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Potential factors affecting competition for private land between Forestry and Agriculture in Canada

by

Patience Silundi Tshuma

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Dedication

I can do all things through Christ who strengthens me (Philippians 4:13).

This thesis is dedicated to three very important people in my life: my husband Patrick, my daughter Khanyisile and my late mother Siphiwe Gabela.

Abstract

This study assesses two factors which could influence the competition for private land between agricultural crops and hybrid poplars in Canada: tax policy and investment portfolio diversification. I find differential treatment of trees for property tax purposes across provinces, but negligible differences with respect to income taxes. I also examine the use of Real Estate Investment Trusts (REITs) - an alternative corporate tax structure for land ownership – in the context of tree and agricultural production that could confer tax benefits to farms with hybrid poplars. I find that existing rules, such as restrictions on foreign ownership of land and non-recognition of timber cutting contracts as rental income, pose significant barriers to farmland and timberland-based REITs. Lastly, I estimate a Capital Asset Pricing Model to compare the systematic risk added by farmland and timberland to a diversified portfolio. Both assets have zero betas indicating neither is favoured on private land.

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Chapter 1: Introduction

1.1. Background

The last decade has seen growth in the Canadian bio-energy industry driven by government sponsored subsidies to boost production on the supply side (Walburger et al., 2006) and Federal level mandatory blending of biofuels in gas on the demand side[1] (Kumarappan et al., 2009). As the industry expands, ligno-cellulosic feed stocks could play a larger role in biofuel production (Mabee & Saddler, 2010). In addition to forest and agricultural residues, plantation trees such as hybrid poplars have been identified as good candidates for producing ligno-cellulosic biomass (Mizrachi et al., 2012). Hybrid poplars result from cross breeding members of the *Salicaceae* family (i.e., poplars). The primary reason for cross breeding is to combine desired attributes from different species. Hybrid poplars are fast-growing trees which can be harvested on short rotations of between 7 and 20 years (Perlack et al., 2005).

These hybrid poplar trees will have to be grown on private land because current Canadian law prohibits the establishment of genetically modified tree plantations on public land (Cairus, 2008). The future role of the hybrid poplars could therefore be influenced by the extent to which growing the trees on private land can compete with current uses of the land such as agriculture. Therefore, the economic issue addressed in this study is investigating factors which could influence the competition for private land between hybrid poplars (trees) and traditional agricultural crops. We explore two factors: taxation policy and the investment value of the land.

The existing tax policies could have an impact on the competitiveness of growing trees on private land. The tax policies could favour one land use over another. For example, farmland

[1] Bill C-33 mandated use of 5% bio-ethanol by 2010 and 2% biodiesel by 2012, in the Canadian transport sector (Kumarappan, Joshi, & MacLean, 2009).

is subject to low property taxes because it is valued at low rates when assessed for tax purposes (Slack, 2010). This favourable assessment only applies if the land can be classified as “farmland” according to the *Municipal Assessment Act* (Assessment Act, 2013). The classification is only accorded if qualifying crops are grown on the land. If hybrid poplar trees are not recognized as a qualifying crop, this could favour agriculture over trees on private land.

When filing tax returns, persons reporting income designated as ‘farming income’ are eligible for tax credits, lifetime capital gains exemption and are also able to deduct all farm business expenses including interest on loans (LeBlanc, 2006). If income generated from the sale of trees is not considered ‘farming income’ then agriculture could have an advantage over trees on private land with regards to income tax. The income tax rule regarding the length of time allowed to carry forward losses to a future tax year could also contribute to the competition. Carrying forward losses enables farmers to offset potentially large tax bills in the future (Canada Revenue Agency, 2012). Agricultural crops are produced annually while trees have longer rotation periods. If the tax system does not allow losses to be carried forward over sufficiently long periods to grow trees then this could favour agriculture over trees.

An extension of taxation which will also be looked at relates to corporate structure and private land ownership. Private land in Canada could potentially be owned through a corporate structure called a Real Estate Investment Trust (REIT). A REIT is a corporation or trust which owns and manages commercial or other income-producing properties (equity REIT) and/or mortgage loans (mortgage REIT) (Mull & Soenen, 1997). REIT status has a tax savings benefit since any corporation structured this way is exempt from paying corporate tax (Deloitte, 2004).

The competition for land between traditional agriculture crops and hybrid poplars could also be influenced by the investment value of the land. The investment value has to do with which of the two competing land uses provides better diversification to investors' portfolios. Both farmland (Barry, 1980) and timberland (Binkley et al., 1996) have been shown to have positive benefits when added to a diversified portfolio in that they introduce very little systematic risk and they exhibit low or negative correlation with other financial asset.

Studies that quantify systematic risk associated with adding an asset to a diversified portfolio typically use the Capital Asset Pricing Model (CAPM) (Fama & French, 2004). The CAPM estimates a beta parameter which is a measure of the systematic risk (Perold, 2004). The general consensus in the literature is that farmland is a zero beta asset that adds no systematic risk to a well-diversified portfolio and is independent of movements in the general equities market (Barry, 1980; Irwin, Forster, & Sherrick, 1988; Lins, Sherrick, & Venigalla, 1992; Newell & Lincoln, 2007). Timberland on the other hand was initially found to be a negative beta asset implying that it reduces overall systematic risk in a diversified portfolio and moves in an opposite direction to the movements of the market (Binkley et al., 1996; Cubbage, Harris, & Redmond, 1989; Wagner & Rideout, 1991). More recent studies have found timberland to have a positive and low beta (i.e., beta less than 1), but this still makes the asset good for diversification (Cascio & Clutter, 2008; Sun & Zhang, 2001). The amount of systematic risk each asset class adds could therefore influence which land use is favoured between growing trees and crops. The asset with the smaller beta could be the most desirable.

The primary objectives of the study are to:

1. Review current Canadian tax policies and explain how they could influence the competition for private land between trees and agricultural crops;
2. Review the current Canadian REIT policy, and describe how the legislation regarding REITs could be changed to accommodate timberland and farmland REITs;
3. Investigate the portfolio diversification potential of farmland and timberland investments and identify how this will influence competition for private land.

Building on the third objective, a secondary objective will be to investigate whether there are differences in diversification potential due to soil quality variations.

The scope of the study will cover four provinces that were the focus of the main project; namely, British Columbia, Alberta, Saskatchewan and Manitoba. British Columbia is ultimately excluded from the farmland beta studies because of the large variations in farmland value when compared to the other three provinces. The focus is on the earlier provinces because a study found that establishing poplar plantations in the western Prairie provinces would be economically viable because of the larger agricultural land areas and generally lower rental costs (Yemshanov & McKenney, 2008).

1.2. Organization of the thesis

The rest of the thesis is as follows: Chapter 2 reviews property and income taxes as they relate to farms when trees are part of the operations; then Chapter 3 looks at the current Canadian REIT policy and what legislative changes are required for timberland and farmland REITs to exist. Next, Chapter 4 is an application of the CAPM to farmland and timberland returns to investigate which of the two land uses has the best portfolio diversification benefit. Finally, Chapter 5 is the conclusion.

Chapter 2: Impact of taxation policy on the adoption of hybrid poplars.

Tax policy could play a role in creating incentives for one land use over another on private land in Canada. If the tax system treats agriculture and forestry differently, this could influence the competition for land between the two by conferring the land use with the preferential tax treatment an advantage. The differential treatment of agriculture is not uncommon: governments have traditionally encouraged the maintenance of land in agricultural use through numerous tax incentives (Hicks, 1983). Tree plantations competing for private land could therefore be at a disadvantage unless they can also be eligible for similar tax exemptions as agricultural crops.

Two types of taxes that could treat agriculture and trees differentially are property tax and income tax. The federal government is responsible for collecting income taxes while property taxes are the domain of the provincial governments (Veldhuis & Walker, 2006). The lower farm taxation rates for property and income, are applied contingent on the land being classified as "farmland" (Slack, 2010), and the income qualifying as "farm income" (LeBlanc, 2006). To attain farmland status and for revenue generated from that land to be recognized as farming income depends on the types of crops grown (Veldhuis & Walker, 2006).

There are wide ranging regulations and property taxation policies across the different provinces in Canada. Some provinces recognize hybrid poplars and other fast growing exotic tree crops as agricultural crops, allowing hybrid poplar growing to obtain lower farm taxation rates, while others have specific classifications for woodlots. Other provinces have no specific provisions for tree plantations. It is therefore important to take an in-depth look at the various property tax laws in the provinces of interest in this study; i.e., British Colombia, Alberta, Saskatchewan and Manitoba. Of particular significance is how these property tax rules treat trees included as part of the farm operations.

This chapter will review the current property and income tax rules as they relate to agriculture and trees grown on private land. For each type of tax, there will first be a description of the agriculture situation and then a discussion of how the tax rules treat intensively managed trees such as hybrid poplars on private land.

2.1. Property tax

It has reportedly become difficult to determine what constitutes a farming operation for property assessment and taxation purposes because of the way the agricultural industry has diversified into non-traditional agricultural enterprises such as tree plantations (Marz et al., 2002). Property tax rates vary not only across different provinces but also within the same province. The variation results from the fact that provincial governments delegate the duty of setting property tax rates, to the different municipal governments under their jurisdictions (Kitchen, 2004). Even though the final tax rates may differ, the provinces use a similar method to arrive at the property tax rate imposed.

The first step in setting the property tax rate is property assessment[2]. Property is assessed based on either its market value or its productive value. Market value is "the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale" (Floyd & Allen, 2000). Productive value is defined as "the ability of the land to produce income from the growing of crops and/or the raising of livestock" (Cassady, 2010)."

[2] Property assessment is the process of assigning a dollar value to a property for taxation purposes (MacNevin, 1998).

The second step in deriving the property tax rate is the actual calculation of the rate done by dividing the revenue requirement of the municipality by the assessment base (Cassady, 2010). [3]

2.1.1. British Columbia

Although most land in British Columbia is assessed at market value, farmland is "valued at its actual value as a farm, without regard to its value for other purposes" (Assessment Act, 2013). This valuation method results in farmland assessments far below market value (British Columbia Assessment, 2013).

The definition of a farm operation in the British Columbia *Right to Farm Act* includes "intensively cultivating in plantations, any specialty wood crops" (Ministry of Agriculture, Fisheries and Food, 2004). This definition makes British Columbia the only one among the surveyed provinces to recognize intensively managed wood crops such as hybrid poplar plantations in its tax legislation. The regulation provides a tax incentive for the establishment of hybrid poplar plantations on private land (Derbowka et al., 2012).

The *Standards for the Classification of Land as a Farm Regulation* under the *Assessment Act* also recognizes trees in the *Populus* genus – which includes poplars – as primary agricultural products (Assessment Act, 2013). The condition set for hybrid poplar plantations to be classified as a developing farm is that "...in the case of products produced from primary agricultural production that require 7 to 12 years to establish after planting, there is a sufficient area prepared and planted to meet the requirements of this regulation when harvesting occurs and the assessor determines that there is a reasonable expectation of profit from farming" (Derbowka et al.,

[3] Revenue requirement is the amount of money which needs to be raised through collecting property taxes and Assessment base is the total value of all assessed properties in the municipality (Cassady, 2010).

2012). Hybrid poplar tree farmers seeking to benefit from lower property taxes assessed for farmlands will therefore be restricted to fast growing poplar trees which can be harvested within the stipulated 12 years. Beyond this timeline, hybrid poplar plantations are classified as privately managed forestland subject to assessment based on the land's tree growth rate capability. Although the privately managed forestland assessment is based on a forest use value not influenced by other market forces, the resulting property taxes due would be higher than if the land had been assessed as farmland (British Columbia Assessment, 2012). Privately managed forestland assessments are lower than the assessments based on market value but higher than assessment of farmland.

2.1.2. Alberta

The assessment of most property in Alberta is based on market value. However, there are exemptions made to regulated property such as farmland, which is assessed based on its productive value (Marz et al., 2002). The productive value of farmland is determined using a process that "sets a value for the best soils, and then makes adjustments for less-than optimum conditions such as stones, the presence of sloughs, or topography" (Cassady, 2010).

Alberta law does not have well defined property taxation policies relating specifically to farmland on which trees are grown (Derbowka et al., 2012). What exist are general property tax rules which apply to property in agricultural production on one hand, and tax rules which apply to woodlots on the other.[4] A property has to be in agricultural production for it to be taxed at the farm property tax rate (Alberta Agriculture and Rural Development, 2012). A farmer can establish a hybrid poplar plantation and still be eligible for the farmland being assessed on its

[4] "Woodlot is used in a broad sense to mean land covered with trees. A woodlot includes treed land held primarily as a source of fuel, posts, logs or trees, whether the trees are grown with or without human intervention" (Canada Customs and Revenue Agency, 2001).

productive value as long as the farmer continues with other traditional farming activities (Cosens, 2012). If the farmer exclusively engages in the production of hybrid poplars, then the land is considered to be in the use of a woodlot. Operating a woodlot in Alberta is viewed as the harvesting of a natural resource and not a farming activity; hence the land is taxed on its market value (Marz et al., 2002). Under the current conditions, hybrid poplar plantations on private land in Alberta only have a tax advantage when established where other farming operations exist.

The actual property tax paid by farmers is very little. For example a farm in Athabasca county with a market value of $700,000 was valued at $56,000 when assessed based on its productive value (Cosens, 2012). Based on the 2012 mill rate of 6.37 for this county (Alberta Municipal Affairs, 2013), the property tax paid would have been $356.72.

2.1.3. Saskatchewan

Saskatchewan offers a favourable property valuation and taxation rate that applies to rural land, most of which is used for agricultural purposes (Derbowka et al., 2012). The Saskatchewan Assessment Management Agency (SAMA) assesses farmland based on its productive value which results in low property tax being paid by farmland owners (Saskatchewan Ministry of Government Relations, 2013). Arable (cultivatable) land is assessed at 55 percent and non-arable (non-cultivatable) land at 50 percent of the assessed value (Saskatchewan Assessment Management Agency, 2013). Rural forestlands are on non-arable land which puts them in one of the of the lowest property tax classes (Saskatchewan Ministry of Government Relations, 2013).

To date, Saskatchewan has not made any specific policies or property tax measures which could promote the integration of hybrid poplars onto agricultural land in the province (Derbowka et al., 2012). Land on which trees grow is treated like rural property with a value similar to land used for crops or pasture in close proximity (Belcher et al., 2004). Therefore according to these existing tax rules, it would seem that hybrid poplars grown on agricultural land or other rural land would be assessed at low valuation rates.

2.1.4. Manitoba

Assessment of property in Manitoba is carried out by Assessment Services. Based on use, the properties are grouped into 10 property classes defined in the Classification of Property and Portioned Values Regulation (Local Government Assessment Services, 2013). Each class has a corresponding portion percentage which indicates the proportion of the market value used in calculating property tax. Farmland only pays taxes on 26 percent of its market value (Manitoba Local Government, 2013). Farmland owners therefore pay the lowest property taxes in the province.

Manitoba does not have policies and tax measures designed to encourage the establishment of hybrid poplars on private land province (Derbowka et al., 2012). Tree farming operations in general are considered "farming" as defined by the Municipal Assessment Act (Assessment Act, 2013). Private land owners operating hybrid poplar plantations as part of farming operations will likely be taxed at the farm rate.

2.2. Income tax

The definition of farming income for tax purposes includes money earned from tree farming (LeBlanc, 2006). This definition however does not explicitly mention how hybrid poplar tree plantations in particular will be treated. The Canada Revenue Agency therefore provides an interpretation of the income tax law which could see income from hybrid poplar plantations on private land qualifying for classification as farm income. The agency clarifies that for private land with trees to be classified as a farm, the private land first has to be classified as a commercial farm woodlot (Canada Customs and Revenue Agency, 2001). A commercial farm woodlot is one in which "the main focus of a business conducted with a reasonable expectation of profit must be the planting, nurturing and harvesting trees pursuant to a forestry management or other similar resource plan and significant attention is paid to manage the growth, health, quality and composition of the stands" (Canada Revenue Agency, 2012). Hybrid poplar plantations would satisfy this condition because of the intensive management regimes that would be adopted.

