

Evaluation of Tax Incentives that Promote Afforestation and Fast Growing Tree Plantations

Final Report

November 17, 2004

Submitted to:

Natural Resources Canada

Contract No: NRCan-04-0923

File No: 2311205LL05044

Financial Code: F-236-807-00000-006705-00-0-0464

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1 Introduction

The Canadian government has signed and ratified the Kyoto Protocol, which is an international agreement to control emissions of greenhouse gases. Kyoto is concerned with the net emissions of greenhouse gas and recognizes forest harvesting and management, as well as land use changes involving forestry, as components of the overall carbon balance. Article 3.3 of the Kyoto Protocol specifically defined emissions from land-use change as:

“The net changes in greenhouse gas emissions from sources and removals by sinks resulting from direct human-induced land use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990...”

Key terms relevant to this project were defined at the Seventh Conference of the Parties (COP-7) in Marrakech, 2001¹:

Forest as “a minimum area of land of 0.05-1.00 hectares with tree crown cover of more than 10-30 percent with trees with the potential to reach a minimum height of 2-5 metres at maturity *in situ*”.

Afforestation is “the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding, and/or human induced promotion of natural seed sources’ and

Forest Management is “a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner”.

As well, for the purposes of Article 3.3, eligible activities were defined to be afforestation, reforestation and/or deforestation activities that started on or after 1 January 1990. The land-use change must occur on or after 1 January 1990. Using these definitions, afforestation would be limited to the planting, seeding or natural regeneration of forests in the Prairies and specific areas of southern B.C., Ontario, Quebec and the Maritimes that had been farmed since at least 1940. Finally, once land is considered afforested, all anthropogenic greenhouse gas emissions by sources from and removals by sinks on this land must be accounted for throughout subsequent and contiguous commitment periods.

As a signatory of the Kyoto Protocol, Canada is developing a plan for meeting its commitments. In the Climate Change Plan for Canada (2002), the Government of Canada proposed to establish a framework to enable new agriculture and forestry sinks to be sold as offsets in an emissions trading system. As part of this objective, the Canadian Forest Service (CFS) and the Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS) initiative are exploring the potential for a large-scale afforestation effort on private lands in Canada. Afforestation is attractive because it gives rise to additional benefits besides carbon sequestration, and, as van Kooten et al. (2002) state, the consensus opinion is that land use change projects generally cost less per tonne of carbon sequestered than projects aimed at reducing industrial emissions. A number of different projects are underway to examine the structure and feasibility of large-scale afforestation.

The current project is focused on financial incentives, specifically tax policies, that have the potential to attract investments in afforestation and fast-growing tree plantations. Previous studies of the potential for afforestation in eastern Canada (ArborVitae Environmental Services 1999) and western Canada (Nawitka 1999a, 1999b), identified marginal farmland as the class of area that was most amenable to afforestation, however these conclusions were based primarily

¹ United Nations. 2001. <http://unfccc.int/resource/docs/cop7/13.pdf> .

on the area involved, not on the comparative economics of land use. There was also a supposition that these areas were least likely to be profitable under agriculture and therefore the owners would require relatively low valued incentives to afforest them.

This study departs from a draft FAACS report entitled “Incentives to expand forest cover: A framework for Canada (Part 1): An Overview of Global Incentives for Afforestation”, which provides an overview of many programs from around the world designed to encourage afforestation. The consultants for this project examined the draft FAACS report and performed an intensive search of current literature on tax-based afforestation programs in Canada, USA, UK and Europe, Australia and New Zealand, and selected programs in some developing countries. The characteristics of farm and non-farm rural landowners were compared, and the current federal taxation treatment of woodlots was examined in order to better understand the target audience and the points where tax-based efforts could stimulate afforestation. Finally a number of potential methodologies for tax based afforestation were reviewed, and their strengths and weaknesses considered and level of uptake, and by whom, were estimated.

2 Target Markets

Tax incentives can be targeted at any individual or organization that may have an interest in greenhouse gas emission reductions, forest products, generating a return on an investment or wish to reduce their tax burden. The target market can be divided into two general groups: land owners and private investors. While investors are considered to be interested in afforestation for general financial returns, landowners may have a wide variety of interests, potentially including financial returns. Although individual landowners may not be inclined to afforest for financial reasons alone, their interest in afforestation may be heightened considerably should the costs be defrayed through tax incentives. The following sections describe the land-holding and economic characteristics of two types of landowners: farmers and non-farmers, followed by an overview of potential investors in afforestation projects or purchasers of resulting carbon credits.

2.1 Land Owners

Land owners play a key important role in afforestation projects because they control the lands which will be afforested. In the case of farmers, plantations must compete with agricultural uses that yield revenue and perhaps profit, while at the same time there are substantial financial incentives to retain the land in agriculture. The profile of the two main land owner target groups is based on a combination of agricultural census data from Statistics Canada and responses from a recent Environics survey of rural landowners in Canada. We have analyzed and presented the responses on a province by province basis, but for some provinces the small sample size makes drawing significant conclusions difficult.

2.1.1 Farmers

A recent Environics survey (2003) specifically asked a sample of rural landowners who had planted trees on their land between 1990 and 2002, their reasons for doing so. Table 1 summarizes the responses of the farmers in the survey. Across Canada, 11% of farmers surveyed were interested in any type of afforestation, with no particular regional variation. P.E.I. and Quebec farmers were most interested in afforestation, with 20% and 17% respectively indicating interest. Less than 10% of farmers in Alberta, B.C. and Nova Scotia were interested.

Farmers who want to afforest are predominantly interested in creating shelterbelts. This is particularly the case in the three Prairie provinces, where from 70 – 88% of the farmers interested in afforestation primarily wished to create shelterbelts. It is noteworthy that the Prairie Farm Rehabilitation Administration (PFRA) operates in the Prairie provinces and already has a \$4 million incentive program to plant shelterwood to help Canada meet its Kyoto commitment. This

program, the Shelterbelt Enhancement Program, provides planting cost reduction, as well as the technical expertise and free seedlings that the PFRA normally offers. It is not clear what additional stimulus would be required for the interested farmers to afforest.

In comparison, between 20 and 40% of farmers in Ontario, Quebec and BC were interested in afforestation. Interestingly, all PEI farmers and no Nova Scotia farmers would plant trees for shelterbelts. This extreme result may reflect small sample sizes in those two provinces. The next two most common reasons given for planting trees were water and soil conservation and aesthetics. Of interest, farmers are not very interested in creating commercial wood supply or other sources of income (Christmas trees and sugar bushes). Creating commercial wood supply was only a significant reason in Quebec, where 20% of farmer respondents listed this as their purpose. This would suggest that farmers may be more interested in short term incentives to help establish and manage plantations than longer term incentives that may affect income.

These results are somewhat similar to those obtained from a survey of farmers in the Prairie provinces conducted by Kooten et al. (2002). The questions were rather different, but yielded comparable information. Approximately 75% of all respondents were interested in creating carbon offset credits but only 24% of farmers would be interested in planting fast-growing trees in large blocks, while 20% would be interested in planting large blocks of native species, As with the Environics survey, more farmers would be interested in planting shelterbelts or individual trees – 58% indicated this response.

Table 1: Farm Reasons for Afforestation (Environics Survey)

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Aesthetics		50%			38%	56%		36%		33%	37%
Christmas trees					3%						1%
Commercial wood supply					10%	18%			17%		10%
Conservation & wildlife habitat		50%	50%		10%	3%			17%	33%	10%
Firewood											0%
Improve water and soil			50%		17%	6%				17%	10%
Recreation					10%			9%		17%	5%
Reduce climate change							17%		17%		2%
Shelterbelts	100%				10%	18%	83%	55%	50%		24%
Sugarbush											0%
Total Interested	11%	50%	6%	0	26%	14%	16%	22%	8%	9%	15%

Source: Environics (2003).

The Environics survey also asked farmers whether they were considering planting trees on their land in the next five years. If they were not going to plant, the respondents were asked why. Table 2 displays the percentages of farmers who are likely to plant trees or who would not plant because of the cost or poor economic returns. Together this information can be used to estimate the acceptance rate for tax incentive programs.

Table 2: Farm Tax Incentive Acceptance Rate (Environics Survey)

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Will plant		40%	0%		16%	8%	14%	10%	12%	14%	11%
Won't plant											
Cost		0%	8%		4%	4%	2%	5%	3%	7%	4%
Poor Economics		0%	0%		0%	0%	2%	6%	4%	0%	3%
Acceptance rate		40%	8%		20%	12%	19%	21%	20%	21%	19%

Source: Environics (2003).

Table 3 shows the total farm population and number of farms, taken from the Agricultural census, and further characterizes farmers' land holdings based on the Environics Survey (2003) The Agricultural census reported that there are approximately 144,800 farmers with pasture and another 146,300 farmers with idle land. The areas of pasture and idle land are approximately 16,332,000 ha and 15,212,500 ha, respectively, for a total area of 31,544,400 ha.

Table 3. Farm Land Description

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Total Farm Population (2001)	930	5,935	10,155	7,915	91,455	180,900	67,190	118,440	161,445	51,375	695,745
No. of Farms (2001)	643	1,845	3,923	3,034	32,139	59,728	21,071	50,598	53,652	20,290	246,923
No. surveyed		5	12		116	138	81	271	269	58	950
Ave. Annual Income		\$29,200	\$61,800		\$56,000	\$69,000	\$69,000	\$85,800	\$76,900	\$64,300	\$72,800
Ave. Area (ha)		36.9	182.1		124.1	73.8	359.1	447.4	400.1	244.2	314.9
Forest (% of landowners)		60%	92%		89%	71%	56%	32%	47%	71%	54%
Ave. Forest Area (ha)		9.2	45.0		81.1	13.4	27.2	18.5	21.0	12.4	26.8
Crops (% of landowners)		100%	67%		78%	86%	77%	80%	81%	79%	81%
Ave. Crop Area (ha)		15.6	29.1		20.7	32.5	173.5	216.3	182.5	47.7	138.9
Pasture (% of landowners)		40%	67%		53%	46%	67%	63%	80%	76%	59%
Ave. Pasture Area (ha)		3.2	30.3		5.3	6.1	70.5	118.4	143.2	25.2	83.8
Idle (% of landowners)		80%	50%		26%	29%	35%	30%	33%	43%	59%
Ave. Idle Area (ha)		8.7	77.5		14.2	20.9	88.9	90.4	65.6	158.8	67.1
Total Pasture Land (ha)		6,000	118,800		171,300	361,500	1,486,400	5,991,500	7,685,300	511,100	16,331,900
Total Idle Land (ha)		16,000	304,200		456,300	1,246,700	1,873,400	4,572,400	3,520,500	3,223,000	15,212,500

Table 4. Farm Tax Burden (per hectare)

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada	
Gross Property Tax (\$)	3.67	8.46	4.65	4.46	4.46	25.80	14.21	7.30	7.76	4.62	5.73	8.31
Property Tax Rebate (\$)	0.00	0.00	0.00	0.00	0.00	15.39	0.00	0.00	1.06	0.00	0.00	1.36
Net Property Tax (\$)	3.67	8.46	4.65	4.46	10.41	14.21	7.30	6.70	4.62	5.73	6.95	
Realized Net Farm Income (\$)	51.39	27.89	34.87	54.03	164.35	86.83	62.58	29.63	37.25	74.65	51.16	
Farm Income Tax (\$)	8.74	4.74	5.93	9.18	27.94	14.76	10.64	5.04	6.33	12.69	8.70	
Personal Income Tax (\$)		29.73	67.58		69.49	114.33	31.30	28.11	32.99	75.41	43.40	
Total Tax (\$)		105.05	162.90		210.72	230.32	73.01	51.26	62.96	143.00	85.83	

- Notes: 1) Total Farm Population and number of farms from Statscan (2001a); income and area information from Environics (2003);
 2) Average income calculated assuming a gamma distribution for responses;
 3) Total pasture and idle land estimated by multiplying the average area per farm from the survey data by the number of farms.
 4) Farm tax information comes from Statscan (2001a), Statscan (2003), Statscan (2004a), and Statscan (2004b);
 5) Farm Income Tax is calculated as 17% of Realized Net Farm Income (which includes farmers' salaries); and
 6) Personal Income Tax is assumed to be 17.8% of Net Income of average income.

It should be noted that average areas have been estimated from the Environics Survey (2003) by discarding outliers. As well, on an individual response basis, the sum of forest, crop, pasture and idle areas was corrected to account for inconsistent responses using the following assumptions:

- a) the land owner has perfect knowledge of forest, crop and pasture areas;
- b) if the total farm area was greater than the sum of the individual crop, pasture and woodland areas, then the excess was considered to be idle land; and
- c) if the total area was less than the sum of the individual crop, pasture and woodland areas, then the individual areas were pro-rated to conserve the proportion of three classes of area.

Finally, one must consider the distribution of the number farmers and areas of idle lands since this is the most likely land that will be planted. As shown in Table 5, the number of farmers with idle lands greater than a specified area decreases quickly at higher cut-off values, but the total area of idle land decreases less rapidly.

An average farmer makes an annual income of \$72,800 (Table 3) and an average annual farm net income of \$ 51.16 per hectare (Table 4). As described in section 3, farmers already receive much tax relief and tax incentives. For example, across Canada property taxes on farm land are less than taxes on non-farm land (or the farmer receives a tax rebate). In some cases, this may cause a disincentive to plantations.

Table 5: Farmers' Distribution of Idle Land

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Number of Farmers											
>1 ha		1,760	2,280		13,902	35,835	14,657	28,664	29,502	9,354	135,954
>2 ha		1,634	2,091		11,858	31,463	13,634	26,472	26,952	8,032	122,137
>5 ha		1,227	1,807		8,889	24,622	12,036	23,243	23,180	6,091	101,095
>10 ha		696	1,567		6,508	18,716	10,614	20,529	20,006	4,515	83,150
Total Idle Farm Area											
>1 ha		16,000	303,000		443,000	1,231,000	1,870,000	4,562,000	3,507,000	3,145,000	15,077,000
>2 ha		16,000	303,000		439,000	1,222,000	1,869,000	4,559,000	3,503,000	3,117,000	15,028,000
>5 ha		15,000	302,000		424,000	1,192,000	1,863,000	4,549,000	3,489,000	3,024,000	14,858,000
>10 ha		11,000	300,000		399,000	1,133,000	1,852,000	4,531,000	3,462,000	2,855,000	14,543,000

Note: 1) Distributions are estimated assuming a beta distribution.

2.1.2 Non-farmers

As can be seen by comparing Table 6 with Table 1, non-farmers have more varied interests in afforestation than farmers and compared to farmers, non-farmers are more interested in the environmental benefits of forests (aesthetics, conservation and wildlife habitat, improving soil and water, and recreation).

Table 6: Non-farm Reasons for Afforestation

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Aesthetics		50%			38%	56%		36%		33%	37%
Christmas trees					3%						1%
Commercial wood suply					10%	18%			17%		10%
Conservation & wildlife habitat		50%	50%		10%	3%			17%	33%	10%
Firewood											0%
Improve water and soil			50%		17%	6%				17%	10%
Recreation					10%			9%		17%	5%
Reduce climate change							17%		17%		2%
Shelterbelts	100%				10%	18%	83%	55%	50%		24%
Sugarbush											0%
Total Interested	11%	50%	6%	0	26%	14%	16%	22%	8%	9%	15%

Source: Environics (2003).

Shelterbelt planting is also an important area of interest, although nowhere nearly as widely cited as among farmers, and there is a modest level of interest in creating commercial wood supply value on their land. Most of the interest in shelterbelts was again in the Prairie provinces.

When non-farmers were asked whether they would plant trees in the next five years, and if not, why (Table 7), they gave different responses than farmers (Table 2). Non-farmers are 50% more likely to plant trees in the next five years than farmers. As well, non-farmers are less deterred by cost or poor economic returns. Tax incentives may not spur new afforestation, but accelerate afforestation that was likely to happen.

