia (BC) forests overall have become a net source of carbon to the atmosphere (Dymond and Spittlehouse 2009). This is mainly due to the effect of the mountain pine beetle through the vast areas of dead standing timber and the resulting increased rate of harvest in recent years. Replacing dead trees with healthy growing stock is an opportunity to reverse this
trend and make BC’s forests a net sink sooner than would occur naturally. However this process takes time as young stands are generally carbon sources for at least 10 years until the growing biomass exceeds that which is being lost through decay in woody debris and the forest floor (Dymond and Spittlehouse 2009). Figure 1 illustrates how carbon is cycled both in forested and non-forested environments. Carbon emissions are caused by both natural and man-made processes and naturally sequestered through vegetation growth.

**Figure 1. Carbon Cycles on Forested and Non-Forested Land**

![Carbon Cycles on Forested and Non-Forested Land](http://www.for.gov.bc.ca/hfi/pubs/Docs/En/En92.htm)

This paper intends to explore the strategic value of forest carbon offsets and credits to Canadian companies within the forest products industry. This will include a strategic
analysis using a variety of tools, leading into a discussion of strategic alternatives. Some rudimentary modelling and financial calculations will explore whether this can lead to diversified revenue sources that increase the value of the firm including the quantification of potential profits in different future scenarios along with what risks are involved.

In examining potential projects for a forest company, the focus will not be on energy-based projects but rather projects based on forestry activities. As most large forest companies have already moved into green energy to varying degrees, this paper will explore forestry-based projects as a potential next step in developing a complete carbon strategy. The purpose of such projects could be to offset future emission reduction requirements or to sell as carbon credits on the open market. Due to a lack of a federal legislative and policy framework within Canada, project opportunities will be examined within the context of a provincial framework. With the largest forest industry in Canada, British Columbia and the Pacific Carbon Trust were chosen to look at forestry project profitability in this study. BC also happens to have progressive emissions regulations that are based on a cap and trade system.
Carbon Markets

A carbon offset is defined as, “...any kind of reduction in GHG emissions or increase in carbon storage that helps you meet your target for mitigating climate change.” (Dymond and Spittlehouse 2009). The opportunity within managed forests is to remove stem carbon that is retained in long-term products and use the residual fibre to displace fossil fuels as an energy source. This serves to both lock up carbon and displace non-renewable fuels. In other words, trees remove gaseous carbon from the atmosphere and contain it as a component of the wood, which eventually may be harvested and new trees can begin the cycle again. In this way the sequestration of future crops on the site can be considered additional to that previous. In addition, residual products from timber processing can be used to displace energy production that would otherwise be provided by burning coal, oil, or gas.

Carbon markets are far from being mature. Following sharp growth between 2006 and 2007, these markets have held steady in value through the credit crisis and world recession. The market appears to be poised for growth once again. Some possible triggers will be collective international will, common agreement on protocols, and worldwide economic recovery. Figure 2 shows the value of transactions in several trading markets worldwide. These include the Kyoto Assigned Amount Units (AAU), New Zealand Exchange Trading System (NZ ETS), Clean Development Mechanism Afforestation/Reforestation (CDM A/R), Chicago Climate Exchange (CCX), and Over the Counter (OTC) transactions, which are those that occur outside of formally regulated markets.
In order to consider what opportunities are available, the process of carbon trade must be clearly understood. The carbon offset market can broadly be defined as consisting of a compliance (regulated) market and a voluntary (non-regulated) market. Companies that participate in the voluntary market would typically hold environmental or social responsibilities as core values for the company. Other motivations might include investing, philanthropy, perceived marketing advantages, or building credit reserves in anticipation of a regulated carbon market.

Third party certification is becoming an important part of carbon markets. According to Ecosystem Marketplace, who collected data on 226 forestry offset projects, the use of third party standards to validate projects and verify carbon credits increased from 42% in 2002 to 96% in 2009 (Hamilton et al. 2010). One of the difficulties in tracking the market...
is the lack of coordination among the vast array of registries and standards that qualify as emission reductions throughout the world. The World Bank states that there are now more than 12 different certification standards that are competing for market acceptance (Capoor and Ambrosi 2009). While each of these systems are unique in some respects, the common unit of measure is carbon dioxide tonnes equivalent (t CO₂ e).

For land-based activities, certification standards fall broadly within 2 categories. These include those that strictly measure and monitor carbon removal and those that include qualities beyond carbon (also called “co-benefits). Among the more prominent standards for forestry offsets are the Climate Community and Biodiversity (CCB) and the Chicago Climate Exchange (CCX) (Capoor and Ambrosi 2009). Each registry has its own protocol that all projects must comply with in order to be registered. Some common components addressed by all legitimately regulated schemes are:

**Additionality** – the idea that the carbon uptake or emission reduction is incremental to regular management or “business as usual”

**Counted Once** – must not have been previously counted as an offset or credit in any other system

**Leakage** – having safeguards in place to prevent the loss of carbon uptake previously accounted for over a defined period of time or cause an increase in emissions somewhere else

**Permanence** – refers to the longevity and stability of the method of capture and storage

**Verifiable** – contributes to real GHG reductions, monitored and audited post-implementation
The process to achieve verified carbon credit is illustrated in Figure 3. The project proponent (supplier) begins the process by putting work up front to validate a project under a set of protocols. Then the work is carried out and verified to ensure that the credits are being correctly quantified. Once the carbon offsets are registered they may be sold or retained by the project owner. Note that this diagram is overly simplistic in that in many instances there are intermediaries between a buyer and a seller. These may include wholesalers, retailers, brokers, or market exchanges.

**Figure 3. Ex post Carbon Credit Value Chain for a Forestry Project**

![Carbon Credit Value Chain Diagram]

**Compliance Carbon Market**

Among the compliance-based systems operating today are the New South Wales Greenhouse Gas Reduction Scheme (NSW GGAS), the New Zealand Emissions Trading
Scheme (NZ ETS), and various Kyoto Protocol driven entities such as the Clean Development Mechanism (CDM), Joint Implementation (JI), and Assigned Amount Units (AAUs). Both the CDM and JI mechanisms allow for land-based projects including forestry to count as carbon credits for which developed countries can potentially receive credit. In practice, however, a bureaucratic process and restrictive protocols have discouraged forestry projects through the various mechanisms of the Kyoto Protocol.

With the strong preference to allow market forces to control emissions, it is a reasonable assumption that Canada will eventually be operating under a regulated cap and trade system, if not under a federal umbrella then under a series of provincial schemes. There have also been indications that a cap and trade system may eventually be enacted with federal legislation, both in Canada and the United States. This belief is affirmed by the 2010 Point Carbon survey, which indicated that 61% of respondents believe that the US will have a federal cap and trade law by 2015. The American Clean Energy and Security Act (Waxman-Markey bill) and the Clean Energy, Jobs and American Power Act (Kerry-Boxer bill) are examples of cap and trade bills that have progressed to the US Senate over the past year. While neither have become law as of yet, both explicitly support land-based carbon projects (Hamilton et al. 2010). The Honourable Jim Prentice, Canada’s Minister of Environment, has also suggested that North America could work under a cap and trade system and that Canada would closely follow a US model.

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The European Union has been operating under cap and trade since 2005 however in North America this transition has been slower. Although movement at the federal level has been very cautious, there are a number of states and provinces that are moving forward in anticipation of cap and trade or actually initiating it. For instance, California’s Air Resources Board has released draft rules for North America’s first functional cap and trade system which will regulate more than 600 emitters including refineries and utilities\(^6\). In addition, several other states and provinces have partnered with the Western Climate Initiative which also has a goal of working under cap and trade by 2012. BC has also approved the Greenhouse Gas Reduction (Cap and Trade) Act and the Emission Offsets Regulation. As these pieces of legislation come into force there will be financial implications for companies that operate in BC based on how they manage their carbon footprint.

In terms of price, the compliance forest carbon market has held a premium over the voluntary markets with a volume-weighted price average of $10.24/t CO\(_2\) compared with an overall average of $7.88/t CO\(_2\) to date (Hamilton et al. 2010). The recent trend within compliance markets has been greater amounts transacted with lower values per tonne to keep the total market value somewhat balanced since 2007.