Because they are eligible for classification as commercial farm wood lots, future hybrid poplar plantations could qualify for income tax benefits similar to that of agriculture. The main special tax provisions for agriculture are income tax deferral, being able to claim a lifetime cumulative capital gains exemption of $750,000 on qualified farm property, and use of the cash method of accounting to calculate taxable income (Canada Revenue Agency, 2012).

Deferring income recognition to a future year has tax savings if the farmer has a lower marginal tax rates during the year in which the income tax is paid (Tax Bulletin, 2008). Commercial farm woodlots are eligible for income tax deferral of capital gains when farm property is passed from one generation to another (Canada Customs and Revenue Agency, 2001). There is a restriction on the amount which can be deducted in order to prevent a situation where farmers continuously defer taxes in successive years and avoid paying the full tax owing (LeBlanc, 2006). The same restriction applies regardless of whether the land is being used for agricultural production or a commercial woodlot operating as a farm.

The capital gains deduction may only be applied on a commercial farm woodlot upon sale of "treed land". The deduction cannot be claimed on the sale of timber, or on the sale of a license to cut and take timber since this is considered as the sale of personal property, which is not qualified farm property (Canada Customs and Revenue Agency, 2001). There are some countries (e.g., United States) which recognize the sale of timber as the sale of real property (Deloitte, 2004). If this were also the case in Canada then it would give forestry an advantage over agriculture in terms of capital gains deductions.

Farmers, unlike other businesses, can choose between using cash or an accrual method of accounting to calculate taxable income[5] (Tax Bulletin, 2008). When using the cash accounting method, cash is only reported when it is received meaning farmers report the actual receipts from selling farm products (Canada Revenue Agency, 2012). Using the cash method allows the farmer to defer income tax payable by deducting purchases of inventory even if the inventory is still on the farm and expected to be used in the following year (Tax Bulletin, 2008). The cost of all agricultural seeds can be deducted. However, the cost of purchasing tree seed or seedlings that have been planted is not considered as inventory and is thus not deductible (Canada Customs and Revenue Agency, 2001). This could put hybrid poplar tree plantation operators at a disadvantage when compared to other farmers exclusively engaged in traditional agriculture.

There is also the issue of the length of time in which losses can be carried forward. For both agriculture and trees, farm losses can be carried forward 10 years (Canada Customs and Revenue Agency, 2001). This could seem like a relatively short time for hybrid poplars with rotation ages which can range between 7 and 20 years. But since hybrid poplars will likely be

[5] Under the accrual method, a business reports sales billed for which cash payment has not yet been received as income (Tax Bulletin, 2008)

part of farming operations, losses can be deducted from other farm income so the 10 year period would not really matter.

The actual income tax savings of farming income are small. The magnitude of the impact of income tax on a representative cow/calf farm model in Alberta for example was found to be small. The net present value (NPV) of this farm decreased by 0.51 percent after income tax had been accounted for (see Appendix 1).

2.3. Summary

The objective of this chapter was to review property and income taxes to see if hybrid poplar trees grown on private land confer the same tax advantages as growing crops. There is only one case in the surveyed provinces where the property tax legislation favours trees over agriculture - Saskatchewan. This province is the only one which has lower valuation rates for forestland than for agriculture.

Another key finding is that, of the four provinces reviewed, British Columbia is the only one which recognizes tree plantations in the property tax rules. Intensively cultivating a specialty wood crop like hybrid poplar trees is clearly defined as a farming operation meaning the land would be eligible for lower assessment like any other farmland. However, if the rotation of the trees exceeds 12 years, the land is either assessed as a privately managed forestland or based on its market value. The other three provinces do not have explicit property tax laws concerning hybrid poplar trees.

The review also found that trees benefit from being part of a farm in Alberta. In this province, trees are only subject to higher property taxes if they are classified as a woodlot not part of a farm. Private land on which hybrid poplar are grown would likely be taxed at the low farm rates if there are other farming operations. This tax rule could discourage trees.

The Income Tax Act recognizes revenue from tree farming as “farming income” making it eligible for the same favourable tax benefits as the farm income from agricultural production. Therefore, it seems that the current tax system would be unlikely to influence the competition for private land between agriculture and trees. The tax regimes likely would not discourage agricultural producers who plan to diversify to include trees as part of their farming operations. Even though there are cases where the legislation favours trees, such as in Saskatchewan, the actual tax advantages are very small.

Chapter 3: The potential for Farmland and Timberland Real Estate Investment Trusts in Canada

This chapter is not only an extension of chapter 2 on taxation, but it also introduces the concept of the investment value of private land. Private land in Canada could potentially be owned through a corporate structure with tax savings benefits such as a Real Estate Investment Trust (REIT). The specific definition of a REIT in Canada is "either a publicly listed closed or open-ended trust that allows investors to purchase units of a trust that holds primarily income producing real estate assets" (Deloitte, 2004)[6]. REITs as an asset class originated in the United States during the 1960s (Block, 2011). The first Canadian REIT was listed on the Toronto Stock Exchange in 1993 (Londerville, 2002).

The main attraction of REITs for investors and investment management firms are the associated tax savings that come with acquiring REIT status. A REIT is described as a structure that minimizes the total taxes paid by a firm and its investors (Vijay, 2004). REITs avoid the "double taxation" problem inherent in corporations, which occurs when income is taxed at both the firm and shareholder levels. Firms pay corporate tax on their annual earnings since they are viewed as separate legal entities from their shareholders. When the dividend payments are made to shareholders, a personal tax rate is applied, even though the earnings which provided the cash to pay the dividends were already taxed at the firm level (Deloitte, 2004).

[6] There are three types of REITs: equity REITs, mortgage REITs, and hybrid REITs. "Equity REITs own and operate income-producing real estate. Mortgage REITs provide money to real estate owners and operators either directly in the form of mortgages or other types of real estate loans, or indirectly through the acquisition of mortgage-backed securities. Hybrid REITs use the investment strategies of both equity REITs and mortgage REITs" (Singer, 1996).

In both Canada and the United States, the status of REITs as pass through entities "enable the tax consequences to flow through the entity and reside with the shareholders" (Singer, 1996). This means the income earned in the REIT is not taxed at the trust level but is passed as taxable income to the shareholders, along with applicable Capital Cost Allowance (CCA) deductions (Londerville, 2002). In Canada, this rule not only avoids the double taxation problem, but also provides some tax shelter for the cash flow received if the investments are held in a tax-deferred account such as a registered retirement savings plan (RRSP) or in a pension fund (Assaf, 2006). A REIT only becomes subject to corporate taxation when it fails to distribute all of its income to shareholders. The corporate tax is then applied to the portion of income not distributed (Deloitte, 2004). REITs therefore allow investors to obtain a return on capital without paying a corporate tax on the gain (Singer, 1996).

Countries with REITs, including Canada, have modelled these investment vehicles according to the original ones in the United States (Campbell & Sirmans, 2002). The first United States REITs were built around real estate such as shopping centers, residential rental real estate, office buildings and warehouses (Block, 2011). The United States REIT industry has since been extended to ownership of both timberland and farmland. In Canada however, regulatory barriers have thus far prevented the emergence of timberland REITs (T-REITs) and farmland REITs (F-REITs).

Farmland and timberland have been shown in past academic studies to be valuable financial asset classes when added to a diversified portfolio (e.g., Barry (1980) & Painter (2010) for farmland and Binkley et al. (1996) & Cascio & Clutter (2008) for timberland). The Canadian market however lacks an equity market in both farmland and timberland real estate, which could provide publicly traded shares for easier access by small and medium sized investors. REITs built around farmland and timberland could provide access for smaller investors.

The subsequent sections of this chapter will start by comparing the American and Canadian REIT policies. Both T-REITs and F-REITs will then be examined, first looking at the current policy in the United States followed by a look at the potential for T-REITs and F-REITs in Canada. The specific Canadian legislation regarding acquiring REIT status that would have to change in order to accommodate T-REITs and F-REITs will be highlighted.

3.1. Differences in REIT policy between the United States and Canada

REITs in Canada were built in a similar, but not identical, manner to REITs in the United States. Key differences exist in the way REITs are structured and are shown in Table 1. The first difference is that Canadian REITs operate under a trust legal structure which must be an open- or closed-ended mutual fund subject to flow-through taxation rules, while United States REITs operate under a limited liability corporation structure (Kryzanowski & Tcherednitchenko, 2007). This structure affects liability of investors but not tax. In both cases, the structure of the REIT is subject to similar taxation benefits of allowing taxes to pass through the entity, thereby avoiding corporate tax and only being subject to tax at the investor level.

In the United States and Canada, a number of tests have to be passed for REIT status to be granted, namely the Real Property Revenue Test, the Passive Revenue Test, the Qualifying Property Test and the Non-Qualifying Property Test (Deloitte, 2004). The tests ensure that assets and revenues are restricted to real estate, plus a limited portfolio of securities (Campbell & Sirmans, 2002). The specific conditions set in each of these tests are slightly different in the two countries.

Under the Real Property Revenue Test, REITs in both countries should earn 75 percent of their income from real estate sources. The main difference between the two countries is that the United States recognizes timber gains as income from a real estate source but Canada does not. These timber gains are listed as passive revenue in the United States but not in Canada. The Passive Revenue Test ensures that a REIT earns income through passive sources, like rental income. In the United States 95 percent of the gross income earned should be passive revenue compared to 90 percent in Canada.

Table 1: Differences in Canadian and United States REITs

Feature	United States REIT	Canadian REIT
Vehicle	May be a corporation	Must be an open- or closed-ended mutual fund trust.
Liability of investors	Unlimited Liability	Liability of investors is limited due to use of corporate structure.
Real Property Revenue Test	REIT must derive at least 75 percent of its income from real estate sources including timber gains.	A REIT must derive at least 75 percent of its revenues annually from rent from real, immovable properties, interest from mortgages on real or immovable properties or capital gains from the sale of real, immovable property.
Passive Revenue Test	A REIT must derive at least 95 percent of its gross income from investment, which includes interest, rental income from real estate, timber gains and mineral royalties.	A REIT must derive at least 90 percent its revenues from rent on qualified properties, interest, capital gains from the sale of qualified REIT properties and dividends.
Qualifying Property Test	Qualified REIT property, which includes real estate, cash and cash items, and government securities, must comprise 75 percent of a REIT's asset value. A timber REIT specifically, must be a "REIT in which more than 50 percent of its asset value is real property in the trade or business of producing timber."	At least 75 percent of the REIT's annual equity value must be comprised of the total fair market value of a trust's real or immovable property.
Non-Qualifying Property Test	A REIT may hold 25 percent of its assets in non-qualifying REIT properties or taxable REIT subsidiaries.	A REIT may hold 10 percent of its assets in non-portfolio property.
Dividend Distribution Requirement	A REIT is required to distribute at least 90 percent of its ordinary taxable income to its shareholders.	A REIT must distribute all of its income to shareholders.
Investors	Minimum of 100 investors, with no more than 50 percent of units held by five or fewer individuals.	Minimum of 150 unit holders, and be listed on a recognized Canadian Exchange.
Publicly Traded	REITs may be private.	All REITs must be publicly listed or traded.
Domestic Ownership Requirement	No domestic ownership requirement.	Base of investors should be at least 50 percent Canadian.
Governed by	Requirements of Internal Revenue code.	Self-Imposed Trust Declaration and certain requirements of the Income Tax Act.
Taxation	Income is not taxed as long as it is distributed to investors. Income that is not distributed will be taxed at normal corporate rates.	Income is not taxed within the trust as long it is distributed to unit holders.

Source: Deloitte (2004)

The Qualifying and Non-Qualifying Property Tests verify whether or not the property owned by a REIT is allowed under REIT legislation (KPMG, 2013). Unlike in Canada, the United States has a special provision for timber REITs which states T-REITs should be "REITs in which more than 50 percent of their asset value is real property in the trade or business of producing timber" (Deloitte, 2004). The United States REITs are also able to own 25 percent of their assets in non-qualifying REIT properties while Canadian REITs can only own 10 percent in non-portfolio property. Canadian REITs invest mainly in real property and would be classed as equity REITs in the United States (Londerville, 2002). This is despite the fact that the REITs are permitted to invest in other qualifying property, including cash, shares, bonds, debentures and mortgages (Deloitte, 2004).

Another difference between the two countries is that in Canada, REITs distribute a higher proportion of their cash flows to shareholders than in the United States. In order to avoid paying corporate tax, a Canadian REIT must distribute all of its income and capital gains annually, unlike its United States counterpart that only needs to distribute at least 90 percent of its taxable income (Kryzanowski & Tcherednitchenko, 2007). Also, Canada has a domestic ownership requirement that half of the investors should be Canadian, but the United States has no such condition. Lastly, all Canadian REITs have to be publicly traded while privately owned REITs are allowed in the United States.

3.2. Farmland REITs

The investment benefits of farmland have been highlighted in a number of studies. It has been shown that farmland is an effective inflation hedge, is a stable income producing asset, has high total returns and has a low or negative correlation with traditional asset classes such as stocks and bonds making it an attractive asset class for diversifying portfolios (Irwin et al., 1988;

Lins et al., 1992; Mercier, 1988; Newell & Lincoln, 2007; Painter & Eves, 2008). In Canada, there has been a growing interest of including farmland in investment portfolios in order to capture the positive attributes it contributes (Assiniboia Capital Corp, 2013).

The policy environment in the United States has been conducive for the emergence of F-REITs while various legislative barriers prevent the establishment of F-REITs in Canada. In this section, we first examine the recent development in the United States REIT industry which has seen the first F-REIT being formed. Then we look at how the investment market in Canada has evolved to create an opportunity for increased farmland investments and how F-REITs could fit into this scenario.

3.2.1. United States F-REITs

Investing in farmland has historically been the domain of individual farmers and large institutions with a large capital base. Fund managers like Hancock Agricultural Investment Group (HAIG), Cozad/Westchester Agricultural Asset and UBS AgriVest purchase and manage farmland on behalf of large institutional investors such as pension funds (Newell & Eves, 2007).

Until recently, the only option available for small investors to invest in agriculture was either buying stock of agribusiness companies such as Deere & Co. and Potash Corp, or buying shares in United States farmland funds like Chess Ag. However, investing in farmland funds in particular was less accessible for small sized investors. The minimum investment requirement for Chess Ag for example is currently USD $250,000 (Carlson, 2013). An F-REIT provides a way for small investors to include farm real estate in their portfolios.

An F-REIT is a relatively new concept in the United States. Gladstone Land Corporation was awarded REIT status in 2013, making it the first F-REIT in North America. Gladstone Land buys farmland and rents it out to both corporate and independent farmers growing row crops such as strawberries, lettuce, cabbage, and tomatoes (Bergdolt & Mittal, 2012). The corporation owns farmland in California, Florida, Oregon, and Michigan valued at more than $79 million (Gladstone Land, 2013). Revenue generation is through a combination of rental income over the term of the lease and appreciation value of the land (NASDAQ OMX, 2013).

Gladstone Land Corporation first filed for an initial public offering (IPO) in mid-2010 but later withdrew it in March 2012 (Bergdolt & Mittal, 2012). The corporation filed again in September 2012 and finally began trading on the NASDAQ Stock Market in January 2013, under the ticker symbol "LAND" (NASDAQ OMX, 2013).

This new F-REIT in the United States could set a framework against which potential F-REITs in Canada could be modelled. The way Gladstone is structured will only serve as a guideline because F-REITs in Canada will have to take into consideration the local prevailing legislation regarding REITs and farmland.