Table 7: Non-farm Tax Incentive Acceptance Rate

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Will plant	0%	0%	10%		16%	14%	29%	25%	24%	15%	17%
Won't plant											
Cost	11%	0%	1%		0%	3%	5%	2%	3%	2%	2%
Poor Economics	0%	0%	1%		0%	0%	0%	2%	1%	2%	1%
Acceptance rate	11%	0%	13%		16%	17%	34%	29%	28%	18%	19%

The distribution of the number of non-farmers by area of idle land owned (Table 8) is also different than it was for farmers. Of the non-farmers who own more than one hectare of land, roughly half own more than 10 hectares of idle land. Limiting an incentive to holders of more than 10 ha of idle land only decreases the total potential area available for afforestation by approximately 10%. Unlike farmers, non-farmers may also be interested in planting pasture.

Table 8: Non-farmers' Distribution of Idle Land

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Number of Non-Farmers											
>1 ha	25,951	19,482	88,628		224,588	216,282	52,574	52,056	68,695	94,448	842,703
>2 ha	21,916	14,660	79,084		196,274	183,624	43,932	47,581	60,000	78,273	725,344
>5 ha	16,267	6,279	64,568		155,636	137,199	30,731	40,885	47,332	54,783	553,680
>10 ha	11,884	1,536	52,166		122,840	100,663	20,082	35,191	36,992	36,483	417,837
Total Idle Non-farm Area											
>1 ha	753,000	83,000	3,799,000		17,950,000	2,798,000	645,000	13,642,000	4,639,000	15,044,000	59,353,000
>2 ha	745,000	76,000	3,784,000		17,860,000	2,770,000	633,000	13,624,000	4,613,000	14,780,000	58,885,000
>5 ha	721,000	52,000	3,735,000		17,572,000	2,682,000	593,000	13,563,000	4,528,000	13,923,000	57,369,000
>10 ha	678,000	21,000	3,640,000		17,051,000	2,526,000	521,000	13,448,000	4,374,000	12,429,000	54,688,000

Notes: 1) Distributions are estimated assuming a beta distribution.

Table 9 shows number of non-farm rural households from the 2001 Agricultural census, and area data from the Environics (2003) survey. There are more non-farmers with pasture (805,900) and idle land (1,147,200) than farmers, but on average non-farmers own smaller individual parcel sizes. Nevertheless, the areas of pasture and idle land owned by non-farmers are much larger than was the case for farmers, at approximately 24,623,500 hectares and 60,692,900 hectares respectively (total area 85,316,400 hectares).

Finally, non-farming rural landowners earn less annual income than farmers (\$55,600). Table 10 characterizes non-farmer income and tax burdens. As shown, non-farmers generally pay more taxes than farmers.

There are numerous tax advantages for farmers and agricultural land, versus a small number of tax incentive programs applicable to forested land (e.g. Ontario's MFTIP). As well, under federal taxation policy, non-farmers with forested land are treated differently than are farmers. Section 3 discusses this point in detail.

Table 9: Non-Farm Land Description

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Rural Population (2001)	215,330	74,060	398,105	358,525	1,407,490	1,733,870	312,655	345,930	566,540	595,325	6,007,825
Non-farm population (2001)	214,400	68,125	387,950	350,610	1,316,035	1,552,970	245,465	227,490	405,095	543,950	5,312,080
No. of Households (est)	79,904	26,007	156,005	138,685	552,182	582,210	97,353	90,289	153,230	216,289	2,092,154
No. surveyed	9	4	67	1	113	238	38	51	75	66	662
Ave. Income	\$32,200	\$33,700	\$56,800		\$40,700	\$54,300	\$53,900	\$50,400	\$67,300	\$50,200	\$55,600
Ave. Area (ha)	52.3	90.4	138.1		106.8	32.2	49.8	295.2	167.8	168.7	106.5
Forest (% of landowners)	78%	75%	90%		93%	89%	71%	37%	59%	91%	81%
Ave. Forest Area (ha)	29.7	34.9	26.2		32.3	19.5	10.7	7.9	15.7	17.0	20.5
Crops (% of landowners)	22%	50%	16%		29%	21%	21%	53%	44%	29%	28%
Ave. Crop Area (ha)	7.6	6.8	68.1		35.7	5.2	22.0	71.3	68.3	78.4	37.4
Pasture (% of landowners)	22%	0%	33%		27%	28%	58%	57%	67%	52%	39%
Ave. Pasture Area (ha)	13.3	1.9	18.5		4.0	2.1	10.0	60.0	52.6	12.7	15.8
Idle (% of landowners)	33%	50%	69%		35%	63%	61%	41%	52%	59%	55%
Ave. Idle Area (ha)	9.9	3.3	24.6		33.1	5.0	6.8	151.7	30.8	72.6	32.9
Total Pasture Land (ha)	1,064,300	49,200	2,881,500		2,191,800	1,221,100	976,600	5,420,400	8,066,100	2,752,500	24,623,500
Total Idle Land (ha)	787,600	85,600	3,832,900		18,297,400	2,902,000	664,700	13,693,400	4,722,700	15,706,600	60,692,900

Table 10: Non-Farm Tax Burden (per hectare)

Region	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Canada
Net Farm Property Tax (\$)	3.67	8.46	4.65	4.46	10.41	14.21	7.30	6.70	4.62	5.73	8.31
Farm Property Tax Rebate (\$)					15.39	42.62	5.34	1.06		2.58	
Net Property Tax (\$)	3.67	8.46	4.65	4.46	25.80	56.82	12.64	7.76	4.62	8.31	8.31
Personal Income Tax (\$)	113.30	74.80	77.84		93.62	356.58	205.46	38.16	76.00	61.28	101.20
Total Tax (\$)	116.97	83.26	82.49		119.43	413.40	218.10	45.92	80.62	69.58	109.51

- Notes: 1) Rural Population from Statscan (2001b). Non-farm rural population is calculated as the rural population minus the farm population. Number of rural households is estimated using the non-farm rural population and the average number of persons per household by province.
 2) Income and area information from Environics (2003);
 3) Average income calculated assuming a gamma distribution to responses; and
 4) Total pasture and idle land estimated by multiplying the average per farm from the survey data by the number of farms.
 5) Net Property Tax is calculated by adding the net farm property tax to the farm property tax rebates or reduction where known
 6) Personal Income Tax is assumed to be 17.8% of Net Income of average income

Figure 1. Number of Owners of Idle Land by Size Class, Farmer vs. Non-Farmer

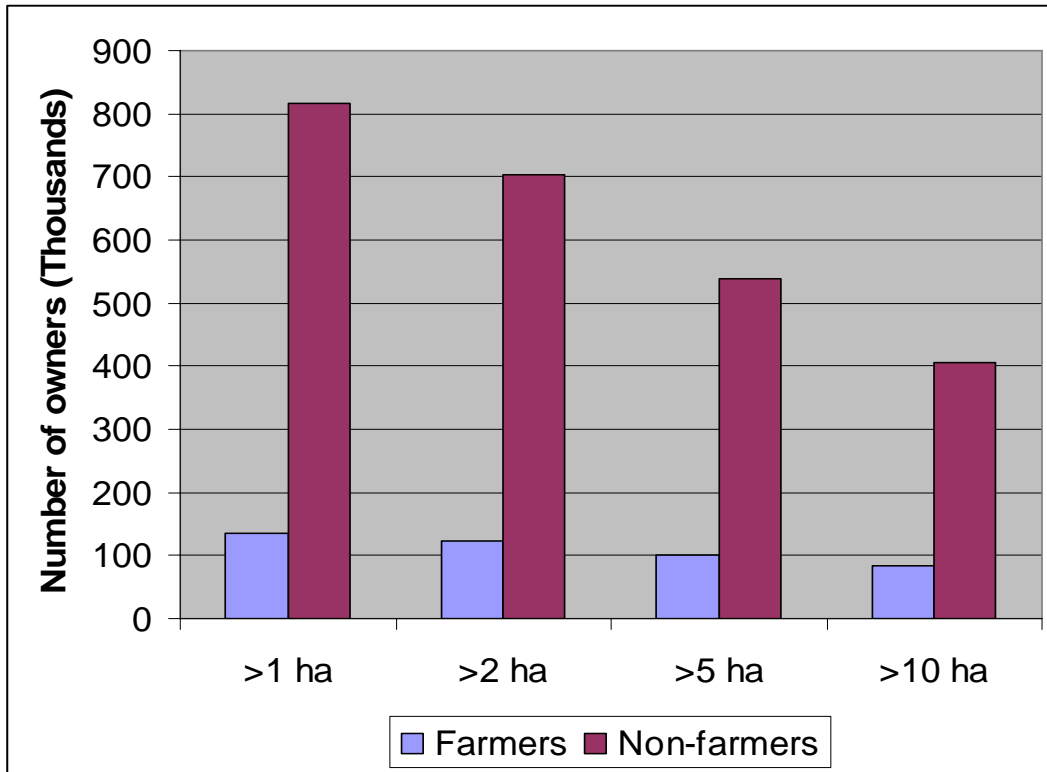


Figure 2. Total Area of Idle Land by Parcel Size, Farmer vs. Non-Farmer

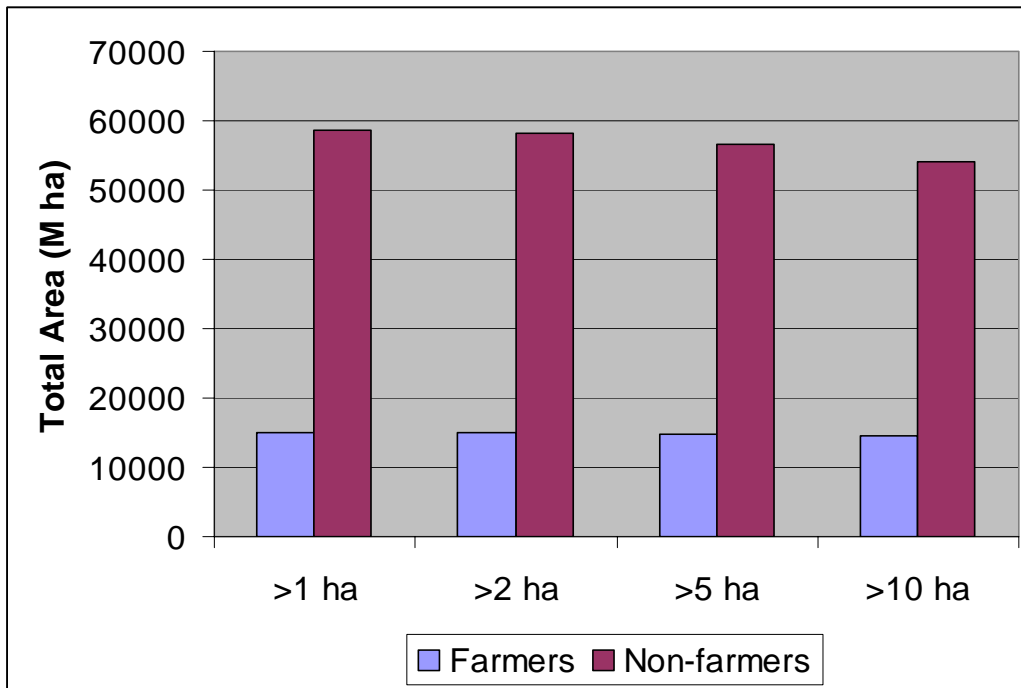


Figure 3. Average Parcel Size by Minimum Area Cut-off, Farmers vs. Non-farmers

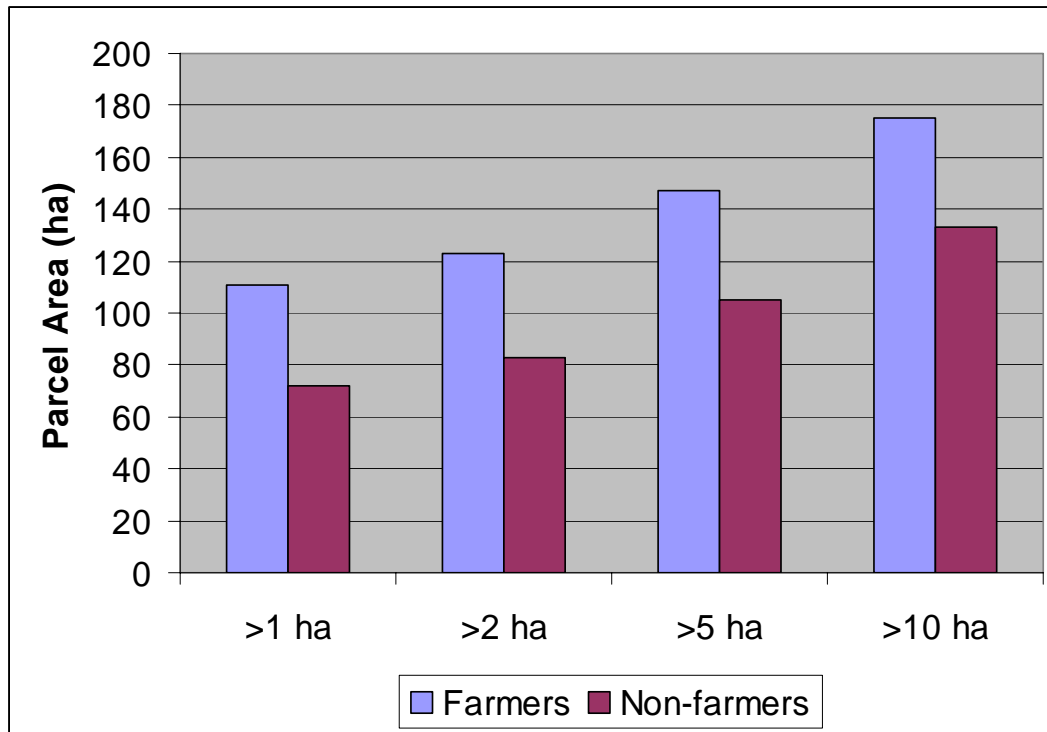


Figure 1, Figure 2 and Figure 3 compare some salient statistics regarding idle land holdings of farmers and non-farmers from all Canadian provinces except New Brunswick and Newfoundland, which lacked full data sets. Figure 1 shows that far more non-farm rural landowners own idle land than farmers, with 400,000 non-farm owners of parcels larger than 10 ha, compared to 83,000 farm owners of parcels in the same size class. As the minimum parcel size increases, the number of owners rises substantially. However, as Figure 2 shows, when the minimum parcel size is raised, the total area declines much less rapidly than the number of owners. This relationship is most clearly shown in Figure 3, which shows the average parcel size at different minimum area cutoff levels.

These figures, which are based on the preceding tables, clearly show the value of pursuing non-farm rural landowners with larger holdings of idle land.

2.2 Private Investors

2.2.1 Carbon Purchasers

Carbon purchasers will tend to be companies (or their representatives) that have greenhouse gas emission targets as part of the Federal program to meet Canada's Kyoto Protocol obligation. These will be individual companies categorized as Large Final Emitters (LFEs) and Carbon Aggregators, which are organizations that pool greenhouse gas emission reduction projects for sale to the LFEs.

Large Final Emitters are companies that produce goods in emission-intensive sectors including primary energy production, electricity production, and selected areas of mining and manufacturing. As well, an LFE must meet two additional criteria:

1. Average annual greenhouse gas emissions per facility of 8 CO₂e kilotonnes or more; and
2. Average annual emissions per \$1,000 output of 20 CO₂e kilogram's (kg) or more.

Under the Government of Canada's Climate Change Action Plan, LFEs have:

- targets for reductions established through covenants with a regulatory or financial backstop (55 megatonne (Mt) reduction); and
- access to a domestic emissions trading system, domestic offsets, and international permits to provide flexibility.

At this time, these organizations will be interested in short term sequestration results (2008 to 2012) at the lowest price possible since this represents a direct cost of doing business. As well, these companies can purchase the needed emission reductions on the international market as part of the Clean Development Mechanism or other Kyoto Mechanism. Ideally, the afforestation incentives should not reduce the amount of emission-reduction effort expended by LFE's. However, these decisions are based on economic factors, as well as companies' desire to maintain a positive public perception. Many emission reduction actions will result in reduced production costs and/or more efficient production, and so will provide direct benefits to the company beyond those associated with emission reduction. For this reason, it is not just a matter of comparing the cost of emission reduction versus the cost of carbon credits from afforestation projects.

