Building a Case for Good Forest Management

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Building a Case for Good Forest Management

Summary

A series of case studies were developed to profile examples of responsible long term forest management in southern Ontario. Eight landowners were interviewed to gather their financial and forest information and to summarize the history of activities on their properties. Annual revenue and costs for various products (timber, fuelwood, and maple syrup) were obtained from the landowner. A representative crop model was developed for a typical crop rotation in Ontario using corn, soybeans & wheat. The model was based on crop enterprise budgets developed by OMAF, which reflect agriculture industry average costs and returns. A Present Value calculation was used to estimate the equivalent 2010 value for revenue and costs from the woodlots and agriculture crops. This paper summarizes the results of the eight cases. The results show that, during the time periods covered in this study, sound management of woodlots has provided returns that are complimentary and favourable in comparison with agricultural returns. The overall purpose for this study was to promote and document responsible management of privately owned forests.

Introduction

Small forests and woodlots are a central feature of the rural Ontario landscape. They form the foundation for our natural environment, and provide environmental and social values which people depend upon to ensure health and quality of life. These forests also support a broad range of economic activity. How these forests are managed has a direct impact on their health and the corresponding economic and ecological benefits they provide. One may ask, "What factors motivate private woodland owners to manage their woodlots sustainably?" For some it may be personal interest or stewardship ethic, while others may be more influenced by potential for economic returns.

The case study concept was suggested in a brainstorming exercise with participants the Maitland Watershed Partnership Initiative in 2003 looking for ideas on how to encourage responsible management of farm woodlots. It was recognized that many of the woodlots in rural Ontario are owned by farmers and sometimes receive limited attention as farmers often need to concentrate their management focus on busy farm operations.

The case studies were undertaken, in part, to investigate whether economic returns from woodlots can compare favourably with those from agriculture. Returns from these managed forests (mostly from timber sales but including other activities such as production of maple syrup or fuelwood) were compared to the budgeted income from agricultural crops over the same period.

These case studies demonstrate the potential for enhanced long-term financial returns and examples of responsible stewardship provided by the woodland owners profiled. It is hoped they will provide an increased awareness and incentive for woodlot owners to manage their woodlots responsibly.

While demonstration sites have been utilized through a variety of projects over the years, to our knowledge very few case studies illustrating long-term economics and forest management have

been developed, and those few have involved conifer plantations. None that we are aware of have attempted to compare agricultural with forest returns.

This summary paper provides background details, methodology, and some limited discussion of individual cases, differences and anomalies.

The overall purpose for this study is to promote and document responsible management of privately owned forests in southern Ontario. Specific components included:

- Developing a series of case studies through interviews and data collection;
- Estimating the net present value (NPV) of historic revenue from the woodlots selected for these cases;
- Estimating the NPV that could have been derived for the same tract of land under an agricultural crop rotation using OMAF crop enterprise budgets; and,
- Comparing the historical monetary returns under the woodlot and crop rotation scenarios.

Approach

Case Development

Inquiries were sent to local resource managers to find suitable candidates for the cases. We were looking for landowners who had been managing their forests for many years and who had financial records from timber and maple syrup sales. A number of subjects were suggested and we selected eight of the best candidates. There were many with examples of long-term forest management, but few with the records to support it. A structured questionnaire was used to obtain the necessary information on background, forest harvest and value, and landowner views. In six of the cases, we contracted a writer to develop a story based on an interview with the landowner to document history, motivation, objectives, and results. Two stories were prepared by the landowner themselves. These stories comprise Part One of the cases. Stories were prepared between 2004 and 2006 and short updates were added in 2012 with financial update to 2010.

Forest Management

It is reasonable to ask if the forests profiled in these case studies are being managed sustainably, or if the growing stock may have been sacrificed in the interest of short-term economic gain. Inventories were carried out at all of the case study sites, and the data compared to the recommended stand structure diagram for tolerant hardwoods in Site Region 6E (which is the area where these case studies are located). Inventory was done using fixed area plots of 400 m^2 in size. Attributes collected included tree species, diameter size class, and tree quality. Data was assessed, graphs were generated; the "y" axis represents the number of trees per unit of area, while the "x" axis represents the diameter at breast height (dbh) of the trees. The resulting curve was compared to a "Reverse J" curve, representative of trees found in a well managed stand, i.e. many trees in the smaller size classes and progressively fewer trees as size increases.