3.2.2. Potential for F-REITs in Canada

The agricultural investment market in Canada has seen major changes in the past decade. Of particular note has been the emergence of large farmland investment funds (FIFs) which buy up large tracts of farmland and lease it to farmers seeking to expand production (Sommerville, 2013). The FIFs have arisen to capitalize on the growing demand for investing in farmland.

This section seeks to investigate the conditions which have made FIFs feasible and how these could set the framework against which F-REITs could be modelled. The existing barriers to the formation of F-REITs will also be examined, including how current legislation would need to change in order to accommodate F-REITs.

3.2.2.1. Changes in Canadian farmland structure driving increased farmland investment demand

The demand of farmland investment has been driven by significant changes in the structure of Canadian agriculture over the past 50 years (Painter, 2009). These changes are highlighted in the most recent Agriculture census conducted in 2011 as shown in table 2.

Table 2: Comparison of 2006 and 2011 Agricultural census results

	2006	2011	percent Change
Rented/leased area as percentage of total area (percent)	39	41	+2
Number of Farms	229,373	205,730	-10.3
Farm size (Hectares)	295	315	+6.9
Farm operators aged 55 and older (percent)	40.7	48.3	+7.6
Farm debt ($/Farm)[7]	221,000	277,000	+25.3
Value per acre of farm land and buildings ($)[8]	1184	1610	+36

Source: Statistics Canada (2012)

The table shows that the farming sector in Canada is characterized by (i) an increased change in ownership trends from "family farming" whereby the family owns the land, to the farmers leasing a large proportion of the land under their operation; (ii) a decline in farm numbers; (iii) an increase in average farm size; (iv) an aging population of farmers; (v) farm debt accrual; and (vi) increased farmland values (Sommerville, 2013).

The census results point to a growing demand for leased land due to an increasing trend of large operators in the Canadian farming community. These operators use their capital mostly to invest in machinery and equipment instead of buying farmland, choosing to lease instead

[7] The total farm debt in Canada increased from $52 249 489 in 2006, to $68 409 485 in 2011 (Statistics Canada, 2012)

[8] Increasing farmland values is a characteristic which makes farmland an attractive investment choice (Garner & Brittain, 2012).

(Painter, 2000). These acquisitions have been financed largely through loans, thus resulting in farmers steadily accruing debt for the last 40 years (Sommerville, 2013). The farmland values have also been increasing over time and this could also have contributed to constraining farm operators from purchasing land to expand their operations.

Against this backdrop of the changing structure of agriculture coupled with increasing investor interest in farmland, FIFs have arisen. FIFs play an important role in supplying leased land to those seeking to expand their farming operations and buying land from retiring farmers (Assiniboia Capital Corp, 2013).

3.2.2.2. Farmland Investment Funds

FIFs provide a more accessible vehicle (relative to direct investing) through which investors can add farmland to their investment portfolios (Bonnefield, 2012). Direct investment is where an investor buys the whole or part of a physical property (Reita, 2013). Leasing out land is the primary mode of revenue generation which provides an annual source of cash income for the FIFs (Assiniboia Capital Corp, 2013). The appreciation of farmland values contributes a once off income generating opportunity for these funds when they refinance or liquidate the fund or its assets at some point in the future (Sommerville, 2013).

FIFs use a Limited Partnership (LP) investment vehicle. The LP is a flow through entity for income tax purposes. The income and losses are allocated to the members, so the entity is not taxed (Thomas, Johnson, & McQuillan, 2006).

The largest Canadian FIF is Assiniboia Capital Corp, which runs the Assiniboia Farmland Limited Partnership built from the merging of four earlier established partnerships (Assiniboia Capital Corp, 2013). The fund owns 110,000 acres of Saskatchewan farmland and generates returns through a combination of income generated by the rental of the land and long term capital appreciation. Cash distributions are made to investors twice a year, in June and December (Sommerville, 2013). Investors have benefited from the increasing value of Saskatchewan farmland which has raised the value of their units. [9]

In December 2013, Assiniboia Capital Corp sold the Assiniboia Farmland Limited Partnership to Canada Pension Plan Investment Board (CPPIB) for $128 million. This now gives many Canadians the opportunity to invest in Saskatchewan farmland via their pension plans (The Leader Post 2013).

Agcapita is an Alberta based FIF which launched its first fund in 2008, and has opened four funds to date. Only the fourth fund is currently open to investors (Agcapita, 2013). The first three funds raised in excess of $30 million in investment capital and acquired 45,000 acres of farmland in Saskatchewan (Cross, 2013a). The first fund matured in early 2013 and the assets in the portfolio are currently being sold and the proceeds returned to fund investors. This first fund had $10 million of investment capital which was used to buy approximately 19,300 acres of Saskatchewan crop land (Agcapita, 2013). The land being sold has appreciated in value to $1000 per acre compared to the $439 per acre purchase price (Cross, 2013b). Both Assiniboia Capital Corp and Agcapita invest exclusively in Saskatchewan farmland because they believe it is cheaper than equally productive land in Alberta and Manitoba (Assiniboia Capital Corp, 2013). Agcapita is unique in that it is Canada's only Registered Retirement Savings Plan (RRSP) eligible farmland investment fund (Agcapita, 2013).

[9] "Over the last nine years, Assiniboia investors have seen an exponential increase in the value of their holdings, from a net asset value of $18 in 2005, to between $55 and $58 in 2013. The average rate of return has been 15 to 20 percent annually" (The Leader Post 2013).

Bonnefield is a FIF that owns land in more than one province, unlike Agcapita and Assiniboia that only own land in Saskatchewan. Bonnefield owns farmland in Alberta, Manitoba, Saskatchewan and Ontario (Sommerville, 2013). Investors are offered options of owning farmland either through pooled limited partnerships or individually managed accounts for larger investors. Bonnefield manages two pooled limited partnerships, and operates by buying and holding farmland on behalf of multiple investors (Bonnefield, 2012). The first pooled limited partnership was fully invested as of October, 2013. Bonnefield owns 15,000 acres of land, 33 percent of which is in Ontario (Sommerville, 2013).

The emergence of the FIFs points to an increased demand for farmland by non-institutional investors seeking an accessible way to diversify their investment portfolios. However, investors and fund managers alike could possibly benefit even more if these funds were able to trade publicly on the stock market. The disadvantage of FIFs is that they are less liquid than publicly traded companies. For example buying Assiniboia and Bonnefield units is a long term investment of between 5 and 10 years, while Agcapita holds its farmland for 5 years before liquidation (Sommerville, 2013). Although the FIFs provide investors with a more accessible way to include farmland as part of their investment portfolios, there still exists a "lack of liquid, divisible and marketable farmland investment vehicles that trade in well-established secondary markets" (Painter, 2010). F-REITs could provide such vehicles.

Both REITs and FIFs offer the same tax benefit of avoiding double taxation. FIFs have the added tax advantage of allowing losses to pass through the entity and be claimed by investors when reporting their personal income (Thomas et al., 2006). REITs on the other hand have three main advantages over FIFs: greater liquidity, low minimum investment requirement and eligibility to be held within a RRSP. Since all Canadian REITs are publicly traded on a major exchange, they can be easily bought and sold at per-share prices comparable to stocks, making them highly liquid. In contrast, no formal public market for FIF units exists (S&P Capital IQ Financial Communications, 2013). FIFs have high minimum investment requirements which could discourage some investors. For example, the minimum investments required by the firms are $5000, $100,000 and $150,000 for Agcapita, Assiniboia and Bonnefield respectively (Sommerville, 2013). The FIFs also have stringent restrictions on who can invest i.e., investors meeting specific income and net worth thresholds (S&P Capital IQ Financial Communications, 2013). In contrast, REITs do not have any minimum investment requirements and investor restrictions. Lastly, all REITs are Registered Retirement Savings Plan (RRSP) eligible investments which offer special tax benefits for investors (Tax Bulletin, 2012). Only one FIF (Agcapita) is currently eligible for RRSP, the rest do not meet the eligible investment criteria as outlined in the Income Tax Act.

3.2.2.3. Barriers to F-REITs in Canada

F-REITs have not yet been established in Canada despite the advantages of REIT status and demand for farmland by investors. There are two main barriers to F-REITs in Canada, both of which relate to ownership of farmland. Canadian REITs have to be publicly listed on a stock exchange, but provinces have different laws regarding ownership of land by a publicly listed company. Provinces also have varying rules regarding foreign ownership of farmland. The legislation regarding ownership and public listing (on a stock exchange) of farmland are highlighted in Table 3. Since the FIFs have mostly been purchasing farmland in the prairies, only these provinces will be presented in the table. Other provinces will be examined in the discussion.

Table 3: Restrictions on ownership of farmland in the Prairie Provinces

Province	Legislation	Restriction on ownership of farmland	Restriction on public listing of farmland on a stock exchange
Manitoba	Farm Lands Ownership Act	Persons who are not Canadian citizens or permanent residents, as well as entities that are not family farm corporations, municipalities, local governments or government agencies, or qualified immigrants, as defined under the legislation, are limited to ownership of or leasing not more than 40 acres.	Organization with shares listed on an exchange are not allowed to own farmland in Manitoba
Saskatchewan	Saskatchewan Farm Security Act	Persons who are not a Canadian citizen or resident as well as non-Canadian owned entities, as determined under the legislation, are limited to ownership or leasing of not more than 10 acres.	The public listing of farmland is not permitted.
Alberta	Agricultural and Recreational Land Ownership Act; Foreign Ownership of Land Regulations	Persons who are not a Canadian citizen or permanent resident or that are foreign governments, corporations incorporated elsewhere than in Canada, or foreign-controlled corporations, as determined under the legislation, are limited to ownership of two parcels containing, in the aggregate, not more than 20 acres. Leasing by such parties is permitted for a period of up to 20 years.	No restriction

Source: Sommerville (2013)

For an entity to be accorded REIT status in Canada, it has to be publicly traded on the stock exchange (Deloitte, 2004). This requirement is in contrast with Saskatchewan and Manitoba legislation governing farmland ownership, which stipulates that an organization with shares listed on an exchange is not allowed to own farmland. Alberta is the only prairie province with no such restriction.

One of the FIFs has attempted to gain REIT status by fulfilling the public listing requirement. In January 2012, Bonnefield applied for an initial public offering (IPO) on the

Toronto Stock Exchange, hoping to raise $100 million in the IPO. They withdrew their application citing “various regulatory approvals were not received in time for us to close on the pending committed property transactions within the required timeframes” (Critchley, 2012). In order to get around these rules, Bonnefield wants to only own mortgages on farmland in those provinces (Koven, 2012).

A possible option is that a prospective F-REIT could only buy farmland where there is no public listing restriction and circumvent this problem. In addition to Alberta, land could also be purchased in other provinces such as Ontario, British Columbia and Quebec. However, this would mean the REIT would have to spend more money since the price of the land in other provinces is relatively higher than in Saskatchewan, where FIFs have the majority of their land holdings. The 2010 average farmland values per acre were $523, $1506, $896 and $4113 for Saskatchewan, Alberta, Manitoba, and British Columbia respectively. In the rest of the provinces the values range between $1550 and $5062 (Statistics Canada, 2013a).

All three provinces also have a domestic ownership requirement which specifies that only Canadian citizens or permanent residents can own large areas of farmland. This restriction currently prevents the FIFs from allowing investment from non-Canadians (Agcapita, 2013). The domestic ownership requirement does not only include the company but also extends to the shareholders.

Changes to the provincial laws governing ownership of farmland are therefore required if F-REITs are to be established in Canada. An F-REIT was able to be formed in the United States because of differences in REIT policy and land ownership laws. Unlike in Canada, the United States have private REITs which do not have to be publicly listed (Deloitte, 2004). Also unlike in

Canada, foreign investors in the United States are permitted to invest in agricultural land (Zedalis, 1979). An F-REIT in the United States does not have to exclude foreign investors the way a potential Canadian REIT would have to.

3.3. Timberland REITs

Interest in timberland investment has grown over the years in the United States, Europe and Canada (Binkley, 2007). The main investment characteristic of timberland which has made it grow in popularity is its good portfolio diversification potential due to the relatively high return, low level of financial risk, and low correlation with other financial assets (Hotvedt & Tedder, 1978; Liao, Zhang, & Sun, 2009; Sun & Zhang, 2001). In addition, timberland is reported to serve as a good hedge against inflation (Lutz, 2007), since the value of timberland increases with rising levels of inflation, unlike other types of investments which do not change under the same conditions (Binkley, 2007).

Timberland investment returns are generated though income and capital accumulation. Income is generated periodically through selling timber and annually through leasing of recreation rights; e.g., for hunting. Capital appreciation is realized from continued biological growth. As the trees grow, both per-unit price and volume increase (Cascio & Clutter, 2008). Biological growth also contributes to lower financial risk of timber because trees can be left uncut and appreciating in value during periods of recession, depressed lumber prices, or other sources of investment risk (McAbeer, 2010).

3.3.1. T-REITs in the United States

Traditional timberland investors in North America were farmers who owned forestland and large vertically integrated forest products companies who supplied large pulp and paper mills (Zinkhan & Cubbage, 2003). The forest ownership structure in the United States has, however, evolved over the years to include institutional investors and T-REITs (Zhang, Butler, & Nagubadi, 2012).

Institutional investors such as pension funds, insurance companies, banks and universities, are organizations that hold assets and act as trustees for investors (Binkley et al., 1996). The institutional investors do not manage the timberland themselves but rather employ timberland investment management organizations (TIMOs) to execute this duty (Block & Sample, 2001). The TIMOs are responsible for finding, purchasing, managing, and selling timberlands on behalf of the investing institutions. (Zinkhan, 1993).

In addition to avoiding corporate income tax, T-REITs have additional tax efficiency to standard REITs because the dividend income paid out to investors is classified as a long-term capital gain under the Internal Revenue code IRC 631b. The classification means individuals who own trees for a set amount of time are taxed at the rate of 15 percent, which is lower than the average investors' marginal income tax rate of between 10 percent and 40 percent (Binkley, 2007). The tax benefit of T-REITs has attracted private investors and fund managers alike, which is likely to drive future demand for timberland investments (McAbeer, 2010) [10].

Institutional investors may buy shares of T-REITs since the shares are publicly traded (Zhang et al., 2012). The T-REITs provide institutional investors with the option of short-term investments and an easy exit strategy from timberland real estate. Normally, institutions make long term investments of a fixed length of between 10 and 15 years (Clutter et al., 2005). For the

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[10] Other drivers of timberland demand are population growth and increased wealth. As the global population increases, so does wood consumption. The wealth aspect relates to emerging economies' also increasing consumption of wood because of high per capita incomes thus driving demand up (McAbeer, 2010).

smaller investors, T-REITs are a feasible way of investing in timberland because they are liquid and the smaller units make it more accessible.

In recent years, a number of timber companies in the United States have restructured their operations in order to qualify for REIT status (McAbeer, 2010). Changes in the tax rules accommodating timber gains in qualifying for REIT status was the main incentive for the companies to convert to T-REITs (Binkley, 2007). A list of T-REITs in the United States is presented in Table 4.

Table 4: Timberland REITs in the United States

Firm/organization	Type	Acres in the United States
Plum Creek	Public REIT	6,800,000
Weyerhaeuser	Public REIT (industrial before 2010)	5,800,000
Potlatch	Public REIT	1,600,000
Rayonier	Public REIT	2,100,000
CatchMark Timber Trust, Inc.	Public REIT	282,000
Anderson-Tully Corporation	Private REIT	300,000

Source: Zhang et al. (2012) and Wang (2011).