However, it is very likely that many companies will purchase carbon credits produced by sequestration projects as part of their overall approach, and a secondary objective of Canada might be to ensure that Canadian afforestation projects are attractive and are supported by Canadian LFEs. Cost is certainly one issue, but may not be the most critical. The consultants feel that Canadian projects will be attractive if there is a sufficient supply of Canadian afforestation projects that will provide credits over both the short and longer terms, an effective aggregation mechanism, and a high degree of security of production. Carbon investors also have a concern about below ground carbon sequestration. In addition, taxation incentives need to make carbon credits from Canadian based afforestation projects competitive with international prices to encourage the support of national programs by Canadian companies.

Carbon purchasers are already receiving some tax incentives for plantations. Currently, costs associated with the creation of an emission reduction, or the cost of a purchased emission reduction, would be considered an operational expense. As such, these costs would be deducted from a company's gross income before paying taxes. To be attractive to large purchasers of carbon credits, any new tax incentive must create an increased benefit so as to further stimulate plantation adoption.

2.2.2 Timber Companies

Timber companies represent another large group of companies that will be interested in plantations for timber supply. Most large and medium sized Canadian wood processing facilities obtain the majority of their roundwood either directly or indirectly through licences to harvest timber on Crown land. Most companies supplement their wood supply with wood from private land where it is available; in the more northerly parts of many provinces, private land is limited and so is its contribution to wood supply. However, mills may receive a high proportion of their wood from private land in the Maritimes, southern Ontario, Quebec and B.C, as well as in the forest-agriculture fringe in the Prairies. Many of the large forest products companies own land used to grow timber, but few grow fast-growing plantations. Alberta-Pacific and Domtar in southern Ontario lease private land and manage it intensively under contract with the landowner. An unusual entity in the Canadian forest sector is TimberWest, a company that is organized as an income trust. TimberWest grows Douglas-fir on short rotations under intensive management on Vancouver Island purely as a business proposition.

The attraction of high-yielding plantations grown for timber production is obviously the wood produced when the plantations mature. Plantation grown-wood would likely be grown relatively close to the mill, and be of a large and relatively uniform size and quality. These are all characteristics that increase the value of the timber as furnish for the mill. In addition, private wood may be seen as being more secure than Crown timber, which is subject to multiple uses and a continuously shrinking level of availability and a steadily increasing cost of procurement. Like Carbon Purchasers, timber companies are interested in high yields, but they are also interested in short rotations. They are interested in living biomass only, with some species, such as poplar, being more widely used than willow or larch.

Like Carbon Purchasers, timber companies already receive some tax relief for the establishment and management of plantations since this would be considered an operational expense. Unlike Carbon Purchasers, timber companies would also generate income from the plantation upon harvest. A new tax incentive could alter the tax treatment on this income, so making the returns on plantation establishment more attractive.

2.2.3 Other Investors

Other investors may be large institutions from the financial industry looking for investments with rates of return that reasonably reflect the risk of the investment. They have some goals in common with timber companies, but risk is dealt with in a more rigorous manner.

Timberland in the United States, Australia, and New Zealand is more widely included in investment portfolios in those countries, due to the wide availability of large areas of private forest land and the higher returns¹. Hancock Timber Resource Group, a leading timberland manager and investment adviser, produces a number of research notes reviewing the use of timberlands in investment portfolios. There is a standardized index of timberland financial returns, known as the NCREIF (National Council of Real Estate Investment Fiduciaries) index, which is currently weighted with 68% of its property in the US South, 26% in the US Northwest and 6% in the US Northeast.

A recent research note (Hancock Timber Resource Group 2003a) compared the performance of U.S. stocks, bonds, commercial real estate and timberland investments from 1960 to 2002. A timberland portfolio with 50% in the US South, 40% in the Pacific Northwest, and 10% in the US Northeast would have returned an average of 12.57% per annum, exceeding other classes of

¹ Hancock Timber Resource Group (2003c) noted that US institutions only began to invest in timberlands in 1985.

investments except small capitalization stocks, which returned 13.47. Large cap stocks returned 10.0%, US Treasury bills 5.83%, and meanwhile the average annual rate of inflation was 4.33%. Moreover, the annual variability in rate of return from timberlands was low compared to the rate of return earned; small cap stocks had twice the variability of yield as timberlands, for example. Returns from timberland are well correlated with rates of inflation, indicating that timberland provides partial hedging against inflation, and inversely correlated with rates of return from equities, corporate bonds and commercial real estate. These characteristics make timberland an attractive component of a large portfolio, such as might be held on behalf of a pension fund or other institutional investor interested in reasonable returns with a relatively low level of variation from year to year.

Hancock Timber Resource Group (2003b) reported that timberlands in the United States returned 7.7% in 2003, a rate of return in line with historical averages. This is based on the NCREIF index. Of this return, 3.9% was due to capital appreciation (e.g. increases in the value of the land and standing timber as prices for those goods rose) and 3.8% was due to income from operations, excluding capital appreciation. Historical analysis has shown that changes in timber prices are the primary determinant of rates of return from timberland (Hancock Timber Resource Group 2003c).

As mentioned above, there is one publicly traded timber growing company in Canada, with the majority of its assets on Vancouver Island. John Hancock Resource Group (2003c) estimated historical rates of return from timberlands in the US, as well as Australia, New Zealand, and coastal British Columbia. Their finding was that the BC timberlands would have yielded an annual rate of return averaging 12.81% from 1963 to 2002, which is roughly 1.25% lower than returns from the US South and Pacific Northwest but much higher than returns from New Zealand¹. This indicates that timber management in B.C. is very competitive with management elsewhere in the world.

Existing tax treatment of other investors who own and manage timberlands would be identical to that of timber companies, however other investors also include those who purchase timberland index-based securities, and these investors are only indirectly affected by the tax treatment of timberlands.

Clearly, the potential value associated with carbon credits from plantations would only add to the returns from timberland management, as long as administrative and monitoring costs were below the value of the credits. However, it may take some before large investors are comfortable with the dynamics of the carbon markets before they attribute much additional value to timber due to the carbon.

¹ A full data set was not available for NZ. Between 1983 and 2002, the average return from NZ timberlands was 5.24%, versus 8.94% from BC, 9.22% from US Southeast and 15.83% from Pacific Northwest. Hancock Timber Resource Group (2003c) attributed the performance in NZ to falling timber prices.

3 Taxation Treatment of Woodlots – Canadian Federal Tax Policy

A woodlot may be categorized as being either a farm or a non-farm woodlot. A farm woodlot is one where the main focus of the business is growing, nurturing and harvesting trees, and there are many tax advantages if the woodlot is declared to be a farm woodlot. Having a forest management plan, and paying attention to the health, species composition, and quality of the trees supports the classification of the woodlot as a farm woodlot. Christmas tree farms, tree nurseries, and maple sugar stands are also classed as farm woodlots.

If the emphasis of the business is logging, even though there may be reforestation, the woodlot does not qualify as a farm woodlot. Also, woodlots that are essentially unmanaged and unharvested would not likely qualify as farm woodlots. Non-farm woodlots are treated as either commercial non-farm woodlots or as non-commercial activity unrelated to farming.

There are some significant tax advantages associated with having a farm woodlot, compared to a non-farm woodlot. The most significant of these as noted by Mallin (2004) are:

- The ability to use the “cash” method, rather than the accrual method, to compute income;
- Access to the \$500,000 capital gains exemption for farmers on disposition; and
- The ability to roll over the property to children.

The woodlot may be subject to the “loss restriction” if farming is not the main source of income. In addition to the actual level of revenue received, in determining the main source of income, Revenue Canada also considers the time commitment, capital commitment and expectation of future profit. A taxpayer may have a farming loss without affecting the status of farming as the major source of income. The farming and another subordinate source of income are together the main source of income. Losses from a commercial farm woodlot are fully deductible.

A taxpayer who operates a commercial farm woodlot but whose major source of income is not farming or a combination of farming and some other source of income is limited in the deductibility of losses from the commercial farm woodlot. For limited deductibility to be available, there must be a reasonable expectation of profit. In that case, deductibility may be carried back three years or forward ten years, but is limited to the amount of income earned from all farm businesses.

There are two basic options that can be used to report income, and the choice of which method is used also affects how expenses can be treated. Basically, the “cash” method is where revenue is counted at the time that it is received, and recurring expenditures related to the commercial activity are counted when they are incurred. Expenditures that could be classed as recurring include planting, pruning, thinning, tending, fertilization, cultivation as well as property tax and interest payments. In some cases, such as where the land is not used commercially in a given year, Revenue Canada may not allow deductibility of property tax and interest.

Under the accrual method, income is counted when it is earned (as opposed to paid) and some types of expenditures, such as capital expenditures, are required to be amortized. The cash method is generally more favourable to the land owner, although there appear to be inventory adjustments required no matter whether the cash or accrual system is being used. However, I have not explored these in detail.

Under the cash method, if revenue from the commercial farm woodlot is the chief source of income, then losses from the commercial farm woodlot will be fully deductible. If the woodlot is not the chief source of income, the amount of any loss that may be claimed in a year may be limited.

The \$500,000 lifetime capital gains exemption continues to apply to farmers who dispose of “qualified farm property”. This exemption applies the sale of a farm woodlot; however it does not include the sale of timber or other “personal” property. Note that the capital gains exemption is not applicable to a timber resource property, which is one used in a timber (i.e. non-farm) business.

In addition to meeting the definition of “qualified farm property”, a use test or a profit test must be satisfied to qualify for the capital gains exemption. If the property was acquired on or before June 17, 1987, the use test must be met. This test requires that the property must have been principally used (i.e. more than 50% used) in the course of carrying on the business of farming in the year of its sale or for at least five years during the period when it was owned by current owners. For a property acquired after June 17, 1987, a gross revenue test must be satisfied.

Where the woodlot is operated as a farming business, the capital gains exemption can be deferred and used when the property is given, while the parent is still living (i.e. inter vivos), to a child, grand-child, etc as a gift or sold. More recently, this has been extended to woodlots managed under a management plan.

In summary, because in any afforestation effort, there will be a major emphasis on establishing, growing and nurturing trees, most afforestation projects would qualify as the creation (or expansion) of farm woodlots.

4 Productivity and Cost by Region

The Environics data (2003) indicate relatively high levels of interest in afforestation in PEI, Ontario and Quebec, moderate levels of interest in Manitoba and Saskatchewan, and low levels in Alberta, BC, Newfoundland, and Nova Scotia (with no data for New Brunswick). The van Kooten et al. (2002) survey suggests that levels of interest may be higher in the Prairie provinces than indicated by the Environics study. The Agricultural Census data indicate relatively high amounts of idle land in BC (especially among farmers) and Saskatchewan (especially among non-farmers), as well as Alberta and Manitoba. While these factors are important components to identifying the most attractive areas to target, productivity and cost are also relevant.

Resource Efficient Agricultural Production (REAP) Canada reviewed short-rotation plantation costs and yields in a 1999 report. They identified productivity ranges (of above ground biomass, apparently) for hybrid poplar plantations harvested at 10 -15 years, and estimated the cost per 1000 metric tonnes using a software package. The results are shown in Table 11.

Table 11. Productivity and Cost of Production Data for Short-Rotation Hybrid Poplar.

Province	Yield Range (od Mt/ha/yr)	Cost (\$/Mt)
Alberta	1 – 5	146-173
British Columbia	9 – 12	80 – 97
Manitoba	1 – 5	146-173
New Brunswick	2 – 6	127 – 164
Newfoundland	2 – 6	127 - 164
Nova Scotia	2 – 6	127 – 164
Ontario	2.5 – 7	112 - 160
PEI	2 – 6	127 – 164
Quebec	2.5 – 7	112 - 160
Saskatchewan	1 – 5	146-173

These data appear to be on the high side compared to operational data presented by REAP Canada. For example, hybrid poplar yields of merchantable timber (estimated to be 90% of above-ground biomass) in Eastern Ontario have typically been between 2 and 4.5 od mt/ha/yr, with one data point (out of five) reaching an upper value of 6.6 od mt/ha/yr. Roughly similar results were reported from Quebec. Operational data from BC suggests average annual yields of 6.6 – 13.2 od mt/ha/yr. REAP also noted that hybrid poplar plantations make large demands for water to achieve optimal growth, and results may tail off sharply as water availability declines.

Van Kooten et al. (2002) cited some results of economic analysis that showed the present value of planting spruce and harvesting it at 80 years is a loss of from \$530 to \$1575/ha. In contrast, a series of hybrid poplar rotations of 15 years was estimated to produce a present net value of from \$1000 - \$2100/ha. These calculations did not include any value attributed to carbon sequestration credits.

5 Review of Past and Present Taxation Incentives

As part of this project, we reviewed existing and past afforestation incentives, including direct cost re-imbursement (full or partial), provision of free planting stock, provision of technical advice, provision of low-interest loans and loan/grant combinations, as well as tax-based incentives. The survey included the Canadian provinces, the United States, Europe and the United Kingdom, Australia and New Zealand, and Chile and Costa Rica, which were known to have programs of interest. A more detailed summary of the various incentives can be found in Appendix I, however a brief overview of which types of taxation-based incentives are used where is shown in Table 12. We note that much of the information for Table 12 was derived from a draft report prepared under the Feasibility Assessment of Afforestation for Carbon Sequestration (Gilsenan 2003), but we have substantially supplemented this information as well.

Table 12. Summary of Jurisdictions which Provide Afforestation Incentives.

Incentive	Canadian		Non-Canadian	
	Taxation	Non-Taxation	Taxation	Non-Taxation
Establishment	Quebec, Ontario	Canada, Alberta, PEI, Quebec, B.C.	Chile, Costa Rica, U.S., Miss., Ireland, N.Z., Australia	France, U.S., Europe, Belgium, Denmark, Finland, Germany, Ireland, Norway, Sweden, U.K., Austria, Poland, Chile, Costa Rica, N.Z., Australia
Maintenance	Quebec	New Brunswick, PEI, Quebec	Chile, Costa Rica, Miss., Australia,	U.S., Europe, Germany, Ireland, U.K., Chile, Costa Rica, Australia
Real Estate	Quebec, Ontario, Manitoba, Alberta, B.C., Sask.		Finland, Chile	
Harvest			Ireland, Norway, U.S., N.Z.	France, Australia
Land Transfer/ Capital Gains	Canada		Chile, Ireland, U.S., Australia	
Lease Income				
Carbon				N.Z

Table 12 shows that tax incentives directed at the costs of establishment are commonly used in most countries included in the survey, but are uncommon in Canada. Less widely available are incentives relating to the on-going maintenance of plantations, but again the pattern is that they are more widely used elsewhere than in Canada. The “Real Estate” category is concerned with rebates or other tax-related treatments of land taxes, which in practice is mainly confined to property taxes. This approach is used relatively often in Canada but infrequently elsewhere, although the key criterion for the potential of such a tax incentive is the “business as usual” tax rate on rural woodland/ plantation versus on farmland – if the tax rates are comparable, then no incentive is required to balance the playing field between agriculture and afforestation.

The remaining categories of tax incentive are rarely employed – these include favourable tax treatment on the value of timber produced by plantations, the sale or intergenerational transfer of

woodlots or perhaps more narrowly, land which has been afforested, revenue from leasing land that is used to grow plantations, and the value of producing carbon credits or income from trading them.

Within Canada, the range of incentives and support programs varies widely among the provinces. Many provincial governments offer cash incentives for silvicultural activities such as planting and thinning (New Brunswick, Quebec, and Prince Edward Island). Free seedlings are provided for reforestation or shelterbelt projects in Alberta and Quebec. As well, there are private programs that are run by Forestry Associations, industry or environmental groups¹.

The European countries presently rely heavily on direct incentive payments to landowners to encourage afforestation. The EU Directive 2080/92 requires that direct payments be applied. It is interesting that few other countries continue to use this approach, and the consultants suspect that the reason this approach is maintained in Europe is largely cultural – the incentives are mainly directed at farmers who are used to receiving direct payment incentives from agricultural programs.