Agricultural Crop Production Model

Representative crop models were developed for typical crop rotations in Ontario using grain corn, soybeans & soft white winter wheat. Crop models for two regions (Western Ontario and Central Ontario) were developed representing the area where the cases were located. The representative farm model was based on past crop enterprise budgets, developed by the Ontario Ministry of Agriculture and Rural Affairs (OMAF), that reflect industry average costs and returns. (Crop

budgets are estimates that project costs for the coming years and may be different than the actual costs incurred in that year.) Individual revenues and costs can vary significantly from crop budget estimates. Both variable and fixed costs were used in the calculations. Although fixed costs do not change with marginal changes in acreage, overall fixed costs, including depreciation, must be covered to maintain long-term profitability. (Fixed costs do not include land rent or interest on land.) Revenues were developed based on yield and price data provided by OMAF.

Historic crop enterprise budgets were available from 1975 to 2010 with a few exceptions as noted. Cost of grain corn and winter wheat production were missing from 1975 to 1979, and 1984, 1992, 1994, and 1996. Soybean production costs were missing from 1975, 1992, 1994, and 1996. Revenue and yield data were available from 1975 except that soybean yield was missing from 1975 to 1977. For the years where data is not available, crop budgets in years closest to the missing year were interpolated to get as accurate an assessment as possible. To accommodate changes in reporting of crop enterprise budgets over the years, estimates using linear trends and averages based on the available historic numbers were determined.

Net Present Value

Typically agricultural crop sales are made on an annual basis, while sales from woodlots are made only periodically. In order to assess them in terms of comparable timing of cash flows, the Net Present Value (NPV) of cash flows over time was estimated to give the equivalent value of sales would have at a fixed future date (2010). To convert past values to the present, the NPV calculation a five percent return was the standard and is shown in the tables. Calculations based on 2, 4, 6, 7.5 and 10 percent were also used.

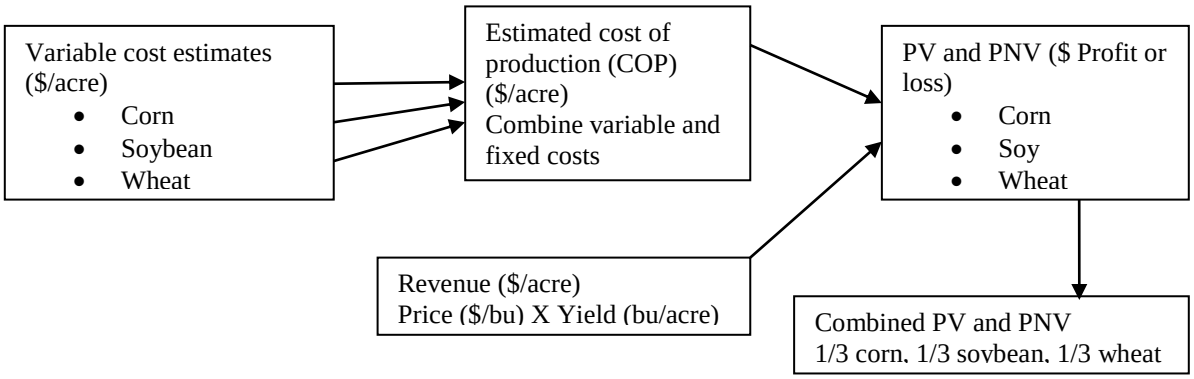
Figure 1 shows how the Enterprise Budget tables were developed over a series of tiers. The first tier is the Variable Cost Estimates for corn, wheat and soybean production. The variable costs are inserted into the Estimated Cost of Production (COP) table showing variable and fixed costs. These are available from the OMAF Crop Enterprise Budgets and are expressed in dollars per acre. The Revenue table was built for each commodity based on the product of price, in dollars per bushel, and the yield, in bushel/acre, to produce revenue in dollars per acre.