Plum Creek was the first timber company to convert to a publicly traded T-REIT in 1999 (Block & Sample, 2001). The conversion followed a request for a private letter ruling from the Internal Revenue Service (IRS) regarding the definition of real estate, specifically if real estate included timberlands. The IRS issued a ruling stating that "the income from the sale of the trees under IRC section 631(b) can qualify as REIT real property income because the uncut timber and the timberland on which the timber grew is considered real property and the sale of uncut trees can qualify as a capital gain derived from the sale of real property" (Chiang, Yee, & Genest, 2009). The ruling paved the way for the other timber companies to also convert to T-REITs. Plum Creek serve as an example of how T-REITs can benefit from an expanding biofuel industry. The company has begun servicing the ethanol industry by supplying wood pellets to

Drax Biomass International plant, for use as a feedstock in the production of ethanol (Plum Creek Timber Co. Inc., 2013).

Anderson-Tully Corporation was the first private T-REIT formed in 1998. Public and private REITs are similarly structured, but differences exist with respect to management, size and formation. Private REITs are managed by a separate entity, have high growth rate of aggregate total assets and are formed by a sponsor firm that brings together properties or capital from different sources (individual or institutional investors) into a REIT structure[11] (Sahin, 2012). Private REITs are more stable, less susceptible to fluctuations in the market and have produced more predictable returns than public REITs (Smith, 2003).

3.3.2. Potential for T-REITs in Canada

"Canada's private timberland holdings attract around C$20 billion of institutional capital, and they have been growing at a yearly rate of about 20 percent since the early 1980s" (Barrios, 2011). This institutional investment is restricted to privately owned land. The privately owned land constitutes six percent of the total Canadian forestland. Most of the remaining forestland is owned by provincial and territorial governments (90 percent). The federal government and Aboriginal peoples each own two percent (Canada Forest Service, 2013). This structure of timberland ownership leaves a relatively small "investment opportunity set" because most of the land is owned by the crown (Binkley & de Bever, 2004). Barrios (2011) however states that even though private landowners own a smaller proportion of timberland compared to the Crown, this area is significant in terms of size and production.

[11] Publicly traded REITs have management teams & boards and have a lower growth rate of aggregate total assets (Sahin, 2012).

REITs could allow more investors to own timberland and enjoy the diversification advantages the asset class brings to portfolios. Institutional investors have been able to invest in timberland because they have access to a large capital bases required to purchase large tracts of land, unlike smaller investors (Block & Sample, 2001). T-REITs could provide many Canadian investor with a more liquid way of including timberland as part of their investment portfolios. T-REITs could also be a more tax efficient vehicle to own timberland compared to direct investment (Block & Sample, 2001).

The way a potential T-REIT could operate in Canada can be illustrated by the Poplar Farm Land Lease Program initiated by Alberta Pacific Forest Industries Inc. In 1993, Alberta Pacific began partnering with private landowners to develop a large network of poplar farms within 200 km of the company's mill site. Farmers signed 20 year land leases to grow hybrid poplars to be used for pulp production at the mill. The trees were to be grown primarily on marginal land not under agricultural production (Alberta Pacific, 2005). The advantage to farmers becoming a part of the lease program was threefold. The poplar farming operation would provide long-term guaranteed income, maintain the value of the land and provide farmers with extra income when they performed maintenance work (Bozic, 2012). The Farm Land Lease Program was set to run over a 20 year period during which 2,964 acres each year would be planted (Alberta Pacific, 2005). Alpac however stopped signing new contracts in 2012 and opted to focus on managing their existing tree farms (Kryzanowski, 2012).

The Program was designed in such a way that Alberta Pacific dealt with each farmer individually. A T-REIT in this particular scenario could own the land instead of the farmers. Alberta Pacific would only have to deal with one landholding entity, thus reducing transactions costs. The company would only have a single lease and a single payment to make. A T-REIT could be more attractive to rent from instead of from numerous fragmented landowners.

Despite the documented benefits of existing T-REITs in the United States and the investment potential in Canada, T-REITs do not exist in Canada. The main barrier is the passive revenue test which every REIT must pass to maintain its status. This test stipulates that all REITs should earn 90 percent of their income from passive sources such as rent, interest and dividends (Deloitte, 2004). Unlike in the United States, timber gains are not considered as passive revenue by the Canada Revenue Agency (CRA).

The existing legislation would have to change to accommodate T-REITs in Canada. If a timber company were to follow the route that enabled the emergence of T-REITs in the United States, then the company would have to get an Advanced Income Tax Ruling from the Canada Revenue Agency[12]. An advance income tax ruling is a "written statement given by the Directorate to a taxpayer stating how the CRA will interpret and apply specific provisions of existing Canadian income tax law to a definite transaction or transactions which the taxpayer is contemplating" (Canada Revenue Agency, 2002). To date though, no timber company in Canada has taken this route.

3.4. Summary

Legislative changes are needed in order to accommodate F-REITs and T-REITs in Canada. The changes relate to specific policy regarding gaining REIT status and the provincial legislation on farmland ownership. If F-REITs were to exist, they would likely be modelled in a similar fashion to the existing FIFs, which are currently the main investment vehicle through

[12] An Advanced Income Tax Ruling from the Canada is the equivalent of a Private Letter Ruling in the United States.

which investors can include farmland as part of their portfolios. Two main changes would be required to make the formation of F-REITs possible both of which relate to provincial farmland ownership rules. Firstly, the restriction that companies which have shares listed on a stock exchange cannot own farmland could have to be lifted. REIT status in Canada can only be attained if a company is publicly listed on a stock exchange. Secondly, the Prairies and other provinces would have to permit non-Canadian individuals and companies to own large tracts of farmland. Currently foreign ownership or leasing is restricted to between ten and forty acres. An F-REIT would need to hold large tracts of land.

T-REITs cannot be established on private land due to the same ownership restrictions faced by F-REITs. T-REITs face a further barrier because unlike in the United States, timber gains in Canada cannot be counted as passive revenue as per the requirement of the Passive Revenue test for REIT status to be obtained.

As the bioenergy industry is expected to expand and ligno-cellulosic feedstocks are also expected to play a bigger role, both F-REITs and T-REITs could benefit. An F-REIT could rent out to farmers engaged in the production of purpose grown woody crops such as hybrid poplars. A T-REIT could also lease to an operator who establishes plantations of hybrid poplars. In addition, the T-REIT could also benefit from selling wood pellets to ethanol plants since these pellets can also be used as ligno-cellulosic feedstock.

Chapter 4: Competition for private land in the context of investment portfolio diversification

Real asset classes such as farmland and timberland have been shown in past studies to be good candidates for portfolio diversification. These assets offer strong risk-adjusted returns and have low correlation with traditional financial assets (Cremers, 2013). The investment value of the asset has traditionally been investigated by measuring the amount of risk it adds to a well-diversified portfolio (Perold, 2004). The risk added by farmland and timberland is a factor which could influence the competition for private land between agricultural crops and trees in Canada. A commonly used method of calculating a measure of the risk added by an asset to a well-diversified portfolio is the Capital Asset Pricing Model (CAPM). The risk in this model is measured by the beta parameter (Fama & French, 2004).

In the following sections of this chapter, background information of the CAPM is first given, followed by a literature review of how the model has been applied to studies involving farmland and timberland investments. Lastly, the empirical section is presented which includes a description of the model, calculation of returns to farmland and timberland, the data used and the results.

4.1. Background of the CAPM

The concept of efficient portfolios was first introduced by Harry Markowitz in the 1950s. He developed a model of portfolio choice in which an investor selects a portfolio at time t-1, which produces a stochastic return at time t (Fama & French, 2004). The model suggests that assets are considered for portfolios based not only on their individual expected returns and risk, but also on how their returns are correlated with other assets (Markowitz, 1959). James Tobin in

1958 expanded on Markowitz's work by adding a risk-free asset to the analysis, producing the Capital Market Line (CML). The CML is a line that represents risk efficient combinations of a market portfolio and risk-free assets (Tobin, 1958).The greater the slope of the line, the better the investment performance (return per unit of risk) for all levels of risk greater than zero (Painter, 2010). The CML led to the development of one of the main tools used to assess how an investment added, contributes to a portfolio's risk, i.e., the CAPM (Copeland, 2001).

The CAPM was built on derivations made by Sharpe (1964) and Lintner (1965), respectively, and its main contribution is its ability to relate the impact of systematic risk upon the returns of an investment (Cascio & Clutter, 2008). According to the model, an asset's total financial risk is made up of both systematic and non-systematic risk. Systematic risk reflects asset price movements resulting from changes in the macro economy. Non-systematic risk reflects factors unique/specific to the particular asset which are independent of the macro economy (Copeland et al., 2005). The CAPM is used to estimate systematic risk because the non-systematic risk can be eliminated through diversification (Zinkhan & Cubbage, 2003). Even if an asset has a high total risk level, if most of that risk is diversified away within an efficient portfolio then it adds little risk to the overall portfolio and would therefore be considered a low-risk asset (Painter, 2010).

The CAPM formula specifies an equilibrium relationship between an asset's expected rate of return $E(R_i)$, risk free rate of return (R_f) and the expected risk premium β_{it} [$E(R_m) - R_f$] (Copeland, 2001). The equation is expressed as follows:

$$E(R_{it}) = R_{ft} + \beta_{it}[\,E(\,R_{mt}) - \,R_{ft}] \qquad (1)$$

The expected rate of return on any asset, E (R_{it}), is equal to the risk free rate of return plus a risk premium. The risk premium is the amount by which an asset's expected rate of return exceeds the risk-free rate (Copeland et al., 2005). The CAPM is graphically represented by the Security Market Line (SML). The SML differs from the CML in that the SML determines risk or return for individual stocks while the CML determines risk or return for efficient portfolios. The CML uses standard deviation as the measure of risk while the SML uses beta as the measure of risk (Copeland et al., 2005). The assumption of the SML is that a portfolio is made up of 1) an asset that pays a risk free return (i.e., R_f), and 2) a market portfolio which contains some of every risky asset in the market (Perold, 2004). The SML is plotted on a graph with the expected returns to an asset on the Y-axis and the risk, as measured by beta, on the X-axis (Figure 1).

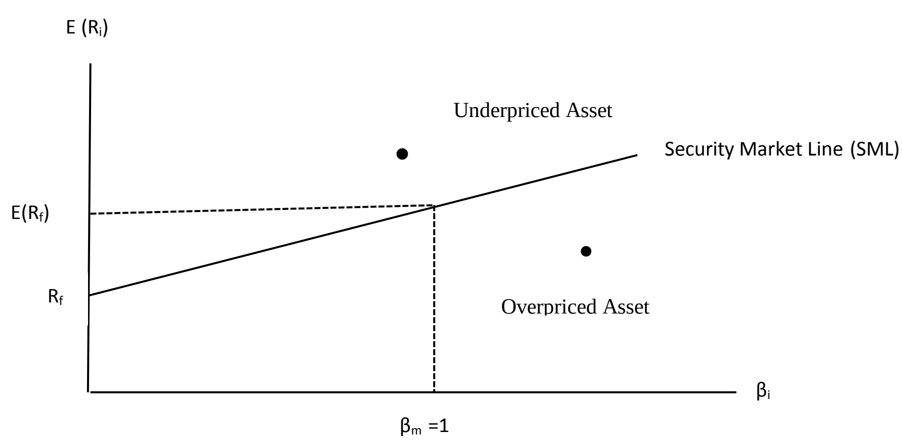


Figure 1: Graphical representation of the Capital Asset Pricing Model

Source: Copeland et al (2005)

According to the CAPM, if capital markets are in equilibrium then all assets should fall on the SML when returns are plotted against risk (Perold, 2004). An asset which lies above the SML is underpriced because the expected return is too high in relation to the expected return. Investors will therefore bid up price until expected return falls. If the asset lies below the line, it is overpriced since expected return is too low compared to the expected Return. Investors will thus sell the asset, which drives down price until expected return rises. A correctly priced asset is one that lies along the line (Copeland et al., 2005). The SML is positively sloped indicating a positive relationship between the expected rate of return on any asset, E (R_i) and the quantity of risk, β_i. The slope of the SML is the price of the risk i.e., the difference between the expected rate of return on the market portfolio and the risk free rate of return (E (R_m) - R_f) (Copeland et al., 2005).

Equation (1) defines the expected rate of return of an asset at time t, as a function of the risk free rate and the expected premium on the market. Estimating the equation can be complex because the expected returns at time *t* are not directly observable in the market (Lundgren, 2005). A solution proposed by Jensen (1969) showed that the beta parameter could be estimated from historical data in the form of realized returns. The nominal CAPM equation could then be expressed in terms of excess returns as follows:

$$R'_{it} = \alpha'_i + \beta_i R'_{mt} + \varepsilon_t \qquad (2)$$

where;
$R'_{it} = E(R_{it}) - R_{ft}$= Excess return on asset i at time t
$R'_{mt} = E(R_{mt}) - R_{ft}$=Excess returns on the market at time t
β_i=Measure of systematic risk of asset i
α'_i=Index of asset performance
ε_t= Error term

Alpha (α) is a performance evaluation indicator which assesses how an investment performs with respect to the market benchmark being used. The alpha signifies the valuation of an asset due to factors other than the overall market (Sun & Zhang, 2001). The parameter measures the difference between the rate of return an asset has generated and the rate that was justified by the asset's level of systematic risk (Lundgren, 2005). The expected value of alpha in the CAPM is zero because the model implies that the return of an asset is only determined by its covariance with the market portfolio (i.e., systematic risk) (Copeland et al., 2005).

Even though ideally the alpha should be zero according to the CAPM, there are cases where it has been found to be positive or negative and statistically significant. A positive (negative) alpha indicates that returns from the asset are greater (less) than what is needed to compensate for a given level of systematic variability measured by the beta parameter (Redmond & Cubbage, 1988). What this essentially means is that if an asset has a positive (negative) alpha, it would generate more (less) returns than the market would expect given its risk level (Irwin et al., 1988).

Beta (β), also known as the market beta, measures the sensitivity of the asset's return to variations in the market (Copeland, 2001). According to the CAPM, an asset's returns are correlated with the variability of the market portfolio's returns (Copeland et al., 2005). The beta parameter is statistically defined as the covariance between returns on the risky asset and the market portfolio, divided by the variance of the market portfolio:

$$\text{Market Beta} = \beta_i = \frac{Cov(R_i, R_m)}{VAR(R_m)}$$

Differences in the market beta are used to explain differences in expected returns across securities and portfolios (Fama & French, 2004). The value of β_i determines the level of systematic risk of the asset[13]. The larger the value is, the greater the systematic risk contributed by the asset to a diversified portfolio. An asset which has a beta greater than one means the asset moves more than a corresponding move in the market. Such an asset is more risky than the market, and commands a higher expected return. In contrast, an asset with a beta less than one

[13] The beta of an asset is compared to the market beta which is equal to one (Perold, 2004).

moves less than a corresponding move in the market which makes it less risky than the market and commands a lower expected return. An asset with zero beta means the asset's returns are uncorrelated with market returns (Cascio & Clutter, 2008). A negative beta means the asset moves in the opposite direction to the market. The negative beta asset reduces the overall systematic risk of a diversified portfolio but results in the expected return being less than the risk-free rate (Copeland et al., 2005). In this study, a combination of the alpha and beta values of the assessed assets will be used to investigate which of the two competing land uses (crops or trees) on private land, is favoured.

The market rate of return (R_{mt}) is an important component of the CAPM because it is the explanatory variable in the model, against which asset returns are regressed. A proxy of the market should ideally reflect all possible assets an investor could have. The most common index for the market in CAPM studies for the United States is the S&P 500 (Binkley et al., 1996; Cascio & Clutter, 2008; Sun & Zhang, 2001). Examples from other countries include the Helsinki stock market index in Finland and the Stockholm stock exchange index in Sweden (Heikkinen & Kanto, 2000; Lundgren, 2005). Other studies have made use of a broader market portfolio consisting of stocks, bonds, real estate, and cash equivalents (Barry, 1980; Bjornson & Innes, 1992).