Both Australia and New Zealand have been and continue to be heavy users of afforestation incentives, which were used to transition the forest sector from a reliance on native forests to one dependent on plantations. Due to the dwindling size of the native forest area in both of these countries, and the very productive growth of plantations, both countries have developed large export-oriented forest products sectors based almost exclusively on plantations. Both countries have also followed a similar trajectory in the design of afforestation programs. The largest part of the countries' early plantations were established and managed by the government, and the private sector had little interest in plantation establishment roughly until the 1960's. From 1967 to 1982 in Australia (Australia Agriculture, Fisheries and Forestry 2002) and 1962 to 1983 in New Zealand (New Zealand Ministry of Agriculture and Forestry 2002), a variety of low interest loans and grants were available to landowners to encourage afforestation. In both countries, these approaches stimulated afforestation, although the loan rates and terms of repayment were varied frequently during the periods in an attempt to fine-tune the attractiveness of the incentive. The Australian Softwood Loans program is credited with increasing the area of plantation (almost all of which was radiata pine) from 170,000 ha to nearly 900,000 ha (Australia Agriculture, Fisheries and Forestry 2002).

Interestingly, the original target group of these incentives in Australia was the individual States (i.e. provinces); it was only later that they were available to private landowners. Also, between 1949 and 1958, New Zealand offered prospective plantation owners deductibility of plantation establishment costs and the ability to declare timber revenue over a five year period, but there was very little uptake. This was partly attributed to a relative abundance of native timber and price controls imposed on timber during and after the Second World War, as well as buoyant agricultural markets (New Zealand Ministry of Agriculture and Forestry 2002).

During the 1980's in Australia, the government attempted to target private landowners, especially smaller landowners (less than 1000 ha), and private planting for the first time overtook public planting. However, the bulk of the private planting was for large industrial concerns, as export markets for chips began to develop. The conclusion is that the smaller landowners did not take up the programs as expected because the programs were designed with the sponsors' needs in mind more than the needs of the landowner, the establishment costs were a disincentive, and there was a lack of awareness of the potential benefits from plantations (Australia Agriculture, Fisheries and Forestry 2002). A somewhat similar outcome was reported for grant and loan incentive programs run in New Zealand between 1964 and 1984, with good uptake from small-scale landowners but better uptake from companies (New Zealand Ministry of Agriculture and

¹ Jean-Pierre Dansereau and Peter deMarsh. 2003. A portrait of Canadian woodlot owners in 2003. *Forestry Chronicle* 79, No. 4.

Forestry 2002). Notably, companies, but not individuals, in New Zealand were allowed in 1965 to deduct plantation establishment costs, and with the demise of timber price controls, reduced profit from agriculture, and other supporting programs in place, supported the afforestation encouragement programs.

In 1984, brought on by high levels of public debt and low growth, New Zealand went through a major economic transformation, with public holdings, including plantations, sold off, the civil service downsized, and many grants and subsidies removed. Immediate deductibility was disallowed in 1987, and this measure, combined with the other upheavals of the time, caused planting levels to plunge. In 1991, immediate deductibility was permitted again and a spike in the international price of logs attracted many landowners to timber plantations. A continuous dismantling of agricultural subsidies also took place during this period, contributing to afforestation.

A similar, though somewhat less pronounced approach was taken a few years later in Australia, which included deductibility, removal of competing agricultural incentives, and other measures. A similar very positive result has been achieved from 1990 to present in Australia, as well as New Zealand.

The experiences of New Zealand and Australia are of interest because the countries have a number of similarities with Canada, although there are also profound differences. One of the major differences is the profitability of both hardwood and softwood plantations, which form almost 100% of the basis of the domestic forest products industry and are also exported in significant quantities as chips and logs. In comparison, growth rates of most Canadian forest types, especially indigenous forest types, are so slow that the rate of return is negative or very low.

It is of interest that Australia and New Zealand have now largely dispensed with the use of cash payments and low interest loans to stimulate afforestation. Recent attention has been turned to the use of the taxation system and leveling the playing field with respect to agriculture. In both Australia and New Zealand, agriculture has become less profitable since its most recent peaks in the 1950's and 1960's, which has further encouraged afforestation.

To fully assess the effectiveness of various types of tax incentives, it would be necessary to know the intended impact, and this information was not widely available. For some of the programs reported, we have information on the number of hectares planted, but this statistic is not particularly helpful, because it is not comparable to a target area, and because it does not indicate the "additionality" or increase in afforestation activity which can be attributed to the incentive.

Of the few programs for which there are success rates, France's Afforestation/ Reforestation Law of September 30, 1946, which created the National Forestry Fund, was accorded an 86% success rate. However, because this rate applies to such a long time frame, it is a questionable statistic. More revealing are programs put in place in Finland, which offered direct subsidy payments starting in 1995. This program reached 42% of its goal, having a high acceptance rate in the first few years that then tailed off. The program has since been cancelled by the government. Belgium/ Flanders also had a direct payment program that was responsible for 662 ha of afforestation between 1997 and 2000, well short of the 12,000 ha goal. Denmark had a similar program that achieved approximately one-third of its target; competing European Union subsidies for agriculture were cited as the major constraints.

Ireland also had a direct incentive program, but of the 143,000 ha treated, approximately 20% of the lands planted were bogs and other unsuitable areas. In contrast, the recent program adopted by Poland, which included direct payments as well as property tax reduction, was so successful that the government used up its entire budget for the program.

In general, the success or lack thereof of any particular measure is not a reflection on whether or not the measure is intrinsically useful or not. Instead, the degree of success depends on the balance between the incentive and the costs and benefits of other land uses, the assessment of risk associated with afforestation versus other land uses, and the presence of competing incentives for agricultural land use. The Australian model is instructive in that the measures applied have varied over the years as the government has adapted to different circumstances and also made changes to obtain a higher success rate.

The Irish example is instructive in that either a lack of direction regarding land types to plant, or a lack of enforcement, resulted in the planting of inappropriate lands, with negative ecological effects and wasted program expenditures. Early measures used in Australia resulted in some native forest being cleared and converted to plantation, which was not intended.

In summary, it appears that it is difficult to design a program that works effectively. One reason for this may be that programs do not adequately consider the perceived (and real) risks associated with afforestation.

6 Disincentives to Afforestation

There are many different instruments and programs that directly affect the attractiveness of afforestation, and indirectly affect it through making alternate land uses more or less attractive. Thus, while there are incentives in place to afforest, there are also disincentives that work against the incentive programs. This was recognized by Australia and New Zealand in recent years (Australia Agriculture, Fisheries and Forestry 2002; New Zealand Ministry of Agriculture and Forestry 2002), where the emphasis has been to remove disincentives to afforestation and put all land uses on as level a playing field as possible. From this perspective, incentives for competing land uses, notably agriculture, function as indirect disincentives to afforestation. Chapter 3 above identifies a number of taxation advantages that are provided to farmers to keep their lands in agricultural use. Van Kooten et al. (2002) also noted that eligibility for agricultural programs is sometimes linked to the area of land under cultivation or yield, which are both negatively affected by converting agricultural land to tree plantations.

Experience with the Forest 2020 pilot tests in the Maritimes has shown that there are some substantial disincentives for farmers to participate but, in spite of these, there is a fair amount of farm land that was brought into the program. The major disincentive for tree planting on agricultural land in New Brunswick is cost of leaving the Farm Land Identification Program (FLIP)¹.

FLIP has been in existence since 1979 and provides for the deferral of the provincial portion of real property taxes on eligible agricultural land and farm outbuildings. Eligible land includes land that is actively used for agriculture, as well as land that has agricultural potential. The provincial real property tax rate of \$1.50 per \$100.00 of the assessed value of the farm land and/or outbuildings will be deferred so long as the property continues to qualify under the regulations. Registered property may also have a reduction of the level of municipal and local taxes. Some one who plants trees loses the benefit and also has to pay the deferred taxes.

Despite this, there have been three means by which farmland has come into the afforestation pilot:

- Some smaller farmers have been unable to compete with large producers and so have left agriculture;
- There have also been small, irregular tracts of farm land on which one cannot run a large piece of farm machinery; and
- Land that has been inherited from farming parents by children who have no interest in farming.

Participants in the pilots have had all establishment costs paid for, which is a more generous incentive than is offered by other existing programs. Some participants in the pilot tests were induced to plant trees because of the high benefit amount, but most were already on waiting lists to take advantage of other existing afforestation incentive programs. Foremost among these is a program that pays for most of establishment costs. Several years ago, 90% of the costs of tree planting on small private woodlots were refunded by the provincial government. Last year, this was reduced by 10%, which attracted a number of people to the Forest 2020 pilots. The provincial budgetary outlook suggests a further cut in the subsidy, which should make alternative incentives such as those described in this report that much more attractive.

Other general disincentives are related to costs that may be imposed to meet the requirements afforestation tax incentives, administrative hurdles that must be cleared to be accepted or maintain status in a program, minimum size restrictions, and lack of availability of information on afforestation programs.

¹ <http://www.gnb.ca/0398/menu/abo/fa/NLPP/index-e.asp>

Examples of costs that may be imposed on someone who wishes to obtain an afforestation incentive may include a requirement to have a certified forest management plan, the imposition of monitoring costs or costs of obtaining a consultant to provide advice during the project, and crop insurance costs. There may also be legal fees if an owner wished to have a contract reviewed by some in the legal profession. Van Kooten et al. (2002) discuss a number of these transaction costs.

Disincentives such as administrative hurdles and lack of information are self-explanatory.

Requirements for participants to have more than a certain area afforested will certainly exclude people with less area than is minimally required, and may also exclude people with borderline amounts of afforested area. In addition, the more levers there are in a program, the more things that there are for governments to alter and change the attractiveness of the investment or perhaps make a participant ineligible.

Finally, there are cultural values at play as well. A number of sources mentioned that there is a strong reluctance by farmers to reforest areas that may have been cleared by a father or grandfather, even if planting timber may make economic sense. In such a situation, even a high level of incentive is unlikely to have a strong impact. The anti-forest stance of both the provincial and federal government agricultural ministries has been evident at times in the Maritime Forest 2020 afforestation pilot tests.

7 Classification of Taxation Incentives

Our discussion and review of past and present taxation incentives suggests that there are five commonly used types of tax-based incentives for afforestation:

1. Tax credits on establishment costs;
2. Tax credits on maintenance costs;
3. (Partial) rebate of property taxes;
4. Favourable tax treatment of harvest income; and
5. Favourable capital gains treatment and tax credits on other costs associated with land transfer.

As well, with potential for income from carbon sequestration or leasing of land for carbon sequestration or timber production by another party, there are two additional opportunities to develop taxation incentives:

6. Favourable tax treatment of lease income; and
7. Tax credits on carbon sequestration.

Although most of the tax-based incentives listed above have been described as tax credits, the actual mechanism can be structured in various ways, all of which have the net effect of reducing the cost to the landowner and/ or investor or reducing the taxation of revenue.

Most tax-based incentives are directed at landowners, based on the obvious idea that landowners are key players when it comes to afforestation. As the above review indicated, most of the incentives are aimed at reducing landowners' initial costs of afforesting lands. This has the effect of raising the rate of return earned by plantations, which appeals to landowners who primarily see plantation establishment as an investment, and also making afforestation more affordable for landowners motivated by non-investment rationales. For those landowners who may potentially be attracted to afforestation as an investment, one of the unfavourable characteristics of plantations is that they require large up-front establishment costs, followed by a long waiting period until revenue can be earned from harvesting. This long gestation period is widely considered to be an obstacle to investment, especially by individuals whose lifespan may be much shorter than the time from planting to harvest. As a result, many tax-based incentive programs provide for an early write-off of plantation establishment costs. Other incentive programs, not reviewed here in detail, provided low cost loans and/or grants or re-imbursing of costs – clearly policy makers recognized that the initial costs are often significant impediments to afforestation. Other types of incentives may be applicable during the middle stages of the plantation development – after establishment and before harvest. Still others, mainly associated with treatment of the harvest revenue, can be viewed as “late stage” incentives.

We have used these timing categories to characterize and distinguish the seven types of incentives listed above. Table 13 shows the timing associated with each of the proposed tax incentives. Note that some types of costs, such as property taxes, are applicable throughout the life of a plantation and have the effect of encouraging the care and retention of plantations. Alternately, an incentive that is only applicable during the establishment phase does not incent an owner to maintain the plantation, unless there are penalty clauses for non-performance. In fact, if there are incentives to convert forest to agriculture, there is a potential for abuse of the incentive systems.

In Table 13, we have also indicated the potential size of the tax benefit to the landowner by identifying particularly high-valued incentives with double x (i.e. xx). The size of benefit is inversely related to the expense to government, expressed on a per hectare basis.

Table 13: Timing of Tax Incentives

Incentive	Early	Middle	Late
Establishment	xx		
Maintenance	x	x	
Property	x	x	x
Harvest			xx
Land transfer	x	x	xx
Lease income	x	x	x
Carbon	x	xx	x

The land transfer incentive may come into play at any time during the life of the plantation, but when the crop is mature, it will be especially valuable due to the value of the plantation. On the other hand, the favourable taxation treatment of carbon credits will be highest when the plantation is exhibiting its maximum current annual increment (both above and below ground).

Because of different timing aspects, each tax incentive will be of interest to different target markets. These are summarized in Table 14.

Table 14: Target Markets for Tax Incentives

Incentive	Farmers	Non-farmers	Carbon Investors	Timber Companies	Other Investors
Establishment		x	x	x	x
Maintenance		x	x	x	x
Property		x	x		
Harvest	x	x		x	x
Land transfer		x			
Lease income	x	x			
Carbon	x	x	x	x	x

Farmers and non-farmers may potentially take advantage of each type of taxation incentive, depending on the exact nature of the incentive and the way in which the landowner operates. However, some of the incentives are already provided to farmers, and so they would be of limited interest unless the benefit provided was above the norm for that type of incentive. Carbon investors, who may invest in specific projects, will also be interested in incentives that reduce the costs of the project. Those investors who are solely interested in investing in the carbon credits will be only affected by taxation treatment of the credits themselves.

Timber companies, and other investors who are primarily interested in timber production, are more likely to lease land than purchase it for afforestation. In such cases, incentives directed at property tax reduction or the taxation treatment of lease income will only have an indirect interest. However, favourable treatment of plantation establishment, management, and harvest costs will be viewed as beneficial.

Van Kooten et al (2002) has pointed out that there may be substantial transaction costs associated with afforestation for carbon credits, including the costs of obtaining information,

contract negotiation, and sale of carbon credits. Auditing and enforcement costs, as well as costs of insurance, may also be substantial. These have not been dealt with below. Van Kooten et al (2002) also found that farmers in their survey population would prefer to deal with governments, were not averse to dealing with large corporations, but were generally reluctant to deal with ENGOs or other “non-traditional” organizations.

In the sections below, we evaluate in more detail each of the seven types of incentives described above. Each incentive will be described, the primary target market identified, and an estimate of uptake and cost provided. Uptake estimates are based on the farm and non-farm data from Statistics Canada and Environics (2003), and also assume that the incentive of concern is the only one adopted. Of course, the application of the different types of incentives is not mutually exclusive – it depends on how much stimulus authorities wish to provide, and where the major impediments are believed to lie. The estimates of uptake and cost will be based on a relatively extreme version of the incentive. For example, it is possible to reduce property taxes by anything from 1 to 100% - a 100% reduction will be modeled, although any percentage could be selected. In many cases, the costs will be proportional to the rate of reduction, although the amount of uptake would behave in a non-linear manner as the rate of the incentive varies.

7.1 Incentive #1 – Tax Credit on Establishment Costs

7.1.1 Description

A common approach is to provide tax-based incentives that reduce the after-tax cost of plantation establishment (there have also been many programs based on granting low-cost loans for establishment, or simply re-imbursing part of the establishment costs, but since these are not tax-based systems, they will not be considered here). The most typical approach is to allow a rapid write-off of some or all of the establishment costs (site preparation, planting stock, planting, and competition control), which in the extreme becomes an immediate write-off of all costs. Australia and New Zealand, for example, allow an immediate deduction of 100% of the costs. However, this is only effective if the individual or corporation has income or profit against which the deductions can be claimed. New Zealand found that planting rates declined from 30,000 ha/year to 15,000 ha/year during the 1987-1991 period when immediate deductibility was eliminated and replaced with a requirement to capitalize the costs and write them off against the plantation harvest revenue. Full, immediate deductibility was restored in 1992.