**Voluntary Carbon Market**

The voluntary carbon market world-wide has grown at a rapid pace in recent years. For example, according to the World Bank its value increased by over 50% from $263 to

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$397 million USD for the years 2007 and 2008 respectively (Capoor and Ambrosi 2009). A few of the many forestry-based projects are identified as examples below:

- South Africa’s Standard Bank is targeting A$250 million to manage planting and management of 50,000 ha in Australia for carbon sequestration.

- In October 2009, British Petroleum signed a deal with Carbon Conscious - an Australian sharefarming subsidiary - to plant up to 10 million Oil Mallee Eucalyptus trees across Australia’s wheatbelt. In July of the same year BP also signed a carbon sink forest deal with Origin Energy that is potentially worth up to $169 million.

- Brazilian beef group J&F, ag. firm MCL, and two pension funds are also partnering to plant eucalyptus on 335,000 ha of degraded pastures. The purpose is initially to supply wood chips for power generation but they also expect to earn revenues through the sale of carbon credits.

- Finite Carbon announced a 4300 acre forest land project located in eastern Tennessee under the Improved Forest Management protocol under the Climate Action Reserve.

Growth within Canada is also gaining momentum with numerous offsetting projects occurring across the country in a variety of industries. For example, the federal government has established a voluntary registry for domestic projects (including forestry) to issue offset credits under Canada’s Offset System for Greenhouse Gases (Greig and Bull 2009). Also, designed to sell carbon credits to large businesses, the Toronto-based Greening Canada Fund was launched in October 2009 and has already received

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7 http://www.reuters.com/article/idUSLR41915920091028 accessed April 22, 2010
9 http://www.reuters.com/article/idUSLR41915920091028 accessed April 22, 2010
investments from the BMO Financial Group, and the TD Bank Financial Group for amounts of $10 million and $3 million respectively\textsuperscript{11}. Within the forest industry itself, there is a progressive movement toward carbon accounting and eventually carbon neutrality. This is demonstrated by the commitment from the Forest Products Association of Canada (FPAC) membership in October 2007 to become carbon neutral by 2015 without the use of carbon offsets\textsuperscript{12}. Member companies essentially have less than five years to ensure that they are on track to meet this commitment.

Even outside of Canadian registries, it has become easier to sell offsets from Canadian projects internationally. In July 2008 the Voluntary Carbon Standard Association announced that it would accept voluntary carbon units (VCUs) without requiring the Canadian government to provide evidence that it would not be double counted as part of compliance with the Kyoto protocol. This decision will streamline the bureaucratic process to allow the owners of these projects to offer their offsets to a broader global audience. This could yield higher prices to the developers of these projects\textsuperscript{13}.

While the volume of trade in the voluntary market is increasing, the price has faltered. According to a survey of 141 corporate purchasers of forest carbon offsets in 2008, the average price paid was between $7 and $9 USD/t CO\textsubscript{2}, although there was a wide range of prices paid depending on the perceived quality of the offset. Also there was a strong

\textsuperscript{13} www.finacialpost.com/story-printer.html?id=2234714. accessed January 15, 2010
demand among buyers who wanted co-benefits in biodiversity and community values. Nearly all buyers were willing to pay a premium for the CCB standard offsets, but most were not willing to pay more than a $3/t CO₂ premium. The survey also found that while there was a preference among buyers to pay for offsets only after they are delivered, there was some interest in pre-financing offset projects, particularly with North American buyers. (This “ex ante” approach to carbon sales may be of particular interest to proponents of forestry projects with long life spans.) Finally, a large number of buyers were interested in purchasing call options. These are contracts that allow the buyer to purchase a specific quantity of carbon offsets, at a specific price, for a defined time period. This would suggest the expectation of future price increases.

**Market Opportunities**

Carbon credits, or the ability to acquire them, are truly tangible assets and should be recognized as such by accounting standards. While these assets may not be as liquid as cash or other commonly exchanged assets, they are certainly more marketable than traditional long-term assets such as property, plant, and equipment. In holding these credits as current assets, they could either be bought and sold timing market cycles or held as a reserve for a time where cash is required in the future. An example of the value recognition is after the worldwide recession began in late 2008 and during the subsequent credit crisis, there was a massive selloff of carbon permits from European companies that

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was mostly on the spot market. There were also many call options placed in order to hedge against compliance exposure (Capoor and Ambrosi 2009).

The real potential here is that since carbon trade appears to be in a growth phase there is potential for significant value appreciation. Knowing that regional governments such as BC and California have committed to working toward a low carbon future, demand in the carbon market should continue to increase. An important question to answer is how responsive the supply will be to meet this demand and from what industry sectors the demand will be supplied. Part of the answer rests in the amount of private investment that is given to carbon projects now and in the future. Jennifer Weiss, spokesperson for California’s Climate Action Reserve suggests, “Considering the popularity, industry interest and high offset prices, we expect to see continued growth in forestry projects not just in the US but throughout North America”.15

As mentioned previously, BC has established a legislated framework with the intention of encouraging the use of renewable energy sources and to enable a provincial carbon market. The public sector is leading the way in this venture with a commitment to carbon neutrality in 2010.

**Pacific Carbon Trust**

Within BC, the Pacific Carbon Trust (PCT) is a Crown corporation that was established in 2008 with the stated purpose of providing high quality offsets from projects initiated in BC. The primary client is initially the Province of BC to meet their carbon neutral

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commitment. As of June 30, 2009, the BC Government had retired 34,370.44 tonnes of carbon, purchased from 15 different projects. This refers to purchased offset tonnes that may not be transferred or resold.

Their process follows the BC Emissions Offset Regulation which begins with project verification and then registration. While there currently is no registry in BC, a BC project can be registered in an outside jurisdiction. Once a project has moved through the verification and registration stage it is then marketable. The PCT currently has a draft protocol for forestry projects which includes fertilization, select seed, and afforestation as means to sequester carbon. The purpose of this protocol is to provide guidance and support for offset projects that can be retired by the PCT. These initial three categories were chosen because baselines and additionality are easier to define and quantification protocols are further developed. Another advantage is that these types of projects do not have complex issues that present concerns with leakage. Several other forestry related protocols are being considered for the future (Raymer, 2009).

The PCT negotiates prices with offset suppliers and these contracts are not published. The offset value is determined based on both market pricing and offset quality for the verified project. These offsets are then sold to government at $25/t C02. The private sector within BC is also encouraged to purchase offsets from the PCT and some have already made purchases. Table 1 shows a typical weekly view of carbon prices as gathered from markets around the world. Information such as this factor into the pricing negotiations between the PCT and project proponents.
Table 1. Carbon Market Pricing

**Carbon market snapshot**
March, week 1

<table>
<thead>
<tr>
<th>INSTRUMENT</th>
<th>PRICE</th>
<th>MTH CHG</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUA Dec 10 EUETS Phase II</td>
<td>€13.30</td>
<td>+0.58</td>
</tr>
<tr>
<td>EUA Dec 13 EUETS Phase III</td>
<td>€15.56</td>
<td>+0.27</td>
</tr>
<tr>
<td>CER Dec 10 EU secondary</td>
<td>€11.86</td>
<td>+0.70</td>
</tr>
<tr>
<td>CER enpass Primary CDM</td>
<td>€7.7-10.4</td>
<td>-</td>
</tr>
<tr>
<td>RGGI Dec 10 US RGGI allowances</td>
<td>$2.13</td>
<td>+0.02</td>
</tr>
<tr>
<td>CRT Dec 10 V09 CAR VERs</td>
<td>$5.25</td>
<td>-2.00</td>
</tr>
<tr>
<td>CFI 2010 CCX VERs</td>
<td>$0.07</td>
<td>-0.03</td>
</tr>
</tbody>
</table>

Exchange traded prices only.
€=euros $=US dollars
Sources: Reuters Interactive, ECX, CCX, Nymex, IDEAcarbon

List of Acronyms:
EUA – European Union Allowance
CER – Certified Emission Reduction
RGGI – Regional Greenhouse Gas Initiative
CRT – Carbon Reduction Ton
CFI – Carbon Financial Instrument
ECX – European Climate Exchange
CCX – Chicago Climate Exchange
Nymex – New York Mercantile Exchange
Methodology

First Mover Advantages

A firm may benefit in various ways by taking the initiative to become a “first mover”. A common occurrence among first movers is that they have significant influence in the development of government legislation and policy. Since the regulatory environment for carbon trade is still in developing in Canada, this could be an opportunity through market leadership. A company might also gain an economic advantage by reducing their emissions prior to a cap and trade system becoming established. This could effectively put the firm in a position to be a “seller” while their competitors are “buyers” in order to meet emissions targets. Another benefit that this may provide is a comparative advantage in marketing and sales of forest products. For example, the first “carbon-neutral” forest company could leverage this accomplishment by promoting their brand publically. This could lead to a favourable response from customers. Finally, another characteristic of first movers is that they can easily acquire the best of limited resources by not having to compete for them. This could be manifested through land acquisition for forestry projects, or by securing contracts with the government for forestry projects on Crown Land.