A good market proxy for Canada is the S&P/TSX Composite Index. Use of the S&P/TSX Composite Index as a market proxy is common in the finance literature because it represents a broad Canadian equity benchmark (Bauer et al., 2007). The S&P/TSX Composite is defined as the "headline" index for the Canadian equity market because it is the broadest in the S&P/TSX family. It is an index of the stock prices of the largest companies on the Toronto Stock Exchange

(TSX) as measured by market capitalization (Standard and Poors, 2013). Real-time and historical data for the index are distributed by the Toronto Stock Exchange.

The risk free rate (R_{ft}) in the CAPM calculation represents the minimum level of return required by an investor given a risk free investment (Lundgren, 2005). The risk free rate occurs when the actual return and the expected return are the same such that there is no risk of the return on the investment being different from the expected return (Perold, 2004). In the real world though, a completely risk free asset does not exist. Short-term government Treasury bills are not entirely risk free but they are a relatively safe investment. The bills can be used as a proxy for a risk-free asset (Copeland et al., 2005).

The underlying assumptions of the CAPM according to Lundgren (2005) are that:

1. The only two decision parameters are risk and return.
2. Investors are risk averse.
3. Investors have homogeneous expectations about asset returns. This implies that all investors perceive identical opportunity sets i.e., everyone has the same information at the same time.
4. Investors that are operating in the asset market are price takers.
5. There are a definite number of assets and their quantities are fixed.
6. All assets are perfectly divisible, liquid and priced in a perfectly competitive market. It implies that human capital is non-existent (it is not divisible and it can't be owned as an asset)
7. The investment time horizon is identical for all investors.
8. The capital market is perfect, and investors can lend and borrow money at the same interest rate. It implies that the borrowing rate equals the lending rate.

9. There are no market imperfections such as taxes, regulations, information or restrictions on short selling.

The CAPM has been criticized on a number of fronts. Firstly, the CAPM beta is used to evaluate the future performance of an asset based on historical data and the historical position of the asset (Fama & French, 2004). Specific issues which could have influenced returns of an asset in the past; for example, recessions are not factored in.

Secondly, the traditional CAPM is nominal; therefore, it does not capture the impact of inflation. Inflation affects assets to varying degrees (Arthur, Carter, & Abizadeh, 1988). Evidence shows the CAPM betas are overstated if there is a positive covariance between the asset being studied and inflation (Irwin et al., 1988). Farmland and timberland have both been shown to be positively correlated with inflation. The CAPM betas in literature that do not include inflation could therefore have been overstated by not incorporating inflation into the model.

Thirdly, the CAPM is said to be static because the relationship (measured by beta) between securities and the market portfolio is assumed to be time invariant (Kayahan & Stengos, 2007). These are issues that have been repeatedly pointed out in literature.(Arthur et al., 1988; Sun & Zhang, 2001; Washburn & Binkley, 1989). Despite its shortcomings, the CAPM continues to be used in evaluating financial, as well as agricultural and forest investments because of the insightful results it provides.

4.2. Previous literature on CAPM in farmland investment

One of the earliest applications of CAPM in agriculture occurred because there was an "increasing interest in and policy concerns about agricultural investments by nonfarm investors, particularly in farm real estate" (Barry, 1980). Agricultural assets, including farmland, were seen as low risk and had good diversification potential for portfolios. Numerous studies have investigated the risk-return characteristics of a number of agricultural assets but this review will focus only on those which have studied farmland/farm real estate.

Barry (1980) used the CAPM to estimate risk premiums required to hold farm real estate in a well-diversified portfolio. His study covered eleven regions in the United States. The risk premiums on farm real estate were calculated by regressing the excess annual returns on farm real estate against excess annual returns for the market portfolio for the period 1950-1977. He used a broad market proxy which was a combined stock, bond and farm real estate index. The excess returns were calculated by subtracting a risk free rate which in this case was the returns to three month United States Treasury bill rates. Beta values obtained ranged between 0.10 and 0.29, and all were not statistically different from zero. Alpha values were relatively high ranging from 3.91 to 7.62 and were statistically different from zero in eight out of the eleven regions. The main conclusion drawn from the results was that farmland adds very little risk to a diversified portfolio because most of farmland risk is non-systematic therefore diversifiable.

Irwin et al. (1988) extended Barry's study by accounting for the effect of inflation on portfolio performance, using a broader market proxy and lengthening the sample period to include the relatively prosperous years following the end of World War 2 (i.e., 1946 to 1950). The period of study used in Barry (1980) was believed to have been a time of rising nominal farm real estate returns. Irwin et al (1988) were interested in accounting for inflation because a past study showed that the traditional CAPM overstates systematic risk under inflation if the covariance between the rate of return on the asset and the rate of inflation is positive (Roll, 1977). The econometric model estimated two beta parameters, the first being the traditional market beta reflecting an asset's response to market risk and the second being an asset's response to inflation risk. Two sample periods were considered, 1950-1977 and 1947-1984. For the first period, the one factor model yielded a beta of 0.19 which was not statistically different from zero and an alpha of 7.64 which was statistically different from zero. These were similar results to those obtained by Barry (1980). Including the inflation factor for the first period reduced the market beta to 0.15 and the inflation beta was 0.60 , with neither being statistically different from zero. For the second period 1947-1984, the parameter estimates from the one factor model were alpha of 4.15 and beta of 0.32 with neither being statistically significant. For the two factor model in the second period, the only statistically significant result was the 0.86 value for the inflation beta. The market beta was 0.25 and the alpha was 4.40. The market beta was consistently smaller with the inflation factor added indicating systematic risk was lower than what was predicted by the CAPM. The result showed that farm real estate exhibited substantial risk from uncertain inflation. The other main result was consistent with earlier work by other researchers: namely, that farmland adds little systematic risk to a well diversified portfolio.

Arthur et al. (1988) also used the CAPM to investigate the relationship between risk and return of agricultural assets. Fourteen United States farm assets including farmland were studied using the CAPM. The stock market index used was the S&P 500 and three month Treasury bills of the United States government were used as the risk free rate. The farmland beta value of -0.03 was statistically not significant, a result consistent with earlier work reported above. The alpha value of -0.01 was also not significantly significant, meaning it was essentially equal to zero as predicted by the CAPM.

Bjornson (1994) investigated whether the CAPM is able to track the predictable variation in agricultural asset returns. The assets included agricultural commodities such as wheat and oats, as well as farmland. This study considered the risk free asset as the United States 90 day Treasury bills and the S&P 500 was used as the market proxy. Farmland parameters estimated were a beta of -0.30 and -0.15 for the periods 1963-86 and 1963-82 respectively. The respective alpha values were 0.03 and 0.07. Only the first beta value was statistically significant and both alphas were not statistically significant. The results showed a low sensitivity of farmland to the market portfolio consistent with earlier studies.

Mercier (1988) conducted an analysis of the equilibrium risk and return relationships of Alberta farmland. This was one of the earliest studies in Canada to investigate such a relationship. The rate of return on six month Treasury bills was used as an approximation of the risk free rate and the Toronto Stock Exchange (TSE) 300 Composite Index was used as the market portfolio proxy[14]. The returns to farmland were calculated for all the municipalities in the province, as well as for the different census divisions. The beta values estimated varied in magnitude but were mostly statistically insignificant. More than half of the alphas were positive and statistically significant. The alpha results indicated that for some of the Alberta municipalities, the returns to farmland outperformed the TSE 300 Composite Index.

Although these studies differ in the choice of market proxy and in the data used to derive the return to farmland, a common trend emerges regarding the diversification potential of farmland. The magnitude of the beta values calculated is generally low, within the range of -1 to +1. In the majority of the studies, the betas are not statistically significant implying that farmland as an asset has returns which are independent from any movements in returns to the market. This quality is a good indicator of the positive diversification value of farmland when added to a well-diversified portfolio. The alpha values obtained are generally not statistically significant, which means they are essentially equal to zero as predicted by the CAPM. Two exceptions were from

[14] In 2002, the TSE 300 Composite Index became known as the S&P/TSX Composite Index (Malik, Ewing, & Payne, 2005).

Irwin et al. (1988) and Mercier (1988) who found positive alpha values which were statistically different from zero. The implication of the positive alphas is that farmland outperformed the benchmark market index because the returns to farmland were in excess of that which was required to compensate for non-diversifiable risk.

We observe from the reviewed literature that the analysis of risk-return in farmland does not account for differences in soil quality. But, differences in soil quality on farmland are associated with differences in the types of production activities on the land. For example, good quality soil is commonly associated with crop production activities whereas soils of a lesser quality may be used for livestock production (Alberta Agriculture and Rural Development, 2011). Since these farming activities are different, the risk-returns, and consequently the diversification potential associated with each type of farming activity are likely to be different. Thus, our study seeks to include a more robust evaluation of risk-return in farmland by accounting for the heterogeneity in farmland production activities due to differences in soil quality.

4.3. Previous literature on CAPM in forestry investment

Only a few studies have applied the CAPM to timberland. This literature review will therefore also include studies which have applied the CAPM to forestry related products. The use of CAPM to examine the risk and return in forestry was pioneered by Hotvedt & Tedder (1978), who used the model to evaluate the performance of five forestry industry firms. They calculated the quarterly returns of the firms to evaluate their common stocks for the period 1970-1976. The market rate of return used was the S&P 500. The beta coefficients calculated ranged from 0.9071 to 1.549, and they were all statistically significant. The returns of the companies closely followed changes in the overall market except for one company with beta of 1.549 which is above the market beta of 1. The authors did not report the alpha values obtained.

Olsen & Terpstra (1981) used the CAPM to analyze risk and return in the spot market for softwood logs in Oregon from 1968 to 1978. Log sales prices and storage costs were used to compute returns on thirteen individual log species and grades. The market proxy used was the returns calculated from both the Standard and Poor's and the New York Stock Exchange stock (NYSE) Composite Indexes. Thirteen-week United States Treasury bills approximated the risk free rate. The betas ranged between -0.27 to 1.19 and were all statistically insignificant. The alphas were all positive ranging from 0.89 to 2.83, and all were statistically insignificant. The results indicated that log investors earned a return similar to the yield on United States Treasury bills and the returns did not exhibit any significant amount of systematic risk as measured by beta.

Redmond & Cubbage (1988) evaluated risk and return of timberland based on 22 stumpage price series for various species, products and regions. The yearly stumpage price plus growth changes for the period 1951 to 1985 were used as a measure of investment returns. The S&P 500 was used as the market proxy and the United States Treasury bills were the risk free rate. The average returns and regressions were performed for three time periods, 1951-1985, 1951-1967 and 1968-1985. This was done to investigate whether inflation during the different periods (low before 1968 and high afterwards) affected the results. It was found that only the magnitude of the differences varied between time periods but in general the different time periods did not affect returns. Four out of the twenty two estimated betas were positive, the rest were negative. Of the negative betas, four out of 18 were statistically significant. The beta results indicated that stumpage prices were in most cases opposite to market cycles for the S&P 500 and could therefore be used to reduce the volatility portfolios. The alpha value for state pine saw timber in Georgia was 0.14 and the only one out of 22, which was statistically significant. The rest of the alphas ranged between 0 and 0.13. These alphas were statistically insignificant and essentially equal to zero as predicted by the CAPM.

Binkley et al. (1996) analyzed the institutional ownership of timberland in three regions of the United States for the period 1960-1994. The risk free rate proxy used was the 90 day United States Treasury bills. The most commonly used proxy for the United States market portfolio in previous studies were the historical returns for the S&P 500. Binkley et al. (1996) opted for a more broad based market portfolio composed of 35 percent common stocks, 6 percent small company stocks, 11 percent corporate bonds, 33 percent United States government bonds and 15 percent United States Treasury bills. The estimated beta values of -0.21, -0.58 and -0.88 were statistically significant, as were the positive alpha values of 2.80, 5.89 and 10.22. The results showed timberland to have good diversification benefits when added to a well-diversified portfolio.

Sun & Zhang (2001) assessed the financial performance of 18 investment portfolios or price indexes. Eight of these were major forest-related investment vehicles eight forestry-related: Timberland performance index (TPI), National Council of Real Estate Investment Fiduciaries timberland index (NCREIF-T), Timberland Limited Partnership Portfolio (TLP), Large forest industry company portfolio (L-FICP), Medium forest industry company portfolio (M-FICP), Southern stumpage price average (SSPA), Pacific northwest stumpage price average (PNSPA), and Lumber futures (LUMBER). All the data used comprised quarterly returns from 1986 to 1997. The S&P 500 was used as the market proxy. The CAPM results yielded positive and statistically significant betas of 0.52 for a timberland limited partnership portfolio and 1.04 for a large forest industry company portfolio. The results show the timberland alone has a lower risk level than when combined with timber processing facilities. The betas for the two timberland indices and the other vehicles were not statistically significant. The only statistically significant alphas were for the two timberland indices, TPI and NCREIF-T. The alphas were 0.018 and 0.042 respectively.

Lundgren (2005) evaluated the investment performance of Swedish timberland over three decades (1965-1999) using the CAPM. A two factor model was applied to the returns. In addition to the beta (*b*) measuring the systematic risk, an inflation parameter (*c*) was also estimated. The results were *b* equal to -0.03 and *c* equal to 1.44. The beta measuring systematic risk was not statistically significant implying returns to timberland and returns to the market were independent. The inflation estimate showed that timberland is a suitable investment alternative for investors looking for protection against inflation. If inflation increases by 10 percent, timberland returns will increase by 14.4 percent. The alpha value was 0.06 and statistically significant, meaning the timberland returns outperformed the market by 6 percent.

Cascio & Clutter (2008) estimated timberland CAPM betas based on the NCREIF index at the United States. National, Pacific Northwest, Northeast and South regional levels, using annual returns data spanning 19 years. The study also included construction of synthetic timberland return series [15] for 22 regions within the United States. The S&P 500 index was used as the market proxy, yields for the one year United States Treasury bill was used as the risk-free rate and ordinary least squares (OLS) regression was used to estimate the model. Positive CAPM betas of 0.167, 0.349, and 0.193 and 0.147 for the National, Pacific Northwest, Northeast, and

[15] "A time series simulated using a model is called a synthetic series to distinguish it from an observed historical series" (Cowpertwait and Metcalfe, 2009).

South areas of the United States respectively, were obtained. These betas were not statistically significant. The corresponding alpha values were positive and statistically significant. The betas for the synthetic series constructed for the 22 regions were between -0.137 to 0.279, and none of them were statistically significant.

These previous studies that applied CAPM to timber investments all drew similar conclusions. Firstly, the return for timberland was weakly correlated with financial instruments making it a useful asset for diversifying a portfolio of traditional financial assets. Secondly, the beta values estimated for forestry related products were mostly negative. Since beta measures volatility of an asset, the common result of negative betas for timberland investments is a sign that they exhibit less volatility than the overall stock market. Some of the betas were not statistically significant and so were essentially equal to zero, implying returns to timberland and the market were independent. Both these results suggest that portfolio managers such as pension fund managers could be more inclined to include timberland in their investment portfolios because of the diversification benefit.