For this type of incentive, as well as many of the other types, it is possible to structure the incentive so that it is only payable if certain classes of land are afforested (e.g. areas subject to erosion). The program can be tailored to promote afforestation with specific species, but as already discussed; different landowners have different reasons for planting, all of which tend to be environmental in nature. The incentive may also be designed so that it becomes payable if the land is retained in forest for some minimum period of time. A different type of constraint is a minimum area requirement, which reduces the administrative cost of dealing with numerous small landowners and targets the incentive towards larger landowners, who can undertake meaningful amounts of afforestation. Figure 1, Figure 2 and Figure 3 provide an indication of the impact that a minimum area requirement might have on administrative costs, as well as cost and uptake. As a trade-off, the acceptance rate may decline because some landowners may only wish to plant areas of land that are too small to be eligible for the incentive.

Recommendations

- Establishment costs receive equal treatment for all landowners.
- Minimum land size can be adjusted to maximize benefits while reducing administrative costs. As an example we will consider a two-hectare minimum for afforested area.

- There is no restriction on species planted. An alternative is that species of interest to the federal government (i.e. hybrid poplar) receive a tax credit of 1.5 times the establishment cost.

7.1.2 Target Market

As Table 14 illustrates, a tax-based measure that reduces the impact of establishment costs would appeal to all identified target markets. Since farmers are already allowed full deductibility of woodlot expenses, only non-farmers would benefit from this type of incentive.

7.1.3 Estimated Acceptance Rate

The estimated upper rate of acceptance is 19%, which is the national proportion of non-farm rural landowners that are interested in planting trees plus those that would plant trees except for the cost or poor rate of return on the investment. This acceptance rate was obtained from the data shown in Table 7. If a minimum area of two hectares is required to participate, the amount of land potentially available from non-farmers is shown in Table 8.

7.1.4 Approximate Cost

The cost depends on how the tax credit is delivered. If the landowner receives a federal tax credit for an establishment cost of \$1,200 per hectare, the credit will equal 22% of this cost or \$264 per hectare, using an average federal tax rate for an upper income bracket. A landowner who afforests two hectares would receive a total tax credit of \$528. However, the average size of holding of idle land for all non-farm rural landowners with more than 2 ha is 83 ha, which implies an average tax credit of \$21,912 if all of the idle land is afforested. If all landowners in the target group accepted the maximum level of the incentive, the total cost would be \$3.1 billion.

On the other hand, if the tax credit was structured so that the entire establishment cost was deductible against income, then the tax loss would be equal to the product of the taxation rate and the establishment expenditure. The federal tax rate varies by income bracket and the provincial rates are quite variable although all are graduated with income. A typical (provincial + federal) taxation rate for an individual with an income of \$55,600 would be 35%, of which 22% is the federal rate and 13% would be provincial. Thus, an individual would see a reduction in tax of \$420 for each hectare established at a cost \$1200/ha. The cost to the federal government would be \$264/ha while the province would lose \$156/ha. Naturally, such an approach would require the consent of the provinces. However, if 19% of the 725,000 non-farm landowners with more than 2 ha of idle land (137,000 landowners) participated and afforested all of their idle land, the total cost to all governments would be \$4.8 billion.

In practice, the acceptance rate is likely to be below 19% and not all of the land would be afforested. We would guess that perhaps 10 % of non-farm landowners would participate and offer perhaps 20 ha each of idle land. This produces an estimated cost to the federal government of \$609 million.

7.2 Incentive #2 – Tax Credit on Maintenance Costs

7.2.1 Description

Maintenance activities include competition control, spacing (pre-commercial thinning), pest and disease management, fertilization and other practices that may be applied occasionally during the development of the plantation. As with establishment costs, tax incentives can also be designed

to permit the rapid write-off of maintenance expenses. Many of the points made with respect to establishment costs in 7.1.1 are applicable to maintenance costs.

7.2.2 Target Market

As Table 14 illustrates, a tax-based measure that reduces the impact of establishment costs would appeal to all identified target markets. One decision to be made is whether the incentive would apply to plantations that have already been established. If so, this increases the potential impact of the incentive, although without better information related to existing plantation area, an estimate is not really possible. Since farmers are already allowed full deductibility of woodlot expenses, only non-farmers would benefit from this type of incentive.

7.2.3 Estimated Acceptance Rate

Assuming that a minimum area of two hectares is required, we have assumed that 19% of non-farmers with idle land greater than 2 hectares would wish to participate. This acceptance rate was obtained from the data shown in Table 7; 19% is the national proportion of non-farm rural landowners that are interested in planting trees plus those that would plant trees except for the cost or poor rate of return on the investment. Existing plantation owners could also participate.

7.2.4 Approximate Cost

In a plantation setting, competition control and spacing cost roughly \$200 - \$300/ha, with pest management expenditures being variable. Issuing a federal tax credit for an expenditure of \$250/ha would produce a tax incentive of \$55/ha (which is also the cost to the federal government). Spacing and competition control might be applied 2 – 3 times during the life of a plantation. The tax credit should be on the net cost of the operation; once trees in a plantation reach a diameter of several inches or more, the spacing might provide revenue to the landowner, reducing the tax credit. If the spacing yields net revenue, the government would gain tax revenue.

As above, if the actual acceptance rate is such that 10% of non-farm landowners participate and offer 20 ha each of idle land, and the land is treated twice at \$250/ha each treatment, the estimated cost to the federal government is \$160 million.

7.3 Incentive #3 – Partial Rebate of Property Taxes

7.3.1 Description

A third approach targets annual expenses, which usually means property taxes, in the case of landowners. The idea behind this type of incentive is to reduce the holding cost of the plantation and bring the level of taxation to greater parity with agriculture. The usual approach here is a partial rebate of property taxes, with a full rebate being an extreme possibility. Note that even farmers pay some property tax, and so full tax rebates are not provided in most cases. One implication of this approach in Canada is that municipal governments usually collect property taxes, but such rebate programs are often initiated by provincial governments.

7.3.2 Target Market

Assuming that the goal of this incentive is to create a more equal playing field with agriculture, the target audience is non-farm rural landowners. Timber companies that own land and investors in afforestation projects would also benefit since this measure would reduce their costs of

afforestation. However, depending on whether the rebate was directed at all plantations, fast-growing plantations only, or all woodlots, the target market is quite different. For example, forest companies that own large blocks of land may be induced to plant fast-growing trees if this is the only type of woodlot that benefits. On the other hand, even if the incentive applies to all woodlots, having a lower cost base may encourage a shift to a higher rate of investment and more intensive management.

7.3.3 Estimated Acceptance Rate

Estimating the acceptance rate depends heavily on the extent of coverage. If the target market is non-farm rural landowners, and the measure is designed so that it hits this target, then Table 10 shows the average property taxation levels involved.

7.3.4 Approximate Cost

The cost per hectare can be readily computed for each province by taking the average net property tax paid by province (Table 10) and multiplying it by a 50% rebate rate (a figure that seems like a reasonable incentive but will probably not put the tax rate below the agricultural tax rate). The product of these provincial per hectare rebates and the number of hectares available in parcels greater than 2 ha, and the proportion of owners who may be interested gives rise to a total annual cost of \$46.4 million.

7.4 Incentive #4 – Favourable Tax Treatment of Harvest Income

7.4.1 Description

A fourth approach is to subject the revenue from the sale of timber to favourable tax treatment. These types of programs are aimed more at landowners who manage timber for the purposes of harvesting it, and do not benefit landowners who have little interest in harvesting trees. The most commonly adopted approaches used in other jurisdictions are to allow a landowner to spread the revenue over some number of years, including years after harvesting has taken place, and to treat the income as a capital gain, which entails a lower taxation rate than if the timber revenue was treated as regular income.

7.4.2 Target Market

This incentive will provide a benefit to the landowner, especially an owner with a relatively low income level that can maintain a lower marginal tax rate by judicious income distribution over time. This is expected to benefit farmers as well as non-farm rural owners, and also timber companies and other investors in afforestation projects.

7.4.3 Estimated Acceptance Rate

In the absence of other tax incentives, it is questionable to what extent individual landowners will be motivated to afforest, since there will be a wait of 20 years or more until the main harvest of the plantation takes place. One would expect that some landowners would be motivated by this incentive, but the incentive might have a greater effect on timber companies and investors with long time horizons, such as pension funds.

7.4.4 Approximate Cost

The approximate cost is difficult to estimate because it is a future cost that is dependent on future tax rates, income levels, and timber prices. In the case of timber companies, pricing timber harvested and used by the company itself will be difficult. There are several options that could be used to value timber grown on company land, but each option has some major drawbacks. Options include using an average local market price, provincial government stumpage rates, or a published market price index adjusted for provincial conditions. Local markets may not exist or be only small or sporadic, and therefore subject to manipulation, provincial dues rates may not at any given time be representative of market prices, and there are few published market indices that would be widely applicable in Canada. Internal company transfer prices can be somewhat arbitrary, and it is not reasonable to assume a regional or provincial price, but calculating a local price in the absence of sales transactions can be daunting and controversial.

7.5 Incentive #5 – Tax Credit on Land Transfer Costs

7.5.1 Description

In Canada, the sale of farm properties to family members is subject to a \$500,000 lifetime capital gains exemption, and this also applies to gifts of farmland to family members (as long as the donor is living). Such an approach was recently extended to allow for the intergenerational transfer of woodlands, which is especially appropriate due to the long duration of the timber growth cycle. This incentive is described here because it may be advisable to extend it; one of the limitations is that the owners must have forest management plans in place, which is costly for owners of small forest areas. The incentive could also be extended to include deductibility of property transfer costs, including land transfer taxes, and legal fees.

7.5.2 Target Market

The capital gains exemption is only really applicable to individual landowners, and since farmers already have such an exemption, non-farmers would be most interested. Because medium and large corporations have many types of capital gains, an exemption for these types of firms would likely not be particularly targeted or effective in stimulating afforestation. Similarly, deductibility of land transfer costs is relevant to private individual but insignificant in the context of a medium or large firm's budget.

7.5.3 Estimated Acceptance Rate

The rate at which a capital gains exemption on the sale or gift of a plantation property is captured depends on the frequency of land transfers, the value of the land compared to its original purchase price, and also whether there are capital losses that can be used to offset the capital gain. Following the last several years of generally poor stock market returns, there may be many people with a substantial value of tax loss credits.

As mentioned above, this measure that could be made applicable to a greater number woodlands, or just to planted areas (lots of grey area with this proposal), or just to fast-growing plantations. If the measure is kept in a broad format, it can be used by many people who have and are not afforesting their property, and so we would suggest that a capital gains exemption that is generally applicable would not be particularly beneficial at increasing afforestation for the purposes of sequestration.

7.5.4 Approximate Cost

Since this incentive has been only recently put in place for owners of forests that have and follow forest management plans, it is early to assess the cost to the government. However, if the capital gains exemption applied only to forest land, and the average holding of forest plus idle land is 54 ha (see Table 9), then a 54 ha parcel of land could have capital gains of up to \$9,300 per hectare before the owner eliminated his or her capital gains exemption.

7.6 Incentive #6 – Favourable Tax Treatment of Lease Income

7.6.1 Description

Where private landowners lease their land to companies the plant and manage timber plantations, the venture would become more attractive to landowners if the revenue from the lease payments was treated favourably in the tax system. As it now stands, lease payments would be treated as regular income. It would more favourable to tax lease income at the same rate as a capital gain (which is at a lower tax rate) or allowing some deductibility of the lease income.

7.6.2 Target Market

The target market is landowners, both farmers and non-farmers, who might be interested in leasing their land for the purposes of timber production. Alpac and Domtar in Cornwall are examples of two companies that use this approach to secure part of their timber supply on lands close to the mill. Alpac reported that many of the people who enter into a leasing agreement with it are retiring or retired farmers – Alpac plants and manages hybrid poplar plantations on these lands. However, the extent of the target market is limited by the desire of forest products companies to enter into leasing agreements, and landowners located far from mills are unlikely to be involved in a lease program, even if other investors begin to initiate these types of arrangements.

7.6.3 Estimated Acceptance Rate

The degree to which this incentive is employed will depend on rates of leasing. The introduction of favourable tax treatment may encourage more landowners to participate in existing programs, and it may make it feasible for additional companies to begin a leasing program.

7.6.4 Approximate Cost

According the Alberta-Pacific's web site, the company currently has lease arrangements on 950 ha and they are looking to gradually increase the scope of their program. On the other hand, Domtar in Cornwall currently has about 800 ha under lease and the size of the program has been declining as agriculture has picked up and land formerly in the program is reverting back to agriculture again (Streit 2004). Therefore, in 2003, 50% of the capital gain would be counted as income, provided that there were no offsetting losses (Mallin 2004). In effect, this means that the combined federal and provincial tax rate declines from an average of about 35% to an average of 17.5%. If the lease rate is \$100/ha/year, then on 1750 ha (the area under lease to Domtar and Alpac), the cost to the federal and provincial governments is 17.5% of \$175,000 or \$30,625.

7.7 Incentive #7 – Tax Advantage for Carbon Sequestration

7.7.1 Description

A final set of incentive approaches would be to create more attractive conditions for landowners to produce and sell carbon credits and for investors to purchase carbon credits. Because carbon markets are poorly developed, no applied examples of this type of incentive have been found. But, in theory, it is possible to give landowners who sell carbon credits favourable treatment of the income received from their sale – this could range from applying capital gains taxation rates to the revenue to creating a new taxation rate that is lower than that applied to regular income. Landowners might also receive a tax credit for the carbon credits that they create, even if they do not sell them. Providing a tax incentive at source (i.e. for the landowner) is probably a better approach than providing favourable tax treatment of investment gains made on buying and selling credits, or on commissions. Most investment dealers understand risk very well and in theory are able to structure their portfolios to manage risk, which obviates the need to provide favourable treatment of investment gains.

If an incentive was targeted at the revenue earned from the sale of carbon credits, proof of sale and sale price and quantity would be the raw information required to determine the value of the incentive. These materials would also be the documents that would be requested by the Canada Revenue Agency (CRA) in an audit situation. The administrative burden of such an approach would be minimal, except that there might be some requirements for additional hiring at CRA.

One shortcoming of this approach is that landowners who do not sell credits are not able to take advantage of this incentive. A second related problem is that it will probably be very difficult for small landowners to sell carbon credits because the transaction costs will eat up most of the value of the credits.

As an alternative, landowners who generated carbon credits could receive an incentive without needing to sell the credits. Such an incentive could be a deduction equal to some or all of the value of the credits created. Under this approach, there would be a requirement for verification – this could be facilitated by the preparation of easy to follow guidelines, but verification resources will still be required (some of the onus for doing this should be placed on the landowner). If the landowner was able to obtain a tax credit for producing carbon credits through afforestation, and once the credit was claimed ownership of the credit passed to the Crown, then the Crown would effectively act as an aggregator, which would enhance the attractiveness of the proposal. This would also reduce the transaction costs.

7.7.2 Target Market

Both farm and non-farm private landowners, as well as corporate landowners, would be the intended beneficiaries of this type of incentive.

7.7.3 Estimated Acceptance Rate

This incentive has the advantage of providing a benefit to the landowner before the plantation is harvested, so the period between establishment and the realization of the first benefits would be no more than a few years with a fast-growing plantation, perhaps ten years with pine, and maybe 15 – 20 years with tolerant hardwoods. Thus, this incentive would be more attractive than an incentive that was realized only at the time of harvest.

However, because carbon is not well-known as a commodity and its value is not well-established yet, there may be a substantial degree of hesitancy on the part of landowners to afforest solely on the basis of this incentive.

With this in mind, we would estimate the incentive being adopted by only 25% of interested small private landowners (i.e. 25% of the interested 19%). Some industrial landowners would be interested, but many larger landowners may be more interesting in disposing of the carbon credits themselves. Looking at non-industrial farm and non-farm landowners, we therefore estimate that if all participants afforested all of their idle land, then a total of 5,750 farmers and 35,250 non-farm landowners would participate. With average holdings of idle land estimated at 123 and 83 ha, respectively, per landowner, a total of 3.5 million hectares would be afforested.