It may be said that a company that is developing a low carbon strategy will promote the firm as being socially responsible. The trends of companies moving to corporate social responsibility (CSR) have been attributed to various strategic factors. Some have attempted to justify this behaviour by suggesting that companies that are leaders in CSR outperform peer companies in stock price performance. Others argue that competitive
advantage is achieved by gains in reputation and or public acceptance. The point is that the popularity of CSR is not only attributed to business ethics but also to competitive strategy (Peterson et al. 2005). This becomes particularly apparent when a “stakeholder” view is considered rather than simply a “shareholder” view. Table 2 illustrates what a stakeholder summary might look like for a public forest products company in Canada.

Table 2. Stakeholder Summary for a Public Forest Products Company

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Interest</th>
<th>Influence/Power</th>
</tr>
</thead>
</table>
| Shareholders (represented by Board of Directors) | - maximize value of the firm  
- (Ethical interests) | - provide direction for management on major decisions such as policy and strategy |
| Customers                          | - reliable delivery, consistent quality, low cost  
- Ethical interests | - ability to impact revenues based on choice  
- demand impacts production and/or price  
- can pressure supplier to provide assurances that are not related to the product based on ethical interests (e.g. Certification) |
| Creditors                          | - minimize risk of default  
- (Ethical interests) | - covenants on debt can limit management flexibility  
- convertible debt can give shareholder power |
| Employees                          | - jobs, fair working conditions  
- personal agreement with job and company direction | - limited influence as individuals  
- significant influence collectively |
| Government                         | - minimize risk of default (stumpage and other revenues)  
- environmental performance | - collect a well defined series of revenues  
- can penalize for environmental offences |
| Local Community                    | - employment  
- minimize risk of default (stumpage, taxes, and donations)  
- environmental performance and ethical interests | - limited influence on the surface  
- more influence considering that membership comprises a component of all other stakeholders  
- some influential segments (e.g. Chamber of Commerce) |
Stakeholder Analysis

The primary stakeholder for a public company should be its owners or shareholders. For shareholders the primary objective must be return on investment, either through dividends or capital appreciation, or both. However an interesting trend that has occurred more recently is the popularity of “ethical investing”. It may be that some investors are willing to forego some level of profit for the assurance that companies within their ownership are operating in a socially acceptable or ethical manner. It is difficult to determine to what extent this would be true of individual and institutional investors in Canadian forest companies.

An important question, based on stakeholder analysis, is whether a public company should move toward carbon neutrality before receiving a legal mandate. The considerations include the potential impacts to shareholders, creditors, customers, and employees. While climate change action is likely not the primary concern of any single group of stakeholders it is very likely that it is either a secondary or tertiary concern to all. Therefore it would be in the best interest of the firm to address this in some manner.

Peterson et al. (2005) suggests that among all the various stakeholders that influence managerial decision-making, regulators are highlighted as the most effective. This is true particularly where there are trade-offs between profits and protection of the environment. As reporting requirements and codes of conduct become regulated, there will be a requirement for companies to comply. Currently, rather than forcing companies to begin
their green transformation, the present government tactic is to allow market incentives to motivate companies to change.

To reduce uncertainty, many companies will rely on being imitators and others will adopt climate change initiatives as a group. For example, as mentioned previously, FPAC has been moving the larger industry along the journey to a low carbon future. The decision to be made by individual companies is whether or not a first mover strategy would lead to profitable opportunities that present a competitive advantage. If this strategy were successful, it could only be sustained if they continue to redefine themselves as a low carbon leader with bold, new initiatives. Due to the imitation factor, a successful carbon strategy will soon lose its competitive advantage if it is not continually evolving.

To initiate a low-carbon culture within an organization, a logical first step for an early mover would be a focused effort on reducing their emissions or “carbon footprint”. The impacts of simple things like recycling programs or energy use in buildings are relatively easy ways to get people on board before instituting bigger changes in the future. Through sourcing ideas with staff involvement, there will undoubtedly be innovative options to reduce GHG emissions in the company. Considering the concept “what is measured can be managed”, the starting point would be to define the current carbon footprint for the company as a baseline. Knowing this baseline will allow the company to set visible goals in reducing the carbon impacts of their business. This can be a win-win both from a cost reduction and an employee engagement perspective. An additional upside is the potential to create a trading surplus of carbon credits which could in effect make the company a
seller rather than a buyer in a future cap and trade system, thereby creating a competitive advantage among its peers.

**Environmental Scan (PEST Analysis)**

Before beginning to formulate strategy, a company must scan the external environment to identify external factors that can be exploited. Research has shown a positive correlation between environmental scanning and profits (Hunger and Wheelen 2007). The PEST analysis is done by simply detecting and analyzing the major forces that are at play mainly outside the company’s industry. These forces can be broken into four categories: Political-legal, Economic, Societal, and Technological (Appendix I).

**Political-Legal Forces**

Within western Canada, the political-legal situation has also been changing with respect to climate change. In an effort to drive changes at home, the BC government passed the Greenhouse Gas Reduction Targets Act in 2007 and the Greenhouse Gas Reduction Act in 2008. The Reporting Regulations under the latter was enacted as of January 1, 2010 requiring emitters of over 10,000 tonnes of greenhouse gases to report their emissions. At the same time there have been efforts to move to a low-carbon economy by using market forces. Evidence is seen with voluntary actions and commitments such as combining with the Western Climate Initiative (WCI) and instituting a mandate and mechanism by which all government agencies are to become carbon neutral. As mentioned previously, the PCT was established to make local carbon offsets in BC available to meet this goal.
Considering the various standards available, a proponent of a forestry project must consider which protocol would look most favourably on their project. In general, forestry projects have not been a primary focus of many schemes and therefore several protocols are either new or still under development. Having a clear understanding of the rules and how they are applied is critical to a project’s success. Also important is the stability over time of these protocols. Forestry projects are long in duration by their very nature and typically will not yield immediate carbon storage results. Therefore a serious risk is that standards may change over time due to new science or political agendas. These are important risks to consider prior to investment.

**Economic Forces**

The forest industry worldwide has suffered through one of the worst ever economic downturns. Following one of the deepest and longest troughs in commodity price cycles from 2005 to 2008, the worldwide recession struck in the late 2008 which continues to impact business of all sorts. One of the ways that federal governments have attempted to stimulate economic growth is by using debt to create vast amounts of “stimulus” money available to encourage economic growth through retail spending and investing. An effect of the economic recession is monetary and other policy incentives that promote the renewable energy industry which is viewed as a necessary transition to reduce dependency on fossil fuels over the long term. For example, the Canadian Government has committed $1.5 billion to encourage the forest industry to diversify into green energy.

\[\text{www.env.gov.bc.ca/epd/codes/ggrcta/reporting-reg.htm accessed April 23, 2010}\]
energy\textsuperscript{17}. Another recent trend on the world scene has been the economic rise of the BRIC nations. These four developing countries - Brazil, Russia, India, and China - have all experienced economic growth and prosperity that has increased the individual standard of living in these regions and this growth is expected to continue\textsuperscript{18}. This has implications for the west, not the least of which will be an increased burden on global resources, including energy.