The more recent studies (e.g., Cascio & Clutter (2008) and Sun & Zhang, 2001)) found positive betas which are in contrast with the negative betas for timberland studies by past researchers. Cascio and Clutter (2008) offer an explanation for this trend as either being the fact that systematic risk of timberland is increasing with time or the data currently being used (i.e., NCREIF series and TPI) is different and more accurate than the stumpage prices and synthetic timberland return series used in the past. The two timberland indexes are the only ones currently in existence and reports on quarterly and annual returns are available. The TPI is published by Jon Caulfield at the Warnell School of Forestry at the University of Georgia and consists of returns (weighted by market value) from 13 timberland funds managed by 3 timberland investment managers (Lutz, 1999). The NCREIF index has been published by the National Council of Real Estate Investment Fiduciaries since 1994 and contains returns dating back to 1987. It is a property-based index reporting returns for three regions of the United States: the South, Northeast and Pacific Northwest (Fisher, 2005).[16]

Before the existence of these two indexes in the United States, researchers used a proxy of forest returns based either on annual changes in stumpage price or constructed a synthetic time series of returns for a hypothetical forest. The generally applied method of calculating this synthetic series was:

$$R_t = \frac{NI_t + CV_t}{CV_{t-1}} - 1$$

Where
R_t = Total return per acre of the asset at time t
Ni_t = Net income per acre received of the asset at time t
CV_t= Capital value of the asset during time t
CV_{t-1}= Capital value of the asset during time t-1

The net income was computed by subtracting the costs from the revenue:

$$NI_t = H_t P_t - C_t$$

Where;
H_t=Volume of stumpage harvested
P_t=Price of stumpage
C_t=costs which include regeneration expenses, property taxes, insurance from fire and pests.

4.4. Empirical analysis

This section first describes the econometric model and the data used in this study, followed by a description of how the returns for each of the model components were calculated. The different econometric tests conducted are also described.

[16] More information on the actual construction of the index available at: http://www.htrg.com/pdf/rn_returns_02.pdf

4.4.1. The empirical CAPM model

The excess returns version of the single-index model (2) was used to estimate alpha and beta parameters. Previous applications of the CAPM used OLS to run the CAPM regression. In this study, OLS is used to estimate the timberland alpha and beta because there is only one equation.

Farmland alphas and betas are estimated using seemingly unrelated regression (SUR) equation because there are multiple equations. Using SUR to estimate equations as a system instead of estimating them individually has the advantage of attaining efficiency gains in estimation from combining information on different equations (Verbeek, 2000). SUR is used to estimate the CAPM parameters for each of the Prairie Provinces. OLS is used to estimate the alpha and beta for a pooled average of returns in the three provinces.

A secondary objective of this study is to investigate whether there are diversification potential differences in farmland due to soil quality variations. SUR is also used to estimate alphas and betas for each of the six soil classes in Alberta. Data limitations in the other provinces prevented the computation of parameters for different soil classes. The data analysis and statistical software program used is STATA.

4.4.2. Data

The farmland data used in this study spans 36 years (1976-2012). The Alberta soil class betas however are calculated over 32 years (1981-2013) due to data limitations. The timberland data available was over 27 years (1986). The CAPM is applied to farmland provincial returns over two time periods, 1976 to 2012 and 1986 to 2013. The second time period will enable a direct comparison with the timberland results since it will be over the same period.

The S&P/TSX Composite Index data for calculating the capital gains is obtained from the Yahoo Finance database which is available online (S&P/TSX Composite index (^GSPTSE) (2013). The dividends yield data were obtained from the 'Data stream International' data base available through the University of Alberta, School of Business (Data stream International, 2013).

Previous CAPM applications in both farmland and timberland investment studies have used short-term government Treasury bills as a proxy for a risk free asset (Barry, 1980; Bjornson & Innes, 1992; Cascio & Clutter, 2008; Zinkhan & Cubbage, 2003). The risk free asset proxy used in this study are the returns to 3 month Canadian Government Treasury bills. The data were obtained from the Statistics Canada CANSIM data base available online (Statistics Canada, 2013b).

Most of the data needed to calculate returns to farmland were obtained from Statistics Canada online database, CANSIM. To calculate the capital gains on farmland, the data needed are the market value of farmland for the provinces of interest (i.e., Alberta, Manitoba and Saskatchewan) (Statistics Canada, 2013a). The income returns are calculated using data on depreciation, property taxes and cash rents for each province (Statistics Canada, 2013c). Since the cash rent data were aggregated by province, values per acre were calculated by dividing using the total land leased per province (Statistics Canada, 2013d). Alberta farmland values for the different soil classes were also obtained from the Alberta Ministry of Agriculture and Rural Development website (Alberta Agriculture and Rural Development, 2011).

Canada does not have an index of historical returns to timberland therefore a synthetic return series is constructed. Annual changes in value of timberland, as measured by the land expectation value (LEV), are used as a proxy for timberland returns. Data on actual timberland values in Canada is not available hence the use of the LEV. The price series used in the calculation of the LEV was constructed from the hardwood pulpwood raw materials price index (RMPI) available on the Statistics Canada website (See Appendix 2, table 2). The hardwood pulpwood index was chosen because hybrid poplars are the trees of interest in this study (Statistics Canada, 2013e). The rest of the data (yield and costs) used to calculate the timberland returns were collected from the Canadian Wood Fibre Centre (CFWC). The yield data used was obtained from CWFC's hybrid poplar yield curve for the Peace River region of northern Alberta and British Columbia (Canadian Wood Fibre Centre, 2012).

4.4.3. Calculating returns for the model components

This section presents the methods used to calculate returns of the various CAPM components. The method used to compute the market proxy is first presented, followed by a description of how the farmland returns were computed. Lastly, the construction of a synthetic series of timberland returns is described. Descriptive statistics for the calculated returns in this section are presented in Appendix 2, table 1.

4.4.3.1. Risk free rate

The risk free rate proxy used in this study are the annual returns to the three month government of Canada Treasury bills. The yields to these Treasury bills were available in a usable state hence no calculations of returns will need to be made.

4.4.3.2. Returns to the Market portfolio proxy

Annual returns to the market portfolio proxy (i.e., S&P/TSX Composite index) were computed as follows:

$$R_{mt} = \text{Capital gains yield} + \text{Dividend yield} \tag{3}$$

where:
R_{mt}=Total returns from the market at year t

The capital gains are calculated as follows:

$$CGY_{mt} = \frac{SP_t - SP_{t-1}}{SP_{t-1}} \tag{4}$$

where:
CGY_{mt}= Capital gains yield from the market at month t
SP_t= Value of S&P/TSX Composite Index at the end of month t
SP_{t-1}= Value of S&P/TSX Composite Index at the beginning of month t

The annual capital gain yields were then calculated by taking a mean of the monthly capital gain yields for each year. The dividend yields were downloaded in a usable state.

4.4.3.3. Returns to Farmland

The total returns to farmland in this study arise from two sources. The first is the capital gain component resulting from the change in land value from one period to the next. The second is the income component which is similar to the dividend portion of returns from common stocks. The income return is based on the net lease revenue obtained from renting out the farmland to operators. The calculations of the returns are adapted from (Painter, 2010), with changes made because of the assumptions of the current study.

The capital gain component is calculated as follows:

$$CGY_t = \frac{V_t - V_{t-1}}{V_{t-1}} \tag{5}$$

where:
CGY_t= capital gain yield per acre in year t;

V_t, V_{t-1} = average farmland values per acre in years t and t-1, respectively.

Income returns are calculated using average net lease value obtained from renting out land. A cash rent approach is used because it is assumed that the landowner rents out the land and is not directly involved in the daily operations of the farm. The landowner is responsible for paying property taxes and building depreciation. The net lease income will therefore be:

$$IR_t = LR_t - PT_t - BD_t \tag{6}$$

where:
IR_t = income return to farmland per acre in year t;
LR_t = Gross lease revenue per acre in year t;
PT_t = property taxes per acre in year t;
BD_t = building depreciation per acre in year t

The annual income yield is:

$$IY_t = \frac{IR_t}{V_{t-1}} \tag{7}$$

where:
IY_t= income yield per acre in year t;
IR_t = income return to farmland per acre in year t;
V_{t-1}= average farmland value per acre in year *t-1*.

The total returns at time *t* are the sum of capital gains at time *t* and income yield at time *t*:

$$\text{Total Returns}_t = \text{Capital Gains}_t + \text{Income Yield}_t \tag{8}$$

4.4.3.4. Returns to Timberland

The returns to timberland are calculated based on annual changes in land value. Since historical data on timberland values in Canada does not exist, the LEV is used as a proxy for these land values. The LEV is calculated as follows:

$$LEV = \frac{P_b \, V(t)}{(1+r)^t - 1} - C_t - \frac{C}{(1+r)^t - 1} \qquad (9)$$

where;
LEV = land expectation value in \$ per hectare
V(t) = the stand volume of a hectare hybrid poplar in oven dry tonnes
P_b = the price of biomass in \$ per oven dry tonne
C_t = the present value of all silvicultural costs per hectare
r= discount rate
t = rotation age in years

A rolling average is used to smooth out prices since real land values are based on expectations over a long period and not on price changes from one year to the next. A long interval for the rolling average is ideal for smoothing random fluctuations in prices (Droke, 2001). However, the longer the interval, the more observations are lost. Three, five and ten year intervals were considered. The three year interval did not smooth out the fluctuations the way the five and ten year intervals did. Since the five and ten year intervals had similar results, the five year interval for calculating the rolling average was chosen in order to avoid losing a lot of observations.

The discount rate chosen is 4 percent, which has been used in other Canadian studies (e.g., Anderson & Luckert (2007); Yemshanov & McKenney (2008) and Allen et al. (2013)). Using equation (9), the LEV calculation is used to determine the optimal economic rotation (OER). The OER is calculated based on the rotation age that maximizes the LEV. The OER in this study is calculated to be 26 years.

4.4.4. Econometric tests

In all the models run, a number of econometric issues were tested for, and where required, corrected.

4.4.4.1. Breusch-Pagan test of independent errors

When dealing with more than one equation, there could be some efficiency gains from estimating the equations as a system instead of individually (Verbeek, 2000). The farmland returns required the estimation of many equations (i.e., for each of the three provinces and for the six soil classes in Alberta). The Breusch-Pagan Test is used to test the assumption that the errors across equations are contemporaneously correlated. The null hypothesis is no contemporaneous correlation (Verbeek, 2000).

CAPMs applied to the farmland returns were estimated using SUR[17]. The Breusch-Pagan test of independence yielded significant p-values on the test-statistics suggesting there are efficiency gains from applying the SUR instead of the OLS. The actual beta estimates calculated are the same for OLS and SUR estimations because the explanatory variables used in each regression is the same, that is, the excess returns to the market proxy. The efficiency gains are through the resulting lower standard errors in SUR compared to the OLS.

4.4.4.2. Test for stationarity

A standard requirement for any times series used in econometric applications is that it must be stationary; the mean and variance should be constant over time (Verbeek, 2000). A non-stationary series results in a spurious regression whereby the estimated parameters may appear to be significant when in actual fact they are not (Abildtrup, 1999). The Dickey-Fuller (D-F) tests for unit roots are used to test for stationarity in the returns data used. The null hypothesis in the

[17] SUR was used for the beta calculations of the different Alberta soil classes as well as for the betas for the different provinces

test is that a variable contains a unit root and the alternative is that the variable was generated by a stationary process (Verbeek, 2000).

The results from the D-F test show p-values which are not statistically significant at the 5 % level for all the provincial farmland data (0.10 for Manitoba, 0.24 for Saskatchewan and 0.16 Alberta) returns as well as for the risk free asset proxy (0.69). We fail to reject the null hypothesis and conclude the returns are non-stationary. First differencing is used to get stationary data. The p-values for the market returns data, farmland returns data by soil class and the timberland returns data are all statistically significant at 1 percent level of significance, therefore we reject the null hypothesis and conclude these data are stationary.

4.4.4.3. Test for autocorrelation

Time series data in general can be susceptible to serial autocorrelation (Verbeek, 2000). Past studies which applied CAPM used the Durbin-Watson (D-W), in testing for autocorrelation in the data used (Binkley et al., 1996; Lundgren, 2005; Redmond & Cubbage, 1988). D-W statistic tests for first-order serial correlation; that is, the D-W statistic measures the linear association between adjacent residuals from a regression model. A D-W test statistic of around 2 is obtained if the data do not exhibit serial correlation, below 2 if there is positive serial correlation and between 2 and 4 if there is negative correlation (Verbeek, 2000).

The D-W test for first order autocorrelation was conducted. The test on the regression results for the returns to farmland shows D-W values of between 2.35 and 2.38. These values are close to 2 therefore we fail to reject the null hypothesis that there is no autocorrelation.

The D-W test statistic for the returns timberland was 0.43. Since this test statistic is less than 2, we reject the null hypothesis and conclude that the returns exhibit autocorrelation. Presence of autocorrelation “leads to wrong standard errors for the regression coefficient estimates. This in turn leads to wrong t-statistics on the significance of these regression coefficients and misleading statistical inference based on a wrong estimate of the variance-covariance matrix computed under the assumption of no autocorrelation" (Verbeek, 2000). Standard errors for the regressions are corrected for autocorrelation using the Newey-West procedure. The resulting standard errors are robust not only to autocorrelation, but also to heteroskedasticity.

4.5. Results

The regression results could be influenced by inflation. Hence the first part of this section presents results of whether or not the CAPM is affected by the rate of inflation. The farmland results are then presented, followed by the timberland results. For each of the results' section, the historical values of the returns are given followed by the CAPM results.

4.5.1. Effect of inflation

The traditional CAPM overstates the systematic risk if an assets rate of return has a positive covariance with the rate of inflation (Roll, 1977). The covariance between the returns and the rate of inflation measured by the Consumer Price Index was calculated and neither farmland nor timberland returns have positive covariance with the rate of inflation as shown in table 5.

Table 5: Covariance coefficients of assets with the rate of inflation

	Farmland										Timberland
	Manitoba	Saskatchewan	Alberta	Pooled average of the prairie provinces	Soil class 1	Soil class 2	Soil class 3	Soil class 4	Soil class 5	Soil class 6	
Correlation coefficient	0	-0.1	0	-0.3	-0.4	-0.3	-0.4	-0.4	-0.4	-0.2	0

4.5.2. Farmland results

4.5.2.1. Performance of returns

A comparison of the performance of the provinces' farmland, the stock market and the Treasury bills is shown in figure 2. The graph shows variations and trends in the investment alternatives. Over the 36 year period of the study, the returns to farmland were more stable than the returns to the Canadian stock market represented by the S&P/TSX Composite Index. Even though there were many years when the market outperformed farmland, farmland did not fluctuate as much. The 2008 recession saw a major dip in the market returns but in contrast, the returns to farmland went up by 7.7 percent in 2008 (Statistics Canada, 2013).

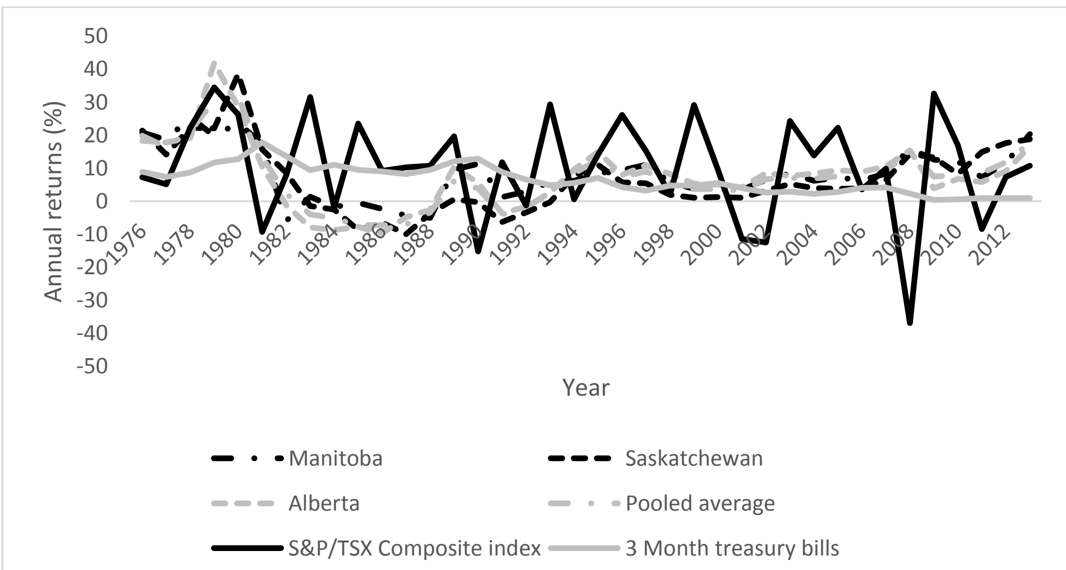


Figure 2: Performance of Alberta, Manitoba & Saskatchewan farmland and the stock market

The historical returns by soil quality in Alberta are based on returns computed for the six different soil classes. Soil classification is based on the Canada Land Inventory (CLI) rating system which provides an indication of the agricultural capability of land. The CLI class assigned for a particular parcel of land is based on the dominant CLI class for the parcel (Alberta

Agriculture and Rural Development, 2011). The agricultural capability of each class is described in table 6:

Table 6: Alberta soil classes based on the Canada Land Inventory (CLI) rating system

Soil class	Description
1	Soils with no significant limitations in use for crops
2	Soils with moderate limitations that restrict the range of crops or require moderate conservation practices
3	Soils with moderately severe limitations that restrict the range of crops or require special conservation practices
4	Soils with severe limitations that restrict the range of crops or require special conservation practices or both
5	Soils that are unsuitable for annual cultivation these soils could be improved for the production of perennial forages or pasture
6	Soils that have some natural grazing potential but where improvement practices are not feasible

Source: (Alberta Agriculture and Rural Development, 2011)

The soil class scale is from 1 to 6, with 1 representing the most productive soils agriculturally and 6 being the least productive, hence their reservation for natural grazing. In addition to these six classes, soils described as “Other” also exist but they will not be considered for this study due to data limitations (Alberta Agriculture and Rural Development, 2011).