Crop returns are cyclical in nature, based on crop rotations. To mitigate the effect that a given crop rotation cycle would have on the end result, the crop model was evaluated assuming the rotation planted 1/3 to corn, 1/3 to soybean and 1/3 to wheat annually. The NPV of the rotation was used for the purpose of comparison with the woodlot per-acre revenue. For each of the commodities, cost was subtracted from revenue to give profit (or loss), and discounted each year to give NPV.

Forest Model

Economic information for the woodlot was obtained through a personal interview with the landowner. Actual revenue and costs were collected for each forest operation for which data was available. A Present Value calculation was used to estimate the equivalent 2010 value for revenue and costs from the woodlots. Then a NPV or profit was calculated. The NPV was then calculated on a per acre basis and summed over the time period since 1975 in order to compare returns from the woodlots to that from agricultural land.

Figure 1. Understanding the Enterprise Budget Tables



Results

Eight candidates were selected and stories written. See Table 1 for participants, story author, family ownership, location, area, and cropping. Landowners were receptive and excited about participation. Their personal stories make enjoyable, informative and fascinating reading. Previous to this study Bob Staley had prepared his own pamphlet entitled *The Staley Woodlot; Racoons, Recreation and Red Oak Logs*. Mack Williams had written his woodlot history and promoted good forestry practice in various venues. Many of the others had promoted the value of good management in their local area at woodlot owner meetings or similar situations. Four farms or forests have been in the family for more than 100 years.

Table 1. Case study participants and background information.

Landowner	Municipality	Part 1 Author	Family Ownership (Start year)	Forest Area (acres)	Total Farm area (acres)	Cropping Description
George and Sandy Barrie	Region of Waterloo	Keith Roulston	1864	45	245	cropland (corn, soybeans, wheat, and some hay) and approximately 50 beef cattle that overwinter; 15 acres in young plantation for land retirement
Russell Horning	Bruce County	Keith Roulston	1887	16	100	Land rented and used for grain and hay production
Norman Horst/ Albert Martin	Region of Waterloo	Keith Roulston	1959/2000	18	108	Mixed farm with orchards, corn and grains, livestock and maple syrup
Murray Scott	Huron County	Keith Roulston	1857	100	400	rotationally cropped (wheat, soybeans, corn and hay) as cash crops or feed for their beef cattle operation.
David Foote	City of Kawartha Lakes	Dave Pridham	1979	25	100	Small grains, pasture and hay for beef operation
Bob Staley	York Region	Bob Staley	1903	13	18	n.a.
Mack Williams	Simcoe County	Mack Williams	1946	100	100	n.a.
John Somerville	Dufferin County	Ron Wu-Winter	1918 and 1920's	441 and 72		n.a.

Somerville – two properties, Welch and Berry-Robinson

Forest Inventory and Management

In the interest of determining if the case study woodlots were being managed sustainably, an inventory of each woodlot was completed. The number of inventory plots installed per property, ranged from a low of 8 to a high of 36 (see Table 2). All stands (except Williams which is a pine/spruce plantation) were dominant to sugar maple with five of the properties having more than 90 percent sugar maple. Other important species were ash, beech, hemlock, and cherry.

Basal area on all forests ranged from 19 to 24 m^2 per ha. The basal area range indicates landowners had not over harvested (which potentially would have opened the forest canopy too much and reduced the value of their growing stock. The basal area range also indicates stands are not overstocked (which potentially reduces rate of growth on future "crop" trees).

Table 2. Forest inventory data including number of plots, basal area (BA), diameter and forest species.

Landowner	Plots installed	BA (m^2/ha)	QMD* 10+ (cm)	QMD 24+ (cm)	Forest species
George and Sandy Barrie	16	21	31	40	Mh90,Cb4,Aw3,Mr3
Russell Horning	9	24	32	38	Mh95,Be3,Aw,He,By,Ea
Albert Martin /Norman Horst	11	23	34	44	Mh99,Be,Cb
Murray Scott	36	21	22	32	Mh71,Aw9,Cb7,Ea6,Bd,Be,Id
David Foote	11	19	30	38	Mh92,Be3,He2,Aw,Id,Cb,Bd,Bu
Bob Staley	8	24	29	40	Mh90,Aw8,Cb,He,Id,Bd
Mack Williams, hardwood	6	24	31	32	Mh73,Be24,Id,Cb,Aw
Mack Williams, Softwood Pw stand	10	35	24	5	Pw80,Hd20
John Somerville, Welch	11	22	28	34	Mh73, Aw8,Bd6,Cb5,He4,Be,By,Ea,Mr
John Somerville, Berry-Robinson	10	24	29	35	Mh72,Be10,He7,Bd4,Aw,Cb,Id,Mr