In the European Union Greenhouse Gas Emission Trading System (EU ETS), the 2008 reporting showed that emissions were reduced overall by approximately 4.6\% but was still short of the overall target. This reduction is predicted to be 30\% due to cap and trade, 40\% due to recession, and 30\% due to energy conversion (World Bank, 2009, 7).

**Societal Forces**

According to a Globescan survey conducted in late 2009 for the BBC World Service, 64\% of people think that climate change is a “very serious” problem, up from 44\% in 1998. According to Globescan chairman Doug Miller, “The poll shows strong worldwide support for action on climate change, in spite of the recession.”\textsuperscript{19}.

While the world is composed of a diverse mosaic of societal interests, environmental consciousness is one trend that can be identified. Based on the behavior of democratic

\textsuperscript{17} http://www.trurodaily.com/Business/Natural-resources/2010-02-02/article-822235/Forestry-industry-must-diversify,-capitalize-on-demand-for-green-energy:-study/1 accessed April 23, 2010


\textsuperscript{19} http://www.mundgroup.com/archivos/Series_9_Number_41_MUND_GlobeScan_BBC_Climate_Change_in_Public_Opinion.pdf accessed April 23, 2010
nations, it can be argued that climate change consciousness is strong within Europe, with growing concern from all other jurisdictions as demonstrated by the regulatory and incentive-based actions of these governments. At COP 15, one common theme was the tension between developing countries not wanting to be economically constrained by emission reductions and the unwillingness of developed nations to fund the transformation to a “green economy” in these countries.

**Technological Forces**

In most industries, technology continues to drive change rapidly. Since the rise of the internet and continued advances in wireless communication our society has become increasingly dependant on technology in our daily lives.

During the recent period of rapid technological advances, there has not been an abundance of technological changes in the forest industry. Research and development has largely been a function of pooled industry/government-funded resources (e.g. Forest Engineering Research Institute of Canada - FERIC) rather than investment from individual firms in the forest sector. The focus of technology has been to increase the efficiency and production of manufacturing facilities, which in BC are generally considered world class.

**TOWS Analysis**

A TOWS analysis is a helpful tool to examine the competitive landscape for a forest products firm exploring carbon strategies (Appendix II). This tool is a variation of the
more common SWOT analysis and explores how the Threats, Opportunities, Weaknesses, and Strengths of the firm interrelate with each other and lead to potential strategies that can be further evaluated. Drawn as a table, this chart surveys both dynamics within the company and the competitive landscape outside of the company. This gives an indication of where the inherent competitive advantages lie both for a forest company in the larger carbon market and as an early mover within the forest sector. This exercise also examines the characteristics, capabilities, and market position of a firm that can be successful with a carbon strategy. The result is a visual display of where a forest company can leverage its strengths within the broader carbon market.

**External Threats**

One of the threats to pursuing a carbon strategy is the prospect, however remote, that the commonly accepted theory of global warming is in fact proven false with no risks to current or projected future emission levels. There has always been a portion of the scientific community that has not been convinced that the planet is becoming harmfully warmer. Recently this movement has gained momentum as emails from IPCC scientists were recovered that suggested data tampering has occurred in previous studies\(^20\). These serious allegations have had international experts calling for an explanation to these claims including distinguished Canadian scientist Andrew Weaver calling for the resignation of the IPCC chair\(^21\). While this specific matter remains to be resolved, the general conclusion that the earth is warming has been reached by many different studies.


Much critical thought has been put into this question and a general consensus has been reached. Considering this, the chance that global warming is not occurring is likely remote.

Assuming that climate change is occurring, other threats would include whether a forest company would have the financial means to become a carbon player in a meaningful way. As the forest industry worldwide is reeling from economic pressures, the survivors are not showing strong balance sheets, compared to companies in the energy sector for example. Also, one would have to consider the inability to achieve international agreement on climate change mitigation as a threat to any company’s carbon strategy. The recent Copenhagen conference is testimony to how difficult it will be to reach consensus, which could be an easy way for non-performing nations to opt out of any meaningful commitments and undermine a collective process.

**External Opportunities**

It appears that several opportunities are on the horizon. The first is the fact that the carbon market is young which indicates that the steep growth in both projects being developed and carbon traded will continue for some time yet. This growth would only be enhanced by a regulated cap and trade scheme in North America and in other global regions. The belief that this growth will occur is supported by the current interest of buyers in the carbon futures market and the desire to purchase call options as noted earlier.
Another opportunity can be in branding and marketing for forest companies and their products. As the public seems to be ever more aware of the climate change concern and more demanding of companies that produce consumer goods, it is reasonable to expect the standards for climate action to increase. This trend has been seen through the past 20 years with sustainability concerns in forest practices which eventually led to wide scale third party certification throughout the Canadian Industry. With 145.7 million hectares of land under third party certification, Canada now has 40% of the world's certified forests\textsuperscript{22}. Much of this change was driven by the expectations of customers or retailers. For example, home building center RONA has committed to only selling third party certified wood products by the end of 2010 with at least 25% being Forest Stewardship Council certified by the end of 2012\textsuperscript{23}. Given this progression in the relationship between customers and suppliers, how long will it be before the powerful retailers of forest products demand carbon neutrality from producers?

As discussed previously, the province of British Columbia has made a concerted effort to be a leader in the low carbon economy and is actively seeking to purchase carbon offsets from verified private sector projects. Meanwhile the acceptable list of forestry projects seems to be expanding within many protocols. As it was recognized that land based offsets are an important part of lowering greenhouse gas levels, and that the Kyoto Protocol has not attracted sufficient investment, there is a movement to encourage and

expand these types of offsets. Within BC for instance, the PCT has the objective to expand its forest offset protocol once the initial protocol is established (Raymer, 2009).

**Internal Weaknesses**

One of the drawbacks for Canadian forest companies, particularly in the west, is the lack of private land ownership. As the vast majority of their operations occur on Crown land under various forms of tenure, the assurance of benefit from long term carbon sequestering activities are uncertain at best. Even if the rights and assurances were granted, Canadian forests are also at an investment disadvantage due to short growing seasons. This limits the amount of CO₂ that may be captured compared to other countries on a per dollar of investment basis. Another weakness is that there is a notable lack of expertise of carbon trade within the industry including amongst many of the consultants that support the industry. Finally, with most or all Canadian forest companies having tight budgets and scrutinized cash flows, there may be limited options for financing new investments in forestry projects. This resourcing challenge cannot be understated. By contrast, companies from the finance and energy sectors, likely through their own retained earnings, are financing several forestry projects being conducted throughout the world.

**Internal Strengths**

Inherent to the strengths of forest companies is that they carry the well-earned experience and expertise in silviculture operations. This not only includes manpower but also key
assets such as seed orchards and nurseries. These skill sets and vertical integration have occurred over many years and could not be quickly replicated. Another strength is sustainable practices. This gives the advantage of both being well-versed in various protocols for third party certification but also affords the benefit of reputation in the marketplace. Operational efficiencies round out the list of strengths carried by Canadian forest companies. While there has not been a lot of strategic diversification in the industry (outside of sales and marketing), there has been a tremendous movement in lowering costs and improved utilization that has occurred in recent years. Economist and strategy guru Michael Porter would describe this as approaching the “efficient frontier” which has been required through fierce competition in the industry. This competition has led to an industry that is lean and efficient.

Figure 4. Efficient Frontier

Strategic Alternatives

In order for a company to effectively implement strategy, it must make a conscious decision of what it must give up. This concept of trade-offs is an important consideration because without it the firm is in danger of straddling which tends to make both the company’s core business and new business less effective and easily imitated by competitors. According to Porter (2008, p70), “Strategy is making trade-offs in competing. The essence of strategy is choosing what not to do.” In considering a carbon strategy, a forest products company must therefore think about what it is willing to give up in terms of trade-offs. The Canadian forest industry has been forced to reduce its cost structure and create operational efficiencies over the past several years. When operating toward the outer edge of the “efficient frontier”, gains in one area will come at a cost to another. Companies that have survived the recent economic downturn are now operating closer than ever to this theoretical threshold in producing forest products. However it may be argued that they have not done well to lessen competitive forces through product diversification or developing niche markets.