Figure 3 shows how the different soil classes performed compared to the stock market. The returns to all the soil classes followed a similar trend which in most years moved in an opposite direction to the movements in the market. The land classes could therefore have good diversification potential. The performance of the returns to these classes resembles the trend exhibited by the returns to provincial farmland in figure 2. Returns to class 1 farmland increased more than they did for the other classes in 2012. The increase is likely because of the large increase in class 1 land values between 2011 and 2012 (Alberta Agriculture and Rural Development, 2012).

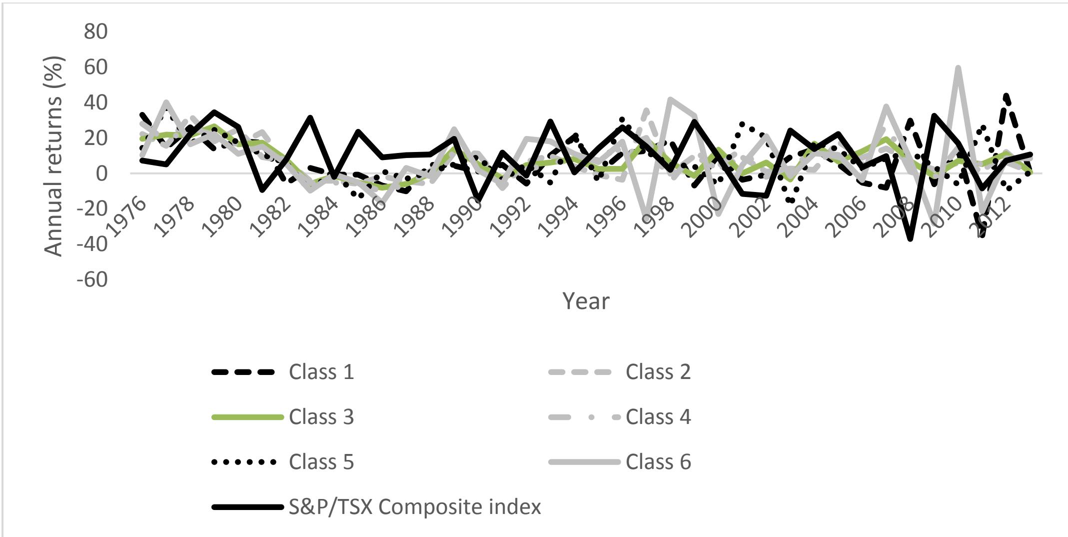


Figure 3: Performance of Alberta farmland by soil class, the stock market and Treasury bills

Class 6 moved in a similar fashion to the returns to the market in some of the years (e.g., 1998, 2008 and 2010). This could be because class 6 is not suitable for growing crops but has other uses, one of which could be recreational value. The potential recreational use value for class 6 land could be more directly related to the market.

4.5.2.2. Regression results

The farmland regression results for the provinces are reported for two time periods. The first period corresponds to the timberland available data and is from 1986 to 2012. The second period spans 36 years and represents all the data that was available. The results for the two periods are shown in tables 7 and 8, respectively.

In table 7, the provincial betas and alphas are statistically insignificant. The beta values imply that returns to farmland are uncorrelated to returns in the stock market. Investing in farmland in the three provinces between 1986 and 2012 would not have added systematic risk to a diversified portfolio. These beta values are similar to those calculated in previous studies such as Barry (1980), Irwin et al. (1988) and Bjornson & Innes (1992).

Table 7: Regression results of farmland by Province 1986-2012

	Manitoba	**Saskatchewan**	**Alberta**	**Pooled average of the prairie provinces**
Beta (β)	-0.02	-0.05	-0.05	-0.05
Alpha(α)	2.05	-4.64	-2.71	-3.35
R^2	0.00	0.01	0.01	0.02

***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively

The alpha parameter is the difference between an asset's performance and that predicted by the CAPM, given the amount of systematic risk of the asset (Perold, 2004). The alpha coefficients for the provinces are between -4.64 and 2.05. They are however not statistically different from zero which means investing in farmland between 1986 and 2012 would have earned a return adequate for the risk taken. The alpha values reflect what past researchers have also found. The result satisfies the theoretical prediction of the CAPM that in an efficient market, the expected value of the alpha coefficient is zero (Arthur et al., 1988).

The R^2 in regression models provides a measure of the goodness of fit of the regression, ranging in value from zero when there is no relationship between two variables, to 1 if one variable is perfectly linked to another (Verbeek, 2000). In the context of the CAPM, the R^2 value indicates the percentage of variability in the stock's return that can be explained by the variability in the market's return i.e., the percentage of an asset's volatility that is systematic (Graham, Smart, & Megginson, 2009).The R^2 values of the province farmland regressions are relatively low indicating fluctuations in the market account for virtually none of the movements in the returns for the farmland. A small fraction of the farmland's volatility reflects systematic risk.

Table 8 shows the regression results of farmland for each province over a longer time period. The results are the same as the ones obtained for the period 1986 to 2012. The alphas and betas for all the provinces are essential equal to zero because they are statistically insignificant.

Table 8: Regression results of farmland by Province 1976-2012

	Manitoba	**Saskatchewan**	**Alberta**	**Pooled average of the prairie provinces**
Beta (β)	0.00	0.00	0.00	0.04
Alpha(α)	1.38	1.39	1.39	-1.73
R^2	0.00	0.00	0.00	0.00

***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively

Not all agricultural land is capable or suitable for producing all agricultural products. The soil quality determines the products produced. The regression results for the two time periods for the soil classes in Alberta yield similar results as shown in tables 9 and 10. For both periods, class 5 has a negative beta which is statistically significant, while the rest of the classes have betas which are statistically insignificant meaning they are essentially equal to zero. A beta of zero means the returns to farmland for the classes are independent from the returns to the market. The returns to the farmland would essentially be equal to the risk free rate of return. Farmland in this case would not add any systematic risk to the portfolio. Risk associated with farmland could be diversified away. The zero betas are consistent with results in the study which look at the beta values for each of the provinces.

The negative beta for class 5 farmland could be linked to the different use value when compared to the other soil classes. According to the classification system presented in table 6, classes 1 to 4 are deemed capable of production of annual field crops such as grains and oilseeds, while classes 5 and 6 are recommended for different agricultural uses, such as perennial forage crops, improved pasture and native grazing. Classes 5 and 6 are therefore more suited for cattle raising. The land gets value from what it produces. Beef prices and agricultural crop prices are different and so we would expect the underlying land to also have different variations with the market. From the results, the negative beta of class 5 indicates that returns to class 5 farmland move in the opposite direction as the returns to the market, making it a good candidate for diversification. In contrast to the other classes (with betas equal to zero) which do not add any systematic risk to a well-diversified portfolio, the negative beta of class 5 implies it could reduce the overall risk of a portfolio. As such, class 5 could have a more desirable diversification potential when compared to the other classes. However, the disadvantage of having a negative beta would be that class 5 farmland would have expected returns lower than the risk free rate.

Table 9: Regression results of Alberta farmland according to soil class 1981-2012

	Soil Class					
	1	**2**	**3**	**4**	**5**	**6**
Beta (β)	-0.04	0.03	-0.05	0.08	-0.28*	0.06
Alpha (α)	-4.35	-3.53	-3.44	-2.85*	-2.67	-0.99
R^2	0.00	0.00	0.01	0.01	0.13	0.00

***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively

For the period 1981-2012, five out of the six soil classes have alpha values which are statistically insignificant and therefore essentially equal to zero as predicted by the CAPM. Class 4 is the only one with a statistically significant alpha value, whose negative sign implies the returns to farmland in this class are lower than what was predicted by the CAPM. Compared to the market-based return estimate, class 4 underperformed by 2.85 percent. Investing in Alberta farmland soil class 4 between 1986 and 2012 would therefore have yielded returns less than the reward for the assumed risk. The other classes have alphas equal to zero as predicted by the CAPM. For the period 1976-2012, all the alphas are statistically insignificant.

Table 10: Regression results of Alberta farmland according to soil class (1976-2012)

	Soil Class					
	1	**2**	**3**	**4**	**5**	**6**
Beta (β)	0.00	0.08	-0.01	0.06	-0.22*	0.01
Alpha (α)	-2.39	-2.00	-1.71	-1.31	-1.2	-0.31
R^2	0.00	0.01	0.00	0.01	0.07	0.00

***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively

The R^2 values for all the classes are very low in both time periods, with some values equal to zero. This implies a small fraction, and in some cases, none of the farmland's volatility reflects systematic risk.

4.5.2. Timberland results

The timberland returns were calculated under two scenarios. The first scenario is based on the currently available data. The LEV calculations yielded negative values. Since the LEVs are used in this study as a proxy for land values when trees are grown on private land, the negative values could indicate that growing trees is not the best use for the land given current conditions. Since the negative LEV points to the lack of profitability of land if used to produce trees, we explore a second scenario in which we determine what it would take (with respect to costs) for the LEVs to be positive. The positive LEVs could signify an increase in profitability from the first scenario. All the LEVs are positive when costs are reduced to $1147 per hectare. The positive LEVs and thus positive land values could be a plausible scenario in the future if costs become lower due to technological change. [18] The LEVs for both scenarios are graphically presented in Appendix 2, figure 1.

4.5.2.1. Historical performance of timberland returns

Timberland investment in the United States have been reported to be more attractive than high return financial assets because their "superior returns do not excessively increase risk" (Binkley & de Bever, 2004). Timberland returns in the United States have outperformed the stock market, with the annual nominal return for timberland between 1987 and 2011 reported to be 15 percent versus 10.54 percent for the S&P 500 index (Barrios, 2011). This high return-low risk characteristic makes timberland a good asset for investors seeking to diversify their portfolios.

In contrast, this study shows only a few years where the calculated synthetic returns to timberland in Canada outperformed the market (e.g., 1990, 2001, 2002 and 2011) (Figure 4). The returns to timberland did not oscillate as much as the market returns.

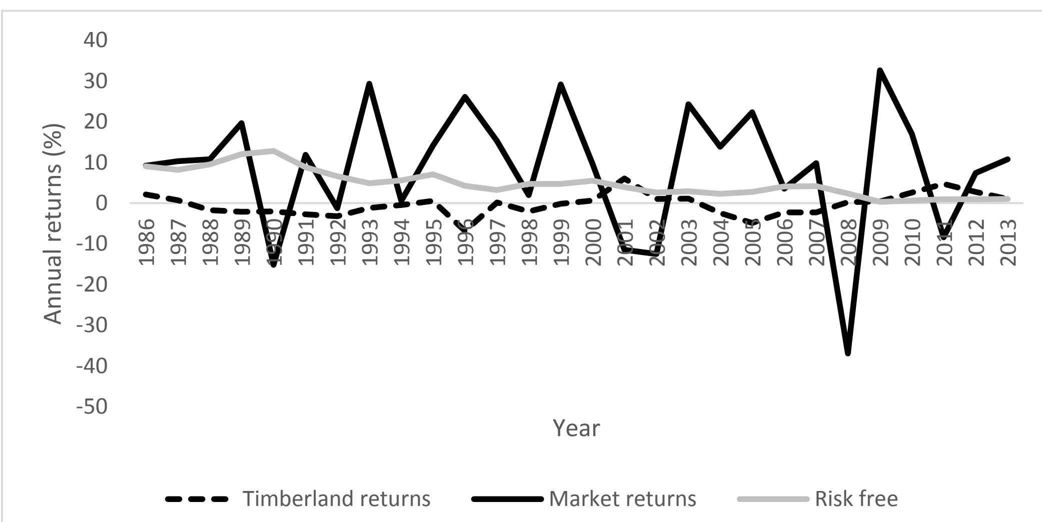


Figure 4: Historical performance of the timberland returns

[18] OER is calculated to be 24 years in the second scenario.

Figure 5 shows that had the land values been positive during the study period, the returns to timberland would not necessarily have outperformed the market.

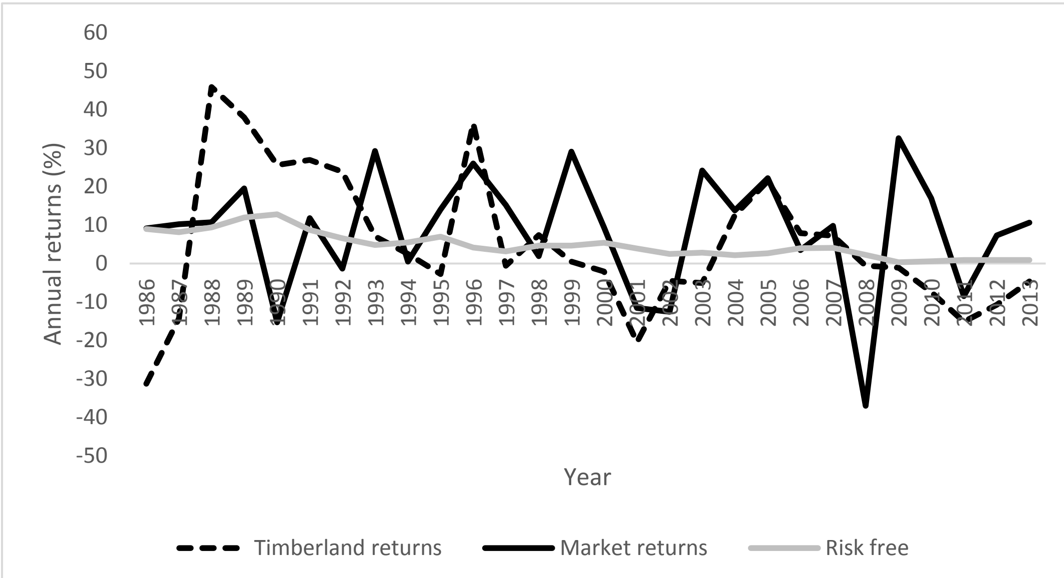


Figure 5: Historical performance of the timberland returns when land values are positives

4.5.2.2. Regression results

Evidence from earlier research in the United States showed that timberland is a negative beta asset, which makes it good for diversifying portfolios (Binkley et al., 1996; Redmond & Cubbage, 1988). More recent work now points to timberland either having a positive (Sun & Zhang, 2001) or zero beta (Cascio & Clutter, 2008). The recent positive results can be attributed to the more reliable timberland index of returns being used. Though positive, the betas are still very small in magnitude, mostly less than 1. Timberland still adds little systematic risk to a well-diversified portfolio even though it moves in the same direction as movements in the market.