*QMD – Quadratic Mean Diameter
See species codes in Appendix

Figures 2 shows the stand structure curves for each property owner. The "Recommended" curve represents the ideal size class distribution in an all-aged, deciduous, shade tolerant upland forest, being managed under a single tree selection system. This silviculture system is the forest objective for most of the landowners.

We recognize the "Recommended" curve represents an ideal distribution. This is in reality a goal to strive for in management, but in practice is something that will never be exactly achieved in a real life woodlot setting. There will always be some variation influenced by many factors, including; past management, proximity in time to recent or near future harvests, forest health, management objectives (e.g. timber vs. Maple syrup production), etc. Nevertheless, it does provide an objective means of helping to evaluate whether or not the woodlots are being managed sustainably. We've assumed that some reasonable proximity to the "Recommended" curve by stand structure in case study woodlots will help support the conclusion that the woodlots are being managed sustainably. As the reader will observe in viewing curves for the various woodlots, all stands (except the Williams pine/spruce plantation) are, in fact, reasonably close to the "Recommended" curve.

In developing these case study profiles we learned that all landowners had accessed professional assistance in managing their woodlots. We were also impressed by the owners' interest, knowledge and skills in woodlot management.

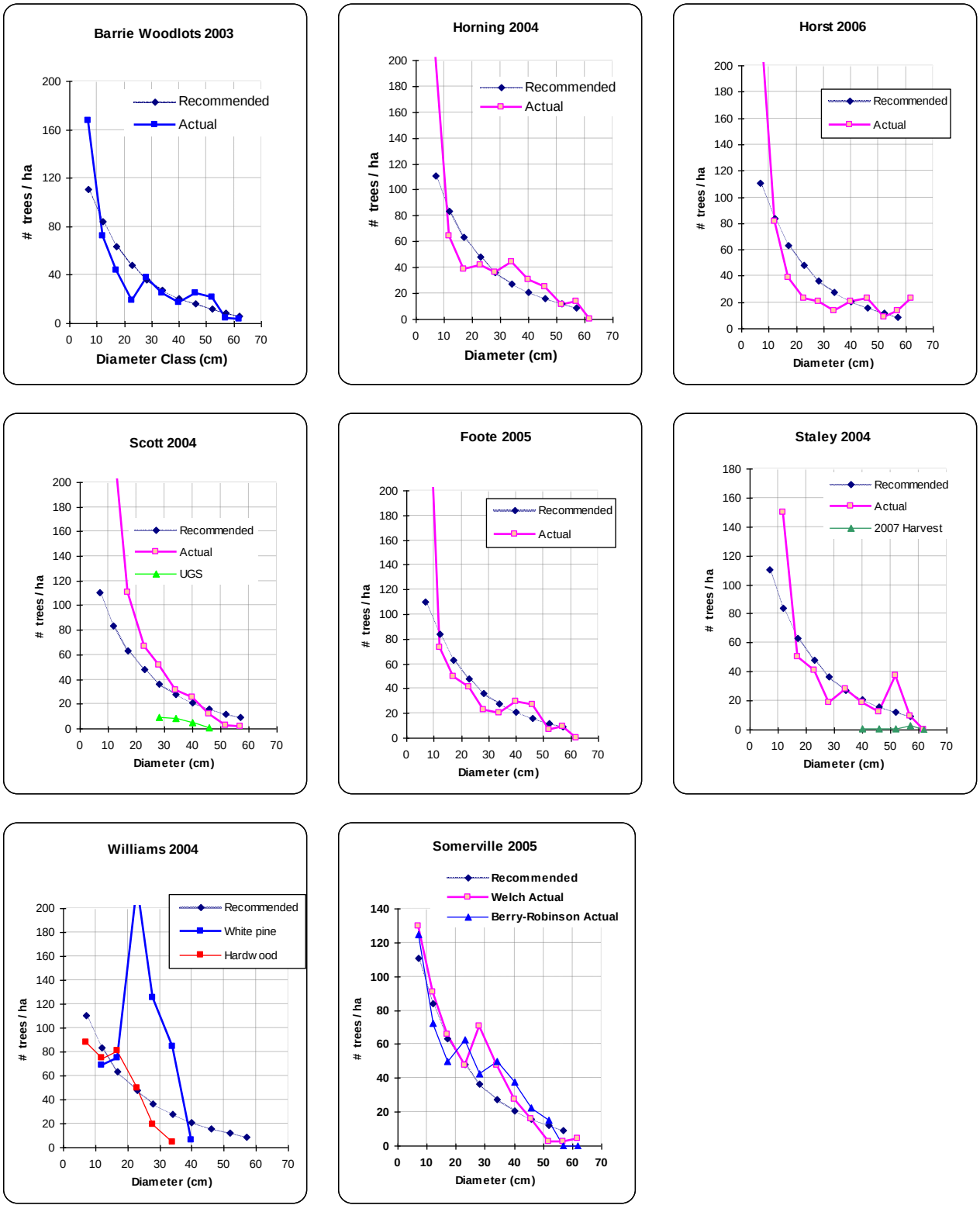


Figure 2. Stand structure curves for all properties.

For all the above reasons, it appears that these forests are in a good state of management and are being sustainably managed. These cases studies are great examples of how woodlots can be managed for economic return in a sustainable way while providing other multiple benefits. They illustrate how various objectives are often mutually compatible and how a woodlot owner does not have to choose one over the other. There is some limited additional discussion of management within each of the individual case studies.

Agriculture Returns

The average NPV per acre per year from 1975 to 2010 (36 years) was $138 for the Western Ontario crop Model and $49 for the Central Ontario model. This is based on the 1/3 rotation of corn, soybean and winter wheat at a five percent discount rate (Table 3).