It remains unclear as to whether direct investment in forestry carbon can be a profitable venture at today’s prices. Nonetheless various projects are being initiated in Canada, most notably in afforestation. Further to this idea, Stavins (1999) notes that the marginal costs (opportunity costs) on higher quality agricultural lands sharply increase when considered for afforestation use. Tropical deforested regions have been considered to be more efficient carbon storage engines and generally offer lower opportunity costs for the land
than many temperate regions (Newell and Stavins, 2000). However, a recent study has found that cool, moist, temperate forests provide the optimal carbon storage potential of any global forest region (Heather et al. 2009).

Hoffman (2008) suggests that it is critical for a company to know their price for carbon prior to a regulated environment in order to form an intelligent strategy. He also recommends that companies use benchmarking. This is the done by comparing your company’s processes and practices to the best companies within and outside your industry, through direct observation. This is a way of learning from others’ successes.

**Industry First Movers**

Despite North American forest product companies being largely unprofitable for some time, there are indications that forest companies are beginning to consider their role in climate change. For instance Weyerhauser recently announced that they have reduced their carbon footprint by 10% from the year 2000.\(^{24}\) As a company, they have committed to reducing their carbon emissions by 40% from 2000 levels by the year 2020. Their stated primary method to achieve this goal is by deriving more of their energy requirements from carbon neutral biomass. This proposal is expected to benefit shareholders through lower energy costs. Thus the company has began the process of measuring their carbon footprint through energy use at processing facilities and the emissions given by their transportation fleet. In measuring their carbon footprint, Weyerhaueser uses the Greenhouse Gas Protocol Initiative’s Greenhouse Gas Protocol,

Revised Edition\textsuperscript{25}. Their carbon accounting process through this protocol normalizes the baseline to consider the effect of acquisitions and divestures. In this way emissions reductions are not understated or exaggerated as a result of the selling and buying of company assets. While they have not yet recanted their 40\% reduction pledge, they are now stating that the target may have to be revisited because of the economic downturn and the capital required to make the switch to bio-energy on a large scale.\textsuperscript{26} On March 18, 2010, the company announced that it would become the twenty-ninth member of the U.S. Climate Action Partnership group which is lobbying coalition of companies and NGOs that are promoting federal climate and energy legislation in the United States.\textsuperscript{27}

AbitibiBowater has also chosen to proactively go down the path toward a low emissions future. Ranked the leading forest products company in the 2008 Climate Disclosure Leadership Index, they were determined to be best-in-class in disclosure practices and emissions reporting. Several initiatives have helped this company to reduce absolute emissions 51\% from 1990 levels. President and CEO David J. Patterson declares, “We are committed to reducing our carbon footprint and we want to become a carbon-neutral enterprise”.\textsuperscript{28} Other companies may be undertaking similar initiatives but not disclosing them publically.

\textsuperscript{25} http://www.ghgprotocol.org/standards/project-protocol accessed April 23, 2010
\textsuperscript{26} http://www.weyerhaeuser.com/Sustainability/Footprint/ClimateChange accessed April 23, 2010
\textsuperscript{28} www.americanprinter.com January 2009-Industry News
Potential Projects in British Columbia

The quantification framework for calculating forestry offsets in BC is summarized within the Emission Offsets Regulation. The regulation also requires that biological projects store carbon for the equivalent of 100 years or more and that payment is “ex post” which means after the offset is generated. Removals are calculated differently for projects that involve future harvest than those that do not (Raymer 2009). Currently the forestry offset protocols do not recognize the capture and storage of carbon within products in use. This has deterred investment in forestry projects. The problem of assessing carbon stored in manufactured wood products seems difficult when one thinks of all the different possible uses of the same product, especially lumber and panels. The other problem is that rarely will these products be in service for 100 years. However, by tracking product use, values can be assigned based on averages. For instance, a high proportion on sawn wood has a service life of 50 years, after which much ends up in landfills where at least 80% of the carbon remains after 46 years (Ximenes and Cowie 2008)

Land ownership or control is another important issue. Unless the land is owned or a legal transfer of rights is in place, any benefits by way of carbon offsets would not be realized. In Canada, this would mean either fee simple ownership, a long-term lease arrangement, or a long-term contract that secured control of the land base for the period in question. Since the majority of forest land is owned by the Crown, this becomes an obstacle for private investment.
Other important considerations for each alternative is local climate and site index. Within BC, there is much diversity in climate and site productivity. Other factors to consider are the rate of decay releasing carbon from debris, forest floor, and soil. These factors can also vary considerably based on site.

**Afforestation**

Afforestation refers to the process of converting denuded land to forested land. For example, stocking agricultural land with trees would be considered under this definition. The best opportunities here would appear to be with land that is both inexpensive and devoid of any requirement for site preparation. Inexpensive agricultural or range land in rural areas and is marginal in terms of farmland would be well suited. This land would also have to fall under for “change of use” status to be available for afforestation. Any potential benefits would be reduced by the need to undertake any form of physical treatment such as slash burning, brushing, mounding, or trenching. Not only would these activities incur immediate expense but they would also be an immediate source of carbon emissions through combustion, removing vegetation, and exposing soil. This could delay the time for the site to become a net carbon sink by as much as 30 years (Dymond and Spittlehouse 2009).

**Fertilization**

Fertilization projects have the opportunity to increase carbon uptake in forest stands by increasing the mean annual increment (growth rate) of the stand. These increases are for a finite period of time, not continuous or exponential. The amount of potential
enhancement varies according to tree species and site index. The incremental growth is what can be claimed as additional carbon capture.

The operational method to apply fertilizer to a forest stand uses aerial methods with a fixed wing aircraft or helicopter. While several projects have been conducted throughout the province for research or stand improvement that is funded publically, fertilization is not a common treatment method on Crown Land in BC. Through the various research projects conducted over time, there have been yield tables established to show how this treatment impacts growth of different tree species on various sites across the province.

**Select Seed**

Select seed projects are those that use planted seedlings selected for specific traits such as increased growth rate, volume, carbon content, or disease and pest resistance. These seeds may be from natural sources with superior provenance or from a seed orchard. In demonstrating additionality, the baseline condition would be one where select seed is not used or where an increased proportion is used from common historical practice.

In this study, the projected genetic gain used in scenarios 3 and 6 is 10% at 60 years.

**Eligibility Criteria**

The “British Columbia Forest Offset Protocol”\(^{29}\) was published as a draft for review on June 24, 2009. A final protocol is expected to be released soon. For the purposes of this study, the draft protocol will be used to examine eligibility and is summarized as follows:

Quantification of Project Reductions

In order to show how the results will be achieved, it must be tabled and graphed to demonstrate the amount claimed. Two methods are available under this section. The first is to grow trees with no harvest planned within 100 years, the second is to harvest within 100 years. This project will explore base case harvest scenarios at 60 and 100 years after planting, base cases with fertilization, and base cases with fertilization and select seed treatments applied.

Permanence

Risk is inherent with any forestry project or activity. Loss as a result of wildfire, insects, pathogens, or drought can all be detrimental to the permanence of a project and are called risk of reversals. The Emission Offsets Regulation of BC\(^{30}\) requires that risk mitigation and a contingency plan must be in place to demonstrate due diligence should a reversal occur. Some approaches that have been accepted in other protocols are:

1) to apply a discount factor to the amount of C stored
2) to establish a buffer pool, or
3) reversal replacement.

Within this project, a 10% discount factor was applied to the incremental carbon claimed which could be an acceptable way to address risk of reversal.

\(^{30}\) http://www.pacificcarbontrust.com/LinkClick.aspx?fileticket=r%2BIAy2pzzxY%3D&tabid=90 accessed April 23, 2010
Leakage

The protocol currently recognizes the potential for unanticipated decreases or increases of GHGs, caused by the project, realized outside of the project boundaries. The protocol describes how government can address these concerns but offers no specific guidance to proponents at the project plan stage.