7.7.4 Approximate Cost

If each afforested hectare yields an average of five tons of CO₂ equivalent per year, the annual value of carbon credits produced would be \$1.8 billion, assuming a cost of \$Cdn 10/credit. This compares with a recent estimate of the average price of a credit as being \$US 7.60 (Idaho Soil Conservation Commission 2003). If the value of these credits was deducted from personal income, then at an average tax rate of 35%, the cost to federal and provincial governments would be \$637 million per year.

8 Conclusions

This project has reviewed a variety of afforestation incentive programs, concentrating on those that are tax-based. The review indicated that direct payments to landowners are widely used in Europe while Australia and New Zealand have moved away from this approach to one based more on providing tax incentives and removing dis-incentives. Agriculture is the major competing land use, and almost all countries have various measures in place to encourage agriculture, ranging from outright payments to farmers to favourable taxation treatment. The bias in the system in favour of agriculture, and against alternate uses such as forestry (plantations are usually not counted as agricultural crops), is a major disincentive for afforestation. This bias in favour of farmers is also found in Canada, with the result that the target audience of many of the incentives proposed here is the non-farm rural landowner, since farmers already receive many of the same types of taxation treatment being proposed for non-farmers.

A second disincentive in most of Canada is the poor economic return associated with timber growing, when timber is the sole crop. The potential for carbon sequestration to provide a marketable value will enhance the economics of plantations, but there will likely need to be a length of time for this message to reach a significant number of landowners.

While this report has been concerned with the provision of tax incentives for afforestation, which will represent a cost to at least one level of government, it is important to recognize that there are benefits to governments from afforestation, aside from the contribution to meeting Canada's Kyoto commitment. The examination of the taxation system indicates that there are many tax advantages associated with farming that do not apply to non-farm rural landowners. From the perspective of the consultants, this suggests that the playing field is tilted in favour of agriculture over forestry, and if it is brought closer to a level position, then one would expect an expansion of forested area as the economic advantages of the revised system affect landowner decisions. Over time, there will be an increased wood supply from lands that are probably located relatively close to existing forest products mills. This could benefit the mills if it enables them to replace expensive wood growing far from the mill with nearby wood. The stumpage revenue will also benefit the landowner.

Some of the new forests will provide greater ecological benefits than the previous land use did, especially if the afforestation is undertaken with native species that are allowed to grow for a relatively long period of time. Hybrid poplar plantations are not likely to provide much, if any, biodiversity benefit. Other benefits from plantations include water regulation and soil improvement, and aesthetic benefits

We have identified seven types of tax-based incentives. Of these, the two with the potential for the greatest impact, in the view of the consultants, are deductibility of plantation establishment expenses and a tax credit equal to the value of the carbon sequestered. Establishment costs are substantial, even if the land needs little in the way of site preparation, and this, coupled with the relatively long wait to crop maturity, is a major disincentive. Providing a tax benefit will have a substantial impact on the landowner and could mitigate what is probably the largest obstacle to more widespread tree planting. Providing a tax credit for carbon credits is also attractive in theory, although in practice it will be more difficult and costly to implement than the establishment cost incentive (in terms of administrative and enforcement costs). It is attractive because the benefit is obtained relatively rapidly, the benefit may be substantial, and the Crown could use this approach to aggregate credits produced by many small landowners.

Of more moderate potential benefit are deductibility related to maintenance costs and the favourable treatment of harvest revenue. These are viewed by the consultants as having less attraction to landowners because they are available only in the medium and longer-term for plantations that might be established in 2004.

The remaining three incentives are not expected to be likely to sway a landowner by themselves, but are viewed as “sweeteners” that would make it more attractive to a landowner who was mulling over afforestation as a possibility. The consultants hold this view because there are already property tax rebates in place for managed forests, and so there is not a great deal of room to improve in some jurisdictions, while the incentives aimed at lease income and land transfer are indirect and apply to relatively few landowners at any given point in time.

It is important to note that many of the incentives based on deductibility of costs or provision of a tax credit will impact the finances of both the federal and provincial governments. Provincial government agreement and cooperation is therefore needed, and may not be forthcoming.

It is also important to bear in mind that more than one of these incentives could be applied simultaneously, obviously increasing the attractiveness of afforestation. Due to difficulty in estimating uptake of a package of incentives, and the many potential packages that could be put together, the consultants have not pursued estimates of uptake and cost in this situation.

Finally, we note that there is the risk that these incentives could encourage the planting of inappropriate lands, including very poor or wet lands, lands with high conservation value, etc. One way of reducing the amount of inappropriate planting, and also providing a better species to site match, would be to require that beneficiaries of these incentives have an up-to-date forest management plan. Unfortunately, the downside is that this is an additional step and a cost, and would make it less likely for holders of small parcels to participate.

8.1 Packaging Tax Incentives

There will be some advantages in providing a package of tax incentives rather than individual programs. For example, the same administrative requirements would be required for a package of tax incentives as for each one individually. Similarly, the uptake of a package of incentives may be better than it would be for individual programs. Finally, there will be less opportunity for “free-riders”, participants that take advantage of a particular incentive without really fulfilling the goal of the overall program.

Clearly, some tax incentive should be given to offset establishment costs. This will likely have the highest affect on the landowner’s decision to afforest. In addition, to ensure plantation survival, tax incentives should be given for proper forest management, management planning and tending. These two programs combined will provide adequate incentive for the establishment and the development of the plantation to the “free-to-grow” state.

Beyond these early measures, tax incentives could be given for continued participation. These could be a reduction in property taxes, favourable treatment of income from carbon sequestration, or some other tax advantage for carbon sequestration. As shown in Table 4 and Table 10, average annual property taxes are approximately \$8 /ha. Hybrid poplar with a mean annual increment of 5 t / ha / year would sequester approximately 12 t CO₂e / ha / year. At a conservative, \$5 / t CO₂e, the annual carbon sequestration value could be \$60 / ha / year, significantly more than property taxes.

We have summarized potential tax packages below:

Table 15: Possible Tax Incentive Packages

Package No.	1	2	3	4
Description	Establishment costs	Establishment and management costs	Establishment and management costs, and property taxes	Establishment and management costs, and carbon value
Advantages	Simple	Simple, ensures survivability to “free-to-grow”, minimal monitoring	Simple, ensures survivability to “free-to-grow”, promotes continued participation, minimal monitoring	Ensures survivability to “free-to-grow”, promotes continued participation
Disadvantages	Survivability questionable		Property taxes are cross-governmental	Monitoring required
Possible Uptake	10%	15%	17%	19%

8.2 Recommendations

- The target audience should be non-farm rural landowners.
- The consultants would further recommend that a minimum area requirement be associated with many of the incentives. Minimum areas of either 2 or 5 ha would seem to be optimal.
- The government should most strongly consider the implementation of a package incentives that would lessen the burden of establishment costs and that would provide benefits for carbon sequestration.

9 References

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Appendix A – Detailed Review of Selected Taxation Incentives

Table A1. Canadian Programs

Tax-based Incentives				
Jurisdiction	Program	Incentive	Description	Success/Notes
Quebec	Real Estate Refund Program (Programme de remboursement des taxes foncières)	Municipal tax reduction of up to 85% on forest management expenses	<ul style="list-style-type: none"> Available to certified forest producers that own the land only. Activities have a pre-ordained financial value. Site preparation, seedling costs are eligible Eligible expenses greater than annual real estate taxes carried forward and used as credits for up to 10 years. 	<ul style="list-style-type: none"> Acceptance rate requested from Government of Quebec Agricultural Tax Rebate –minimum of \$300 and minimum of 30% of gross agricultural income or 70% of property taxes. Must be a registered agricultural producer within the agricultural zone that has a gross income of more than \$150 / ha and total gross income of more than \$5000. http://www.agr.gouv.qc.ca/publications/Programme-INTER2004-OK29-01.pdf
Ontario	Managed Forest Tax Incentive Program (MFTIP)	Municipal Tax Reduction of 75% on qualifying lands	<ul style="list-style-type: none"> To qualify lands must: be at least 4 ha acres in size; have a management plan approved by a registered plan approver; meet a definition of “forest cover”; and be re-approved every 5 years. Reduction in tax brings the rate for qualifying lands down to the same as for agricultural lands. Management objectives for lands can include: environmental protection; forest products; investment; recreation; wildlife; and others. PST not applicable on purchased stock 	<ul style="list-style-type: none"> Program has over 10,000 participants with approx. 1.8 m ha. Benefits are greater for residents in southern area as tax rates are higher there. Definition of “forest” is based on trees/ha; plantations would qualify. Recent controversy regarding land assessment values has decreased the number of eligible properties
Ontario	Conservation Land Tax Incentive	Municipal Tax reduction of	<ul style="list-style-type: none"> Tax relief provided for owners of 	<ul style="list-style-type: none"> 40,000 property owners are eligible,

Tax-based Incentives				
Jurisdiction	Program	Incentive	Description	Success/Notes
	Program (CLTIP)	100% on qualifying lands	<p>provincially significant wetlands, designated areas of natural and scientific interest, habitat for endangered species, Niagara Escarpment lands, or community conservation lands.</p> <ul style="list-style-type: none"> • Lands must be designated by Ministry of Natural Resources. • Land owners must agree to maintain land in a natural state and not degrade it. 	<p>but only 14,000 participate;</p> <ul style="list-style-type: none"> • MNR thinks participation rate reflects reluctance of landowners to consent not to not change their lands. • MNR contacts landowners annually • Landowners must re-submit applications annually, but MNR trying to change the rules so that agreements cover 5 yrs. • Area covered – 200,000 ha
Ontario	Farm Property Tax Class Rebate Program	Municipal Tax Reduction of 75% on qualifying lands	<ul style="list-style-type: none"> • Property must be assessed as farmland by municipal property assessment corporation. • Property must be part of a farming business generating over \$7,000 gross income. • “Farm income” as defined by Canada Revenue Agency includes tree farming and Christmas tree farming. 	<ul style="list-style-type: none"> • Should include afforested areas if they can be shown to be “tree farms”? • Info on uptake not readily available.
Manitoba	Ecological Tax Credit	Property Tax Credit (amt?)	<ul style="list-style-type: none"> • Incentive is intended to encourage farmers to return marginal agricultural land to a “natural condition”. • Planting of trees should qualify as effort to return farm land to natural state. 	<ul style="list-style-type: none"> • Credit is referred to in 2001 budget and tax documents, but no other references to it have been found • does it still exist?
Manitoba	Land tax Assessment Categories	Municipal taxes rates	<ul style="list-style-type: none"> • There are several tax assessment categories for land depending on the productivity. Forest land has a low assessment rate. • This is not an afforestation program per se, but could provide encouragement for tree planting. 	

Tax-based Incentives				
Jurisdiction	Program	Incentive	Description	Success/Notes
Saskatchewan	Land tax Assessment Categories	Municipal tax rates	<ul style="list-style-type: none"> • There are 4 categories of land for taxation purposes. Improved agricultural land; Unimproved agricultural land- which generally includes forested land; Residential land; Industrial land 	
Alberta	Land Tax Assessment Categories		<ul style="list-style-type: none"> • Agricultural and forest land is taxed at the same rate 	
B.C.	Property Taxes		<ul style="list-style-type: none"> • Unmanaged forest taxed at \$4.50 / \$1000 • Managed forest and agriculture taxed at \$0.50 / \$1000 • Rural residential land taxed at \$0.95 / \$1000 • Land classification based on zoning not land use. No incentive to reforest land zoned residential. 	

Other incentives				
Jurisdiction	Program	Incentive	Description	Success/Notes
Canada	Permanent Cover Program/Greencover	Direct Payments per ha – amts. differed by province.	<ul style="list-style-type: none"> • The Permanent Cover Program was a five-year program (1989–1994) that was offered to farmers in the Prairie provinces and the Peace River region of British Columbia. • The new Greencover program is structured similarly and has a similar intent • The main objective was to convert marginal lands under cultivation (Canada Land Inventory classes 4, 5, and 6) to permanent forage or tree cover. 	<ul style="list-style-type: none"> • Approx. 15 000 farmers converted approximately 522 000 ha of marginal, erosion-prone land from annual crops to permanent cover under 10- or 21-year contracts. • No indication of how much land was converted to forest vs. other permanent covers
Prince Edward Island	Hedgerow and Riparian Zone Planting	Tree planting subsidies	<ul style="list-style-type: none"> • Year-old seedlings \$ 0.40/tree • Two year-old seedlings \$ 1.00/tree • Herbicides and other site prep at \$.12/seedling • Maximum of \$35,000 per farm. • Agroforestry acceptable 	<ul style="list-style-type: none"> • Acceptance rate requested from Government of P.E.I.
Quebec	Forestry Financial Support Program		<ul style="list-style-type: none"> • Minimum area 80 hectares • Low interest loans (at residential mortgage rates) of up to \$500,000 	<ul style="list-style-type: none"> • Acceptance rate Requested from Government of Quebec. • http://www.financiereagricole.qc.ca/default1024.html
B.C.	Land-Base Investment Program		<ul style="list-style-type: none"> • Planting subsidies on backlog crown lands 	<ul style="list-style-type: none"> • Probably would not be considered afforestation under Kyoto.

Table A2. Non-Canadian Programs

Tax-based Incentives					
Jurisdic.	Program	Incentive	Description	Success	Notes/ Applic. to Canada
Finland	Farm Income Tax Act	Tax incentive for afforested lands	<ul style="list-style-type: none"> Afforested fields exempted from forest taxation schemes (treated like agriculture?) Initiated in 1967 		Similar to Ontario's MFTIP program
France	National Forestry Fund	Financial assistance and tax breaks (no details)	<ul style="list-style-type: none"> Direct payments and various tax breaks for farmers converting agricultural land to forests (no details) 	Since inception, natural regen. and afforestation has averaged approx. 63,000 ha/yr	
Germany	Disaster Relief	Tax Relief	<ul style="list-style-type: none"> Forest owners compensated for natural disasters in the form of tax relief 		Not really an afforestation incentive
Ireland	Tax exemptions	Tax exemptions	<ul style="list-style-type: none"> Returns from forestry are tax free 		Possibly – this would require afforested land being kept in forest even though harvesting would occur.
Norway	Forest Trust Fund	Tax deferment, through a trust fund	<ul style="list-style-type: none"> Small forest owners must contribute some portion of their forest revenues (5 to 25%) to a trust fund. Money is not taxed when paid into fund. When money is withdrawn and applied to long-term investments (including afforestation), a significant portion of the money can still be deducted from annual income taxes. Functions sort of like an RRSP 		Not an incentive for afforestation per se, but for good forest management. However, the notion of deferring tax to encourage planting may have merit.
Chile	Various	Payments and tax subsidies.	<ul style="list-style-type: none"> Tax exemptions for plantations, and direct payments of up to 75% of the cost of reforestation 	Govt. spent \$150 m in subsidies in	How should incentives for other aspects of forest

Tax-based Incentives					
Jurisdic.	Program	Incentive	Description	Success	Notes/ Applic. to Canada
			<ul style="list-style-type: none"> • Further payments available for additional silv. activities • Exemptions on property and inheritance taxes on reforested lands. • Special central Bank line of credit for reforestation • Planting subsidy removed in 1994 	20 year period prior to 2000, but this was responsible for catalyzing \$4 billion in investments.	management be linked to initial incentive for afforestation?
Chile	Laws to protect forest environment	Tax credits	<ul style="list-style-type: none"> • Recent new laws allow for one time tax credit for following activities: reforestation of fragile soils, marshes, etc; recovery and forestation activities for eroded non-arable dry soils; and sand dune stabilization and forestation 		One time credits may not be as appealing as longer-duration incentives.
Costa Rica	Income Tax deduction Program	Income tax incentives	<ul style="list-style-type: none"> • Tax incentives targeted at large investors allowed them to deduct the cost of establishing and maintaining plantation investments from their income tax liability, provided that portion was invested in govt.-prescribed activities. • Tax grant valued at US\$800/ha 	<p>Incentives may have been so high as to encourage cutting of natural forest and then establishing plantations.</p> <p>Incentive did not address small landowners as only large landowners pay income taxes</p>	Should there be separate incentives targeting large landowners/forestry companies from those targeting farmers/small landowners?
Costa Rica	tax incentives	1993	<ul style="list-style-type: none"> • Above incentives modified to include small-medium land owners. 	10,000 –50,000 ha planted	
Costa Rica	Income Tax	Write-off of tax	<ul style="list-style-type: none"> • Up to 16% of income tax liabilities can 		May be appealing to

Tax-based Incentives					
Jurisdic.	Program	Incentive	Description	Success	Notes/ Applic. to Canada
	Act 4465	liabilities	be written off if invested in reforestation. <ul style="list-style-type: none"> • Can be used by individuals and companies who own land 		landowners with liabilities, but would be more if liabilities could be written of for more than they were worth if invested in afforestation. → can this be done?
Costa Rica	Forestry Bonds (CAF)	Bonds used for tax payment	<ul style="list-style-type: none"> • Bond can be used to pay any kind of tax. Payment is made when investor provides proof that a plantation has been established 	600 businesses participated and approx. 38,000 ha reforested	Likely not applicable
Costa Rica	Fossil Fuel Tax (part of PSA program)	Tax payment to forest owners	<ul style="list-style-type: none"> • One-third of the tax on fossil fuels goes to forest owners, who may invest the payment in reforestation, management of natural forests, or forest protection. 	In 1997 and 1998, these funds were invested in reforesting 13.9% of the total planted area.	Likely not applicable
USA	General taxation policy	Capital gains treatment for timber	<ul style="list-style-type: none"> • Timber could be treated as a long-term capital gain for tax purposes starting in 1944. This measure applied to individuals and corporations; previously applied only to individuals who occasionally sold timber. • Meant that only 40% of timber sale income was taxable • Preferential tax treatment of capital gains ended in 1986, re-instated in 1996. Since improved under Bush government. 		Not really an afforestation incentive Capital gains treatment of farm woodlots exists under Canadian Tax policy; the same treatment is not available to non-farm woodlots
USA	General taxation policy	Tax credit for tree planting –	<ul style="list-style-type: none"> • For up to \$10,000/ year of planting expenses, there is a 10% investment 	Between 1977 and present,	Similar credit could exist in Canada.