Table 11 shows the CAPM regression results for the returns calculated with negative LEV values (1) and returns calculated with positive LEV values (2). The two beta estimates yield similar results, the betas are both statistically insignificant which means they are essentially equal to zero.

Table 11: Regression results for returns to Timberland (1981-2012)

	1	**2**
Beta (β)	0.02	0.14
Alpha (α)	-5.29	-2.43
R^2	0	0.01

***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively

The alpha values are also similar for the returns calculated with positive and negative LEVs, i.e., they are both equal to zero. These results are consistent with past research (Redmond & Cubbage, 1988; Binkley et al., 1996). The absolute profitability of timberland investments in this case does not seem to affect the performance of the timberland asset with respect to portfolio diversification.

4.6. Summary

This chapter sought to find empirical evidence showing that the competition for private land between trees and crops could be influenced by the risk-return characteristics of the land. The CAPM was applied to farmland returns and a synthetic series of timberland returns. The estimated parameters (beta and alpha) are the basis of the comparison. The systematic risk measured by the betas is not overstated because the correlation between inflation and the returns to farmland and timberland is not positive.

Based on both the alpha and beta results, the competition for private land does not favour either agriculture or forestry. Both the farmland for the provinces and timberland betas obtained for the provinces are essentially equal to zero. The two assets do not add any systematic risk to a diversified portfolio. Assuming the same level of risk, the beta estimates indicate that an investor holding a market portfolio would have obtained the same level of return by investing in either farmland or timberland. The alpha values for farmland in all three provinces were not statistically significant and thus equal to zero as predicted by the CAPM. The timberland alpha values were also not statistically significant for both investigated scenarios.

The study also sought to find out whether farmland investment potential exhibits variations according to soil quality. The results show the betas for five out of the six soil classes were similar to those for the provincial farmland estimates i.e., not statistically significant. Class 5 however has a negative beta which is statistically significant implying the movements in returns to farmland of this class move opposite to the market. Classes 1 to 4 are suitable for the production of crops while class 5 is more suitable for livestock. These products have different prices and this could contribute to the observed differences in correlation with the market. The negative beta implies class 5 farmland could have better diversification capability than timberland because it is capable of reducing overall systematic risk when added to a diversified portfolio. Timberland in contrast would only have the advantage of not adding any systematic risk. Five out of six alpha values for the soil classes were statistically not significant. Class 4 has the only statistically significant alpha value, which is negative.

The timberland section explored an alternative scenario because the initial calculated LEVs were found to be negative. Negative LEVs mean the land values are negative since LEVs are a proxy for land values in this study. The second scenario assumes future profitability of timberland investments where costs are reduced due to technological change resulting in positive LEVs. Both scenarios yielded similar results of betas and alphas which were not statistically significant. From these results, timberland as an asset is shown to be independent of market returns and so does not add any systematic risk to a well-diversified portfolio.

Chapter 5: Conclusion

The main objective of this study was to look at how the potential for an expanding biofuels industry could lead to competition for private land in Canada. As the biofuels industry is expected to expand and potentially become more dependent on ligno-cellulosic feedstocks, it raises the question of where trees will be grown to support this forest based biofuel industry. Purpose grown trees such as hybrid poplars might have to compete with current uses of private land such as agriculture. We investigated two factors that could contribute to this competition, namely taxation policy and the investment value of the land.

In Chapter 2, we conducted a review of the current tax legislation in Canada. The review focused on property and income taxes. The objective of the chapter was to investigate if hybrid poplar trees grown on private land confer the same tax advantages as growing crops. There were variations in the property tax treatment of trees on private land across the surveyed provinces. The review on property taxes yielded three key results, 1) Saskatchewan is the only province with property tax laws which favour trees over agriculture; 2) British Columbia is the only one amongst the surveyed provinces which has an explicit land assessment rule for specialty wood crops like hybrid poplar trees; and 3) in Alberta, trees benefit from being part of a farm. The benefit is that the trees avoid the higher taxes charged under woodlot classification if they are grown as part of other farming operations. The income tax rules do not differentiate between trees and agricultural crops. Hybrid poplars on private land would qualify for the same favourable income tax treatment as traditional agricultural crops.

Chapter 3 extended the discussion on taxation from the preceding chapter by examining the potential tax savings benefits of land ownership through a REIT corporate structure. In this chapter, we also introduced the concept of the investment value of private land. Ownership of land through a REIT in Canada could offer not only tax savings benefits, but it could also provide an accessible way for investors to include farmland and timberland as part of their portfolios. The tax savings of REITs in Canada are through the exemption from paying corporate tax if 90% of their income is distributed as dividends to shareholders. Unlike in the United States, Canada does not have any REITs built around farmland and timberland. A review of the current Canadian REIT policy was therefore made to identify the legislation barriers to the formation of F-REITs and T-REITs. We found that two main barriers to F-REITs and T-REITs exist, both of which relate to provincial farmland ownership rules. Firstly, a requirement for REIT status to be granted is that a corporation has to be listed on a public stock exchange, but companies which have shares listed on a stock exchange cannot own farmland in most provinces. Secondly, a number of provinces also have farmland domestic ownership requirements. The provinces have different rules regarding foreign ownership of farmland, but in the provinces we reviewed, foreign ownership or leasing is restricted to between ten and forty acres. The foreign ownership rule is designed to prevent non-Canadians from buying significant amounts of prime agricultural land, thus ensuring the land is owned by Canadians. This rule is more about distribution than market efficiency and is therefore unlikely to change. T-REITs face an additional barrier because unlike in the United States, timber gains in Canada cannot be counted as passive revenue as per the requirement of the Passive Revenue test for REIT status to be obtained. The prospects for T-REITs in Canada could depend on the expansion of the bio-energy industry, which could increase demand thus making T-REITs more relevant. Increased use of biofuel could depend on how competitive they are when compared with fossil fuels. If fossil fuel supply increases, this would decrease prices making biofuels less competitive.

If F-REITs were to exist in Canada, they could be structured in a similar way to FIFs. FIFs have emerged in the Canadian market to meet investor demand for farmland by providing small units which improve accessibility for small sized investors. The FIFs are also capitalizing on the changing structure of Canadian agriculture which has seen an increased demand for leased farmland and an increase in aging farmers looking for a market for their land as they retire. But FIFs have a problem of being illiquid, which F-REITs could address. There is therefore potential for the formation of F-REITs in Canada, but some legislative changes are needed to accommodate these REITs.

The last section of this paper investigated the portfolio diversification potential of farmland and timberland investments and how this could influence competition for private land between crops and trees. A secondary objective was to investigate whether there are diversification potential differences in farmland due to soil quality variations. A CAPM was used to estimate beta, a measure of systematic risk added by an asset to a well-diversified portfolio. Returns to farmland were calculated using historical data in three provinces i.e., Alberta, Manitoba and Saskatchewan. Due to the lack of historical data on timberland values, a synthetic series of returns to timberland was developed based on LEVs. The estimated beta parameters for farmland and timberland were all statistically insignificant except for farmland with class 5 soil quality, which had a statistically significant negative beta. Correlation coefficients with inflation were calculated to ascertain if these betas could have been overstated. The CAPM overstates the systematic risk if an assets rate of return has a positive covariance with the rate of inflation. The coefficients were zero and negative; therefore, none of the betas were overstated.

Based on the CAPM results, only class 5 farmland has an advantage over timberland because it reduces overall systematic risk in a diversified portfolio. Class 5 also moves in the opposite direction to movements in the market whereas timberland and the other classes of farmland have betas equal to zero meaning they are independent of movements in the market. Classes 1 to 4 are suitable for the production of crop products while class 5 is more suitable for cattle production. These products have different prices and this could contribute to the observed differences in correlation with the market. Despite its diversification advantage, the negative beta for class 5 farmland also means its expected returns would be less than the risk free rate.

The initial LEVs calculated were negative implying land values could be negative if trees are grown. We explored a second scenario which assumes future profitability of timberland investments, where costs are reduced due to technological change resulting in positive LEVs. Both scenarios yielded similar results of betas and alphas which were not statistically significant. Based on the synthetic series of timberland returns, the results show timberland as an asset is independent of market returns and so does not add any systematic risk to a well-diversified portfolio.

The contributions to the literature are: (1) using a synthetic series to evaluate the returns to Canadian timberland in the context of portfolio diversification, which has never been done before for Canada and (2) investigating if there are soil quality variations in farmland returns and CAPM parameters. The main challenge in this study was the lack of information on the actual market value of land in timber production in Canada. As such, it is possible the synthetic series could have understated or overstated the actual returns from annual changes in timberland value. This in turn could have an impact on the beta calculated and so could potentially shift the dynamics of the competition for private land between agriculture and forestry.

Appendix 1: Magnitude of the income tax impact on the financial viability of a representative farm model in Alberta

To gain a better understanding of how tax would affect the financial returns of a farm, the study investigates the effect of income tax on a representative a representative Cow/Calf farm model in Alberta. The property taxes were not included because it would have been difficult to make assumptions about the assessed value of the farm to which the property tax rate is applied. Farmland in Alberta is based on its productive value and this value would have been challenging to ascertain. A summary of the characteristics of the farm, the model used and the results obtained is presented in this section.

Farm size

The farm size of 4000 acres was chosen based on the assumption that the modelled farm should be representative of a typical Cow/Calf farm in the Athabasca County. The representative farm model is assumed to have the following operations: Crops, Forage/Hybrid poplar trees, Cows and Pasture.

Model

Cash flow Net Present Value (NPV) analysis is used to investigate the financial impacts of adopting hybrid poplar trees on private land. The study explores a scenario where part of the land used for growing forage crops is allocated to growing hybrid poplar trees. The NPV is calculated using cash flows associated with crop input costs, crop and forage revenues, machinery costs, and revenues and expenditures for AgriStability[19] and crop insurance programs.

[19] The AgriStability program is designed to help farmers deal with drops in income by providing assistance when their margins (operating income less operating expenses) decline (Manitoba Agriculture, Food and Rural Initiatives, 2014).

Cash flow analysis for each operation was calculated over a 60 year period in order to accommodate the long rotation age of trees. The net cash income for whole farm was then calculated and a corporate tax rate of 15 percent applied. The farm is assumed to be a corporation in order to apply the flat corporate income tax rate. The NPV of the farm was then calculated using the net farm incomes and a discount rate of eight percent was used.

Results

Calculations were made of the NPV of the farm, before and after the income tax had been deducted. The NPV before subtracting income tax was $3 143 769.18. There was a 0.51 percent decrease in NPV to $3 127 734.86, after the income tax was accounted for. The results show income tax does not have a large impact on the NPV of the farm. If trees were to be subject to higher taxes then it would likely deter farmers from including them as part of their farming operations since it would possibly result in a lower NPV. The review of the income tax laws showed that agricultural crops and trees would be treated the same which means neither land use has a tax advantage.

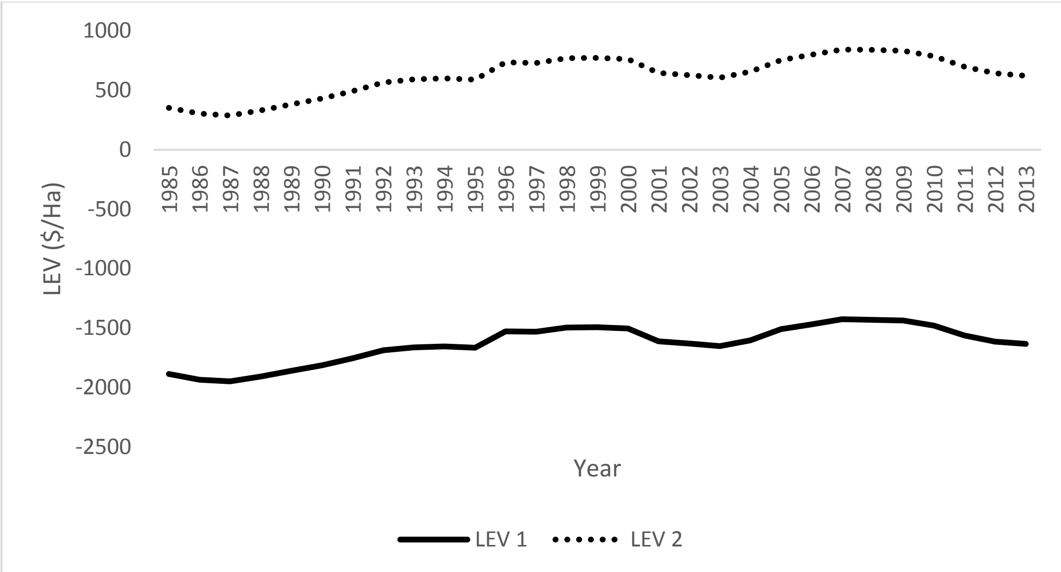
Appendix 2: CAPM components

Appendix table 1: Descriptive statistics of the CAPM components

Variable		Mean	Standard deviation	Minimum	Maximum
S&P/TSX Composite Index		8.99	15.96	-36.99	34.49
3 month Canadian Government Treasury bills		6.31	4.04	0.32	17.81
Returns to farmland	Alberta	7.44	10.25	-9.74	41.95
	Saskatchewan	6.52	10.17	-9.98	38.53
	Manitoba	8.19	7.94	-6.10	25.43
	Pooled average of the provinces	7.18	9.28	-7.34	31.52
	Class 1	6.47	14.29	-35.44	44.06
	Class 2	6.97	10.32	-8.26	35.68
	Class 3	7.12	9.02	-8.03	26.57
	Class 4	7.63	10.31	-10.22	27.97
	Class 5	7.35	13.02	-18.20	37.08
	Class 6	8.57	19.12	-28.31	59.62
Returns to timberland	LEV 1	-0.46	3.25	-8.13	7.24
	LEV 2	2.49	9.78	-15.16	24.38

Appendix table 2: Price series constructed using the hardwood pulp Raw Material Price Index

Year	RMPI Hardwood Pulp	Price	Producer Price Index	Price after inflation
1981	57.3	25.95	59.63	50.58
1982	58.6	26.54	63.63	48.47
1983	55.9	25.32	65.83	44.70
1984	57.8	26.18	68.82	44.21
1985	62.3	28.22	70.72	46.37
1986	62.9	28.49	71.33	46.41
1987	65.7	29.76	73.31	47.17
1988	70.2	31.79	76.48	48.31
1989	72	32.61	78.02	48.57
1990	75	33.97	78.28	50.43
1991	76.2	34.51	77.46	51.78
1992	78.7	35.64	77.83	53.22
1993	77.4	35.05	80.63	50.53
1994	80.3	36.37	85.52	49.42
1995	86.4	39.13	91.88	49.49
1996	112.2	50.82	92.28	64.00
1997	93.5	42.35	92.93	52.96
1998	95.5	43.25	93.26	53.90
1999	89.6	40.58	94.93	49.68
2000	91.2	41.30	98.99	48.49
2001	102.9	46.60	99.95	54.18
2002	97.4	44.11	100.00	51.26
2003	97.7	44.25	98.78	52.05
2004	104.7	47.42	101.95	54.05
2005	112	50.72	103.63	56.89
2006	116.7	52.85	105.98	57.95
2007	112.4	50.91	107.61	54.97
2008	110.4	50.00	112.28	51.75
2009	110.1	49.86	108.36	53.48
2010	110	49.82	109.48	52.88
2011	109.7	49.68	114.55	50.40
2012	110.4	50.00	115.25	50.42
2013	110.4	50.00	116.21	50.00



Appendix figure 1: Land Expectation Values (LEVs)

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