Table 3. Net Present Value (NPV) data for Timber, Fuelwood and Maple combined by property.

Landowner/ Crop Model	Agriculture Region	Acres of Woodland	Range of years of data	Years	NPV $	NPV$/ acre	NPV$/ acre/ year
	Western						
Crop Model		**n.a.**	**1975 - 2010**	**36**	**--**	**4,979**	**138**
George and Sandy Barrie	Western	45	1975 - 2010	36	398,948	8,866	323*
Russell Horning	Western	16	1975 - 2010	36	95,256	5,954	166
Albert Martin /Norman Horst	Western	18	1982 - 2010	28	253,382	14,077	503
Murray Scott	Western	100	1975 - 2010	36	1,096,643	10,966	305
	Central						
Crop Model		**n.a.**	**1975 - 2010**	**36**	**--**	**1,781**	**49**
David Foote	Central	25	1980 - 2010	31	89,192	3,568	115
Bob Staley	Central	13	1975 - 2010	36	36,471	2,805	80
Mack Williams	Central	100	1975 - 2010	36	131,845	1,318	37

* NPV/acre/year calculated for years of data collected for each component. See notes in Table 4.

Forestry Returns

All landowners harvested timber for income, and seven of them produced fuelwood although only four produced fuelwood for sale. Some of those sales were annual and some followed a larger harvest. Two produced maple syrup. On Williams' property, the woodlots evaluated were plantations. All the others were upland hardwood with a large sugar maple component to their forest. All have been managing their forest and utilizing wood products since the 1960's or earlier with the exception of David Foote who purchased his farm in 1979, Norman Horst purchased his farm in 2000 but the farm was in the Martin family from before 1940 and the transition is an excellent example of a seamless change in ownership.

NPV figures comparing agriculture with forest production are found in Table 3 and 4. Some landowners had records before 1975, but this year was selected as a starting point since agricultural budgets started to become available with some consistency.

Comparison to Agriculture Returns

For the four owners in the Western region, values of the agricultural rotation were 26 to 84 percent of the value of the forest products. Scott had the highest product value at almost $1.1 million for the 100 acres over 36 years. His average NPV per acre per year was $305. Horst's average NPV per acre per year was $503 supported mainly by his maple syrup operation.