Tax-based Incentives					
Jurisdic.	Program	Incentive	Description	Success	Notes/ Applic. to Canada
		both for reforestation and afforestation	credit and 95% of expense is amortized over 8 years <ul style="list-style-type: none"> Started in 1980, continues to present 	planting rate grew at 2.4% per annum; not sure how much is afforestation vs. reforestation Stumpage prices generally stable during this period	
Mississippi	Reforestation Tax Credit	Income Tax credit	<ul style="list-style-type: none"> Applies to reforestation of agricultural, pasture, cutover or idle land. Only applies for individuals, groups or associations; companies not eligible. Tax credit is for 50% of the actual cost of approved reforestation practices or 50% of the average cost of approved practices as established by Miss. Forestry Commission, against the taxes imposed for the tax year in which the costs are incurred. Maximum of \$10,000 lifetime Costs included: seeds, seedlings, planting, site preparation Owners must have a reforestation plan prepared by a registered forester 		Similar system could be applied in Canada
Ireland	Afforestation Grant and Premium Schemes	Tax incentives	<ul style="list-style-type: none"> Planting grants received under the EU Forest Grant and Premium Scheme is exempt from Income Tax. Capital Gains Tax: The land is liable while the crop is exempt. Capital Acquisitions Tax: Transfers between parent and child are exempt up to a threshold. This was €422,148 	Established in 1990	Having capital gains applicable to land, but not to crop would be new for Canada, but in theory it could work. Similar systems exist in forest tenure, where companies

Tax-based Incentives					
Jurisdic.	Program	Incentive	Description	Success	Notes/ Applic. to Canada
			<p>in 2002.</p> <ul style="list-style-type: none"> Established in 1990 		have ownership rights to trees, but not land.
New Zealand	Incentives for the export of logs	Increased Exports Taxation Incentive (IETI) and Market Development Expenditure Scheme (MDES)	<ul style="list-style-type: none"> In 1959, the government recognized the value of creating a log export industry Two early export incentives introduced in Income Tax Act in early 1960's, not specific to forestry. One was a reduction in tax paid on the increased revenue from exports (IETI); the second was a deduction based on the increase in export revenue (MDES) Export Development Grants introduced in 1975 (a 40% deduction of costs incurred to promote exports) and New Market Increased Export Taxation Incentive allowed another 15% deduction equal to 15% of the increase in export sales to new markets. Another five export incentive measures from the early 1980's are listed, ranging from convertible loans, grants, tax deductions to increased depreciation on machinery purchased to produce goods for export. All export incentives were terminated in mid-late 1980's, including those on agriculture. 	<p>Tariffs on log imports were low to minimal but were higher (from 20-40%, with lower rates from developing countries, Australia and Canada) on chips, HW pulp, boards and plywood.</p> <p>Price spike of 1993-94 led to surge in log exports; government resisted calls to limit exports. Note that export of logs of indigenous species is controlled.</p>	Not really afforestation incentives. While increasing export incentives may lead to increased planting, the link is likely tenuous given that private landowners are of interest here.
New Zealand		Deductibility of plantation establishment costs	<ul style="list-style-type: none"> Immediate full deduction of plantation establishment expenses from taxable income eliminated in 1983. In 1984, forest establishment costs 	Private land planting peaked in 1985 at 36,000 ha then fell to 15,000	Could be applied in Canada

Tax-based Incentives					
Jurisdic.	Program	Incentive	Description	Success	Notes/ Applic. to Canada
			became fully deductible against income; this measure was removed again in 1987 and restored in 1991.	ha in 1992, rose to 50,000 ha in 1993 and 98,000 ha in 1995.	
Australia	New Taxation System, introduced July 1 2000 by the Australian Taxation Office	Favourable tax treatment of plantation costs; 12 month rule Non-commercial losses (NCL); Capital gains	<ul style="list-style-type: none"> Reduction of tax costs from plantation establishment through transport and manufacture Immediate deduction for select prepaid expenses in a plantation mgmt agreement; must be completed within 12 months of start; does not apply when prepaid expenses relate to a plantation under tax shelter rules There are a number of very favourable treatments of capital gains from plantations 	On July 1, 2000, government ended "13 month rule", and required activities to be undertaken in same fiscal year as pre-payments collected. This led to high planting rate in 2000, sharp decline in planting rate in 2001 and collapse of one public company; "12 month rule" announced in Oct 2001 and passed in March 2002 (iied).	
Australia	Landcare deduction (1985); landcare offset (1997)		<ul style="list-style-type: none"> Immediate deduction for expenditures related to soil conservation; Offset allows claim of 30% of capital expenditures for soil conservation, etc. (alternative to landcare deduction) 		Soil conservation measures could include planting, but likely not directly relevant to afforestation incentives

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
United States	Forestry Incentives Program	Federal Government direct payment of costs.	<ul style="list-style-type: none"> Established by 1996 Farm Bill. Federal government pays 65% of the costs of tree planting and stand improvement to a maximum of \$10,000 per year if the landowner agrees to maintain practices for at least 10 years. Intended to take marginal agricultural land out of production. Program has run since 1996, although earlier versions of the program extend back to 1974 	From 1974 to 1994, FIP cost-shared more than \$200 million, for approx. 3.32 million acres of tree planting, 1.45 million acres of stand improv. and 0.27 million acres of site preparation on non-industrial private forests.	Incentives for both planting and stand improvement applicable to Canada - afforestation incentives should cover more than establishment
United States	Stewardship Incentives Program	Federal Govt. direct payment of costs and provision of technical assistance	<ul style="list-style-type: none"> Established by 1996 Farm Bill. Funds and technical assistance are provided to landowners who develop Forest Stewardship Plans (including afforestation). Federal govt covers 75% of the costs up to \$10,000 per year if the landowner agrees to maintain the planned practices for 10 years. Intended to take marginal agricultural lands out of production. Program has run since 1996 	Between 1991–99, 150,964 hectares (372,881 acres) of trees were planted. The cost of the program during this same period was about \$23.5 million.	Incentives for good stewardship should be part of afforestation incentive program
United States	Conservation Reserve Program (CRP)	Federal Govt. direct payment of costs. Govt. funds	<ul style="list-style-type: none"> Helps farmers retire environmentally sensitive cropland for 10 years in return for rental and cost-sharing payments and technical assistance. 	As of October 1999, 12.5 million ha of cropland were	Although funds received are partially tax deductible, the main feature of this program is cost-sharing arrangement

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
		received are partially tax-deductible	<ul style="list-style-type: none"> Federal govt provides up to 50% of the costs of a cover crop to a maximum of \$10,000 per year. Funds received under these programs are partially tax-deductible. Enacted in 1985 and expanded in 1990 	enrolled in the CRP	
Europe	Directive 2080/92	Direct Payment by EU member states	<ul style="list-style-type: none"> An EU initiative in which the European Agricultural Guidance and Guarantee fund finances up to 75% of the costs of reforestation of poor agricultural lands. The directive is comprised of many individual programs which include: Aid for afforestation, aid for investment in new plantations, premiums for maintaining new plantings, permanent protection of forest against clearing. Fast growing species only funded on farm land. Hardwood funded on all land. 	1 million ha of agricultural land were afforested between 1994 and 1999	Only somewhat applicable to present interest; main intent is to retire poor agricultural land although incentives are provided for several stages of forest management.
Belgium Flanders	2080/92 regulation Joint programmes for public and private owners	Direct financial instruments	<ul style="list-style-type: none"> Support for planting, income compensation, and extra support for afforesting marginal agricultural land. Variable payments depending on species (900-3700 Euro/ha) 200 - 500 Euro/ha/annum extra support for the first five years for maintenance, depending on the tree species used minimum area of 0.5 ha 	Over the period 1997 - 2000 343 private owners and 85 public owners benefited from the programme 1997 – 2000 Output: 662 ha	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			<ul style="list-style-type: none"> land must have existed as farmland before July 1992, the afforested land must stay afforested for a period of at least 20 years time Source: EFI: EVALUATING FINANCING OF FORESTRY IN EUROPE Country Level Report BELGIUM: JOINT PROGRAMMES FOR PUBLIC AND PRIVATE OWNERS 1997 - 2000 	Initial target: 12,000 ha Considerable underachievement relative to target	
Belgium Flanders	National forest assisting programs	Direct financial instruments	<ul style="list-style-type: none"> 500 Euro/ha for poplar cultivars up to 2500 Euro/ha for indigenous species (as pedunculate oak), depending on the tree species used. total afforested area should be at least 0.5ha. Same source as above 	Between 1991 - 1999 285 private forest owners obtained financial support for afforestation, 1832 private forest owners used support for reforestation Considerable underachievement relative to targets	
Belgium Walloon Region	National forest assistance programs	Direct financial instruments	<ul style="list-style-type: none"> Variable rates by species, with assistance only provided for some species (42 total) for conifers, financing only if 10 % of the regenerated area are regenerated with broadleaved species 	over the period 1991 - 1999 1249 private land owners obtained financial support	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			<ul style="list-style-type: none"> in case of planting, the minimum and maximum amount of plantation per are for each tree species should be respected regeneration of indigenous species are subsidized for cultural reasons or to enhance biodiversity agricultural land: minimum area afforested: 1 ha Source: <i>EFI: EVALUATING FINANCING OF FORESTRY IN EUROPE</i>, Country Level Report <i>BELGIUM: NATIONAL FOREST ASSISTANCE PROGRAMS</i> 		
Belgium Walloon Region	Public forestry sector: afforestation of new forest land and reforestation after cuttings	Direct financial instruments	<ul style="list-style-type: none"> practices that can be subsidized are: soil preparation before planting or natural regeneration, purchasing, transporting storage, planting, game protection, cleaning and maintenance, the first clearance by hand or mechanical, except for chemical clearance. the financial support is calculated on the costs, limited to 3470 Euro/ha Very similar financial incentives and restrictions to above program Same source as above 	over the period 1990 – 1999 1 province, 113 municipalities, around 7 health care organisations and another 6 other public institutions did use this financial support It is not clear, which part of this program refers to afforestation/refo restation according to the	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
				Kyoto Protocol	
Denmark	The Forest Act	Direct payment subsidies	<ul style="list-style-type: none"> Act has a goal to double the forest area over one tree-generation (5000 ha / yr). Subsidies are given for nature conservation in private forests, afforestation particularly for urban, recreation broad-leaf forests and forest improvement and afforestation on private land. Also planting subsidy of up to 75% of direct costs (broadleaf in target areas). 	30 -35% of target by 2000. Competition for agricultural uses constrained implementation. Disincentive EU agricultural subsidies.	
France	Afforestation/ reforestation- Law of September 30, 1946 (creation of the National Forestry Fund)	subsidies Low-interest loans Indexed and postponed loans	<ul style="list-style-type: none"> Usually 20 – 40 % of the overall expenditures interest rate ~ 0.25% covering up to 80 % of the expenditures (for individual private owners), 100 % for communes and joint private owners loans repaid to the bank when the crop is realised 	Over the period 1990 – 1998 more than 6,600 public owners have benefited from the programme (= more than 50 % of the French communes) over the period 1990 – 1998 more than 35,500 private owners benefited from the programme (almost every private owner has been helped	Efficiency: average 1990 – 1998: Financial value of output: 6,6 M Euro/an Administrative costs: 2,4 M Euro/annum

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
				through this programme) Program reached 86% of target objective	
Finland	Field Reservation Act	Direct payment of subsidies	<ul style="list-style-type: none"> Subsidies paid for suspension of agricultural production in afforested fields for up to 15 years. Initiated in 1969; subsidy increased in 1977 	Goal in 1995 was to afforest between 10,000 and 20,000 ha / yr. Actual results were 42% of goal. Currently Govt. has abandoned its afforestation programs	Shows pattern that activity very high at start of a program and falls of dramatically thereafter.
Finland	Forest Improvement Act	Direct payment of subsidies	<ul style="list-style-type: none"> Allows for 100% subsidy for the cost to afforest areas unsuitable for agriculture. Initiated in 1969 	Finland	
Finland	Act Concerning Agricultural Production Regulation and Balancing	Direct payment	<ul style="list-style-type: none"> Payment for costs of afforestation to farmers who agree to afforest fields. Initiated in 1977 		
Germany	Investment subsidies within the Joint Scheme for the	Direct payment of 100% of costs	<ul style="list-style-type: none"> Federal and State governments share complete costs for promotion of forest management on private lands. Afforestation is among the practices covered. 		Afforestation rate decreased as available land was used up.