Inventory and Monitoring

Established procedures in the forest industry should be used by proponents to collect tree stocking and growth information. This would include silviculture surveys and change monitoring inventory using vegetation resource inventory standards. A monitoring document must be submitted as part of the project report. Finally, all plans and associated data must be made publicly available as per the Emission Offsets Regulation.

Third Party Assurance

The project plan must be validated to ensure that the plan meets all the eligibility criteria. Similarly, the emission reductions or removals must be verified through the periodic project reports. These are quality assurance steps that must be conducted by a third party and signed off by a professional.

Modelling

Models are an acceptable means to quantify the baseline and incremental carbon stocks as they relate to a project. If the model is accepted by the protocol and a field study has verified the existing site conditions and other assumptions, then the project proponent is
able to proceed with the project on the basis of model simulation. As monitoring occurs
over time, the proponent is able to correctly set the parameters in the model. There are a
variety of carbon models available and they all function to determine existing carbon
stocks on a site and predict the effects of forest management activities. The workings of
the model is based on field study data showing relationships between measureable tree
growth and carbon that is stored, both above and below ground. Also the relationships
with site types and stand history give an indication of the carbon that is captured within
the soil. Both the TIPSY and CBM-CFS3 (see below) are stated to be pre-approved for
use in the aforementioned draft protocol.

Analysis Tools

Carbon Budget Model - CFS3

The model used for this analysis is CBM-CFS3\(^3\) which is an aspatial, stand and
landscape-level model used to simulate the dynamics of a variety of forest carbon stocks
(aboveground biomass, belowground biomass, litter, dead wood and soil organic
carbon). It is also compliant with the carbon estimation methods set forth by the IPCC.

It should be noted that all models have their own set of shortcomings that must be
recognized. For the CBM model it has been noted that yield tables for BC have been
overstating the true carbon yields on a number of sites. The means of correction
suggested by Natural Resources Canada is to use net merchantable volume yield curves
rather than those for gross volume (Kull 2010). Another concern with this model is that
carbon flux estimates from the model can have an uncertainty of at least 20%. Despite
these flaws, this model was chosen for this analysis since of the Canadian models available, the CBM appears to be the most widely recognized and has an intensive support mechanism that is consistently updating and improving the model’s results. With respect to the CBM’s shortcomings, it is often better to know where the deficiencies are and be able to compensate for them than to naively accept the results from other untested models without knowing their validity.

**TIPSY**

The Tree Interpolation Program for Stand Yields (TIPSY)

is a growth and yield program that produces stand yield tables and economic outputs created by two other models (TASS and SYLVER). It’s various versions have been in use since 1985 when it was developed for forest researchers. The outputs from TIPSY that were used in this exercise were yield tables and economic analysis based on a series of selected inputs and default values assigned in the program. These inputs were intentionally kept simple for this hypothetical example. These inputs also provide optimistic scenarios by design for the purpose of determining if any of the results would create an attractive case for investment. For example TIPSY default costs for site preparation, tree planting, harvesting, milling, overhead, and lumber prices were all factored into the NPV output.

31 http://carbon.cfs.nrcan.gc.ca/CBM-CFS3_e.html  accessed April 23, 2010
Other assigned variables used in this analysis were:

- Prince George, Sub-Boreal Spruce Biogeoclimatic zone
- 5% ground slope
- 100% Lodgepole Pine planted
- 1600 stems per hectare planted
- no real cost increases
- no operational adjustment factors

**Afforestation Project Description**

This exercise is being done as a “pre-screening” to acquire rough estimates on profitability and therefore the analysis is intentionally being kept simple. One of the requirements for developing an afforestation project with the CBM is to have yield tables for species and site in question. These tables were developed from the TIPSY model (Appendix III) and put into the CBM model for simulation.

In this analysis, two harvesting scenarios are examined. Both scenarios are situations where deforested land is planted to lodgepole pine at 1600 stems per hectare and eventually harvested. Lodgepole pine was the species chosen due to its versatility as a pioneer species and its ability to capture carbon faster than other species such as spruce or douglas-fir. Fertilizer treatments were applied earlier than what is typical for analysis timber objectives only. A stand age of 25 years is the TIPSY default for fertilization and was thought to be appropriate to allow the stand to sequester carbon faster and thereby limit some of the time risk in the project. The site chosen was one in the Prince George
area with a site index of 20\textsuperscript{34} (a relatively good site). A summary of the six different
scenarios is given below.

Scenario 1 – No treatments, harvest at 100 years
Scenario 2 – Fertilization at 25 years, harvest at 100 years
Scenario 3 – Select seed used, fertilization at 25 years, harvest at 100 years
Scenario 4 – No treatments, harvest at 60 years
Scenario 5 – Fertilization at 25 years, harvest at 60 years
Scenario 6 – Select seed used, fertilization at 25 years, harvest at 60 years

Assumptions
The model runs were done using generic assumptions with respect to the growing site
conditions and disturbance pattern over a 100 year period. A summary of these
assumptions are:

- Trees grown on previously deforested land.
- To mimic a project at a reasonable operational scale, 1500 ha total comprised of 3
  x 500ha areas, each with low residue and average, minimum, and maximum soil
  organic carbon respectively
- Yield tables were generated using TIPSY model for above ground biomass using
  “net merchantable volume” for growth yield.
- Results for net carbon sequestered were analyzed on a per-hectare basis.

\textsuperscript{34} Site index is a measure of site productivity for a given tree species. For example, SI 20 indicates that the
trees will on average be 20m tall at 50 years of age.
Financial Analysis

Each of the six scenarios are evaluated using a financial analysis with a spreadsheet. The variables observed in the analysis are discount rate (%) and carbon price per tonne ($/t C). The exercise is done for project screening purposes to see what conditions would be necessary to make an afforestation project a good investment in the BC interior including land purchase price. It will also give an indication of the relative value of the treatments of using select seed and fertilization on that site. The evaluation is based on net present value (NPV) which is the current value of future cash flows with a given discount (interest) rate. The tests are that the NPV would have to be positive and, at a minimum, must be sufficient to cover the initial land cost. As afforestation is within a forest company’s skill set, the assumption will be that if this test is met, then direct investment in forest carbon projects could be considered as part of a company’s carbon strategy for financial purposes. Table 3 shows the results of the financial analysis.

Other Assumptions

Discount Rate - For this exercise, rates of 3%, 5%, and 8% are calculated to show sensitivity and to cover a number of possible futures and expected returns. While rates of 3% to 5% have traditionally been used for forestry projects, 8% may be a more appropriate assumption for private sector investment that includes a risk premium.

Carbon Price – Carbon price is another uncertain area in the financial analysis. With Table 1 showing a list of current pricing, it is difficult to predict what prices will yield
into the future. The chosen scenarios, priced in real terms at $5, $10, or $20/t C, which would cover a range of $18.35 to $73.40/t CO₂ equivalent.

Setup Costs – Initial and ongoing costs such as third party validation and verification are not considered in this screening analysis. These are highly variable costs and their exclusion supports the evaluation of an optimal scenario.

Table 3. Summary Analysis – Carbon Afforestation Projects

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<th>NPV @ Discount rate</th>
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Discussion

The results of this analysis shows some valuable information. Based on the inputs and assumptions given, all of the 60 year harvest scenarios (4,5, and 6) result in a positive
NPV regardless of the discount rate or carbon price options used. By contrast, nearly all of the 100 year harvest scenarios (1, 2, and 3) had a negative NPV. This shows that the time horizon is a key factor to profitability potential. As might be expected, the opportunity for positive NPV also has a strong dependence on discount rate. A higher discount rate correlated to lower profitability in the results due to the concentration of cost early in the life of the project and revenues later in the project. Another interesting observation is that in every case, the NPV increases with both select seed and fertilization treatments applied.