In the Central region, values of the agricultural rotation were 46 and 63 percent of the value of the forest products in the hardwood forests. In the Central region forest values (NPV per acre per year) were lower than all the Western region values. The Williams softwood plantations have not reached their prime production and had started from bare soil in 1946. Their NPV per acre per year of the agricultural rotation is 132 percent of the value of the forest products. Williams's property was put in the central Region, although Simcoe County is in the Western area. His property is on the Oro Moraine in the north part of the County and certainly not prime agriculture land (CLI 6 and 7). Staley could have achieved higher values if he had harvested some of his surplus high-value timber.

Table 4 provides a breakdown of the forest products information that was collected; timber, fuelwood and maple. The Somerville property was treated differently here. Although there is a long history of harvesting this property, there is not enough information to provide comparisons to agriculture returns. The Somervilles have had forest inventories done on their properties since 1956. Analysis of this data is used to illustrate the sustainability of the harvest.

Strong forest product returns are achieved for a few reasons. All landowners sought out professional advice through subsidized government advisory and marking programs that were available during initial years of the study. This early management advice likely helped increase long term returns through increased productivity, quality and certainty of receiving fair market value. Also, management and other input costs tend to be quite low relative to returns even when landowners started paying for professional advice in some cases. For most of these forests, when a deal is reached for sale of logs, the loggers offers a price based on net value that includes consideration of harvest costs. In one case the landowner and logger shared the income on a percentage basis.

Anecdotal evidence suggests landowners who get multiple bids on standing timber appear to make more income than those who sole source to a single logger.

Through the late 1990's to about 2006, timber prices reached all time highs and some bids were extremely high to the landowners benefit. Prices have come down since 2006 to the point where many landowners are not as actively selling timber. This is one of the advantages in marketing forest products vs agricultural crops; landowners have the option of delaying timber sales until markets are more favourable. In the meantime the value of their crop generally grows through increased volume and grade.

Agriculture must balance returns against costs (particularly variable costs) on an annual basis. In the logging business the logger (contractor) must look after capital costs. Weather is also more of a factor in affecting yield and harvest of annual agricultural crops. Conversely, agricultural returns offer annual cash flows from which to operate, and business risk management programs are in place that help balance returns from annual crops in poorer years. These were not considered in this study.

This analysis did not attempt to place a monetary value on the many other woodlot benefits such as site protection, contributions to water quality or groundwater recharge, opportunities for recreational use, etc. It is typically more difficult to place a dollar value on these benefits, although in some locations landowners are charging for access or leasing hunting and fishing rights.

Discussion

The empirical results of the study and interviews with participants provided the following insights regarding woodlot management economics.

Market Timing
High prices for maple logs in the latter years of the study did have some influence on the results. This is illustrated in the Staley case study, where without a recent harvest the returns don't look as favourable in comparison to agriculture. However, this does also relate to timing of the cutting cycle as mentioned below. One advantage of a forest crop is that there is more opportunity to time the markets and sell when prices are higher, e.g. trees can be retained during times of depressed prices and will, in most cases, continue to add volume and value until markets improve.

Timing Within the Cutting Cycle
Obviously results are more valid when viewed over a longer time period. For example, if a large timber sale is made just before or after the data collection period begins, it could skew the results in one way or the other unless the time period is long enough to reduce its effect on the overall results.

Landowner challenges
A number of factors influence a landowner's ability to manage their woodlots for long term sustainability and productivity, including:

- Economic conditions on the farm;
- Pressures in active markets to make a sale earlier in the cutting cycle than appropriate;
- Problems with less competent or honest loggers or consultants (e.g. logging damage or inappropriate selection of trees for harvest);
- Availability of training opportunities to enhance landowner knowledge;
- Generational change of ownership;
- Development pressure (change of land use from agriculture).

Common Elements to Success
Common traits of the landowners in these case studies that contributed to their success, included:

- Long term ownership of their properties;
- Long term objectives;
- Interest in and knowledge of their property (including some form of formal or informal inventory);
- Willingness to seek out professional forestry advice (public agencies or private consultants);
- Interest in their forests and in learning about and following good forestry practices.