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
	Improvement of Agricultural Structure and Coastal Protection				
Germany	Afforestation bonus	Direct payments	<ul style="list-style-type: none"> Amounts and schemes vary by State. Compensation to farmers and forest owners for loss of income due to set-aside land (up to 20 years). Amounts also vary depending on soil quality and tree species. 1991-present 		Incentive varies depending on soil quality, and tree species
Ireland	Forest Operational Programme	Compensation payments	<ul style="list-style-type: none"> Annual premium to compensate for loss of farm income due to afforestation. Negative impacts due to planting of bogs and unsuitable land 	From 1990-1997, 143,00 ha reforested	Negative impacts due to planting of bogs and unsuitable land (estimated 20% of total)
Ireland	Revised granting mechanisms	Government grants, premiums and tax-holidays	<ul style="list-style-type: none"> Attractive grants and premiums to promote afforestation. As well, returns from forestry are tax-free. Grants of C\$3100 to C\$ 8200 / ha paid for afforestation. 75% upon establishment. 25% paid after 4 years. As well, premiums of C\$185 – C\$275 / ha / year paid to non-farmers and C\$300 – C\$700 / ha / year paid to farmers. 1992- present (?) 		
Ireland	Native Woodland Scheme Element 2:	Direct financial instruments for the establishment	<ul style="list-style-type: none"> Grant payment is dependent on the achievement of the objectives set out in approved plan. Non-native species are excluded under the scheme. 	Introduced in 2002.	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
	Native Woodland Establishment	of new native woodlands	<ul style="list-style-type: none"> • Operations eligible for funding: surveys, management plan prep;, site prep, forest protection (fencing, etc.), clearance of exotic species, purchase of native stock, planting, regen, maintenance • A second instalment of 25% of total is paid four years after the first instalment, on verification of successful establishment and the achievement of the required stocking levels and species mix specified in the management plan, • Payments for oak are higher • Payments to farmers are higher than to non-farmers • Premiums are payable for 20 years in the case of farmers and 15 years in the case of non-farmers. 		
Ireland	Afforestation Grant and Premium Schemes	Afforestation grants , Forest premiums,	<p>Afforestation Grants</p> <ul style="list-style-type: none"> • Grants cover the costs associated with plantation establishment • payable after planting • payment rate determined by the type of land and the species planted. • The second instalment is payable four years after the date of planting based on a successful inspection <p>Annual Forest Premium:</p> <ul style="list-style-type: none"> • To compensate farmers and non-farmers for the loss in income earning potential from the 	Established in 1990	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			afforestation of their land <ul style="list-style-type: none"> • Payable for a period of up to 20 years in the case of farmers or 15 years for non farmers. • Payment rate determined by land status and the species planted. Minimum plantation areas: <ul style="list-style-type: none"> • A conifer plantation must be not less than 1 hectare. • A broadleaf plantation must be not less than 0.1 hectare. 		
Norway	Forest Protection Act	Direct payments	<ul style="list-style-type: none"> • Provide for Government funding of planting to around 30% (but up to 80%) of costs. • Initiated in 1965 		
Sweden	Agricultural Realignment Program	Grants	<ul style="list-style-type: none"> • Grants provided to afforestation of arable land. 	14,000 ha afforested between 1990-1993	
Sweden	Forestry Act	Legal responsibility	<ul style="list-style-type: none"> • Disused agricultural land must be reforested within three years of falling into disuse 		
United Kingdom	The English Woodland Grant Scheme (EWGS) Woodland creation grants (WCG)	Direct financial instruments	<ul style="list-style-type: none"> • The use of natural regeneration or direct seeding for woodland creation will be supported using the same WCG grant and same payment structure: <ul style="list-style-type: none"> ▪ 5 Woodland categories (standard, small standard, native, community, special broadleaved) ▪ Prerequisites: special 	A new programme, starting 2005 A proposed change to the current WGS grants is that	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			<p>conditions for stems per net hectare required at establishment and spacing</p> <ul style="list-style-type: none"> ▪ <u>Depending on</u> wood size, tree species used, purpose (i.e. designed for public access) ▪ variable payment rates for broadleaves and conifers ▪ extra payments provided for Woodland establishment within 5 miles of 100.000 people or within the Community and National Forest areas or Woodland establishment with agreement to provide for public access and where there is an identified need ▪ payments in two instalments, with 2nd paid if results are satisfactory ▪ Obligation period: Normally 10 years (in case of new woodland intended for public access that access must be allowed for 30 years) 	<p>unimproved land outside Less Favoured Areas will not be eligible for WCG. This change supports the protection of these areas and reduces the risk of their loss.</p> <p>Source: www.forestry.gov.uk/pdf/fcconsultationdoc1.pdf/\$FILE/fcconsultationdoc1.pdf</p>	
United Kingdom	The English Woodland Grant Scheme (EWGS) Farm woodland payment (FWP)	Direct financial instruments	<ul style="list-style-type: none"> • Annual payments to offset loss of income as a result of converting agricultural land to woodland with WCG support under EWGS. • The annual income forgone payments will be made over 10 or 15 years (depending on composition of woodland) 	<p>A new programme, starting 2005</p> <p>The EWGS Farm Woodland Payment (FWP)</p>	Benefit to offset loss of income - could this be incorporated into a tax incentive scheme?

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			<ul style="list-style-type: none"> • payment varies for land class - most for arable land, less for other improved land, and least for unimproved land • Agreement holders must undertake to maintain the woodland concerned for 30 years in case of mainly broadleaved plantings and 20 years in the case of mainly conifer plantings. • The minimum total area per application will be 1 hectare per farm business but this need not be planted as a single block. • Payments rates and land categories subject to review 	will replace the current FWPS (below)	
United Kingdom	Farm Woodland Premium Scheme	Annual Payments	<ul style="list-style-type: none"> • Encourages farmers to convert productive agricultural land. Makes annual payments to offset foregone agricultural income. • Payments are for 10 or 15 years. To receive the latter, afforestation must use broadleaf trees or Scots pine within the native range of Scots pine. Wood must not be harvested for 30 years. Amount of payment depends on quality of land reforested. • Amount of payments are reviewed every five years to see if income is comparable to agricultural land 	Good data on success	
United	Scottish	Direct Payments of	<ul style="list-style-type: none"> • Grants for woodland expansion. Annual payments as above and 		

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
Kingdom	Forestry Grants Scheme	costs	afforestation is subsidized between 60% and 90% of a standard cost. <ul style="list-style-type: none"> Emphasis on native woodlands on wet, nutrient poor sites. 		
Austria	Sonderrichtlinie betreffend die Umsetzung der SRL C IV and Austrian Programme for the Development of Rural Areas	Direct financial instruments for the afforestation of agricultural land	<ul style="list-style-type: none"> 60 % of the overall expenditures will be paid as well as an annual premium for compensation of income loss Only applicable in regions with low forest cover (Burgenland, Styria, Lower Austria) A fixed sum is paid, depending on the tree species planted (low for conifers, high for broadleaved species) The subsidies are paid for a maximum of 20ha/annum Afforestation has to be evaluated by a nature conservation agency Source: www.lebensministerium.at	As almost half of Austria is already covered with forest, afforestation will hardly lead to much further carbon sequestration.	
Poland	Act on Forestry	Direct financial instruments as well as lower taxes after four to five years for the afforestation of marginal agricultural land	<ul style="list-style-type: none"> The incentive can be claimed if the land is either <ul style="list-style-type: none"> infertile of low fertility flooded from time to time degraded or if it has a slope of at least 15 % The minimum area afforested must be 0.4 ha, the maximum area subsidized is 30 ha Species and density standards 	The Act on afforestation of marginal agricultural land was valid between 2001 and 2004. The afforestation	

Other Incentives					
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			defined in overall directions. <ul style="list-style-type: none"> • Afforestation defined as 70% land cover with trees • Payments/ha vary with area afforested • Higher payments if afforestation has led to cessation of agricultural activity by the owner • If the forest is damaged by the owner, payment is stopped. The owner is forced to give back more than what he got • After four to five years, the land is considered forest and lower taxes apply 	programme was very successful. There is no information about how many people have used it, but the government went out of money to pay more grants – so the initial target was more than reached.	
Chile	Various	Payments and tax subsidies.	<ul style="list-style-type: none"> • Tax exemptions for plantations, and direct payments of up to 75% of the cost of reforestation • Further payments available for additional silv. activities • Exemptions on property and inheritance taxes on reforested lands. • Special central Bank line of credit for reforestation • Planting subsidy removed in 1994 		Govt. spent \$150 m in subsidies in 20 year period prior to 2000, but this was responsible for catalyzing \$4 billion in investments.
Costa Rica	Banking system loans	Low interest “soft” loans	<ul style="list-style-type: none"> • National banking system established soft loans for reforestation with an 8% interest rate and 10 year grace period. Payment periods as long as 30 years, depending on the species planted 		

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
Costa Rica	Forestry Loan Certificates (CAFA)	Bonds for plantation establishment	<ul style="list-style-type: none"> This is a redeemable bond for small landowners with plantations of less than 25 ha. The bond was worth US\$520 per ha with 50% paid upon confirmation of contract and the remainder spread over next 4 years. 		
Costa Rica	Fondo de Desarrollo Forestal (FDF) grant	Payment of reforestation costs	<ul style="list-style-type: none"> Similar to CAFA. FDF pays the cost for the first 5 years of plantation activities. Requires participation of local farmer organizations. Organizations receive 70% of reforestation costs on the assumption that the remaining 30% of the cost will be contributed in the form of farmer's labour. 		
Costa Rica	Payment for Environmental Services (PSA)	Direct Payments	<ul style="list-style-type: none"> Landowners compensated for services that forests provide to the national and global community. Landowners receive compensatory payments for: <ul style="list-style-type: none"> Reducing greenhouse gas emissions (by fixing, reducing, binding, storing and absorbing them), Protecting water for urban, rural or industrial use, Protecting biodiversity to conserve it and ensure its sustainable use for scientific and pharmaceutical purposes, and Protecting ecosystems, forms of life, and natural beauty for 		

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			tourism and scientific purposes.		
USA	Soil Bank Program	Direct payments	<ul style="list-style-type: none"> • US Dept of Agriculture paid part of establishment costs and an annual amount of \$10 - \$12 /acre for ten years • Program was designed to take land out of agricultural production and put permanent cover on it – trees or grass • Ran from 1956 to 1960 	880,000 ha of private croplands were planted, mostly in the US South Program driven by desire to reduce surplus agricultural production and reduce federal govt agricultural subsidies	
USA	Forest Incentives Program	Cost share funding	<ul style="list-style-type: none"> • Cost share for tree planting and stand improvement • In 1996, federal program enlarged and broadened the Stewardship Incentive Program, that promotes stewardship of multiple forest resources. • 18 states also have cost share programs, sharing from 50 -75% of tree planting costs 	Cost sharing appears to have stimulated afforestation, but it is not clear how much of the cost share planting was afforestation vs. reforestation About 40% of non-industrial private planting was cost-share from 1951 - 96	
USA	Conservation	Cost share	<ul style="list-style-type: none"> • Federal govt provides 50% of planting/ establishment costs to 	920,000 ha have	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
	Reserve Program	funding	retire land from agricultural production <ul style="list-style-type: none"> • Started in 1986 • In 1990, a Forest Stewardship Program started, in which federal and state forest staff provide technical advice and plan preparation – directed at non-industrial private landowners 	planted under this program (probably from 1986 to 1999, which seems to be date of most recent info), largest area planted under any cost share program during this period	
New Zealand	Forestry Encouragement Loans	Low interest loans	<ul style="list-style-type: none"> • Loan rate of (5%) for up to a twenty year period to cover establishment costs. • Costs of establishment, including tending, spent within a five-year establishment period, were eligible. • Land area between 5 and 100 acres; • Half of loan and interest refunded after 20 years if plantation successful. • Government tinkered with program continuously. Two years after start, interest rate was lowered to 3% and interest charged only on non-refundable half of loan; 100 acre limit removed; municipal governments became eligible • Replaced after 7 years by a grant program for individual landowners and small companies; municipal 	Nearly 200 Loans were approved over the 20 years of the Grant scheme, with 20,000 ha planted.	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			governments remained eligible for loans.		
New Zealand	The future forests programme	Tradable Kyoto Protocol compliant emission units	<ul style="list-style-type: none"> • Forest owners (especially of largely marginal land) who establish new permanent 'non-harvest' commercial forest sinks will receive fully tradable Kyoto Protocol compliant emission units in proportion to the carbon sequestered in their forests • The land must not have been covered in forest as at 31 December 1989 • The new forest must be direct human induced • Emission units will be free to sell to whomever the landowner wishes • Amount of units received will be equal to the increased CO₂ stored in the forest for the period between 2008 and 2012 • It is anticipated that companies or countries with obligations under the Kyoto Protocol may be interested in purchasing emissions units. • Contracts will be in perpetuity but will be able to be changed with the mutual consent of the Parties (landowner and the Crown) • The program will get started in 2004 • After 35 years and on a continuous canopy basis, trees can be harvested 	Source: http://www.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/climate/ http://www.climatechange.govt.nz/policy-initiatives/sink-credits.html	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			<ul style="list-style-type: none"> • Clear-fell plantation forests are not included • the landowner will be required to replace emission units for the CO₂ released, plus make a penalty payment if the forest was harvested for sale outside of the allowable limits. • There are no restrictions on eligible species. • The program is principally designed to allow greater economic benefit to be derived from land, especially marginal land. 		
New Zealand	Forestry Encouragement Grants	Tree planting grants	<ul style="list-style-type: none"> • Began in 1970. • Cash grants would be paid for up to 50% of the establishment costs on approved planting plans, for individuals, trusts, small companies whose annual qualifying expenditure was less than \$200,000. • Maximum grant of \$750/ha • Minimum area of 2 ha. • Per hectare financial limits removed in 1980. • In 1982, gov't introduced a simplified grant program and eliminated forest encouragement loans • Terminated in 1984. 	Over the 13-year life of the program, nearly 3,000 grants were made, resulting in 100,000 ha planted.	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			<ul style="list-style-type: none"> Eliminated deductibility of forestry expenditures from taxable income. 		
Australia	Commonwealth Softwood Forestry Agreements (CSFA)	Loans provided to State gov'ts at favourable rates to establish and care for softwood plantations	<ul style="list-style-type: none"> General purpose of policy at this time was to become nationally self-sufficient in softwood; focus was on softwoods to replace imports and native forest harvesting Under Softwood Forestry Agreement Acts, Commonwealth was committed to provision of low-interest loans to States No interest charged for first 10 years, repayment over 20 years starting in year 15; 35-year cycles coincides with rotations Planting and tending monitored by Australian Forestry Council CSFAs were offered from 1967 to 1982 No incentives offered to private sector at this time; majority of private plantings were of <i>P radiata</i>. 	<p>Plantation area rose from 170,000 ha to nearly 900,000 ha; private sector planted 10,000 ha/yr in late 1970's, mainly for industrial pulp and paper</p> <p>Total expenditure was \$78 million (\$390 million in 2002 dollars)</p> <p>Expansion was accompanied by expansion of markets, infrastructure, R & D, and risk reduction.</p>	
Australia	National Afforestation Program; in 1989 replaced by Save the Bush and One Billion Trees programs		<ul style="list-style-type: none"> Purpose was to expand hardwood plantations, assist in land rehabilitation and afforestation Targeted to State gov't and large private growers; did not address underlying institutional obstacles or do much for smaller, non-industrial landowners Established in 1987 	Program cost \$15 million (Aus) over first five years (1987 – 92);	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
			<ul style="list-style-type: none"> • Subsequent programs had sharper focus on biodiversity 		
Australia	National Forest Policy Statement (1992)		<ul style="list-style-type: none"> • Policy statement that guides subsequent approaches – recognizes long-term nature of plantations and need for security 		
Australia	Bushcare Programme Part of Natural Heritage Trust 1		<ul style="list-style-type: none"> • Aggregation of other programs • Natural Heritage Trust restructured in 2002 to provide more focus on environmental benefits, funding raised 	funding totaled \$350 million from 1997 – 2002	
Australia		Removal of export controls	<ul style="list-style-type: none"> • Progressive removal of export controls on unprocessed wood from plantations (logs and chips) after review of forestry in 1990 		
Australia	National Farm Forestry Programme	Annuities	<ul style="list-style-type: none"> • Intended to encourage addition of tree growing into farming systems; promoted for diversification benefits and also benefited investors in annuity schemes and with plantation investments • Operated between 1996 and 2001 • Effectiveness reduced because program did not overcome initial cost req'ts and long time to maturity of investments; uncertainty over future markets and tax rates, and general lack of awareness 	Between 1995-99, establishment of farm forestry plantations rose from approx 10,000 ha to 23,000 ha	
Australia	Victoria State Govt Farm	Low interest loans	<ul style="list-style-type: none"> • Ran from 1967 to 1992 • Low interest loans with payments 	A total of 8,300 ha planted during	

Other Incentives					
Jurisdic.	Program	Incentive	Description	Dates	Success and Notes
	Forestry Programme		deferred for first 13 years, for planting softwood	the 15 years, administrative costs were high Some participants had difficulty with repayments when unable to sell thinnings	
Australia	Plantation for Australia: the 2020 vision Partners include state and national govts, Plantation Timber Assn of Aust., Aust. Forest Growers, Nat'l Assn of Forest Industry		<ul style="list-style-type: none"> Released in 1997 Designed to create internationally competitive plantation growing and processing industry, market oriented with majority of participation from private sector Intention is to treble plantation area from 1.1 million ha (1997) to 3.3 million ha Approach is increase land availability, get incentives right, improve information flow, and establish private plantation culture. 	Vision reviewed in 2002 and revision increased emphasis on social and environmental benefits, reducing Aust net emissions of greenhouse gas, contribution to rural employment, and contribution to foreign exchange	