Also critical is how management on the ground is conducted. For example, were intensive treatments required prior to planting the site, the proponent would not only be in a prolonged deficit financially but also in the amount of time before the project would become a carbon sink. For example typical stand initiation forestry treatments often include herbicide treatments, mechanical site preparation, and burning slash and debris to increase plantability, survival, and early growth. These are all treatments that rapidly accelerate GHG emissions (Kurz 2009) and therefore work against the objective of making a project profitable. Logically then, choosing a site that can facilitate growth without intensive treatments will likely make the difference between profit and loss.

The stocking density is yet another variable in the modelling inputs that could have an impact on results. The density of 1600 stems per hectare is commonly used in timber analysis and in industrial planting operations in managing for timber resources but this is not necessarily optimal for carbon and forest products. Harvesting at 60 and 100 years
were chosen arbitrarily for comparison purposes. In a real case study more modelling should be done determine what an optimal planting density would be as well as the optimal timing of harvest.

Other factors that would also have some bearing on the profitability of these types of projects would include real increases in land value and storage credit for carbon removed from the site and stored within long term forest products. If either of these possibilities were to factored into the analysis, it could alter the results substantially.

Results

In order to properly assess the option to directly invest in an afforestation project in the BC interior, land purchase price must be considered. The NPV from the financial analysis must exceed the cost of the land in order to make the project viable. A brief survey of land prices across the BC interior was used as a proxy for bare land values and converted to a price per hectare (see Table 4).

**Table 4. Survey of Bare Land Prices Across BC Interior**

<table>
<thead>
<tr>
<th>Location</th>
<th>acres</th>
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<td><strong>Average</strong></td>
<td><strong>605.8</strong></td>
<td><strong>$448.88</strong></td>
<td><strong>245.1</strong></td>
<td><strong>$1,818.62</strong></td>
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With an average land asking price of $1818 per hectare at the time of the survey, it appears that none of the scenarios would match this price and make the project feasible. However there is one property (Penny) where land could be purchased for less than the expected NPV for only the best possible case of all scenarios (i.e. $1221 - $1154 = $67/ha NPV). Consider that this marginal profit would require a high price for carbon ($20/t) and a low expected return on investment (3% not considering inflation). Given this result, it is fair to assume that while there may be conditions that provide for a favourable project in the interior, there is much downside risk with even the most optimal conditions. As companies are looking to invest in projects that exceed their cost of capital, this screening analysis does not show land purchase and afforestation projects in the BC interior to be financially attractive. Therefore, for a firm to incorporate a direct investment approach such as this into their carbon strategy, it would be for reasons other than financial.

Conclusions

As some of the literature and the strategic analysis suggests, there are several benefits to making a conscious effort to manage carbon. The important questions are what to do and how much? To some extent Canadian companies are finding economic opportunities in producing energy from the biomass that once was considered a waste product. This is a logical first step. If forestry offset projects are considered the next step then the analysis would suggest that now is not the time to take this step. Therefore, unless carbon prices exceed $20/t C ($73.40/t CO₂) or bare land can be acquired at a considerable discount, a company might be further ahead to purchase carbon permits or credits on the open market.
than to invest directly in this type of project. Unless you were a first mover in land acquisition, scarcity might also limit investment opportunity and increase cost.

It is assumed that afforestation projects that are currently being conducted in the BC interior are likely speculating on excessive increases to carbon prices to make it a profitable venture. They may also be counting on additional factors such as real land value increases or acceptance of carbon removed and stored in forest products. Another possibility is that ex ante sales are being made at reasonable rates in the voluntary market meaning that the time risk is considerably less.

If a forest company were to pursue forestry carbon projects, the purpose may be for corporate social responsibility or to gain knowledge and experience in the carbon trading process, which would provide some value. If this were the desired strategy, a cautious approach should be taken. Because of the substantial risks over long time periods that are inherent in these projects, projects that look good on paper could turn bad very quickly. As the analysis shows, profit and loss are sensitive to discount rates, land costs, and carbon price.
Recommendations

Given these conclusions what would be the best approach for a forest company to take now to position itself for a low carbon future and improve their competitive position in the broader carbon market?

The answer to this question partly lies in what resources of a given company can be provided without the output of substantial capital. The opportunity to re-deploy human resources comes into play in creating these low cost solutions. Financial resources in the forest sector should increase over time according to market cycles and continued operational efficiencies. As the markets for forest products strengthen, retained earnings will provide companies internal capital to take further initiatives and reduce the need to finance carbon reduction initiatives with debt or equity offerings.

The company’s first key initiative should be to establish its carbon footprint. This can be defined as, “The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide (CO₂).” Without a baseline measure, it is impossible to quantify the impact of your actions and any potential benefits to the company that could be claimed in the future. Footprinting is a detailed but well-defined exercise that can be done by consultants or in-house staff that are given the time to learn the process, gather the required data, and work through the various calculations. Several resources are available to assist a business in working through the process.
Another simple yet important step is to set goals and targets around environmental stewardship metrics. Indicators may be monitored in much the same way that they are for operational goals and targets. The way that this will impact the organization is to create awareness throughout the workplace that environmental stewardship, in this case carbon footprint, is important to the company. As these values are consistent with public opinion, it will not be difficult to create this culture shift within the organization. It may begin with things as simple as recycling programs, or enhancing energy efficiency through various means. If these small improvements are promoted and heralded, it can create momentum for other initiatives that employees from all levels of the organization can become involved in. These initiatives would serve multiple purposes by saving money in material and energy costs, promoting employee engagement and relationships, while at the same time reducing the carbon footprint of the company.

Even though the financial analysis in this project did not favour forest offset projects in the BC interior, it is likely that other parts of the world hold much more promise. A Canadian firm may first want to look at the BC coast where site index and growing seasons are substantially higher and longer. To that end, more financial analysis is required to look at these options as well as those in other part of the world.

**Two Paths**

It is proposed that a company may take one of two approaches with respect to a comprehensive carbon strategy. The first would be a more conservative approach that would move toward a low-carbon future, albeit more gradually than the first movers of

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35 http://timeforchange.org/what-is-a-carbon-footprint-definition
the industry. It would be more reactive to changes in market forces and legislation which would reduce both first mover advantages and downside financial risk. This strategy may be enacted by moving with an association such as FPAC that has a carbon-neutral agenda but also a large membership. This approach would not explore unproven technologies or direct investment in forest carbon projects.

The second approach would be characterized as one where a company would pursue a more aggressive strategy that would demonstrate more investment in green technologies, even some that are unproven. Direct investment in carbon forestry where there is a sound business case would also be explored. This approach must also include a strong public relations campaign in order to accept the benefits in terms of “social licence” through CSR activity. In order to not detract from the company’s core business, investment in carbon projects should be done through either a committed reserve fund for that purpose or by creating a subsidiary company in order to protect it from being evaluated on the basis of the core business.

Regardless of which path is chosen, a conscious decision must be made and understood. The strategy selected should be sufficient to provide vision and guidance in order to prevent confusion and conflicting decisions at different levels of the organization. The worst decision would be ignore the problem in hoping that it will be resolved without intervention. Another pitfall would be to ride the fence and try to select a middle ground that tries to execute both approaches, but not be successful at either one. To conclude, an effective carbon strategy must be well thought out, espoused at the highest levels, and
well communicated throughout the organization. This will be the basis for gaining employee commitment and successful implementation.
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### Appendix I – PEST Diagram

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<thead>
<tr>
<th>Political-Legal Forces</th>
<th>Economic Forces</th>
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<tbody>
<tr>
<td>Regional carbon trade framework can vary based on political will</td>
<td>worldwide recession</td>
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<tr>
<td>Climate change focus currently reflected in proposed or approved legislation</td>
<td>longer downturn in forest industry</td>
</tr>
<tr>
<td>cap and trade is the preferred mechanism for change</td>
<td>stimulus spending by governments to move to “green economy”</td>
</tr>
<tr>
<td>Canada criticized for being a laggard in climate change policy</td>
<td>- rise of BRIC nations</td>
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</table>