Table 4. Net Present Value (NPV) data for Timber, Fuelwood and Maple.

Landowner	Agricul-ture Region	Acres of Wood-land	Years of Data	Volume Harvested (fbm)	Volume Harvested/ acre/year (fbm)	Actual Revenue $	Actual Costs $	PV of Revenue $	PV of Costs $	NPV $	NPV $/ acre	NPV $/ acre/ year
Timber Sales												
Horning	Western	16	36	113,697	197	30,847	519	81,345	905	80,440	5,027	138
Barrie	Western	45	36	182,161	112	123,163	7,437	217,624	12,263	205,361	4,564	127
Scott	Western	100	36	791,723	220	430,788	1,600	1,098,497	1,854	1,096,643	10,966	305
Martin/Horst	Western	18	28		0	42,771	400	63,763	963	62,801	3,489	125
Foote	Central	25	31	108,863	140	61,363	23,211	118,615	35,039	83,576	3,343	108
Staley	Central	13	36	38,163	82	14,623	1,000	28,509	2,653	25,856	1,989	55
Williams	Central	100	36		0	71,721	2,956	137,078	5,233	131,845	1,318	37
Fuelwood sale												
Horning	Western	16	36			6,471	0	14,816	0	14,816	926	26
Barrie	Western	45	17			86,025	45,118	119,201	61,825	57,376	1,275	75
Foote	Central	25	31			3,200	1,100	7,313	1,696	5,616	225	7
Staley	Central	13	33			17,300	13,440	48,169	37,554	10,615	817	25
Maple sales												
Barrie	Western	45	25					210,379	74,167	136,211	3,027	121
Martin/Horst	Western	18	28			337,417	221,958	613,175	422,594	190,581	10,588	378

Total from each of the products may not sum to the values on Table 3 because NPV/acre/year was calculated on ‘Years of Data’ available.

Advice from the Landowners

During the interviews with the landowners we asked what advice they would give to other landowners. Following are a few highlights of the advice they offered:

- Hire a professional forester to help decide which trees should be cut and to get competitive bids (at least three quotes);
- Join a local woodlot owner association;
- Sell only to logger you feel comfortable with;
- Push for government support for the private forest resource;
- Think long term! Never too soon to start!;
- Do not over harvest, if possible, cut only in the winter;
- Returns are very competitive with other farm crops;
- Maintain a diversity of species and sizes;
- Leave some large trees, don't cut them all.

Conclusions

The overall purpose for this study is to promote, through a series of case studies, responsible management of privately owned forests, and to document the economic values associated with managed woodlots, in the context of the mixed agricultural/woodlot landscape in southern Ontario. The results show that sound management of woodlots can provide returns that are complimentary and favorable in comparison with agricultural returns. This is an important recognition in the current context of very high grain prices and strong cash-crop returns for farmers; although some past periods- notably the mid-late 1970's and mid-1990's- do capture these past returns in agriculture. Past periods have also seen material benefits paid to farmers through business risk management programming, which is not reflected here. In periods of very high prices in agriculture can create an incentive to convert land use from woodlots into agriculture. The results here suggest a caution on such land conversion, when long-term economic values are considered.

The observation that managed woodlot returns have been comparable with or exceeded market-based agricultural returns does not carry the implication that agricultural land should be broadly converted to managed forest. If this were to occur it is likely that this would act to depress woodlot values, perhaps for an extended period. Moreover, many woodlots that exist in the agricultural regions of Ontario have continued due to site characteristics that historically made them unsuitable for agriculture- due to topography, drainage, soils, etc.

Rather, the results of the study should be interpreted such that managed woodlots can provide significant value, that management is necessary to achieve the observed results (management is worth it) and that these managed woodlots can contribute profitably to a farming operation.

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Appendix. Species and code for Table 2.

Code	**Species**	**Code**	**Species**
Aw	white ash	Ea	american elm
Be	beech	Hd	hardwood
Bd	basswood	He	hemlock
By	yellow birch	Id	ironwood
Bu	butternut	Mh	sugar maple
Cb	black cherry	Mr	red maple