<table>
<thead>
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<th>Societal Forces</th>
<th>Technological Forces</th>
</tr>
</thead>
<tbody>
<tr>
<td>population growth and pressures on land</td>
<td>rapid technology changes worldwide</td>
</tr>
<tr>
<td>heightened environmental awareness globally</td>
<td>forest industry generally late adopters of technology advancements</td>
</tr>
<tr>
<td>worldwide concern about global warming</td>
<td>forest industry research is primarily publicly funded and government led</td>
</tr>
<tr>
<td>sharing of wealth is an issue between “rich” and “poor” countries.</td>
<td>trading markets appearing for voluntary and compliance carbon offsets</td>
</tr>
<tr>
<td></td>
<td>- new wood products or new uses for by-products targeted toward energy sector</td>
</tr>
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</table>
## TOWS Matrix

### O - External Opportunities

1. Developing market
2. Future market growth with cap and trade and recession recovery $1
3. Potential demand increase in 2011/12 to meet Kyoto commitments
4. "Green" marketing for existing products
5. Gov't incentives

### T - External Threats

1. Climate change debate not over?
2. Forestry firms financially inferior to other sectors
3. International uncertainty
4. Worldwide recession

### S - Internal Strengths

1. Silviculture assets - seed orchards or nurseries
2. Silviculture expertise
3. Sustainable practices
4. Operational efficiencies
5. Use human and/or facility resources to develop project for PCT (S1,S2,O1,O2,O4)
6. Explore product premiums for low carbon commitments (S3,O3)
7. Produce or buy pre-compliance credits to hold as appreciating assets (O1,O2)

### W - Internal Weaknesses

1. Lack of private forest land ownership
2. Short growing seasons
3. Lack of experience
4. Poor cash position
5. Start with projects that have win-win potential (W4,O4,O5)
6. Find partner on project in tropical or temperate zone (W1,W2,O1,O2,O5)
7. Partner with gov't with area-based tenures (W1,O4)
8. Develop expertise from consultants, new hires, or develop within (W3,O1,O2)
9. Use FIA funding to measure carbon footprint (W3,O4)
10. Benchmark those from other industries (W3,T2)
11. Look internally for low energy/emission solutions. (W3,W4,T1,T2,T3,T4)
Appendix III – TIPSY Inputs and Assumptions

All Scenarios

AGENCY : MOF Research Branch
PROJECT : Experimental

STAND
GEOGRAPHY: Prince George/Prince George/SBS/5% Slope
ESTABLISHMENT: Regen delay = 0; Target Density = 1600 trees/ha (Planted)

SPECIES
100% LODGEPOLE PINE; Site Index = 20.00
Site curve: *Thrower (1994)
Top Ht @ bh age 50 (m) = 20.00 (base)
Stock ht = 13cm

HARVEST COSTS
Road Development
No Commercial Thinning Costs
Final Harvest: $1550.00/ha
Tree-to-Truck (Ground Skidding)
No CT Cost Adjustment
Distance to Support Centre: 100 km

MILLING COSTS
(Exponential Equation/Interior)
Sawmill Capital Cost: $8.85/MBF
Cycle Time: 3.0 hours
Added Transport Cost: $0.00

OTHER COSTS
Overhead: $3132/ha
Annual Costs: $0.00/ha
Other Harvest Costs: $0.00/m3

LUMBER PRICES/MBF
2x4 $431.00 2x6 $422.00 2x8 $429.00 2x10 $514.00 Chips $110.00/BDU

ECONOMIC SPECIFICATIONS (All revenues and costs are in constant 2001 Canadian dollars)

DISCOUNTING
Discount Rate: 4.0%
Analysis Base Age: 0 years
Real Price Increase: 0.0%
Real Cost Increase: 0.0%
Scenarios 1 and 4 – No Treatment and Harvest

SILVICULTURE COSTS (Total: $1111.90/ha)

Survey: $15.00/ha  No PCT Costs
Site Preparation: $485.00/ha  No Fertilization Costs
Planting: $611.90/ha  Other Treatments (at age 0) $0.00/ha
(includes $0/ha for improved seed)  Total Silv. Treat. Costs: $0.00/ha
No Brushing Costs

Total Regeneration Costs: $1111.90/ha

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<th>Merch</th>
<th>Harvest</th>
<th>Tree-to-</th>
<th>Haul</th>
<th>Milling</th>
<th>Average Conversion</th>
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<td>Vol (cub ft/ha)</td>
<td>Revenue ($/ha)</td>
<td>Truck Cost ($/ha)</td>
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Scenarios 2 and 5 – Fertilization and Harvest

SILVICULTURE COSTS (Total: $1411.90/ha)

Survey: $15.00/ha

No PCT Costs

Site Preparation: $485.00/ha

Fertilization #1 (age 25): $300.00/ha

Planting: $611.90/ha

Other Treatments (at age 0) $0.00/ha

(includes $0/ha for improved seed)

Total Silv. Treat. Costs: $300.00/ha

No Brushing Costs

Total Regeneration Costs: $1111.90/ha

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<tr>
<th>TIPSY</th>
<th>Top/</th>
<th>Merch</th>
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62
Scenarios 3 and 6 – Select Seed, Fertilization, and Harvest

SILVICULTURE COSTS (Total: $1459.90/ha)

Survey: $15.00/ha No PCT Costs

Site Preparation: $485.00/ha Fertilization #1 (age 25): $300.00/ha

Planting: $659.90/ha Other Treatments (at age 0) $0.00/ha

(includes $48/ha for improved seed) Total Silv. Treat. Costs: $300.00/ha

No Brushing Costs

Total Regeneration Costs: $1159.90/ha

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## Appendix IV – CBM Modelling Outputs and Financial Analysis

### Scenario 1: Harvest at 100 Years, Soil Land

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### Assumptions

- Carbon mitigation cost $50.00/t
- Discount rate 10%

### NPV for harvested age 100 years

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### Scenario 2 - Fertilize, Harvest at 100 Years, 5% Land

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For a 5% discount rate, the NPV is $240,415. For a 0% discount rate, the NPV is $670,258.
### Scenario 3 - Select Seed, Fertilize, Harvest at 100 Years, Soil Land

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### Assumptions
- Carbon market price:
  - Year 0-1: $73/ton CO2
  - Year 2-3: $75/ton CO2
  - Year 4-100: $77/ton CO2

### Discount Rates

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<td>Year 4-100</td>
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### Carbon Credits
- 1 ton CO2 = $73, $75, $77
- 1 ton CO2 = 0.1 ton CO2 = $7.3, $7.5, $7.7
- 1 ton CO2 = 0.01 ton CO2 = $0.73, $0.75, $0.77

---

66
### Scenario 4 – Harvest at 60 Years

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**Assumptions**

- Carbon market price: 5
t
- Discount rate: 3% 5% 8% 10%
- NPV at $5/t (harvest at year 60) $330.0
- Discount factor (risk of reversal): 10%
Scenario 5 - Fertilize, Harvest at 60 Years, Sell Land

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</table>

Assumptions

Carbon market price/t $5/t, Discount factor of recovery 1/06, 1/05, 1/03

NPV at 1/06 $564.17, $623.31, $650.02

NPV at 1/05 $727.01, $767.48, $771.05

NPV at 1/03 $1,103.14, $1,056.32, $1,055.15

Carbon market price/t $5/t
### Scenario 6 - Select Seed, Fertilize, Harvest at 60 Years, Sell Land

<table>
<thead>
<tr>
<th>Time Gap</th>
<th>Total Ecosystem Biomass</th>
<th>DOM</th>
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<th>Discounted</th>
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</table>

**Assumptions**

- Carbon market price: $5/t
- Discount rate: 3% (90% present value)
- MPV at $10/t: $1,034.03
- MPV at $20/t: $2,465.32

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Value</th>
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<tr>
<td>Discount rate</td>
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<td>MPV at $20/t</td>
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**Note:**
- **DOM** stands for domestic
- **MPV** stands for maximum present value
Scenario 4 Harvest at 60 Years, Sell Land

Scenario 5 - Fertilize, Harvest at 60 Years, Sell Land

Scenario 6 Select Seed, Fertilize, Harvest at 60 Years, Sell Land